ARCIALA Series on Intellectual Assets and Law in Asia

Kung-Chung Liu
Uday S. Racherla *Editors*

Innovation, Economic Development, and Intellectual Property in India and China

Comparing Six Economic Sectors

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ARCIALA Series on Intellectual Assets and Law in Asia

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Editors
Kung-Chung Liu
Renmin University of China
Beijing, China

Singapore Management University
Singapore, Singapore

Uday S. Racherla
Indian Institute of Technology Kanpur
Kanpur, India

ISSN 2523-708X ISSN 2523-7098 (electronic)
ARCIALA Series on Intellectual Assets and Law in Asia
ISBN 978-981-13-8101-0 ISBN 978-981-13-8102-7 (eBook)
https://doi.org/10.1007/978-981-13-8102-7

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About the Authors

Arpan Banerjee is a Scientia doctoral scholar at the University of New South Wales in Australia. He is on leave from Jindal Global Law School in India, where he serves as assistant professor and assistant dean and heads the Centre for IP & Technology Law. His areas of interest are IP law (focusing on copyright and trade mark law), media law, and entertainment law. He has published widely and received various grants and awards. In recent years, his accomplishments and engagements include being awarded the Alexander von Humboldt Foundation German Chancellor Fellowship, being co-awarded the British Academy/Leverhulme Small Research Grant, being selected for the Stanford Law School-University of Pennsylvania International Junior Faculty Forum, and winning the ATRIP writing prize for young scholars.

Dian Chen is graduate student at the School of Economics and Management, Beihang University, majoring in finance. She received a bachelor's degree in economics, and her current topic on her graduation thesis is "Empirical Research on the Impact of Margin Financing and Margin Financing on ETF Pricing Efficiency."

Xiangdong Chen is a full professor at the School of Economics and Management, Beihang University, China, in the fields of international technology transfer and innovation studies, particularly patent quality studies. His major research and teaching areas are international technology transfer, innovation management, and international business. In recent 20 years, he has been concentrated on patent and IP-based research projects and published scientific papers and books related to strategic patent resource management in Chinese market and emerging technologies related to regional innovation studies. He received his bachelor's degree in engineering and master's degree in philosophy of technology (Northeast University in China) and PhD in economics and social science (University of Potsdam, Germany), and he was visiting scholar at Manchester Business School in UK and visiting professor at University of Potsdam in Germany, Portland State University in the USA, Maastricht University in the Netherlands, INPI and typical universities in Brazil, etc., on various research over patents.

Celine Melanie A. Dee practices intellectual property, technology, and corporate law in the Philippines. Her research focuses on intellectual property and privacy protection in light of technology, innovation, and development. She received an LLM in information technology and intellectual property laws (with distinction) from the University of Hong Kong.

Biswajit Dhar is professor at the Centre for Economic Studies and Planning in Jawaharlal Nehru University, New Delhi. Prior to joining the university, he was the director general of Research and Information System for Developing Countries, a Government of India think-tank. He also helped in establishing the Centre for WTO Studies, established by the Government of India, and served as its head.

Dhar has been working as a researcher and a policy adviser on technology policy and intellectual property rights for more than three decades. He has served as a member of several expert committees of the Government of India and has also represented India in bilateral and multilateral negotiations, including the World Trade Organization, the UN Framework Convention on Climate Change, and the World Intellectual Property Organization. He has been nominated in several international expert groups of the United Nations Environment Programme and the World Health Organization.

Kaidong Feng received his doctorate from SPRU at University of Sussex, UK, in 2010. He currently works as an associate professor of public policy in School of Government at Peking University, Beijing, China. His research interests focus on China's industrial development, innovation policy, and technological learning of developing country firms.

Juan He is an associate professor of law and an associate director of Division of Social Science and Management of Graduate School at Shenzhen, Tsinghua University. Meanwhile, she is an expert of Intellectual Property Office of Shenzhen Municipality, a legal expert of Shenzhen Law Society, an expert of trial quality assessment of Shenzhen Qianhai Cooperation Zone People's Court, and an expert of mediation of intellectual property rights dispute of Shenzhen Nanshan District People's Court. Her research interests are in the area of intellectual property law and competition law. She holds LLD degree from Peking University, LLM and LLB from Tsinghua University, and BE from Hefei University of Technology. She has accomplished postdoctoral research at Tsinghua University and Erasmus postdoctoral research at University of Turku, Finland.

Yangkun Hou Doctor of Law, is a researcher on IP Law, associate professor of Law School of Beijing Institute of Technology, deputy director of IP Research Center, and visiting scholar of Stanford University Law School. He has more than 20 years of experience as a lawyer and is qualified as an engineer.

He has published more than 10 academic monographs and has published more than 40 academic papers. He has been invited to participate in the legislative work of the Standing Committee of the National People's Congress, the Standing

Committee of the Beijing Municipal People's Congress, and other government departments. He is an expert of the Expert Advisory Committee of the Intellectual Property Case Guidance Research (Beijing) Base of the Supreme People's Court of China, an expert of the National Science and Technology Department, an expert of the Ministry of Education, and an expert of the Beijing Municipal Science and Technology Commission.

Weijie Huang LLB and LLM (Sun Yat-sen University), is a PhD candidate in the Faculty of Law, University of Hong Kong. She got the 2017–2018 Fulbright-RGC Hong Kong Research Scholar Award and studied in University of California at Berkeley, School of Law, as a visiting student researcher from September 2017 to June 2018. Being selected to a PhD training program, she also studied in Singapore Management University, School of Law, for 6 months. Her research interests include copyright, user-generated content, media law, and law and economics. She got the first prize in 2016 Guangdong Province Law Society-Civil & Commercial Law Association Conference and the Outstanding Paper Award in 2017 China Law and Economics Forum. She also ranked Top 10 in 2018 ATRIP Essay Competition. She has involved in many research projects including "Digital China" committed by Australian Research Council and "Joint Research Project on Prosumerism and IP" funded by Eurasia-Pacific Uninet.

Reji K. Joseph is associate professor at Institute for Studies in Industrial Development, New Delhi, India. His broad area of specialization is in international trade, investment, and innovation. He has to his credit papers on trade policy making, WTO TRIPS Agreement, and access to medicines, patents, and innovation, international investment agreements, and a book on Indian pharmaceutical industry.

Malathi Lakshmikumaran has more than 30 years of experience in the field of biochemistry and molecular biology with an expertise in plant genomics, DNA fingerprinting, and genetic transformation. She has successfully supervised several PhD students in the area of plant molecular biology. She has more than 100 publications to her credit in various international and Indian journals.

Prior to joining the firm, she served as the head at the Centre for Bioresource and Biotechnology Division in The Energy and Resource Institute (TERI) for a period of 17 years. At present, she serves as an executive director and heads the IP division of the firm. She is a registered patent agent and has been actively engaged in preparing, filing, and prosecuting of patent applications, both in India and abroad. She mainly works on pharmaceutical, chemical, and biotechnological patent applications. She advises clients on plant variety protection and registration. She is actively involved in the area of biodiversity and traditional knowledge.

Malathi also undertakes extensive work for start-ups and incubates, especially with incubates in C-CAMP and IIT Delhi, advising them on patents and freedom to operate opinions.

Junran Li is currently a PhD student of public administration at Peking University, Beijing, China. Her research interests include science and technology policy, government–enterprise relationship, and evolution of national innovation systems.

Ruixi Li is a lecturer in the Department of Business Administration, School of Economics and Management, China University of Labor Relations. Her areas of research interest include technology learning, technological innovation, and management. She received her PhD degree from Beihang University in 2018, major in management science and engineering; the master's degree at School of Business, Nanjing Normal University, major in economics; and bachelor's degree in school of liberal arts and science, Henan University, major in economics. She has participated in projects of National Social Science Fund and National Natural Science Foundation of China and published articles in journals of *Studies in Science of Science*, *China Science and Technology Forum*, and China's Economic Issues.

Yahong Li JSD (Stanford), is an associate professor and director for LLM Program in IP/IT at the Department of Law of the University of Hong Kong (HKU). She specializes in IP law with a focus on cross-disciplinary study of IP, culture, and technological innovation. She is an author/editor of, *inter alia*, *Patents and Innovation in Mainland China and Hong Kong: Two Systems in One Country Compared* (Cambridge University Press, 2017), *Copyright, Internet and the Balance of Rights* (HKU Press, 2016), *Imitation to Innovation in China: the Role of Patents in Biotech and Pharmaceutical Industries* (Edward Elgar, 2010), and numerous peer-reviewed journal articles. She is a member of ATRIP, a council member of China IP Law Association, and an honorary advisor of Hong Kong Institute of Patent Attorneys.

Yanbing Li is a PhD candidate in law at the University of Freiburg and doctoral researcher at the Max Planck Institute for Innovation and Competition in Munich, Germany. She has graduated from the China University of Political Science and Law and holds an LLM in German law from University of Heidelberg and an LLM in European intellectual property law. She was Yong Pung How Research Fellow at the Applied Research Center of Intellectual Property Assets and the Law in Asia (ARCIALA), Singapore Management University from 2015 to 2016 and external research fellow from 2017 onward. Prior to joining SMU, she was visiting scholar at the Queen Mary University of London in 2013. Her current research interests include international and comparative copyright law and media and entertainment law.

Chuntian Liu is professor of Law and academic supervisor for LLD Candidates at Renmin University of China (RUC). He is founding dean of the RUC Intellectual Property (IP) Academy and chairman of the China IP Law Society. His specialty is intellectual property law.

Liu has published over 60 articles at leading law journals such as the *Social Sciences in China, China Legal Science*, etc. Since 1980, he has been actively

participating in the legislation of China's Copyright Law, Trademark Law, Patent Law, and Anti-Unfair Competition Law. A number of his viewpoints have been well taken and quoted in the legislative documents. He also contributed to designing the National Intellectual Property Strategy of China. In 1985, he was the first professor to teach in-depth lectures on the IP Law in China, and he has been a key pioneer and architect of China's IP law higher education system.

Kung-Chung Liu studied law at the National Taiwan University where he received the degrees of Bachelor of Law and Master of Law. He later obtained his Doctor of Law degree from the Ludwig Maximilian Universität (University of Munich), Germany. Kung-Chung has more than 28 years' and 18 years' experiences in the intellectual property law field and telecommunication and Internet law, respectively. He visited Singapore Management University between April 2014 and June 2015 and found the Applied Research Center for Intellectual Assets and the Law in Asia (ARCIALA). He joined SMU as Lee Kong Chian Professor of Law (Practice) in 2017 after he retired as research fellow from Institutum Iurisprudentiae, Academia Sinica, Taiwan. His academic credential is widely recognized in Asia, as he is also co-appointed full faculty member of the Graduate Institute of Technology, Innovation & Intellectual Property Management; National Chengchi University (2010–), Taiwan; and Renmin University of China (2017-).

Miaochen Lv received her BS at Beihang University of Financial Engineering (2011–2015) and received her MS degree at Beihang University of International Trading (2016–2017). She is pursuing her PhD degree in the school of Economics and Management at Beihang University majoring in management science and engineering. Her current research interests include patent innovation, political uncertainty, and corporate finance. Until now, she has published one journal paper, "Political uncertainty and corporate debt financing: empirical evidence from China" in Applied Economics, and two conference papers, "The Impact of Carbon Emissions Trading on Corporate Innovation-Evidence from China" and "A literature based comparative study on ICT between China and India," in the 14th International Conference on Industrial Management.

Yide Ma is Wenlan distinguishing professor at Zhongnan University of Economics and Law, vice chairman of China IP Law Society, and delegate member to the National People's Congress of China. His specialties are intellectual property law and civil law.

He has published over 80 articles on core journals, such as *Social Sciences in China*, *Chinese Journal of Law*, and *China Legal Science*, and undertaken over 20 national-level research projects, which are highly significant among Chinese academic community. He has played a significant role in the launch and implementation of the National Intellectual Property Strategy and the National Innovation-Driven Development Strategy, for which he himself was one of the framers who had helped draft the National Intellectual Property Strategy Outline. Many of his proposals have been adopted into implementation by Communist Party of China Central

Committee, National People's Congress, and State Council, which strongly advanced the deployment of China IP industry.

Renuka Medury is an intellectual property lawyer from India. She has significant experience in the drafting and review of IP-related contracts and due diligence work. She graduated from the Duke University School of Law, USA, with an LLM in "Law & Entrepreneurship" and undertook a practical experience component with the Office of Licensing & Ventures, Duke University. She previously completed an LLM (Intellectual Property Specialization, Law & Technology Certificate) from the Boalt School of Law, University of California, Berkeley, USA, in 2012.

Renuka worked as a research associate with the Applied Research Centre for Intellectual Assets and the Law in Asia (ARCIALA), Singapore Management University, between 2017 and 2018, and is an external research fellow with ARCIALA. She is currently working as part of the "Commercial IP" team of a prominent law firm in the National Capital Region, India.

Smita Miglani is currently working as a research associate at ICRIER, New Delhi. She has over 9 years of work experience in economic policy-oriented research in India. She has published work in reports, working papers, books, and refereed journals across a number of sectors. Her research has contributed to India's negotiating strategies in signing bilateral trade and investment agreements and policymaking at the domestic level.

She holds an MPhil degree in economics from Jawaharlal Nehru University, Delhi, and is trained in the application of advanced economic analysis and econometrics. Her broad areas of research interest include international trade and investment, finance, and industry sector studies.

Uday S. Racherla served as the professor of Innovation and Intellectual Property Management at IIT-Kanpur, India, during 2011–2017. Prior to this, he taught briefly at the Carey School of Business, Johns Hopkins University, USA. Prior to the academic stint, he had more than 15 years of R&D experience in Fortune 500 companies in USA. During 1992–2011, he held many top executive positions—including senior director of Innovation at PepsiCo, worldwide director of R&D at S. C. Johnson, director of R&D at New Skin Enterprises, and other senior executive positions at Unilever—wherein he invented, innovated, patented, and commercialized many new technologies in the USA, Europe, India, Japan, and China. He obtained his PhD degree under a Nobel Laureate from Purdue University and an executive MBA from the Kellogg School of Management, Northwestern University. He published over 120 research papers, authored a book, served as an editor of two books, and obtained 12 patents.

Shreyashi Ray is a legal researcher and policy consultant from India. She worked as a research fellow at the Centre for Innovation, Intellectual Property and Competition, Delhi, from 2016 to 2018, where she focused on assessment and legal/policy recommendations pertaining to open science in the Indian context. Currently,

she is a consultant with the district administration of Ranchi, Jharkhand, and is responsible for planning and monitoring the implementation of health rights in mining-affected regions. She has previously worked on intersections of law with gender, sexuality, and impoverishment. She has keen interest in the convergence of research, data analysis, and policy implementation in the area of human rights.

Arul George Scaria is an assistant professor of Law and co-director of the Centre for Innovation, Intellectual Property and Competition (CIIPC). He is also an affiliate faculty of the CopyrightX program, which is a course offered each year from January to May under the auspices of the Harvard Law School, the HarvardX distance-learning initiative, and the Berkman-Klein Center for Internet and Society, Harvard University. He did his doctoral research at the International Max Planck Research School for Competition and Innovation, Germany, and postdoctoral research at the Catholic University of Louvain (UCL), Belgium. He has two single authored books to his credit—*Ambush Marketing: Game within a Game* (Oxford University Press, 2008) and *Piracy in the Indian Film Industry: Copyright and Cultural Consonance* (Cambridge University Press, 2014). His key areas of interest and specialization are science and technology policies, open movements, intellectual property law, and competition law.

Juanjuan Sun received her PhD in food law at Nantes University of France. Currently, she is postdoctor as well as a researcher of Center for Coordination and Innovation of Food Safety Governance at Renmin University. Her research interests include regulatory theory, food law, and agricultural law. Experiences specified in food safety regulation include participation in European Food Law Program Lascaux under the EU 7th Framework Programme from 2009 to 2015. When it comes to China, there are legislative activities in revision of food safety law and law on quality and safety of agricultural product, research programs for formulating department rules on risk communication and credit system in the field of agro-food, and evaluation for food law enforcement and food safety city construction. Besides, there are translated books like the European Food Law and European Food Law Completion and published books like Building food safety governance in China.

Sunita Tripathy is associate professor at the Jindal Global Law School, O.P Jindal Global University, India. Email: stripathy@jgu.edu.in. She is currently conducting doctoral research under the prestigious grant at the European University Institute, Italy, and was formerly a NALSAR-Western Master of Laws scholar at the University of Western Ontario, Canada. She has been a teaching and research fellow at the University of Washington School Of Law, Seattle; the Singapore Management University School of Law, Singapore; and Nanjing University of Information Science and Technology, China. She enjoys advanced scholarship about law and its role in the society with special focus on its nexus with technology, intellectual property, and public policy. She has published on issues interfacing intellectual property law and competition policy, led seminars and lecture series on traditional and

alternate approaches to intellectual property protection and management, and has spoken in several intellectual property conferences and forums in India and overseas.

Ruolan Wang graduated from Beihang University, majoring in finance, and received a master's degree. She obtained the Bachelor of Science degree with major in mathematics and applied mathematics. She has participated in the project of National Natural Science Foundation of China on Innovation Management Mechanism Research Based on Complex Product Systems and participated in the research work of the project group of "Postgraduate Case Teaching." The research direction of graduation thesis is that the composition analysis and influencing factors of ETF bid-ask spread in China.

Lizhou Wei is a PhD candidate in law at Ludwig Maximilian University of Munich Germany. He holds an LLB degree from the China University of Political Science and Law and an LLM degree in German law in Munich. He specializes in intellectual property law, unfair competition law, and civil law. His publications mainly focus on issues of trademark law, law on combating unfair competition, and intersection between IP and competition law.

Shaofang Xue graduated from the School of Economics and Management, Beihang University, majoring in Industrial Engineering (Engineering Management) from September 2014 to July 2018, and was awarded the degree of Bachelor of Management. In 2018, she was awarded the title of outstanding graduate in Beijing. Currently she is a master student of the same school, majoring in energy economics and management. As a member of the Center for Energy and Environmental Policy Research (CEEP), she attended the 6th IAEE Asian Conference in Wuhan, China, from November 2 to 4 2018, and gave a report entitled *How Endowment Influences Energy Consumption Mix: An International Comparison*.

Lingzi Yang graduated from Beihang University with major in international business. He did his postgraduation in intellectual property with his supervisor professor Chen.

Chen is a man of great wisdom and has offered him much guidance which makes him go far. He was highly inspired by him at each of his research stage. His awareness of the significance of information technology industry in China just stemmed in his idea "Technical innovation changes world economy."

Currently he is doing a custody-related job based in Shanghai and still has every enthusiasm of feeling and understanding how innovation changes our life.

Haoran Zhang is PhD student at Law School of Renmin University of China. He studied law in Zhongnan University of Economics and Law (LLB), Beihang University(LLM), and studied at Leibniz University Hannover(IN SITU Program). After his master's degree, he worked as a lawyer at Beijing Zhinuo Law Firm and handled several famous patent and trademark cases. He also worked as an assistant

researcher at Zhongguancun Intellectual Property Strategy Institute and provided opinions for government departments and companies. His specialties are intellectual property law (in particular patents), competition law, and internet law. E-mail: hr.zhang@ruc.edu.cn.

Wenjuan Zhang is an associate professor and assistant dean for International Collaborations of the Jindal Global Law School in India. She helped the O.P. Jindal Global University found the Center for India-China Studies in October 2014, which is one of the few most active civil-society-based think-tank on comparative studies, university-based intellectual initiatives related to India and China. She was a visiting scholar of Yale Law School in 2012 and of Columbia Law School in 2006. She had her Marc Haas fellowship with the Brennan Center for Justice of NYU School of Law in 2015 and her PILNET Fellowship in 2006–2007. Before joining the JGLS, she served as vice director of Zhicheng Public Interest Lawyers, the biggest public interest law organization in China. She has been a well-respected legislative and policy advisor on child rights, civil society development, and public interest law in China.

Introduction, Summary, and Some Inferences

Kung-Chung Liu and Uday S. Racherla

Abstract

India and China make a perfect comparison pair in the area of IT industry, with each having its unique strength and potential for cooperation and synergy. Due to heavy involvement of Indian IT firms in software outsourcing arrangement by MNEs, the IP or patent resources are not important. This is especially true when compared with Chinese IT firms, which have much larger patenting volume (compared with other manufacturing sectors). Film industry in India and China has grown despite piracy. In other words, it prospered with little or no copyright protection. More importantly, piracy in China and India did not kill the content industry, film and music alike, but probably helped in building the customer base and cultivating future demand, which might not be true for a small economy with a sophisticated audience such as Hong Kong. India can look at China to find IT means for delivery and payment of cinematographic content. India and China make a perfect comparison pair in the pharmaceutical industry as well. This time around, China can learn much from India. Although there is an increase in the number of patented drugs in the pharmaceutical industry in China, patents have made relatively low contribution to the industrial value, and IP held by Chinese

Special thanks to two of the first author's PhD students at Renmin University of China, Zhang Haoran and Liu Jianchen, and Professor He Jun, Graduate School at Shenzhen, Tsinghua University, for their help in collecting and analyzing relevant materials.

K.-C. Liu (✉)
Renmin University of China, Beijing, China

Singapore Management University, Singapore, Singapore
e-mail: kcliu@smu.edu.sg

U. S. Racherla
Indian Institute of Technology Kanpur, Kanpur, Uttar Pradesh, India
e-mail: udays@iitk.ac.in

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_1

firms is less competitive compared with that of foreign companies. In contrast, major Indian generic companies continue to invest sizeable shares of their sales turnover in R&D, which was manifest in their patenting behavior. They were more active in filing patent applications in foreign jurisdictions, but significantly less so in domestic patenting. The Indian automobile industry's absorption of global best practices has been slower than its Chinese counterpart. Strategies of firms in the Chinese auto industry provided a boost to technological learning more quickly and broadly than in India, especially in the electric vehicle sector. India can benefit from learning from China. IP has a relatively limited role in the development of the automobile industry in India and China.

Keywords
Film · IT · Pharmaceutical · Sharing economy · Automobile · Plant varieties · IP · Innovation · India · China

1 Background

In October 2014, ARCIALA held a workshop on "The Actual Role of IP in the Technological and Business Innovation in India and China" with an aim of bridging the monolithic elephant and dragon. This workshop was the first of its kind, though small in scale, and led to the publication of the book *Innovation and IPRs in China and India—Myths, Realities and Opportunities* in 2016.[1] It was felt that the topic is worth further exploration.

As a follow-up ARCIALA co-hosted a 2-day workshop with Renmin University of China, Jindal Global University (New Delhi, India), and the German Max Planck Institute for Innovation and Competition on "Innovation, Economic Development and IP in India and China" on September 27 and 28, 2016, with expanded ambit and refreshed focus. This workshop was more of a preparatory nature, as it was about searching for a research framework, topics, questions, and approaches.

The workshop strived to examine the development of industries which are reflective of the innovation and economic development of the two giant economies or of vital importance to them. During that examination, it was asked why certain industries have developed in one country and not in the other and what role state innovation policy and/or IP policy has played. Is it causal, facilitating, crippling, co-relational, or simply irrelevant? What can India and China learn from each other, and is there any possibility of synergy, especially given that China is aging rapidly while half of the population of India is under 25?[2]

[1] Kung-Chung Liu/Uday S. Racherla (ed.), Innovation and IPR in China and India—Myth, Realities and Opportunities, Springer 2016.

[2] According to Wikipedia (https://en.wikipedia.org/wiki/Demographics_of_India), more than 50% of India's population are below the age of 25 and more than 65% are below the age of 35. It is expected that, in 2020, the average age of an Indian will be 29 years, compared to 37 for China and

Six topics for this workshop were chosen: Innovation and IPR Policy, Open Innovation: Peer Production and the Sharing Economy, Film Industry, Software Industry, Pharmaceutical Industry and Developments in the Protection of Plant Varieties and Food Security. The width and depth of this study went beyond the domain of legal academics. Therefore, economists and management professors were invited to speak as well.

After the workshop, it was recognized that a solid empirical study on one specific industry in India and China should be first conducted as a pilot project, which can serve as a model for other study groups on different industries. The information technology (IT) industry was chosen[3] given its vital importance to innovation and economic development in China and India. This pilot project was funded by the Max Planck Institute for Innovation and Competition and set out to answer the following questions:

(1) Why have IT services, business process outsourcing (BPO)/business process management (BPM), and the software industry developed in India and not in China?
(2) Why has the hardware industry developed in China and not in India?
(3) What role has state innovation policy played? Is it causal, facilitating, crippling, co-relational or simply irrelevant?
(4) What role has national IT infrastructure played?
(5) What role has IT sui generis legislation played?
(6) What role has IP (national policy, laws, rights, and adjudicated cases) played? Is it causal, facilitating, crippling, co-relational, or simply irrelevant?
(7) What can India and China learn from each other?

In addition, we have convened another six study groups to continue our research topics of the 2016 workshop with recalibration: (1) IP codification and innovation governance, (2) film industry, (3) pharmaceutical industry, (4) plant varieties and food industry, (5) automobile industry, and (6) peer production and the sharing economy.

On December 18–19, 2017, we held a sequel conference on Innovation, Economic Development and IP in India and China in Renmin University of China in Beijing. The seven study groups got together and discussed their initial findings. Two high-ranking judiciary members from India were invited and could not come due to internal rules. Their presence would have greatly enhanced our endeavor.

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48 for Japan.

[3] We have chosen to focus on IT industry, rather than on information communication technology (ICT) industry, as India and China do not make a good pair for comparison. ICT includes (tele) communication, which is highly regulated in China and not open to competition, and innovation can only happen under constraints. In contrast, (tele)communication is less regulated in India. However, the present book has cited many studies that have targeted ICT and has to make necessary adjustments to make its statement focus on IT.

2 Methodology

The project is an interdisciplinary research, in which legal, economic, and management acadmics corroborate and cross-fertilize. Equally important, this project is a cross-country study, in which we compare and contrast China and India. Last but not least, this is an undertaking to explore the relationship between innovation, economic development, and intellectual property in the actual context of India and China in six specific industries.

3 Summary of the Findings of the Seven Study Groups

3.1 IP Codification and Innovation Governance

IP laws as they now are stand generally quite in isolation from each other and lack overarching guiding principles to lead coherent legislation, interpretation, and application of individual IP provisions when dealing with similar or even the same topics, such as exhaustion, fair use, compulsory license of IP rights, damages, etc.[4] Therefore, some national states have made efforts to codify IP laws either into one combined piece of law or into their respective Civil Law code, whether in existence or under construction. Admittedly, these countries are only a minority. Yet, they point out the challenging questions of why some of the same legal issues are dealt with differently across different IP laws within one country. Is it because of ignorance of other IP laws? Is it because of lobbying and under-table exchange of interests between lobbyists? Is it because of unspeakable foreign pressure? Can codification help alleviate the inconsistency or even arm-twisting of IP laws?

In addition, codification of IP laws has a China-specific meaning. China, although a latecomer in the realm of IP, has skyrocketing IP numbers in the last decade with all kinds of state funding and promotion schemes, to the extent that people start to fear for the alienation of IP laws and rights, the remaining space for free and fair competition, and the ramifications of comprehensive state intervention for the rule of law in China. Chapter 2 argues passionately for the codification of IP laws into the future Civil Law code of China, which could even offer some lessons for common law jurisdictions such as India.

[4] In Japan, however, the Trademark Act applies many articles of the Patent Act by analogy. For example, Article 13 provides:"(1)The provisions of Paragraphs (1) to (4) of Article 43, 43–2(2) and (3) of the Patent Act shall apply mutatis mutandis to an application for trademark registration… (2) The provisions of Articles 33 and paragraphs (4) to (7) of Article 34 (Right to obtain a patent) of the Patent Act shall apply mutatis mutandis to the rights deriving from an application for trademark registration." Article 35 further provides: "Article 73 (co-ownership), 76 (Lapse of patent rights in absence of heir), 97(1) (waiver), and 98(1)(i) and 98(2) (Effect of registration) of the Patent Act shall apply mutatis mutandis to trademark rights. In this case, the term "transfer (excluding those by general succession including inheritance)" in Article 98 (1)(i) of the Patent Act shall be deemed to be replaced with "division and transfer (excluding those by general succession including inheritance)."

Chapter 3 looks into the most fundamental, yet often neglected, innovation infrastructure of India and China, namely, the constitution and its governance and power structure and distribution, and tries to identify its impact on their respective national innovation. This chapter rightly considers the wider setting, especially the shared value and power structure, which is highly relevant to the National Innovation System (NIS). India and China believe in socialism for modernization and have put socialism into the preamble of their constitutions but follow different schools of socialism, Fabianism for India and Marxism and Leninism for China.

Broadly speaking, the different versions of socialism substantially influence their ways of pursuing social revolution and social justice, which have different impacts on the social foundation of national innovation capacity. Following its non-violent strategy of civil disobedience for the independence movement, the social revolution after independence in India was also through non-violent means, mainly through universal adult suffrage. In pursuing social justice, India has institutionalized a credible set of checks and balances through electoral democracy plus independent judicial review, which on the other hand can slow down the process of innovation to a less optimal level.

However, China has followed Leninism, with violent revolution for social emancipation. The radical social transformation has helped China build a wider setting for innovation such as strong awareness of social equality, access to health and education, and rapid development of physical infrastructure. China's centralized power and policy-oriented administration make government responsive to and flexible in promoting innovation but at the costs of insecurity and uncertainty caused by the low level of rule-based institutionalization. Although India has lagged in most key economic indicators compared to China, the gradual social change has saved India from dramatic political turbulence and from uncontrolled economic and social transformation as well.

3.2 IT Industry

India and China make a perfect comparison pair in the area of IT industry, with each having its unique strength and potential for cooperation and synergy.

3.2.1 Current Status

China

1. IT Services and BPO/BPM

The estimated revenue of both IT services (mobile apps, e-commerce, online gaming, cloud computing) and BPO/BPM for 2014 was US$117 billion.[5] That

[5] EU SME Centre/China-Britain Business Council, Sector Report, The ICT Market in China, 2015, available at: http://ccilc.pt/wp-content/uploads/2017/07/eu_sme_centre_report_-_the_ict_market_in_china_update_-_july_2015.pdf

figure is estimated to have more than doubled in 2018, reaching US$276.3 billion. The main players are Tencent, Baidu, Alibaba, Netease, and JD.com, with market value estimated to have reached US$ 1454.4 billion in 2018.[6]

2. Software[7]

According to the Ministry of Industry and Information Technology of China (MIIT), the software industry can be divided into six segments, namely software products, system integration, operation services, embedded software, IT consulting, and IC design. Total revenue reached around US$ 815.8 billion in the first 11 months of 2018 (up to November) and about US$ 890 billion for the whole of 2018. Main players include Kingdee, ZTE, Neusoft, Founder Group, and Haier.

3. Hardware[8]

China's hardware industry (also known as electronic information manufacturing industry) mainly includes computer manufacturing, communication equipment (like mobile phone) manufacturing, electronic components manufacturing, and electron device manufacturing. Total revenue of the industry is about US$ 2.1 trillion in 2018. According to Canalys, China's client PC (including desktops, notebooks, two-in-ones and tablets) shipments will reach 88.6 million units and are expected to grow at a compound annual growth rate (CAGR) of 3.3% to reach 101.1 million units in 2019. Main players include Lenovo, Founder Group, Haier, Tsinghua Tongfang, and Xiaomi.

4. IT as a Whole[9]

The Chinese IT industry has developed at a high speed, and its structure was becoming more and more reasonable in 2017. Its main business income was over US$ 2.8 trillion (including communication industry), marking an 11% increase on a year-on-year basis. The total revenue of the software industry was about US$800 billion and increased 13.9% compared with 2016. The total revenue of the

[6] China Academy of Information Communication Technology: A Report on the Development Trend and Business Index of Chinese Internet Industry, available at: http://www.caict.ac.cn/kxyj/qwfb/bps/201807/P020180710555374944625.pdf

[7] MIIT, The Economic Operation Situation of Chinese Software Industry in 2018 (January to November), available at: http://www.miit.gov.cn/n1146312/n1146904/n1648374/c6564586/content.html

[8] MIIT, A Research Report on the Comprehensive Development Index of Chinese Electronic Information Manufacturing Industry, available at: http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057511/n3057518/c6512738/content.html, and http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057511/n3057518/c6529823/content.html

[9] Digital China Union: Development Report of Chinese IT Industry for 2017, published at Chinese IT Leaders Summit Meeting (March 2018), pp. 17–18 (statistics of the whole Chinese IT industry for 2018 will not be available until March 2019).

electronic information manufacturing industry, around US$ 1.96 trillion, occupied a larger portion of the whole Chinese IT industry, about 71.1%. Within the electronic information manufacturing industry, the total revenue of electronic components and electron devices grew at the highest speed and increased 17.8% and 18.2%, respectively.

India

India Brand Equity Foundation (IBEF[10]) classifies IT (or IT-enabled service industry (ITeS)) into four main components: IT services, BPO/BPM, software products and engineering services, and hardware. The 2018 Indian IT and ITeS Industry Report published by IBEF shows the following figures[11]:

1. IT Services

Market size: US$ 86 billion during 2018. Over 81% of revenue comes from the export market. BFSI (banking, financial services, and insurance) continues to be the major vertical segment of the IT sector. IT services made up around 51.7% of the Indian IT sector revenues in 2018.

2. BPM

Market size: US$ 32 billion during 2018. Around 87% of revenue comes from the export market. The BPM industry market size is to reach US$ 54 billion by 2025. The BPM segment made up around 19.2% of the Indian IT sector revenues in 2018.

3. Software Products and Engineering Services

Market size: US$ 33 billion during 2018. Over 83.9% of revenue comes from exports.

The software products and engineering services segment grew 10.5% in 2017. It made up around 19.8% of the Indian IT sector revenues in 2018.

4. Hardware

Market size: US$ 15.4 billion in 2018. The domestic market accounts for a significant share. The segment made up around 9.3% of the Indian IT sector revenues in 2018.

[10] IBEF is a Trust established by the Department of Commerce, Ministry of Commerce and Industry, Government of India. IBEF's primary objective is to promote and create international awareness of the Made in India label in markets overseas and to facilitate dissemination of knowledge of Indian products and services.

[11] Available at https://www.ibef.org/download/it-ites-dec-2018.pdf

5. IT as a Whole

Revenue reached US$ 167 billion and exports stood at US$ 126 billion in 2017–2018. Export revenue from the digital segment forms about 20% of the industry's total export revenue, which is expected to grow 7–9% year-on-year to US$ 135–137 billion in 2019. IT service exports are projected to add US$ 10 billion in 2019 to reach US$ 126 billion. Moreover, revenue from the digital segment is expected to form 38% of the total industry revenue by 2025. The IT industry employs nearly 3.97 million people. The computer software and hardware sector attracted cumulative foreign direct investment (FDI) inflows worth US$ 32.23 billion between April 2000 and June 2018, which ranks second. India has extended tax holidays to the IT sector for software technology parks of India (STPI) and special economic zones (SEZs). Furthermore, the country is providing procedural ease and single window clearance for setting up facilities.

3.2.2 Major Findings

Chapters 4 and 5 have come to the following major findings.

Typical differences among IT companies in the two countries include:

1. Indian companies enjoy high international market penetration (high-end international markets in the IT service sector), while Chinese companies control low- and mid-end international markets in the manufacturing sectors.
2. Close connections between manufacturing and service sectors in China, which are lacking in India, may determine the potential competitiveness of companies in the industries.
3. China and India have followed different development paths in IT evolution. In China's case, it is forward integration, as it has combined the domestic and international markets. In India's case, it is backward integration, as it started from international markets and developed back to the domestic market.
4. Due to heavy involvement of Indian firms in IT software outsourcing arrangement by MNEs, the IP or patent resources are not important. This is especially true when compared with Chinese firms, which have much larger patenting volume (compared with other manufacturing sectors) in IT.

Reasons for the abovementioned differences probably lie in the following:

1. The Indian IT industry, both the hardware and software subsectors, would not have thrived without the strong government policy support, ranging from opening up for foreign investment well before the government officially adopted the policy of economic reforms in the early 1990s, duty-free import of computer systems for software export purposes, 100% foreign-owned enterprises for soft-

ware exports operations were permitted, and the establishment of the software technology parks with government support.[12]

2. In India, national-level patent strategies in promoting public welfare-based litigation for Indian firms in the international community, maintaining a preventive patent database, etc. have protected Indian firms from patent snatching by non-Indian entities. Indian firms can also respond quickly and effectively to IP infringement claims by foreign companies through a highly protective IP system locally. In this regard, China seems to lag behind India, as China's National IP Strategy emphasizes more the creation and exploitation of IP rights by private sectors.
3. India's R&D spending remained sluggish. Indian firms are weaker in self-owned IP assets in IT industries, in both hardware and software. In fact, based on the high volume of outsourcing arrangements by Indian firms, self-owned IP assets are not important for Indian companies in IT industries, particularly in the software sector. In general, the Indian IT industry has not contributed to indigenous technology development.

3.3 Film Industry

Film industry in India and China has grown despite piracy, and India can look at China to find IT means for delivery and payment of cinematographic content.

3.3.1 Current Status

China

After 40 years of market liberalization, China now has a booming film industry, despite high piracy. The number of produced feature films increased 10 times from around 40 in 1997 to 402 in 2007, and annual production ranked third worldwide after India and the USA. In 2015, the top ten private distribution companies made up 84.9% of the market in domestic films distribution, contributing RMB 22.98 billion in box office revenue and 52.1% of the total box office revenue in 2015. China's cinema is approaching a mega-industry. The number of cinema screens increased to 41,179 in 2016, which was for the first time more than those in the USA. All kinds of macro reforms have greatly improved the productivity and market adaptability of Chinese film production. Noteworthy is that China enacted in 2016 the Film Industry

[12] In 2000, India enacted the Information Technology Act (IT Act), which can mislead people into thinking this law is to promote IT technology. Rather, the IT Act is limited to providing legal recognition for transactions carried out by means of electronic data interchange and other means of electronic communication, commonly referred to as "electronic commerce." For an analysis of the relationship between the IT Act and Indian Copyright Act, see Raman Mittal, Actual Knowledge for Secondary Liability of Internet Intermediaries for Third-party Content Means Knowledge Based on A Court Order under Indian Information Technology Act in Kung-Chung Liu (edited) Annotated Leading Copyright Cases in Major Asian Jurisdictions, City University of Hong Kong Press, forthcoming 2019.

Promotion Law to confirm and update the ongoing development directions of Chinese cinema in the form of law.[13]

Equally interesting is the film industry in the Special Administrative Region of China, Hong Kong, once the "Hollywood of the Far East" with 400 annual films, surpassing India, and 119 cinemas in 1993. Hong Kong's film industry experienced sharp decline in the last two decades with the number of cinemas dropping to only 47 (the second lowest per 100,000 persons/screen ratio compared to other major Asian cities) in 2015. It is now regaining its box office revenue, which increased to HK$1947 million in 2016 and HK$1853 million in 2017. However, the receipt increase is attributable to foreign, not domestic, films. In fact, foreign films contribute nearly 80% of the total revenue.

India

The Indian film industry is the world's largest in terms of films produced and tickets sold, third-largest in terms of box office size, and fastest-growing overall. Globally, Indian cinema enjoys popularity among the Indian diaspora, as well as among non-Indian populations in certain parts of Asia and Africa, and forms a component of India's global soft power. It is undeniable that a culture of piracy is prevalent throughout India. Pirated DVDs are openly sold in markets in Indian cities, while illegal file-sharing and downloading are common.

In 2012, India introduced an unwaivable right for authors of works, in particular authors of songs included in cinematograph films or sound recordings, to receive equal royalties accruing from exploitation of their works. It is important to note that there is no affirmative right to receive royalties in the Act. While the copyright can be assigned, the right to receive royalties cannot be assigned by the author to any person other than to the author's heirs or a copyright society for collection and distribution of royalties. The 2012 amendments were devised as reactionary measures to the denial of royalties and mismanagement of copyright societies in India by music labels. However, to date, copyright societies have refused to comply with the dictates of the amendments by all sorts of legal gambit (for more details, see Chap. 9).

Screening of Indian Films in China and Chinese Films in India

So far, Chinese movies have not made much headway into the Indian market. Indian movies as foreign movies are subject to a quota system (some follow the pattern of buyout of screening rights, others follow the profit-sharing arrangement) in China and were not much in demand. India and China signed an agreement on movie co-production in 2014 that would indirectly boost the screening of Indian and Chinese films in the two countries. The breakthrough only came in 2017 with the film "Dangal," which has a record box office of RMB 1.299 billion. In 2018, Indian

[13] Article 29 of the Law imposes on cinemas a high quota of showing Chinese films no less than 2/3 of the total show time. The United Kingdom enacted the Cinematograph Films Act of 1927 designed to stimulate the declining British film industry and to counter Hollywood's perceived economic and cultural dominance. It introduced a requirement for British cinemas to show a quota of British films, for a duration of 10 years. The act is generally not considered a success and was eventually repealed by the Films Act 1960; see https://en.wikipedia.org/wiki/Cinematograph_Films_Act_1927

movies have become the second most popular foreign movies in China, only next to Hollywood.[14]

Major Findings

Chapters 6, 7, and 8 have come to the following major findings:

1. Film industries thrive in both India and China despite high piracy rates. In other words, film industries prospered with little or no copyright protection. More importantly, piracy did not kill the content industry in China and India, film and music alike, but probably helped in building the customer base and cultivating future demand, which might not be true for a small economy with a sophisticated audience such as Hong Kong. So long there is demand and appetite for movies, new ways of paying for movies will be schemed up, be it direct fee payment by buying tickets online, Internet service/bandwidth subscription, or indirect with ad sponsorship. The stronger demand there is for movies, the faster the emergence of new technical means for delivering content and fee-charging, as the Chinese film industry has shown how it can easily ride on the ubiquitous smartphones and smart TVs for this purpose.
2. Major Internet giants in China such as Baidu, Alibaba, and Tencent (the so-called BAT) have been swarming into the film industry, bringing with them big data, technology, funding, platforms, and fundamental changes to audiovisual services, transforming their business models from providing illegal content to legal but free (ad-sponsored) content and to legal and paid premium content. As a result, they not only provide instantaneous access to quality films and make enforcement of copyright against piracy easy but also fundamentally change consumers' behavior and habits in digital content consumption and help set up an industrial code or self-regulation for the digital film market. More and more, copyright law is playing a significant role in the furtherance of cinema industrialization. China is the future India in terms of copyright protection. In that regards, China's IT industry could very well lend a helping hand.
3. It is amazing to find out how the Chinese private film industry, including private film studios and private distribution chains, has managed to boom despite state ideology and a state-monopolized film production and distribution system within a short span of 40 years. The desire to create, share, and enjoy content, the foundation of freedom of expression, is simply unstoppable, even in the era of political left-leaning.
4. The Hong Kong story of how the director-centric production system, due mostly to the kung fu genre, has resulted in "guerrilla filmmaking," "script-butchering," and diluting the storyline, and how scriptwriters remain weak and unprotected caused by the lack of the collective bargaining right, is very illuminating for the film industry in any other economy. So is the overall poor infrastructure of the industry, particularly in terms of education, production, and distribution, which led also to the industry's decline. Moreover, different from other major

[14] http://www.sohu.com/a/280668438_757761

film-producing jurisdictions which grant the right of exploitation to the producer exclusively, such as Italy, France, Germany, China, Korea (per law), USA, and Japan (per practice), in Hong Kong a film is principally co-owned by the producer and the principal director. However, joint ownership is prone to conflicts – between the interests of the producer and principal director, conflicts of applicable laws when the joint owners are from different jurisdictions – and disadvantageous for exploitation.

3.4 Pharmaceutical Industry

The importance of the pharmaceutical industry for India and China is beyond description. As it happens, the two "fellow sufferers[15]" make a perfect comparison pair in the pharmaceutical industry as well. This time around, China can learn much from India.

3.4.1 Current Status

India

In India, domestic generic companies have been far ahead of the affiliates of foreign companies for the past three decades, ever since the generic companies were able to establish themselves as major players in the industry. The growth in sales registered by the leading generic producers in the early 1990s led to a complete transformation of the composition of market leaders. In 1994–1995, five of the ten top firms in terms of sales were the associates of foreign firms. But two decades later, nine of the top ten sellers were generic firms. Generic producers are the most profitable among all the leading sectors of the Indian industry. On average, they have registered double-digit profits since 2011, which could be much higher after including the data for the global operations.

The Indian pharmaceutical sector attracted US$ 15.59 billion worth of FDI between 2000 and 2017. In Q2 2018, the Indian pharmaceutical sector posted private equity and venture capital investments of US$ 396 million. Also, in 2017, India witnessed 46 mergers and acquisitions worth US$ 1.47 billion. Over the past two decades, India's total trade in pharmaceutical products increased from less than US$ 2 billion to more than US$ 27 billion. This expansion came on the back of strong export performance, increased from just over US$ 1 billion in 1996 to over US$ 20 billion in 2016. India's place in the global market as supplier of cheap generics is confirmed by the pharmaceutical industry's growing presence in the market for formulations. Since the beginning of the current decade, exports of formulations have steadily increased, while bulk drug exports have stagnated. Between 2005 and 2016, bulk drug imports have increased more than threefold. China has emerged as the largest supplier of bulk drugs, supplying nearly two-thirds of Indian total imports.

[15] Both have a long history of traditional medicines and yet are both "lagging" behind in the development of patented new drugs.

Market penetration of generic drugs increased rapidly after the enactment of the Hatch-Waxman Act in 1984. By the early years of the new millennium, generic drugs comprised more than 47% of the prescriptions filled for pharmaceutical products, up from 19% in 1984. The Office of Generic Drugs of the US FDA reports that currently, 9 out of 10 prescriptions filled are for generic drugs. The USA is the single largest market for Indian formulations, taking up 39% market share. This market expanded from less than $300 million in 2005 to over $5.2 billion in 2016.

China

In 2010 China's pharmaceutical industry achieved sales of US$ 41.1 billion, making it the third largest in sales worldwide. In 2016, the business income of large-scale industrial enterprises in China's pharmaceutical industry reached RMB 2.96 trillion, an increase of 9.92% over the previous year. In 2015, China's biopharmaceutical manufacturing revenue from product sales was RMB 186.4 billion, and the total profit was RMB 31.0 billion, up 14.8% and 21.6%, respectively, over the previous year. China is the second largest producer of active pharmaceutical ingredients (APIs) and the largest producer of penicillin and P-Lactam drugs and vitamins, accounting for 30% of the world's total output. The trade volume in pharmaceutical and health products in China in 2017 was US$116.76 billion, including US$60.8 billion in exports and US$55.88 billion in imports. It enjoyed a US$4.9 billion trade surplus, a 34.60% drop compared with the previous year.

More than 97% of the domestically produced drugs are generics. Most pharmaceutical companies in China mainly focus on producing generics with relatively low technical requirements and mature technologies. Serious overcapacity exists. The utilization rate of production capacity of tablets, capsules, powder injection, and water injection were less than 45%, 40%, 27%, and 50%, respectively. In China, pharma companies are small in scale, a substantial percentage of them are in deficit (15% in 2009), and market concentration is low (the aggregate market share of the ten biggest companies (CR10) was 15.10% in 2004). As a result, pharmaceutical companies have an R&D intensity of merely 1.77% on average, while the top ten pharmaceutical companies in the USA and India have an R&D intensity of 35.3% and 15.9%, respectively. In 2011, the cost of purchasing drugs by residents accounted for 50%–62% of the total health expenditure in China, much higher than the world average of 20%–30%. In 2010, drugs revenue accounted for 42.1% of the total revenue of government-run medical institutions in China.

Among the pharmaceutical products currently manufactured in China, less than 3% have IP rights. The market of patented drugs is only RMB 12 billion, less than 1% of the domestic pharmaceutical market. The treatment of most infectious diseases such as chronic hepatitis B, AIDS, and other diseases depends on imported patented drugs, which are expensive. Almost all of the clinical standard medicines used in these areas of chronic diseases are patented drugs or patent-expired drugs. Nearly 90% of the patented drugs come from foreign enterprises.

However, annual patent application for polymorphic drugs in China has increased significantly in the last three decades. From 1985 to 2005, 2116 applications were from China, 651 were from the USA, and 432 were from Germany, India, and

Switzerland. From 2005 to 2014, the total number of patent applications from China was 3009, an average of 301 applications each year, with the average annual growth rate at 147.9%.

Major Findings

Chapters 10, 11, 12, and 13 have come to the following major findings:

1. The powerful constitutional obligations of the Indian state to improve public health and to guarantee every person and citizen of India the right to life and personal liberty while promoting its innovation ecosystem and safeguarding the legitimate business interests of inventors have been shaping the evolution of the Indian patent regime since India's independence in 1947, and all the way up to today, despite being listed either as a "Priority Foreign Country" or included on the "Priority Watch List" by the US Trade Representative (USTR) since 1989. Therefore, India is well known as a patent maverick. The refusal to grant product patents and the shortening of the period of patent protection for pharmaceutical process (5–7 years as against 14 years for other fields of technology in India's pre-TRIPS patent regime) allowed the generic pharmaceutical industry to grow starting from the 1970s. In contrast, China, despite having a constitutional mandate for the state to protect people's health,[16] has been a naïve patent taker, not the least in the pharma industry, and never questioned the patent regime advocated by the international IP establishment.
2. After being updated to be TRIPS compliant in 2005, the Indian Patents Act continuously utilizes the leeway left by the TRIPS Agreement, including preventing evergreening of patented drugs, awarding compulsory license, retaining the pre-grant opposition, and introducing the post-grant opposition, to better suit its national interests and developmental needs. It is therefore expected that India's pharma industry is poised to further outperform its Chinese counterpart.
3. India's experiences in legislation and judicial practice to promote the development of its domestic pharmaceutical industry deserve serious attention from China. The ingenious government legal maneuvering can serve as a good example for China to adjust its tactics in international IP negotiation and long-held blind faith in IP. Learning from India, China should start to provide its legal professionals with knowledge of global IP rules.
4. Although there is an increase in the number of patented drugs in the pharmaceutical industry in China, patents have made relatively low contribution to the industrial value, and IP held by Chinese firms is less competitive compared with that of foreign companies. In contrast, although major Indian companies are all producers of generic medicines, they continued to invest sizeable shares of their

[16] Article 21(1) of the PRC Constitution mandates that "The state develops medical and health services, promotes modern medicine and traditional Chinese medicine, encourages and supports the setting up of various medical and health facilities by the rural economic collectives, state enterprises and institutions and neighbourhood organizations, and promotes health and sanitation activities of a mass character, all for the protection of the people's health."

sales turnover in R&D, up from 1.5% at the end of the 1990s, to 2% in 2000–2001, and to nearly 7% in 2015–2016. This aspect of the functioning was manifest in their patenting behavior. They were more active in filing patent applications in foreign jurisdictions, but significantly less so in domestic patenting.

3.5 Plant Varieties and Food Security

Food security is of high importance for the two most populous countries of India and China. To ensure food security, India enacted the National Food Security Act (NFSA) in September 2013, while the National People's Congress of China is now working on passing a bill on Food Security Law. Genetically engineered or modified crop plants are relevant for food security in India and China, as high-yielding crops can help overcome life-threatening food crises, achieve food surplus and feed their masses. India, with 11.4 million hectares (6%), ranks 5th, and China, with 2.8 million hectares (1%), ranks eighth among the 24 countries which planted biotech crops in 2017.[17] During the first 21 years of commercialization of biotech crops, from 1996 to 2016, India has gained US$21.1 billion sales and China US$19.6 billion.[18]

3.5.1 Current Status

India

India is the highest exporter of rice in the world. India was the ninth largest exporter of agricultural products in 2017, and the sector constitutes a share of 13% of total exports of the country.

With the incorporation of gene technology, India has evolved from an importer to an exporter of cotton, and at present, India's average yield is around 500 kg of lint per hectare. India is now the biggest producer of cotton. The cotton production in India for 2017–2018 is around 365 lakh (100,000) bales (1 bale = 170 kg) and exports between 65 and 70 lakh bales. However, due to demand and consumption by local mills, India stands as the fourth largest exporter of cotton, behind the USA, Australia, and Brazil. As it stands, there are no food crops approved for use in India using GM technology. The Indian regulatory authority, the Genetic Engineering Approval Committee (GEAC), has approved Bt brinjal (eggplant) as being biosafe in 2017. However, its commercialization was not approved by the Ministry of Environment, Forests and Climate Change.

The IP framework for genetically engineered crops is prescriptive in its scope, and the recent judgments preclude protection for technologies for the development of genetically engineered plants under the existing provisions of the Patents Act, 1970. This would perhaps serve to disincentive players who have developed proprietary technologies from bringing their latest inventions for use by farmers in India.

[17] The International Service for the Acquisition of Agri-biotech App (ISAAA), Global Status of Commercialized Biotech/GM Crops in 2017, 5.

[18] Ibid., 8.

China

In recent years, scandals involving illegal production and distribution of GM rice and its products have been consecutively exposed, which has led to mistrust among the public. As a response, the Food Safety Law was revised in 2015 to require that the production and distribution of GM food shall be clearly labeled. As far as GM foods are concerned, there are only regulations on transgenic agricultural products in general and labeling requirements provided by the Food Safety Law in particular. The lack of detailed legislation reflects China's evasive attitude toward this issue.

China has achieved remarkable results for the protection of new plant varieties since it promulgated and implemented the Regulations for the Protection of New Plant Varieties in 1997. In the revision of the Seeds Law in 2015, a section on the protection of new plant varieties was added. By 2016, the number of applications for new plant variety rights in China already ranked first in the world. From 1999 to June 2018, China approved a total of some 12,221 breeders' rights, of which 10,863 are for agriculture and 1,358 are for forestry (188 were obtained by foreign applicants from 9 countries, accounting for 13.84% of the total forestry breeders' rights). Chinese breeders mainly apply for breeders' rights in China and rarely pay attention to applying for breeders' rights abroad.

Major Findings

Chapters 14, 15, 16, and 17 have come to the following major findings:

1. Genes, proteins, promoters, enhancers, and chemicals in plants cannot get specific protection under the plant variety law and need to be protected under the patent regime. A recombinant DNA construct, which is neither a plant nor part thereof, nor a variety, can be protected under the patent regime and not under the plant variety law. Rights under the plant variety law and the rights granted under the patent law operate in completely different spheres. In India and China, what is protected under the patent law cannot be protected under the plant variety law and vice versa.
2. While India is still grappling with poverty, famine, shortage in food supply, and massive hikes in prices of basic foodstuffs, China has overcome these issues since 2007 at the latest by self-supply[19]. However, both countries have witnessed scandalous planting of GM plants and are in need of a robust regulatory framework to oversee the development of the genetic industry in agriculture.

3.6 Automobile Industry

Both India and China are catching up in the automobile industry in the last two decades. Comparatively speaking, the Indian automobile industry's absorption of global best practices has been slower than its Chinese counterpart. Strategies of firms in the Chinese auto industry provided a boost to technological learning more

[19] National Development and Reform Commission, Food Supply Abundant and Market Demand Effectively Satisfied in China (in Chinese), China Economic and Trade Herald, 2018, Issue 22, 63.

quickly and broadly than in India, especially in the electric vehicle (EV) sector. India can benefit from learning from China.

3.6.1 Current Status

China

China has become the world's largest automotive producer and consumer, and the previous dominant strategy of the assemblage of imported foreign designs only has already given way to the strategy of indigenous innovation. No doubt, the indigenous car-makers are far from being global technology leaders, yet they are gradually becoming competitive in the global automobile market with the rise of EVs. China overtook the USA as the world's largest producer and consumer of EVs in 2015. EVs are to some extent an innovation with technological discontinuities, as motors and batteries are employed to replace the engines and gearboxes of the fossil fuel vehicles (FFVs). EVs are better able to interface with computer-based technologies, such as AI, the mobile Internet, and cloud computing. This has induced an explosive development of ICT technology applications on the car platform, creating an opportunity for China to pursue catch-up development.

The influx of new local entrants has fundamentally changed the rules of the game in China's car industry. Since 2001, as the new entrants gradually obtained regulatory approval, the entire production scale and the amounts of new products launched annually in China's car industry have skyrocketed, due to the leveraging effects created by new firms.

From 1999 to 2017, multinationals have submitted a total number of 87,089 patent applications in China, while new local entrants filed 66,043 and backbone state-owned enterprises (SOEs) and joint ventures (JVs) filed 32,227. Multinationals have the highest ratio of inventions, at 79.53% (69,265), and a low ratio of utility models, merely 3.06%. The respective ratios for new local entrants are 32.84% and 50.24% and for backbone SOEs and JVs 20.55% and 57.72%. The group of backbone SOEs and JVs exhibit obvious weakness in patent applications, as 58% of their patents fall in the category of utility model. The patent grant rate for the backbone SOEs and JVs is just 35.35%, markedly below that of multinationals and new local entrants, which are 57.01% and 50.28%, respectively. Most patent applications of multinationals are submitted by entities from their home countries, which indicates that their collaboration with JV partners in China remains highly irrelevant to their patent applications.

India

The automobile industry is one of the most important drivers of economic growth in India and one with high participation in global value chains. The automobiles produced in the country uniquely cater to the demands of low- and middle-income groups of the population. In 2017, India became the world's fourth largest automobile market, and the demand for Indian vehicles continues to grow in the domestic

and international markets. India was the sixth largest producer of automobiles globally, with an average annual production of about 29 million vehicles in 2017–2018, of which about four million were exported. India is the largest tractor manufacturer, second largest two-wheeler manufacturer, second largest bus manufacturer, fifth largest heavy truck manufacturer, and eighth largest commercial vehicle manufacturer. The contribution of this sector to GDP has increased from 2.77% in 1992–1993 to about 7.1% and accounts for about 49% of manufacturing GDP (2015–2016). It employs more than 29 million people (directly and indirectly). The turnover of the automobile industry is approximately US$ 67 billion (2016–2017) and that of the component industry is US$ 43.5 billion (2015–2016). The Indian industry accounted for 4.92% of vehicle production globally in 2017 (5.38% of production in the cars segment and 3.48% of production in the commercial vehicles segment). India continues to be a net importer of auto components, with its trade deficit for auto components increasing from US$ 210 million in 2004–2005 to US$ 4.4 billion in 2009–2010 and US$ 13.8 billion in 2015–2016.

As of today, the government encourages foreign investment and allows 100% FDI in the sector via the automatic route. The industry is fully de-licensed and free imports of automotive components are allowed. The Automotive Mission Plan 2016–2026 envisions that the Indian automotive industry will be among top three in the world in engineering, manufacture, and export of vehicles and auto components by 2026, growing in value to over 12% of India's GDP and generating an additional 65 million jobs.

Major Findings

Chapters 18 and 19 have come to the following major findings:

1. Government policy has played a pivotal role in the development of automobile industries in India and China. In China, the sectoral system of automobiles was mainly supported by two institutional pillars. The first pillar was strict regulation of entry permission, according to which all car products formally launched into the Chinese domestic market for sale must have prior permission from the MIIT to be listed in a regularly updated product catalogue. "Catalog-based regulation," a rigid legacy of the planned system, continues even after the transition to indigenous innovation. The second pillar is the "trading market for technology (TMFT)" policy since the 1980s. This strategy literally involves the trading of market access for technology with the multinationals possessing advanced technology, as acquisition of intangible IP assets on technologies would be less productive without the benefit of associated operational learning and expertise.

   It was not until China's introduction of "the 1994 automobile industry policy" that car-making has been recognized as a national pillar industry. China's developmental strategy has transitioned to focusing on indigenous innovation by the National Medium- and Long-term Science and Technology Development Outline

(2006–2020), which allows a group of new, local, innovative firms to enter the industry. Later on, the Chinese government has tabled a range of battery research and production projects and promulgated policies to encourage investment in the development and industrialization of EVs while subsidizing investments in infrastructure, especially a network of rechargeable devices.

The sum of subsidies provided by central and regional governments usually reaches 50% of the purchase price of EVs. It is only after 2013, witnessing how the new administration of Xi continues to stress indigenous innovation, that the backbone SOEs have begun to take innovation seriously.

Policy makers in China have decided to shift the policies again: the restrictions on foreign investment in China's EV industry have been removed in 2018; fully liberalized entry into the entire auto industry will be allowed in 5 years; the subsidy for purchasing EVs will be totally abolished by 2020 and has already been gradually reduced since 2017. The long-existing policy preferences for JVs will fade away.

In India, the growth of the automobile sector has been on the back of strong government support, which has helped it carve a unique path among the manufacturing sectors of India. Indian policy had favored the development of the commercial vehicles industry (light and heavy vehicles for public transport) as opposed to the development of passenger vehicles – considered luxury goods. By the early 1980s, the government had realized the need to develop the passenger vehicle segment and took decisions to allow FDI in automotive assembly in two major waves in 1983 and in 1993. This FDI was mainly "market seeking" in nature. Government policies such as import barriers and local content requirements contributed to the influx of FDI. Liberal policies of the 1990s led to the entry of new competitors and spillover benefits, especially on the technology side, and to increased expenditure on R&D. The setting up of the National Automotive Testing and R&D Infrastructure Project under the Automotive Mission Plan 2006-16 enabled the industry to achieve parity with global standards. Local content requirements or indigenization of up to 70% forced OEMs and their suppliers to make significant capital investments and created a chain of world-class component suppliers.

2. IP has played a relatively limited role in the development of the automobile industry in India and China. Unlike a science-based industry, the car-making industry is manufacturing-intensive and scale-intensive. Its key knowledge is embedded in manufacturing or design experience and does not appear in explicit forms such as utility/invention patents. Although patents are becoming increasingly important, a vast majority of "know-how" or "know-whom" kind of knowledge in this industry cannot be mastered through the acquisition of patents or patent licenses. Indeed, the technical trade or R&D collaboration of many core businesses is through engineering services, design transfer (usually including engineering services), and component supplies. Hence, capacity building in this industry is a long-term process and may take many decades for latecomers.

This is true for India and China. For example, without absorptive capacity for assessing and assimilating technologies, the backbone SOE Beijing Auto bought most of the IPs of SAAB in 2009; however, many of SAAB's high-value IPs had already been peeled off before the deal, as previously they had been traded for several rounds on the market. New entrants underwent a wide range of technical cooperation with international professional technology firms after the 1990s, played a more dominant role and were better able to identify technologies at the systemic level and explore more frontier issues.

In India, the number of patents granted to the seven leading Indian manufacturers between the period of January 1990 and July 2018 has increased, but not significantly. Tata's patents have increased the most, more than 5 times, but its absolute number has jumped from only 10 between 2001 and 2010 to 57 between 2011 and 2018.

3.7 The Culture of Sharing and the Sharing Economy

Both India and China consume goods and services in astronomic numbers and might face the threat of undersupply of goods and services and environmental crisis when they are supplied and consumed to heart's content of the Chinese and Indian people, as it would "burn up, heat up, eat up, plow up, choke up, and smoke up the planet.[20]" The sharing economy as a new economy that creates sufficient supply through an effective mechanism for search and matching holds great promises for India and China. By sharing economy we refer to all business models facilitated by collaborative platforms that create an open marketplace for the temporary usage of goods or services often provided by private individuals, leading to the sharing of resources for their optimum utilization.

3.8 Current Status

China

With the maturing of Internet technology, mobile payment, logistics infrastructure, and huge demographic dividends, China's sharing economy has been leaping forward rapidly in recent years. In 2015 the size of the main sectors of China's sharing market amounted to about RMB 1,697.8 billion; the figure jumped to RMB 3,452 billion in 2016, an annual increase of 103% and accounting for GDP 4.6%. In 2016, over 600 million people participated in sharing economy activities in China. The number of participants in the service sector was approximately 60 million, with approximately 5.85 million employees serving on platforms. The sharing economy is expected to account for 10% of GDP by 2020 and 20% by 2025.

[20] Thomas Friedman, A Green New Deal revisited, New York Times, International edition, Jan. 11, 2019, 11.

India

The *Internet users* in India are projected to increase from 331.77 million in 2017 to 511.89 million in 2022. The vast majority (>95%) are *mobile phone Internet users*, and the young generations of Indians that have a *preference to create, trade, swop, access, and share goods, services, and resources* as opposed to *owning them,* building the powerful undercurrents for the *sharing economy* in India. Thus, in today's India, a variety of new businesses have sprung across a wide range of industries, such as *transportation* (e.g., Uber, Ola, ZipGo, BlaBlaCar, Smartmumbaikar.com, Didi Kuaidi), *accommodation* (Airbnb, Couchsurfing), *work space sharing* (WeWork, Regus, CoWrks, Awfis), *retail commerce* (e-Bay, Flipkart, Myntra, Jabong, Snapdeal), *business loans* (Biz2Credit), *designer clothing* (Rent It Bae), *everyday clothing* (Swishlist), and *furniture and appliances* (Fabrento, Rentickle, and Furlenco).[21]

Interestingly, even rural India has become the cradle of the *sharing economy* in a unique way.[22] Thus, Mahindra & Mahindra, one of the auto giants of India, created a *sharing platform*, *Trringo*, which allows farmers to rent equipments made by Mahindra (and even by its competitors) through placing a call. As a result, Mahindra has been able to increase its customer base, build brand awareness, and, drive rural prosperity by empowering farmers. Thus, *sharing economy* has been rapidly growing in India, particularly as the Gen Z consumers are discovering that it serves their goals and interests more effectively compared to owning the depreciating, underutilized assets.

In summary, *sharing economy* has been boosting the *innovative* entrepreneurship of bold new ideas in India, leading to – creation of disruptive businesses, optimal resource utilization, creation of new jobs, skill development, plus flexibility to operate at one's own convenience. Nevertheless, while India's GDP is expected to grow at 7.3% in 2018–2019,[23] accurate estimates of the contribution of *sharing economy* to the GDP of India or its growth are not yet readily available.

Major Findings

Chapters 20 and 21, more complementary in nature than providing comparable data on India and China, have come to the following major findings:

1. The sharing economy in India has not taken up the pace of China, probably due to lack of knowledge sharing, which is an integral part of the sharing economy. There are gender-based restrictions to knowledge as well as caste-based restrictions to knowledge. The National Intellectual Property Rights Policy and the Startup India Action Plan in 2016 have a bearing on shaping incentives for innovation and creativity in the sharing economy, but fail to take balanced and inclusive approaches.

[21] https://www.liveinstyle.com/black-white-get-togethers/the-rise-of-the-sharing-economy

[22] https://www.bcg.com/en-us/publications/2017/strategy-accelerating-growth-consumer-products-hopping-aboard-sharing-economy.aspx

[23] https://www.ibef.org/economy/indian-economy-overview

2. The emergence of various business models and a series of legal risks and challenges that have restricted or are restricting the development of China's sharing economy, such as duplicated investment and vicious competition; opportunistic behavior, including the infringement of consumer rights and the distortion of reputation evaluation systems; and negative externality issues, could serve as good lessons for India.

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Part I

IP Codification and Innovation Governance

On the necessity of incorporating IP Laws into the Civil Law of China and How

Chuntian Liu and Kung-Chung Liu

Abstract

To codify IP laws into the Civil Law is the way to go for the modernization of the Civil Law in China. China, a mega economy rising swiftly in the last couple of decades and a latecomer to the rule of law, should grasp the moment, ride on the tide of history, surpass its forefathers, break away from the mould and pave the way to modernizing the Civil Law. Furthermore, by codifying IP laws into the Civil Law, China will be laying a solid legal foundation for the long-term strategy of innovation-driven development and for the rule of law in China.

Keywords

Civil Law · General Provisions of the Civil Law · General Principles of the Civil Law · Intellectual Property (IP) · Codification

1 Introduction

In March 2017, China promulgated the "General Provisions of the Civil Law". Thereafter, China has been pushing actively to table the various Special Provisions of the Civil Law in 2020, which will be incorporated into the Civil Law Code as one complete piece of legislation. With regard to the issues of whether intellectual

C. Liu
Renmin University of China, Beijing, China

K.-C. Liu (✉)
Renmin University of China, Beijing, China

Singapore Management University, Singapore, Singapore
e-mail: kcliu@smu.edu.sg

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_2

property (IP) laws should be added into the Civil Law Code and if so, how, controversies exist. While some Civil Law academics are naysayers due to misunderstanding of IP laws, some IP scholars remain passive because of the conceived specialty of IP rights. Although the legislation program of the National People's Congress seems to have dropped the idea of incorporating IP laws into the Civil Law Code, this chapter advocates that IP rights, which are objectively of private right nature, are a new form of real right[1] that has gone through the Industrial Revolution, been ushered into the knowledge economy and fundamentally changed the property structure of human society. IP rights have become a new member of the property system. Following the objective needs of technological, economic and societal development, and judging the development trend of legislation of the Civil Law from a global perspective, codification of IP laws into the Civil Law is the grand trend for modernizing the Civil Law of China. As a mega economy that has risen swiftly in the last couple of decades and a latecomer to the rule of law, China should grasp the moment, ride on the tide of history, surpass its forefathers, break away from the mould and pave the way to the modernization of the Civil Law. Furthermore, China should codify IP laws into the Civil Law and lay a well-established legal foundation for the long-term strategy of innovation-driven development in China.

In the following six sections, this chapter will discuss how the establishment of IP rights has revolutionized property (1), the doctrinal and practical values of codifying IP laws into the Civil Law (2), choice of models for the fusion between IP laws and the Civil Law (3), the relationship between IP laws, the General Provisions of the Civil Law and its respective chapters (4), technical issues for fusing IP laws into the Civil Law (5), and finally why the issue of reuniting IP laws with the Civil Law is closely related to the securing of the rule of law in China (6).

2 The Establishment of IP Rights Has Revolutionized Property

That the results of knowledge and technology have become the objects of property rights manifests a revolution in the history of property.[2] According to traditional jurisprudence or economic theory, possession or labour is the foundation of property. The production pattern in an agricultural society means that the various useful material objects and the interests brought by labour are the most natural property. Gold is property in an ancient agricultural society, but not the "golden touch"

[1] Article 2 of the Property Law of the People's Republic of China (PRC) provides the definitions for "property" and "real right": "(1) This Law shall apply to the civil relationships generated from the ownership and utilization of properties. (2) The term "property" as mentioned in this Law includes real estates (immovable property) and movable property. In case other laws also stipulate certain rights to be the objects of real right, those provisions shall be followed. (3) The term "real right" as mentioned in this Law refers to the exclusive right of direct control enjoyed by the holder according to law over a specific property, including ownership, usufructuary right and real rights for security.

[2] Liu Chuntian, Analysis of IP Rights (in Chinese), Social Sciences in China, 2003, No. 4.

that transforms minerals into gold. In other words, knowledge and technology hidden behind the material property and labour lack the conditions to become property. This is consistent with the property system and property theory of agricultural society that have been developed and perfected over thousands of years.

The progress of technology gave birth to the industrial civilization. Commercially, knowledge and technology hidden behind materials and labour have come to the fore, and the golden touch has become property and the object of market exchange. Legally, this phenomenon has unleashed a brand new form of property—IP rights. With the maturing of knowledge and technology transaction and the perfection of the IP system as a property system, people realize that it was neither the "things", which are the objects of traditional property, nor the act of "labour" that led to the emergence of the new forms of property such as IP rights; rather, it was the other human behaviour of creation, which has been hidden behind labour and yet decided the rise and fall and the specific form of labour. Creation is the source of all knowledge and technology. Without creation, there will be no knowledge and technology, and no labour. In the era when there was only labour, knowledge and technology were nothing but specific forms of labour. The emergence of IP rights, which take creative results as their hallmark and value those results by market standards, has triggered civilized societies to readjust the property system that has been formed over a long history.

That IP rights have become the de facto "first property right" is an indicator of a major revolution in the history of property.[3]

The birth of IP rights also ushers in new inquiries about property, its essence and source. According to economic theory, any property must possess "quality" and "quantity", with the former being its essence and the latter being the yardstick for measurement. Judging from the "quality" perspective of property, "things" as objects of property are derived from their usefulness, which, after deducting the natural attributes of material, depends entirely on the knowledge and technology that exploit the "things". Labour in abstract as a carrier of values, i.e. one of the sources of property, has its true essence in how much energy (power) it can generate. Concrete labour derives its usefulness entirely from its dominance over the knowledge and technology of labour, which decides the actual form of labour. If there is no knowledge and technology to control human mental and physical activities, such activities cannot be labour, and are instead wasteful consumption of natural energy with no value, usage value or social meaning. Therefore, what really makes up the core and soul of property is the dominance of human mental and physical capability by knowledge and technology, in addition to natural factors and regardless of its exterior appearance.

Looking at the "quantity" perspective of property, excluding natural factors, what decides the value of a material property in the knowledge economy era is not the amount of labour, but rather IP rights. Knowledge, technology and commercial indicators play a decisive role in the value composition of modern society. Trade in goods, trade in services and trade in IP rights under the governance of the World

[3] Liu Chuntian, That IP Rights are the First Property Right is the Discovery of the Civil Law Jurisprudence (in Chinese), Intellectual Property Rights, 2015, No. 10.

Trade Organization (WTO) include almost all the property forms of the modern world. While the object of trade in IP rights is exclusively knowledge and technology, trade in services such as financial, technological and commercial service derives most of its value also from knowledge and technology. Trade in goods under the dominance of the real right is no exception, as goods become the objects of trade mainly due to knowledge, technology and commercial indicators, after deducting the natural factors. Contemporary material products can hardly be marketed without the help of IP rights. The knowledge economy is now revolutionizing the traditional understanding of "major" and "subsidiary" values. Traditional wealth treats physical materials and the amount of human labour as the source or subject of product value and treats knowledge and technology only as "technically added value". Nowadays, the more expensive man-made products are, the higher the percentage that IP rights take up in the value composition and the lower the contribution labour can make. From aircraft to limousines, TVs, computers, smart phones, French perfumes, luxury bags and wine, Italian fashion clothing, Chinese Maotai and the like, the product value all comes from IP rights. Study shows that although China produces 90% of the mobile phones in the world, its contribution is mainly manufacturing labour, which is low in the global value chain, and can earn a profit margin of less than 5%. In contrast, Qualcomm, Apple, Samsung, etc., which provide the core knowledge and technology, walk away with 90% of the profit. On the state level, those countries which have the strongest capability in terms of knowledge and technology and the most well-known trademarks must also be the richest and most competitive.

In the knowledge economy, knowledge and technology are the real source of value for material products, whereas objects and labour are the by-product of knowledge and technology. Along with the swift and powerful advancement of digital technology, the trend of the property system is that IP rights have jumped to become ahead of, superior to and more important than material property and are the most important and crucial property form. Decades ago, it was the tycoons of cars, steel and railroads whose wealth could match that of a nation. Nowadays, companies with knowledge and technology as their core property, such as Apple, Microsoft, Google, Samsung, etc., are the new leaders in wealth. IP rights are fast swirling up, replacing the traditional rights over things and becoming the basic, core, decisive and dominant power of the property system and the de facto "first property rights". This is a logical development and a practical one too.

3 Doctrinal and Practical Value of Codifying IP Laws into the Civil Law

The codification of IP laws into the Civil Law has both doctrinal and practical value.

3.1 The Civil Law Principally Guides IP Laws

The codification of IP laws into the Civil Law allows not only the spirits, principles and system of the latter to be systematically projected into the individual IP laws but

also the latter's strength to permeate into the implementation of IP laws. Such codification has both declaratory meaning and substantive value. Human history has been one of constant liberation and gaining of more freedom. Real rights provide basic protection for human rights. The history of property has evolved through stages of monopoly by public power, regulation and private autonomy as society progresses. The precursor of IP rights, be it technological franchises or publishing privileges, all derived from regulatory property rights. The private right nature of IP rights does not depend on any one person's subjective view, but is rather the inevitable result of technological, economic, societal and legal developments, as well as the objective demand of market economy. The practice of history has proven that the establishment of private rights that accompany the market economy can stimulate human creativity; effectively push forward technological, economic and social advancement; and thereby create and accumulate more wealth for the elevation of the living standards of mankind.

That IP rights are private rights has developed into the consensus of the international community in the last decades. Codifying IP laws into the Civil Law is certainly one development trend of the codification movement of the civil law jurisdictions. The so-called codification is the systemization of laws. Systemization is at the same time a thinking tool, a path for legal actions and the goal of laws. Systemization of laws is the product of alliance between the Civil Law traditions of civil law countries, science and rational thinking. The underlying cause for the systemization of laws is the objective demand for legal reform which stems from technological, economic and social progress and the public. Codifying IP laws into the Civil Law can avoid needless repetition and the parallel existence of the so-called IP Code that might even conflict with the Civil Law.

For historical reasons, the establishment of IP laws in the PRC has developed outside the system of the Civil Law legislation, with no framework to abide by, no system to inherit from, no theories to follow and no practice to reference, and has grown single-handedly, separately and individually on the barren land of unitary public ownership, a planned regime and a backward agricultural economy. At the beginning, crossing the river by touching stones on the riverbed, people paid more attention to the superficial difference between the IP system and the traditional property system; and there was no understanding of the commonality between the two systems and their respective essence on the logical abstract level and no understanding of IP laws on the theoretical abstract level either.

The IP legislation was based on the procedural need of having to ascertain rights, followed the traditional thinking and models of the relevant government agencies and was completed based on drafts by different government agencies. The drafters were mostly government officials and technocrats long trained in the planned economy, and few were legal experts. Those drafters lacked the awareness of private rights and legislative experience for localization. Among individual IP laws, there was insufficient mutual echoing and connection, not to mention the guidance over and integration of IP laws by the spirits, goals and principles of the Civil Law. This negatively affected the coordination between individual IP laws and the systems of the Civil Law that were developed in parallel, which led to inherent difficulties for legal practices. For example, the Trademark Law, the Patent Law and the Copyright Law all had disregarded the provisions of the Civil Law and set up their own systems of civil

subjects, which were not abolished until 2001. There were also various provisions contradicting the principles of the Civil Law. Comforting, though, was the fact that the 1986 General Principles of the Civil Law include IP as one of the civil rights[4] and provide the abstract reasoning framework and systematic demarcation, which helped to clarify the private right nature of IP rights from a macro perspective, and set the direction for the later smooth operation and perfection of individual IP laws.

Therefore, some opine that under the governance of the General Principles of the Civil Law, the individual laws of things, copyright, trademark, patent, contracts, family and inheritance constitute a Civil Law system which is a de facto Civil Law Code of Chinese style. According to them, the General Principles of the Civil Law are the framework, and all other laws just mentioned are the details; they appear to be loose, yet clearly structured, with a focused spirit despite a loose appearance. However, during the course of establishing IP laws, the tendency of "de-privatizing rights" and "de-Civil Law-ization" manifested itself due to the influence of power and interests, which hindered the integration of IP laws with the Civil Law and the systemization of IP laws, causing difficulties for social life and the judiciary. The judiciary has to constantly issue large amounts of "interpretations" in writing to connect, coordinate and integrate these contradictions, conflicts and problems,[5] which is in essence connecting IP systems with the basic principles and systems of the Civil Law, towards their incorporation with the Civil Law and systemization. Such interpretations are filling the vacuum left behind by the legislation. However, it is inappropriate for the adjudicating judges to undertake this legislation-like task, which runs the risk of being biased and over-generalized. Such a patchwork of constant piecemeal fixings in the absence of legislation and systemic thinking is not legislation after all and eventually can hardly establish a stable, systematic and statutory relationship between IP system, the General Principles of the Civil Law and other Special Provisions of the Civil Law. As a result, new problems and conflicts will arise in the long run.

In the beginning of the twenty-first century, during the Civil Law codification movement in the PRC under the influence of the General Principles of the Civil Law, the legislature had in mind to set up an "IP chapter" in the Civil Law. Unfortunately, constrained by insufficient knowledge, and lack of doctrinal guidance, a vision and an ideal, the forest was missed because of the trees, and the

[4] Section 3 (Intellectual Property Rights) of Chap. 5 (Civil Rights) of the General Principles only mentions the overarching term of IP rights in its title and enumerates thee specific kinds of IP rights, namely, copyright, patent and trademark. Article 94 provides: "Citizens and legal persons shall enjoy rights of authorship (copyrights) and shall be entitled to sign their names as authors, issue and publish their works and obtain remuneration in accordance with the law". Article 95 stipulates: "The patent rights lawfully obtained by citizens and legal persons shall be protected by law". Article 96 foresees: "The rights to exclusive use of trademarks obtained by legal persons, individual businesses and individual partnerships shall be protected by law". Article 97 provides: "Citizens who make discoveries shall be entitled to the rights of discovery. A discoverer shall have the right to apply for and receive certificates of discovery, bonuses or other awards. Citizens who make inventions or other achievements in scientific and technological researches shall have the right to apply for and receive certificates of honour, bonuses or other awards".

[5] Li Chen, From the Need of the Judiciary for IP to the Codification of the Chinese Civil Law (in Chinese), National Judges College Law Journal 2016, No. 12.

proposed "IP chapter" was not satisfactory, as it only had few articles, paid much attention to technicalities, fixated on the seeming difference between the objects of IP rights and those of the traditional property rights and lacked the awareness of the essence of IP rights and their deep and internal linkage with the Civil Law. This led to a twofold misunderstanding by the Civil Law community and the society at large: On the one hand, IP rights were ill-suited for incorporating into the Civil Law. On the other, the IP community disagreed with the incorporation of IP rights into the Civil Law. Fifteen years have since elapsed, and the above-mentioned problems of knowledge, vision and ideal have been clarified. Therefore, when the enactment of the Civil Law was again initiated, IP scholars have now more of a unified view that IP laws should be incorporated into the Civil Law.[6]

The General Provisions of the Civil Law of the PRC have combined the historical practices, referenced the basic spirits and paradigms of foreign laws and international treaties and again, as some kind of the Basic Law, confirm again the essential nature of IP rights, which has a profound meaning. However, it is by far not enough, as what is needed is the genuine integration of IP rights into the Civil Law. If the Civil Law can set up general rules for IP rights, the appearance and spirits will be unified. Under the guidance of the General Provisions of the Civil Law, individual IP laws can be better interconnected,[7] and current fundamental conflicts can be solved more pragmatically, which will have great benefits for the service economy, social practices, legal research, civil education of citizens' legal awareness, the connection with the international community and the economic and social effects of systemization.

3.2 Feedback from IP Theories and Systems to the Civil Law

The more diverse all matters on earth are, be they technology or society, city or state, the more elements need to be added and consolidated into the current foundation, and the more functions desire to be achieved. The lower the costs and the better the effects, the more order and systemization will be needed. The perfection of any and every system is conditional and relative. Any perfect system will be disrupted when its supporting conditions have changed. In a near perfect system, any addition of new elements and functions will pose a challenge. The system designer must deconstruct, even overhaul the incumbent system, adopt revolutionary reform and rebuild new systems according to the demand of changed conditions. Any substantive progress is not just an isolated, incidental and simple physical adding-up of the changes to the existent matters and life systems. All new knowledge, technology and ways of life are not extraterritorial visitors, but are derived from the existing

[6] The Chinese IP Law Society under the presidency of the first author of the present chapter has proposed "IP Chapters for the Civil Law Code" in 2017, which has 7 chapters and 96 articles.

[7] Li Shishi, The General Provisions of the Civil Law is the Basic Law for Establishing and Perfecting Civil Legal System (in Chinese), The People's Congress of China (half-monthly), 2017, No. 7.

knowledge, technology and ways of life. Any new system is an inheritance from, a breakthrough to and a qualitative jump over the old system.

The fusion of IP laws into the Civil Law Code has its milestone significance not in the simple addition of a new property law member into the existent Civil Law Code, but in the fusion of such a brand new subsystem, which is a historical transcendence over a series of Civil Codes typified by the French Civil Code since the nineteenth century. The substance, system functions, business models, unique property functions and the declared theory and logic about the origin of property, methodology and explanation capacity of IP rights can provide feedback to the Civil Law,[8] bringing it to the new era of the knowledge economy. One simple example is the moral rights of an author, which do not perish with his death immediately, but remain in force for a certain period post mortem,[9] even indefinitely in some jurisdictions.[10] This can have some feedback for the Civil Law, which categorically provides for the immediate cessation of moral rights (or personality rights) the moment the author deceases.

How IP laws have adapted to new technologies, economies and new ways of life can infuse new life blood into the traditional Civil Law. The systems and spiritual core of IP rights developed through the last couple of hundred years, and their theoretical leadership through the history of property can enhance the system and theory of the Civil Law.

4 Choice of Models for the Fusion Between IP Laws and the Civil Law

The 1986 General Principles of the Civil Law already list IP rights on the same level as real rights and creditors' rights. Systemization is the fundamental quest for Civil Law legislation in contemporary countries with codified laws. The movement of codifying Civil Law typified by the French Civil Code and the German Civil Code has real rights and creditor's rights as its two pillars.[11] In the early IP law system, national states enacted patent law, trademark law and copyright law separately. There are at least three models in which national states have dealt with the issue of systemization of IP laws and put IP laws into the property law system under the Civil Law.[12]

[8] Li Chen, On the Necessity for the Chinese Civil Law to Set Up IP Chapter (in Chinese), Journal of Soochow University (Law edition), 2015, No. 4.

[9] For example, 70 years post mortem in Germany.

[10] For example, the French, Chinese, Japanese and Taiwanese copyright law.

[11] Ma Junju/Zhang Xiang, The Ethics and Technique in the Construction of Personality in the Civil Law (in Chinese), Science of Law (Journal of Northwest University of Political Science and Law), 2005, No. 2.

[12] Cao Xinming, Choice of Connection Models between IP rights and the Civil LawFrom the Perspective of Codifying the IP Code (in Chinese), Studies in Law and Business, 2005, No. 1.

The first model is to compile an "IP Code" which collects all the IP laws,[13] such as the French IP Code of 1992,[14] the IP Code of the Philippines of 1997[15] and Vietnamese Law on IP.[16] The second model is to incorporate all IP laws into the Civil Code, such as the 2003 Model Civil Code for the Commonwealth of Independent States (CIS)[17] and the 2006 Russian Civil Code.[18]

The third model is to extract the common features of IP rights to form an IP Chapter in the Civil Law Code, in parallel to other chapters for real rights, creditors' rights law, torts, etc., which uplinks with the General Provisions of the Civil Law and downlinks with all individual IP laws. The Civil Codes of Armenia,[19] Belarus,[20] Kazakhstan,[21] Kyrgyzstan,[22] Uzbekistan[23] and Mongolia have adopted this model.[24]

The shortcoming of the first model is that with the appearance of an independent system, these IP Codes are simple compilation of individual IP laws and can only function under the guidance of its respective Civil Law Code; without their respective Civil Law Code, these IP Codes cannot be enforced by themselves. The problem with

[13] Wu Handong, IP Laws in the Codification Movement of the Civil Law (in Chinese), China Legal Science, 2016, No. 4.

[14] According to Wikipedia (https://en.wikipedia.org/wiki/French_Intellectual_Property_Code), the French Intellectual Property Code is a corpus of law relating to intellectual and industrial property. It was formalised by Law No 92-597 of 1 July 1992, replacing earlier laws relating to industrial property and artistic and literary property. The code is frequently modified: two major modifications are known as the DADVSI law and the HADOPI law.

[15] Republic Act No. 8293 June 6, 1997. An Act Prescribing the Intellectual Property Code and Establishing the Intellectual Property Office, Providing for Its Powers and Functions, and for Other Purposes.

[16] Order No. 28/2005/L-CTN of December 12, 2005, on the promulgation of Law on Intellectual Property. See Wu Handong, IP System in the International Reform Trend and the Bigger Picture of Chinese Development (in Chinese), Chinese Journal of Law, 2009, No. 2.

[17] CIS is a regional intergovernmental organization of post-Soviet republics in Eurasia formed following the dissolution of the Soviet Union. It now has nine members, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Armenia, Moldova, Russia, Tajikistan and Uzbekistan.

[18] Part IV, Civil Code of the Russian Federation.

[19] Division 10, Civil Code of the Republic of Armenia.

[20] Section 5, Civil Code of the Republic of Belarus.

[21] Section 5 of Civil Code of the Republic of Kazakhstan. Article 3 of the Copyright Law explains its relationship with the Civil Code: "Legislation of the Republic of Kazakhstan on copyright and allied rights consists of the Civil Code, of this Law and other legal acts issued in accordance with this Law".

[22] Section 5, Civil Code of the Republic of Kyrgyzstan.

[23] Section 4, Civil Code of the Republic of Uzbekistan. See Khaydarali Yunusov, The Development of Legal Systems of Central Asian States, available as ssoar-studeuropene-2014-2-yunusov_khaydarali-The_Development_of_Legal_Systems.pdf.

[24] Mongolia merges IP rights with other property rights to form a unified property right concept. Article 83.1 of the Mongolian Civil Code provides: "Anybody may acquire assets that are material wealth, and intellectual values, that are non-material wealth, as well as rights, earned by means not prohibited by law or conflicting with commonly accepted behavioural moral norms. In this case the abovementioned wealth is considered an asset". See also Wu Handong, IP Rights into the Civil Law Code and IP Chapter (in Chinese), Law and Social Development, 2015 No. 4.

the second model is that the fast developing IP laws cannot be squeezed into the Civil Law, resulting in the rise of the third model. Taking stock of the current situations in China, the third model is more feasible for the development of the Chinese Civil Law. With the rise in importance of IP rights and the fall of the traditional property rights, IP rights will eventually take over a dominant role in the civil property rights system.

When a new member with the same genes enters a mature or even ancient system, incumbent members will probably feel some anxiety or interim maladjustment, which will later be overcome by long-lasting harmony. The famous German jurist Thibaut has said in his work "On the Necessity of a General Civil Law for Germany": "Only the Civil Law, which as a whole is rooted solely in the human heart, sensibility and rationality, very seldom succumbs to the environment; even this unity (unified Civil Law—*added by the authors*) sometimes causes certain minor inconveniences here and there, [and] the numerous benefits brought by this unity will hugely offset these inconveniences. We need only to consider individual parts of the Civil Law! Many of their contents are only the so-called pure legal mathematics (eine Art reiner juristischer Mathematik), such as the theory of property rights, rights to inheritance, mortgage, and contracts, and what belongs to the general part of the jurisprudence, over which no local speciality can exert any significant influence".[25] Thibaut's ideas about a unified Civil Law should lend some inspiration to those who worry about special features of IP rights affecting the systemic viewpoints of the Civil Law Code.

5 Relationship Between IP Laws, the General Provisions of the Civil Law and Its Respective Chapters

Chinese IP laws have their direct source in the Civil Law. The Civil Law in general as the legal system governing the relationship between private rights has built a unitary private law blueprint for the economic and social life of a modern state. The Civil Law, both its exterior structure and internal essence, is all encompassing and yet fine. The General Provisions govern the Special Provisions as principal does subordinate in a hierarchical relationship. Looking from the structure of the Civil Law, the General Provisions of the Civil Law are the head and foundation of the Civil Law, whereas the special chapters of IP rights, real rights, creditors' rights law, etc. are subordinate, on an inferior level, and are the body and limbs of the Civil Law. The legal spirits, guiding principles, legal principles, regulatory addressees, civil rights, right subjects, private autonomy, juridical acts, agency, extinctive prescription, torts, legal liability, litigation process, etc., all of which are basic systems established by the General Provisions of the Civil Law, are to be applied to special chapters of the Civil Law, without exception.

In practice, once separated from the nutrition and the systemic support of the General Provisions of the Civil Law, real rights law and IP laws alike cannot be

[25] Anton Friedrich Justus Thibaut, Über die Notwendigkeit eines allgemeinen bürgerlichen Rechts in Deutschland (On the Necessity of a General Civil Law for Germany), 1814, pp. 53–54, available at: http://dlib-pr.mpier.mpg.de/m/kleioc/0010/exec/bigpage/%22272169_00000057.gif%22. According to https://www.britannica.com/biography/Anton-Friedrich-Justus-Thibaut, Thibaut is remembered chiefly because of his call for the codification of German Civil Law, reflecting the rise of German nationalism after the Napoleonic wars.

enforced by themselves. IP rights and IP laws are on the same logical level as real rights law, and both are basic civil property rights and basic law of civil property.[26] Just like the real rights law, IP laws are fundamental civil property law, and their relationship with the Civil Law is part of a whole.[27]

6 Technical Issues for Fusing IP Laws into the Civil Law

Whether and how to incorporate IP laws within the Chinese Civil Law Code have been quite controversial during the latter's construction. The General Provisions provide definition of IP rights,[28] and there is certain room to accommodate IP rights in the special chapters. However, currently, scholars from the Civil Law circle who are against the incorporation of IP laws into the Civil Law have the upper hand. They are of the opinion that IP laws are an open system in flux under the influence of technological developments and when incorporated into the relatively stable and systemic Civil Law might harm the stability of the Civil Law.

However, this line of thinking has mixed up three different layers of issues: one about the phenomenon of the fast progressing science and technology, another about the relative stability of the relationship between interests and the last one about the stability of rules that regulate the relationship between interests. As a matter of fact, the traditional real right is facing similar situations. Material products that were unheard of in the past are constantly popping up in our daily life, such as smart phones, gadgets, electric cars, etc. It is just that people are used to conducting logical abstraction of material products and can abstract "property" from any new products and then logically classify them as the object of real rights. In the same vein, under the drive of technology, technological products get innovated beyond imagination but are still within the ambit of "knowledge and technology" and remain the objects of IP rights. Under market conditions, the relationship of property interests triggered by the emergence of new products, new knowledge and new technologies does not undergo qualitative change and can be adjusted under a relatively stable legal regime. Therefore, the above-mentioned worries are nothing but a misunderstanding.

The Civil Law Code is a system of rules, a knowledge system with strict logic. It is at the same time an open system. Take automobiles for example. They are the perfect example of a system which evolves with the progress of time and remains constantly open. Automobiles had reached near perfection in terms of comfort in the

[26] Liu Chuntian, That IP Rights is the First Property Right are the Discovery of the Civil Law Jurisprudence (in Chinese), Intellectual Property Rights, 2015, No. 10.

[27] Ma Yide, Relationship Between IP Laws and the Civil Law—Using Public Order and Good Morals (in Chinese), Intellectual Property Rights, 2015, No. 10.

[28] Article 123 of the General Provisions of the Civil Law has made progress as compared with the General Principles of the Civil Law, in its dealing with IP to the extent that it uses the overarching term of IP and that it recognizes a whole range of IP rights. It provides: "(1) Civil subjects enjoy intellectual property rights according to law. (2) Intellectual property rights are the exclusive rights of the persons on the following objects according to law: (1) works; (2) invention, utility model and design; (3) trademark; (4) geographical indications; (5) trade secrets; (6) integrated circuit layout design; (7) new plant varieties; (8) other objects prescribed by law".

1930s but continuously confronted new challenges and absorbed new technology and devices such as safety belts, power steering, air bags, infinitely variable speeds, antiskid tires, anti-lock braking systems, anti-theft devices, etc. into one unitary system.[29] The same goes with telephones, computers, etc. Meanwhile, whoever refuses to integrate with new and indispensable technology will voluntarily fall behind and withdraw from the market. Codification is a tool, which is neither inherently there, nor standing still. Codification must be practice-oriented, future-facing and evolving with time. Whether IP rights are civil rights and should be incorporated into the Civil Law Code must be decided by the objective demand of the technology and economic development, the nature of things and objective laws. Although IP rights are young as compared with other traditional real rights and creditors' rights, our understanding, thought, induction and refinement of IP rights are not yet mature, and technological progress poses constant new challenges; all these do not change the legal nature of IP rights, namely, as a typified basic property right, nor can these negate the objective fact that IP rights are on the same legal hierarchy as real rights and creditors' rights. Consequently, there must be a place in the Civil Law Code for IP laws.[30]

With technology and institutional innovation increasingly determining the economic development and becoming the major means for wealth generation, IP rights are more and more the core of competitiveness, and not unknown or insignificant anymore. IP rights are the giants for wealth creation, the leading actor of human economic life. Therefore, Civil Law legislators should improve their understanding of property rights and list IP rights as the first property right.

Technology determines everything. The progress of technology will drive the development of society. Civil Law must reflect and serve the change of times. Civil Law originates from Roman law and has undergone a long formation process with numerous changes, and its core has advanced with the times. If the forefathers in Europe were trapped by history and adhered rigidly to Roman law, there would be no French Civil Code. Had they adhered rigidly to the French Civil Code, there would be no German Civil Code. The French Civil Code and the German Civil Code represent different technological and economic eras of their own. If we were obsessed with the German Civil Code and would not destroy its "perfection" by adding IP laws into it, that would be against the logic and progressive spirit that run through Roman law and the German Civil Code. The twenty-first century is distinctively different from the intersection of the nineteenth and twentieth centuries; the Internet has broken with history and disrupted the classic "perfection" of the German Civil Code. The calling of the day is to build a new perfection on top of the old establishment. Chinese people should move ahead with the times and contribute a Civil Law Code of the knowledge economy to mankind, with IP rights standing out as the shining feature of the Civil Law Code.

[29] For details, see Chap. 18 of the present volume.

[30] Liu Chuntian, That IP Rights are the First Property Right is the Discovery of the Civil Law jurisprudence (in Chinese), Intellectual Property Rights, 2015, No. 10.

7 IP Laws and the Rule of Law in China

To the surprise of many outside observers of China is the fact that the issue of reuniting IP laws with the Civil Law is closely related to the securing of the rule of law in China. Breaking away from the rigid ideology of collectivism is the precondition for establishing IP rights and laws in China, which is oftentimes not that self-evident. There have been many countercurrents to pull them back to the old control regimes.[31] One feature of the Chinese IP regime is the ubiquitous administrative intervention into the creation, management, commercialization and even enforcement of all kinds of IP rights. The situation has deteriorated after the introduction and implementation of the National Intellectual Property Strategy between 2008 and 2020.[32] The visible hands of the central, provincial and county governments are everywhere. Governments of all levels have become active players in IP industries, rather than the gatekeepers of the IP regime.

We believe that only by again affirming IP rights as private rights that governments cannot play with or take away just like that, and by returning IP laws into the Civil Law, can the driver of the knowledge economy and the foundation of the rule of law, namely, individual creativity and a private sphere free from state intervention, be protected and the role of the government be reasonably limited.[33]

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[31] One example as mentioned earlier is that the Trademark Law, the Patent Law and the Copyright Law all had disregarded the provisions of the Civil Law and set up their own systems of civil subjects which lasted until 2001. Another is the above-mentioned tendency of "de-privatizing rights" and "de-Civil Lawization".

[32] For a detailed analysis of the National Intellectual Property Strategy and many of its downsides, see Kung-Chung Liu/Chuntian Liu/Ji Huang, IPRs in China—Market-Oriented Innovation or Policy-Induced Rent-Seeking? in Kung-Chung Liu/Uday S. Racherla (ed.), Innovation and IPR in China and India—Myth, Realities and Opportunities, Springer 2016, 161–179.

[33] For a similar opinion, see IP School, Renmin University of China, Report on Development of Intellectual Property in China 2015, Tsinghua University Press 2016, 71, 239.

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Constitutional Governance in India and China and Its Impact on National Innovation

Wenjuan Zhang

Abstract

India and China have attracted research interest due to their potential to catch up to developed nations. The framework of the National Innovation System (NIS) is a popular theory to explain the role of the state in supporting knowledge creation and learning capacity for the catching-up stage. Various comparative studies on sectoral innovation or geography of innovation in India and China have been conducted, mainly by economists. This chapter tries to bring the non-quantified factor-constitutional governance into the discussion from three aspects of the political philosophy for achieving social revolution and social justice, power distribution from three dimensions of vertical, horizontal, and state versus citizen, which have not been favored by economists, due to their lack of rigorousness. At the end, the chapter applies the factors to the analysis of their influence on the economic development path and on the innovation strategy in India and China.

Keywords

India · China · Constitutional governance · National innovation · Comparison

1 Introduction

The attention to national innovation capacity was first captured by economists. The concept of national innovation capacity is usually traced back to Joseph Schumpeter in the early twentieth century. However, the National Innovation System (NIS) as a

W. Zhang (✉)
Jindal Global Law School and Center for India-China Studies, O.P. Jindal Global University, Sonipat, Haryana, India
e-mail: wzhang@jgu.edu.in

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_3

separate concept was raised in the 1980s and further developed by economists, under the influence of the social psychological pragmatist school of Chicago and the ideas of George Mead and John Dewey.[1] The pragmatist version of economic development that "the most important resource in the economy is knowledge and the most important process is learning"[2] is very close to the pragmatist theory in spirit. Today NIS is a very popular concept among academia and policymakers.

India and China are two developing countries which have attracted strong research interest in their innovation capacity due to their rapid economic growth and large domestic commercial markets. Several research efforts have been made under the NIS framework, either by comparing India to China on the general topic of innovation, such as "innovation capacity and economic development"[3] and "transition from production to innovation,"[4] or by conducting the comparison on more specific innovation such as sectoral innovation in the telecom industry[5] or on "geography of innovation."[6]

Bengt-Åke Lundvall, one of the founding scholars of the NIS, reminds us that the focus on the "wider setting" including "the shared value in society and the power structure" may be especially important for the analysis of NIS in developing or less developed countries.[7] However, in the current comparative studies on innovation in India and China, economists prefer the quantitative analysis due to its rigorousness. Attention to the comparative studies of innovation in India and China has been given to input factors such as R&D input and higher education or structural conditions such as GDP per capita, transportation infrastructure, agglomeration, and migration flows. Even if some research has mentioned the "social filter" factors, such as "social and business networks," "social stratification," and "levels of modernity," it has still focused on the quantitative factors such as education rate,

[1] Bengt-Åke Lundvall, National Innovation Systems—Analytical Concept and Development Tool, second version of the paper presented at the DRUID conference in Copenhagen, June 28–29, 2005, available at https://www.researchgate.net/publication/24081600_National_Innovation_Systems-Analytical_Concept_and_Development_Tool. Footnote 7, p. 11. This school focuses on interactive, reflective, and dialectical learning and problem-solving with recent influential publications of this school such as *Pragmatist Democracy* by Christopher K. Ansell, Oxford University Press, 2011.

[2] Lundvall, *supra* note 1, p. 11.

[3] Peilei Fan, Innovation Capacity and Economic Development: China and India, Research Paper, *UNU-WIDER*, United Nations University (UNU), No. 2008/31, ISBN 978-92-9230-077-7.

[4] Tilman Altenburg, Hubert Schmitz, and Andreas Stamm, Breakthrough? China's and India's Transition from Production to Innovation, 36 *World Development*, No. 2, pp. 325–344, 2008.

[5] Sunil Mani, The Dragon v. the Elephant, Comparative Analysis of Innovation Capacity in the Telecom Industry of China and India, 40 *Economic and Political Weekly*, No. 39, Sep. 24–30, 2005, pp. 4271–4283.

[6] Riccardo Crescenzi, Andres Rodriguez-Pose, and Michael Storper, The Territorial Dynamics of Innovation in China and India, 12 *Journal of Economic Geography*, 5, 2012, pp. 1055–1085.

[7] Lundvall, s*upra* note 1, p. 31.

employment rate, or rural-urban migration rate.[8] While there are very few comparative studies on governance and development in India and China[9] or on "the role of sociopolitical factors in inclusive growth"[10] in India and China, there has been little or even no attention to developing the discourse around innovation.

When asked to reflect on the relationship between "the shared value in society and the power structure" and national innovation, two questions appear to be critical: (1) To what extent can constitutional governance be considered in developing the NIS conceptual framework and for comparison of cross-national NIS? (2) Could some qualitative description of India and China, which have so many similarities but also possess critical differences in terms of different constitutional governance for modernization, be meaningful in the conceptual framework of NIS?

This chapter considers the "wider setting," especially the "shared value" and "power structure" mentioned by Lundvall, is highly relevant to the concept of NIS. However, this is far from the methodology and factors favored by economists. It picks up on factors economists disregard due to the difficulty in quantifying them, such as the political philosophy of constitutional governance for social mobility and social justice, the government accountability and innovation policy through horizontal and vertical power structure, and also the confidence in rights protection through the mechanism of constitutional enforcement. My goal in this chapter is to foster further academic interest to enrich the literature in the field of NIS and governance, although it is very limited, even superficial, compared to the big research topics raised in the above two questions.

2 Brief Introduction to the National Innovation System

Before moving to the discussion of the "shared value" and "power structure" emphasized by Lundvall for the analysis of innovation in developing countries, we begin with a brief introduction to the concept of NIS. Inspired by Schumpeter, scholars such as Christopher Freeman have further developed the theory of technological innovation.[11]Robert Solow has also made substantial efforts to quantify the impact of technology on economic growth.[12] In the 1980s, the concept of NIS was

[8] Crescenzi et al., *supra* note 6, pp. 14–15.

[9] Pranab Bardhan, Indian and China: Governance Issues and Development, 68 *The Journal of Asian Studies*, No. 2, May 2009.

[10] C H Hanumantha Rao, India and China: A Comparison of the Role of Sociopolitical Factors in Inclusive Growth, 46 *Economic and Political Weekly*, No. 16 (April 16–22, 2011), pp. 24–28.

[11] Jan Fagerberg, Morten Fosaas, Martin Bell, and Ben Martin, Chris Freeman's Contribution to Innovation Studies, EXPLORE Workshop, 2010, http://www.janfagerberg.org/wp-content/uploads/2013/08/Chris-Freeman%E2%80%99s-contribution-to-innovation-studies-1.pdf, pp. 4–5.

[12] Nathan Rosenberg, Innovation and Economic Development, https://www.oecd.org/cfe/tourism/34267902.pdf, OECD 2004, p. 1.

developed as a separate concept, especially in research about the role of the state in the catching-up process which challenged the Washington Consensus.[13] Special credit was given to Christopher Freeman's book *Technology policy and economic performance: lessons from Japan* in 1987 for the promotion of NIS.[14]

The early attention to NIS "refers to the fact that historical and local context affects where the limits of innovation systems are set."[15] Later, scholars such as Bengt-Åke Lundvall, Nelson, R. R, and Charles Edquist further developed the concept of NIS.[16] Thus, research inquiry was extended to focus areas such as "social systems of innovation," "sectoral system of innovation," "national business system," etc. in the last decade.[17]

Compared to previous theories, NIS's three critical contributions have been emphasized. First, it moves the emphasis for achieving international competitiveness from traditional cost factors and incentives such as cheap labor, devaluation, and tax cuts to innovation.

Second, innovation is defined broadly, including both radical and incremental innovation, even including the diffusion, absorption, and use of innovation.[18] Some have divided it into two types, "science-based" ("promoting R&D, utilizing and creating access to explicit codified knowledge") or "experience-based" ("learning by doing, using and interacting").[19] Some others have placed it into the category of "production capability" ("adapting existing knowledge and minor innovation") or "innovation capability" (new technology for hardware or new soft knowledge for organizing firms).[20]

Third, it brings state back and develops analysis around "how different countries differ in terms of institutional setups supporting innovation and learning,"[21] instead of just focusing on the firm-level innovation. It also focuses on the interaction between users and producers, the interaction among firms, and the wide institutional and social arrangements for innovation.

In summary, "the innovative capacity depends on the density and quality of relationships among enterprises and the relationship between enterprises and support institutions."[22] Or we can conclude that "innovation is regarded as socially and spatially embedded interactive learning process that cannot be understood independently of its region-specific institutional and cultural context."[23]

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[13] Lundvall, *supra* note 1, p. 3. (Washington Consensus is a phrase referring to economic policies recommended by international institutes such as the Institute for International Economics, International Monetary Fund, World Bank, etc. in the 1980s. Some also frame the Washington Consensus as market fundamentalism or neoliberalism.).

[14] Ibid.

[15] Ibid.

[16] Ibid.

[17] Lundvall, *supra* note 1, p. 6.

[18] Lundvall, *supra* note 1, p. 12.

[19] Lundvall, *supra* note 1, p. 9.

[20] Altenburg et al., *supra* note 4, p. 327.

[21] Lundvall, *supra* note 1, p. 8.

[22] Altenburg et al., *supra* note 4, p. 327.

[23] Altenburg et al., *supra* note 4, p. 328.

There are also some critical assessments of the NIS concept. For example, it has been pointed out by many scholars that the understanding of the dynamics of innovation systems is still weak,[24] such as "how the structures of interaction develop and change over time."[25] Some others suggest that understanding of the dynamics of interactive learning "calls for other disciplines than economics."[26] Another critical comment is on its "scientification approach," with too much focus on rigorousness of the research.[27] There have also been suggestions to move the research from an aggregate national level to more specific ones such as regional and sectoral levels, which have been taken by many economists.

This chapter tries to bring the perspective of constitutional law into the NIS research. Constitutional governance is at the apex of power distribution, which is the foundation for understanding the power structure and institutional support. However, it will be limited to explaining the dynamics of interaction between business units and institutional support in a nuanced way.

3 Different Political Philosophy for Social Revolution and Social Justice

Political philosophy sets the foundation and tone for the design and function of constitutional governance. India and China are two countries that believe socialism is the right path for the modernization of underdeveloped and post-colonized nations with large poor and illiterate populations. Both have put socialism into the preamble of their constitution, but follow different schools of socialism, Fabianism for India and Marxism and Leninism for China.[28] The different versions of socialism substantially influence their ways of pursuing social revolution and social justice, which are believed to have different impacts on the social foundation of national innovation capacity in each context.

3.1 Social Revolution: Violent Revolution vs. Democratic Governance

Both India and China are ancient civilizations with long histories. Interestingly, their long cultural traditions carry both nutrients and burdens for their modernization. Cultural inequality is one of the critical barriers for social equality and social mobility. Social mobility is further critical for industrial entrepreneurship, since

[24] Ibid.

[25] Ibid.

[26] Lundvall, *supra* note 1, p. 5. (In arguing for this point, he referred to Reijo Miettinen's comment on the NIS in a publication in 2002.)

[27] Ibid.

[28] K. V. Viswanathaiah, Jawaharlal Nehru's Concept of Democratic Socialism, 26 *The Indian Journal of Political Science*, No. 4, October–December 1965, pp. 91–99.

"[industrial] entrepreneurship can develop only in a society in which cultural norms permit variability in the choice of paths of life."[29]

Both India and China have made efforts for social revolution in the new nation-building but in different ways. In the struggle for independence, India followed Gandhi's non-violent civil disobedience, while China followed Mao Zedong's revolutionary violence with "ideological commitment to the fundamental alteration of the class relationship," especially in rural areas.[30] This commitment to fundamental alteration of the class relationship was continued in the first three decades of the People's Republic of China (PRC) and was even strengthened during the Cultural Revolution under the leadership of Mao. Unlike the leadership of China, Gandhi, Nehru, and other founding leaders of India employed non-violence for social revolution, while they disagreed on industrialization for development.[31] Further, members of the Constitutional Assembly believe that direct election is the pillar for social revolution.[32]

> The Assembly has adopted the principle of adult franchise (said) with an abundant faith in the common man and the ultimate success of democratic rule, and the full belief that the introduction of democratic government on the basis of adult suffrage will bring enlightenment and promote the well-being, the standard of life, the comfort, and the decent living of the common man.[33]

Nobel laureate Amartya Sen, Indian-born economist and philosopher, also argued in his book *Development as Freedom* that social opportunities such as access to primary education and basic health care are not only "important for the conduct of private life" but also important for "effective participation in economic and political life."[34] China has improved life expectancy and literacy as well as reduced infant mortality within a short period.[35] Despite its poorer status compared to India, from 1949 to1953 China was able to raise the life expectancy to 40.3, while the life expectancy in India remained 32.1 in 1951, almost no change from that of 1947.[36] In the mid-1970s, life expectancy in China reached 63.6 for men and 66.3 for women, compared to an average of only 49.4 in India despite the great political

[29] Phiroze B. Medhora, Entrepreneurship in India, 80 *Political Science Quarterly*, No. 4 Dec. 1965, p. 564. (He quoted from the research of Bert Hoselitz.)

[30] Jason Unruhe, Contrast India & China: What a Difference Revolution Makes!, July 20, 2010, Jason Unruhe. Com, https://maoistrebelnews.com/2010/07/20/contrast-india-china-what-a-difference-revolution-makes/

[31] Kazuya Ishii, The Socioeconomic Thoughts of Mahatma Gandhi: As An Origin of Alternative Development, *Review of Social Economy*, Vol. LIX, No. 3, September 2001, p. 301.

[32] Granville Austin, *The Indian Constitution: Cornerstone of a Nation*, Oxford University Press, 2009, p. 58.

[33] Ibid.

[34] Amartya Sen, *Development as Freedom*, Oxford University Press, 1999, p. 39.

[35] Unruhe, *supra* note 30.

[36] Ibid.

turmoil and many natural disasters in China.[37] By 1980–1981, China's infant mortality rate fell to 56 per 1000 live births, while the Indian level remained at a high 122.[38] There is also a big gap in improving literacy in India and China. For example, in 1964, Chinese illiteracy dropped to 52.4%[39] while it was 63.77% in 1981 in India. The gap is still expanding. By the end of 2014, India's adult illiteracy rate was 29.5%,[40] while China's has dropped to 4.1%.[41] Although many factors contributed to the rise of China, some scholars believe that "it was the 'head start' provided by the socialist revolution—in better health, education, infrastructure development and social egalitarianism—that laid the basis for this later advance."[42] Sen also argued that economic liberalization in India has not achieved an outcome similar to China and that this is due to lack of social preparedness, evidenced by the fact that half of its adult population was illiterate in 1991.[43]

The Chinese revolution was not achieved without costs, such as civil war and the death of millions in famine, even after the establishment of the PRC. The social disruption and violence caused by the Cultural Revolution dragged Chinese society into a devastating trauma.[44] Starting in 1978, the political focus has shifted to economic development. Benefiting from social liberation and decentralized power, within a short period of time, China became the world's factory, transforming China "from one of the most egalitarian countries in the world, into among the most polarized," with new stratification, a dangerously high Gini index, a high suicide rate among farmers, and a host of social conflicts and protests.[45]

Although India has lagged in most key economic and demographic indicators compared to China, the gradual social change has saved India from dramatic political turbulence and from wild economic and social transformation as well. Meanwhile, India has made evident progress toward social equality among classes and castes through its constitutional arrangements. Untouchability was abolished by the Constitution and is not visible in daily life. Through seats reservation for education, government jobs, and elected positions as an affirmative action in the Constitution, the status of many people from low castes and underprivileged tribes

[37] Ibid.

[38] Ibid.

[39] Shanghai Institute of Education Studies, Contextualized Analysis on Chinese Human Resources (in Chinese), Shanghai Institute of Education Studies, June 12, 2010, http://www.cnsaes.org/homepage/Upfile/2010612/2010061205505377.pdf. (The age basis for adult illiteracy here was 13, which was lifted to 15 after 2008.)

[40] Department of School Education and Literacy, Ministry of Human Resources Development (MHRD), Education Statistics At A Glance, 2016, http://mhrd.gov.in/sites/upload_files/mhrd/files/statistics/ESG2016_0.pdf

[41] Data from the UNDP China Office, p. A1, http://www.cn.undp.org/content/china/zh/home/mdgoverview/overview/mdg2.html

[42] Unruhe, *supra* note 30.

[43] Sen, *supra* note 34, p. 42 .

[44] Unruhe, *supr*a note 30.

[45] Ibid.

was raised. Low caste has even become a selling point for getting votes such as in elections for Lok Sabha (meaning the "Council of States")[46] and president.[47]

However, concerns about social inequality in India still exist. For example, one scholar argues that "it did not put an end to the institutional aspects of class exploitation and caste oppression."[48] Another scholar even asserted that the Nehruvianism version of the emancipation project "was simply rendering oppression invisible."[49] The caste politics in more than the last two decades "has largely confined itself to the ambition of gaining access to power rather than any substantial agenda of social transformation."[50] It has even become a big puzzle of Indian democracy as to "why the poor, so assertive when election time comes, often do not punish politicians who are ineffective at resolving the endemic problems of poverty, disease and illiteracy."[51]

3.2 Pursuing Social Justice: Transcendental Institutionalism vs. Realization-Focused Comparison

Amartya Sen in his thought-provoking book *The Idea of Justice* divides "the two basic and divergent lines of reasoning about justice among leading philosophers"[52] into "transcendental institutionalism" which "concentrated on identifying just institutional arrangements for a society"[53] and "realization-focused comparison," which "took a variety of comparative approaches that were concerned with social realizations (resulting from actual institutions, actual behaviors and other influences)."[54] In terms of institutional arrangement, the reasoning of the Communist Party of China (CPC) is more from the perspective of comparison and realization under the theory developed by Amartya Sen in his thought-provoking book *The Idea of Justice* and tries to argue that the current choice is fit even if it is not perfect.

This point can be substantiated by the long preamble of the Chinese Constitution both in its 1954[55] and 1982 versions,[56] which contains a long historical review of the political struggles and experiments China experienced from the Opium War to the Revolution of 1911 and to the birth of the PRC in 1949. It doesn't provide principles

[46] Is Narendra Modi really an OBC? *Rediff*, May 10, 2014, http://www.rediff.com/news/column/ls-election-sheela-says-is-narendra-modi-really-an-obc/20140510.htm

[47] Rahul Bedi, India set to elect president from lowest Dalit caste, *Telegraph*, July 17, 2017, http://www.telegraph.co.uk/news/2017/07/17/india-set-elect-president-lowest-dalit-caste/.

[48] Unruhe, *supra* note 30.

[49] Pratap Bhanu Metha, *The Burden of Democracy*, Penguin Books, India 2003, p. 71.

[50] Metha, *supra* note 49, p. 74.

[51] Bardhan, *supra* note 9, p. 351.

[52] Amartya Sen, *The Idea of Justice,* Penguin Books, 2009, p. 5.

[53] Ibid.

[54] Sen, *supra* note 52, p. 7.

[55] China Constitution 1954, http://e-chaupak.net/database/chicon/1954/1954bilingual.htm

[56] China Constitution 1982, http://www.npc.gov.cn/englishnpc/Constitution/node_2825.htm

for an ideal society but instead argues why this is fit for China by comparison to other alternatives which have been tried.

Some Chinese scholars argue that the current Chinese system is of three integrations, that is, culturally *Confucianism*, politically socialism, and economically liberalism, which is the new consensus of reform sustained by the public reasoning.[57] That is reflected in the constitutional governance of the party state, which places political power with the party and administrative power with the state. Following Confucianism and Leninism, power distribution in China is very centralized with the party state and parliamentary sovereignty, which would not be acceptable from the perspective of transcendental institutionalism. It also looks odd to combine fundamental rights with duties in the Chinese Constitution from the eyes of philosophers believing in liberal democracy. In terms of the strategy of enhancing justice or reducing injustice, the CPC identifies the improvement of material living conditions, including the right to a decent standard of living, health, education, housing, and so on as priorities, and places more focus on collective rights than individual rights, as it is more urgent to remove injustice.[58]

Compared to China, India more closely follows the model of transcendental institutionalism. The preamble of the Indian Constitution is very short, but lists four clear principles as the foundation for building the ideal society of justice, liberty, equality, and fraternity.[59] India's Constitution borrowed the best systems of transcendental institutionalism, namely, the parliamentary government from the UK system, the judicial review and fundamental rights from the USA, and the federal structure from the Canadian Constitution.[60] India's Constitution values civil and political rights more than economic and social rights, evidenced by placing the former as fundamental rights under judicial review in Part III and the latter as the guiding principles of state policy in Part IV.[61] "For years, social rights, like the right to food, or the right to shelter, were considered subordinate to civil-political rights, like the right to free speech and/or the right to political participation."[62] Unlike the Chinese way of integrating traditional philosophy with borrowed political philosophy from Western countries, Indian people have not tried to integrate them at the political level.[63] For family and social life, Indians still follow traditional personal

[57] Zhou Lian, The Debate in Contemporary Chinese Political Thought, in Fred Dallmayr and Zhao Tingyang (ed.) *Contemporary Chinese Political Thought: Debates and Perspectives*, Knowledge World, New Delhi, 2013, pp. 34–36 Also from Gan Yang, The Road to China: Thirty Years and Sixty Years (in Chinese), *Dushu* 6, 2004, p. 5.

[58] Henri Feron, The Chinese Model of Human Rights, 3 *China Legal Science* (2015), p. 95.

[59] India Constitution (1950), http://lawmin.nic.in/olwing/coi/coi-english/Const.Pock%202Pg.Rom8Fsss(3).pdf

[60] Krishan Keshav. *Constitution Law-I*, Delhi, Singhal Law Publication, 2016, p. 10.

[61] Gautam Bhatia, Directive Principles of State Policy, in Sujit Choudhry, Madhav Khosla, and Pratap Bhanu Mehta (ed.), *The Oxford Handbook of the Indian Constitution*, New York: Oxford University Press, 2016, p. 645.

[62] Madhav Khosla, *The Indian Constitution*, Oxford University Press, Sixth Impression, 2014, p. 126.

[63] Hanna Learner, The Indian Founding: A Comparative Perspective, in Choudhry et al. (ed.) *The Oxford Handbook of the Indian Constitution*, 2016, p. 61.

law (religion or traditional philosophy),[64] while in political life the people's passion is given to the ideal of liberal democracy.

To conclude, in China the dramatic class disruption prepared its people to embrace social arrangements such as access to primary education and basic health care in the pre-reform era, which further prepared for the capacities of economic and political participation. The centralized power and realization-focused comparison approach to justice give China flexibility to promote policy innovation for economic development as well as building infrastructure for economic facilities. The challenges in China are how to develop principle-based governance with logical reasoning to reduce the people's economic insecurity, which is critical for national innovation in the next step. In contrast, India has a very different path, with faith in the philosophy of evolutionary social change through ideal political arrangement. Constitutional democracy, including universal adult suffrage and judicial independence, has laid a good foundation for the rule of law as a principle of governance, whereas the function of the governance is limited by the big gap between ideal institutional arrangement and the huge social disparity.

4 Power Distribution: Government Accountability vs. Policy Innovation

One of the contributions of NIS is to bring the state back in exploring the catching-up process through innovation. How to identify the right intervention by the state? And how does the state implement the right intervention with the right timing and in the right way? The answers lie in the constitutional power distribution and its interaction with the social reality. In this part, I am going to introduce the difference in power distribution between India and China, including vertical power distribution of the central-local relationship, the horizontal power structure in terms of accountability and policy innovation, and the boundary between citizens' rights and state power. It is expected that the analysis will help provide some clues to understand the difference in the breadth of support for NIS in India and China.

4.1 Vertical Power Distribution: Accountability vs. Local Innovation

People usually define China as a centralized state, and India as a federal one. Upon closer examination, we may find the picture of the central-local relationship in both countries are much more complicated.

From the constitutional perspective, India is better framed as a quasi-federalist, or a federalist state with more central power. One of the critical perspectives is to look at its legislative power distribution. The seventh schedule of the Constitution

[64] Paras Diwan, *Modern Hindu Law*, Allahabad law Agency, 2017 Reprint, pp. 11–26.

gives the union parliament residual power while the states have a fixed list of legislative powers. There is also a long list of powers jointly shared by the union and states. In addition, if the union government believes that some power is better exercised by them, they can pass a constitutional amendment to shift the power from the state to the union government.[65] For example, primary education has been changed from the exclusive power of the states to joint power of the states and union government.[66] "In situations where there is a union and state law conflict, Article 254 of the Indian Constitution prioritizes the former and renders the latter, to the extent of incompatibility or repugnancy, void."[67] For executive power, there is a presidential rule under Article 356 of the Indian Constitution, according to which the president can declare failure of the constitutional machinery of a state, and the union government can exercise the executive power of the state during this emergency period. This power has been limited through judicial review in the case of *S.R. Bommai* after 1994.[68]

Even if the Constitution grants more power to the union government, it doesn't mean that the union government actually enjoys centralized and consolidated power over states in its daily function. In order to understand the functional practice, we also need to look at other factors, such as religious diversity, linguistic diversity, cultural diversity, multiparty politics, etc. India is very different from a traditional national state because it was built "in a social and political context in which the multinational dimension interacts with more linguistic and religious diversity.[69] Before independence, there were more than 500 princely states, which maintained high-level autonomy through agreement with British India. After independence and partition, more than 400 of them were put under the modern state of India. India has more than 1000 parties at state, regional, and national levels which compete for power at different levels. These parties have diversified ideology such as Marxism, secularism with liberal democracy, Hindutva, support for low castes, etc. In many cases, the ruling parties at different levels are not the same, which makes the centralization of power very challenging. Even for building the streamlined tax system, the indirect tax reform such as the Goods and Services Tax reform just managed to pass on July 1, 2017 in India.[70] At the grassroots level, in the 1990s, through the

[65] Khosla, *Supra* note 62, p. 47.

[66] Schedule 7, List III-Concurrent List, Entry 25 says "Education including technical education, medical education, and universities, subject to the provisions of entries 63,64,65 and 66 of List I; vocational and technical training of labor." Entry 25 of List III was introduced through the 42nd Amendment in 1976. From the Constitution of India Bare Act 2017, Universal law Publishing, p. 238.

[67] Khosla, *supra* note 62, p. 50.

[68] Khosla, *supra* note 62, pp. 64–65.

[69] Alfred Stepan, Juan J. Linz, and Yogendra Yadav, *Crafting State-Nations: India and Other Multinational Democracies*, John Hopkins University Press, 2011, pp. 39–40.

[70] VS Krishnan, GST is one of the boldest reforms in post-Independence India, *Indian Express,* August 4, 2016, https://indianexpress.com/article/opinion/columns/gst-bill-passed-entry-52-abolished-2952243/

73rd and 74th amendments, three tiers of local government (panchayats) through direct elections were able to be established.[71]

In India, people value diversity more than scaling up exciting innovations. For example, the state of Kerala has been introduced by scholars and policymakers as a model of equitable development with high literacy and low disparity. However, many years later, India has only one "Kerala." The challenge involved in scaling up might lie in not only the willingness of the people but also its feasibility elsewhere in India.

However, in the Chinese context, Article 3 of the Constitution (1982) clearly sets forth the principle of democratic centralism for vertical power and horizontal power distribution. Meanwhile, China has created different levels of autonomy to deal with the return of previously colonized territorialities such as the high-level autonomous system named Special Administrative Region (SAR) for Macau and Hong Kong and to accommodate ethnic minorities with a middle-level autonomous system such as the autonomous administration system. The majority of provinces and municipalities are part of the centralized system, with a low level of political autonomy. In addition, China started experimenting with direct vote for village committees at the grassroots level starting from the late 1980s, which has become a nationally institutionalized system.[72]

It is further worth noting that Paragraph 4 of Article 3 of the Chinese Constitution (1982) sets out an interesting principle to deal with the relationship between central and local governments on policy experimentation and innovation, even for provinces with low levels of legal and political autonomy. It says "The division of functions and powers between the central and local State organs is guided by **the principle of giving full scope to the initiative and enthusiasm of the local authorities under the unified leadership of the central authorities**."[73] This means that even the provinces with low-level political autonomy still have big space for policy innovation. Scholars have framed this model as "fragmented authoritarianism"[74] or "market-preserving federalism." [75] On the ground, the center gives local authorities space to test new ideas. If they fail, it is limited to the local.

[71] Dilip Mookherjee, "Governmental Accountability" in Niraja Gopal Jayal and Pratap Bhanu Mehta (ed.), *The Oxford Companion to Politics in India*, Oxford University Press India, 2010, p. 479.

[72] For more information, please refer to Chen Zhen, Dilemma, Balance and Remedy for Election at Village Committee from the Perspective of Self-governance at Grass-root Level, research for the 2016 National Civil Affaires Forum, http://mzzt.mca.gov.cn/article/2016mzlt/mzsyfz-tzflt/201610/20161000886907.shtml

[73] For the full text for Article 3, please refer to the link http://www.npc.gov.cn/englishnpc/Constitution/2007-11/15/content_1372963.htm

[74] Haifeng Huang, Signal Left Turn to Right: Central Rhetoric and Local Reform in China, 66 *Political Research Quarterly*, No. 2 (June 2013), p. 294. Also from Kenneth G. Lieberthal and Michel Oksenberg, *Policy Making in China: Leaders, Structures and Process*, Princeton University Process, 1988.

[75] Huang, as *supra* note. Also from Cao Yuanzheng, Yingyi Qian, and Barry R. Weingast, *From Federalism, Chinese Style of Privatization, Economics of Transitio*n, No. 7, 1999, pp. 103–121.

If it is successful then the central government can scale it up to the national level. In order to manage the pace, the rhetoric of the central government is usually conservative, but the local government can initiate unauthorized policy experiments based on their assessment of political risk.[76] Scholars found that this experiment-based policymaking model provides a more powerful explanation than static factors for China's economic transformation.[77]

This mechanism of centralization of direction plus local autonomy has also evolved in terms of promoting geography of innovation. Before 2000, China has heavily used the top-down model of promoting geographical development, which is diffused in a hierarchical way.[78] By comparing it with India, scholars have found that the agglomeration forces which lead to innovation have little spillover effect in China, since the innovation owes much to planned economy or aggressive policy intervention rather than being developed through natural social filters.[79] For example, in the mid-2000s, the geography of patenting in China was much more concentrated, with 46% of patenting in Guangdong province, while in India it was more evenly distributed among the six cities of Bangalore, Chennai, Delhi, Hyderabad, Mumbai, and Pune.[80]

However, starting from 2010, there are some new signals toward the innovation direction. One is that the central direction toward local autonomy has been expanded toward both economic development and social development. The other is that the central government has shifted from directing local authorities' policy innovation to multi-stakeholder, multiform innovation. On September 29, 2010, in the 23rd Workshop of the Political Bureau of the Chinese Communist Party Central Committee, President Hu Jintao clearly set the tone that China should try the utmost to invigorate the innovation power of civil society.[81] On March 5, 2011, in the Central Government Report to the National People's Congress (NPC), Premier Wen Jiabao mentioned in an unprecedented way that "China would mobilize and organize the public to join social management, and promote the positive role of civil society organizations and better governance."[82] Almost from 2010, private tech business such as Sina, Baidu, Alibaba, and Tencent quickly grew. Cities started competition for high-tech companies. In 2017, driven by private business, the geographical distribution of patenting has been more expansive and evenly distributed

[76] Huang, *supra* note 74, p. 302.

[77] Sabastian Heilmann, From Local Experiments to National Policy, The Origins of China's Distinctive Policy Process, 59 *China Journal*, Jan. 2008, p. 29.

[78] Crescenzi et al., *supra* note 6, p. 25.

[79] Crescenzi et al., *supra* note 6, pp. 21–24.

[80] Ibid.

[81] Hu Jintao Hosted the Twenty-Third Workshop for the Political Bureau of the Chinese Communist Party Central Committee, Xinhua News, Sep. 29, 2010, http://news.xinhuanet.com/politics/2010-09/29/c_13535934.htm

[82] Wen Jiabao: Strengthening the Capacity of Government in Social Management and Better Governance, *Sina News*, http://news.sina.com.cn/c/2011-03-05/104722057821.shtml

compared to that of the mid-2000s: nearly all provinces patented, the top three changing to Guangdong, Zhejiang, and Jiangsu, with the percentage of Guangdong dropping from 46% to 24%.[83]

4.2 Horizontal Power Distribution: Accountability vs. Policy Innovation

India developed the longest and most detailed constitution in the world through three years of deliberation, which establishes a functional separation of powers with formal political settings. Learning from reflection on Nazi Germany, India doesn't follow parliamentary sovereignty, but instead adopted the model of parliamentary government believing it to be effective and accountable.[84] The Indian Constitution establishes universal adult suffrage. In addition, India learned from the USA to have an independent judiciary to check the tyranny of the majority. In India, among the three powers of executive, legislative, and judiciary, the judiciary is the most trusted one among the public. Through enforcing fundamental rights guaranteed by the Constitution in Part III and the judicial activism by developing a "basic structure doctrine,"[85] India's Supreme Court is playing an omnipotent role in enforcing the Constitution. The Indian apex court even enjoys more power than its counterpart in the USA.[86] For example, in India, Supreme Court and high court judges are appointed through a collegium, not subject to the real check of legislative and executive powers.[87] Furthermore, "The [Supreme] Court devised ways of monitoring and disciplining the runaway exercises of constitution-amending powers, initially solely entrusted to Parliament and the Executive, via the invention of the doctrine of the basic structure and essential features of the Constitution."[88] The Indian Supreme Court is not confined to the conventional narratives of separation of powers but believes adjudicatory leadership or judicial supremacy.[89] The adjudicatory leadership shapes India as a rule-based country, making governance function more like a forum of principle. The legal formalism and the check and balance in India lay a solid foundation for economic security, which is important for fostering entrepreneurship.

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[83] Zhou Hui, Zhang Jianlin, 2017 China Patenting Report with Top Three of Guangdong, Zhejiang and Jiangsu, *21st Economic Report*, April 27, 2018, http://finance.sina.com.cn/roll/2018-04-27/doc-ifztkpin8971574.shtml

[84] Tom Ginsburg and Mila Versteeg, Why Do Countries Permit Constitutional Review, 30 *Journal of Law, Economics and Organization* (2014), p. 595.

[85] Manoj Mate, Two Paths to Judicial Power: The Basic Structure Doctrine and Public Interest Litigation in Comparative Perspective, 12 *San Diego International Law Journal*, Fall 2010.

[86] Upendra Baxi, Law, Politics, and Constitutional Hegemony: the Supreme Court, Jurisprudence and Demoprudence, Choudhry et al. (ed.) *The Oxford Handbook of the Indian Constitution*, Oxford University Press, 2016, New Delhi, p. 106.

[87] Mate, *Supra* note 85, pp. 204–206.

[88] Baxi, *Supra* note 86, p. 101.

[89] Baxi, *Supra* note 86, p. 106.

However, short-run competitive populism in elections makes mobilization for votes more important than deliberation on how to reduce social injustice through collective efforts. For example, investment-related physical infrastructure and access to qualified education are usually not popular in election campaigns.[90] Neither is it easy to carry out policy experimentation in India under legal formalism and competitive populism.[91] In fact, the gap between elites' transcendental institutionalism and the social reality has also caused some odd phenomena, such as the persistent low ranking in contract enforcement for doing business in India by the World Bank.[92] In contrast, Chinese contract enforcement has been among the top ten for many years.[93] Equally unbelievable is the large number of delayed cases in India, 26.9 million in total as of May 19, 2018, including 2.25 million cases delayed over 10 years.[94]

India has a dual track of politicians and bureaucrats. In order to promote social equality, the Indian Constitution foresees seat reservation as the affirmative action through which scheduled tribes (ST), scheduled castes (SC), and other backward classes (OBC) can be assigned reserved seats for elected positions and nonelected positions as bureaucrats in public sector and educational settings. The multiparty electoral democracy makes politicians very sensitive to constituents' concerns. But ethically, bureaucrats are expected to be apolitical.[95] There is also constitutional protection for bureaucrats' job security. The apolitical ethics and the secured nature of bureaucratic jobs raise the question of how to transcend politician-based accountability to bureaucrat-based accountability.

The Chinese political system is an interesting combination of Confucianism and Leninism, a minority amidst the global prevalence of electoral democracy,[96] in which governance is divided between the CPC with political power and the state with administrative power.[97] Horizontal state power distribution follows the so-called democratic centralism or parliamentary sovereignty. The National Peoples' Congress has the supreme power to supervise all other powers including the

[90] Bardhan, *supra* note 9, p. 349.

[91] Ibid.

[92] N.L. Rajah, Courting the rankings, *Hindu*, Feb. 6, 2018, http://www.thehindu.com/opinion/op-ed/courting-the-rankings/article22661678.ece

[93] On ease of doing business in China, see http://www.doingbusiness.org/data/exploretopics/enforcing-contracts/china

[94] Data are from the daily updated NJDG database, http://164.100.78.168/njdg_public/main.php

[95] For more information about the ethics of bureaucrats in India, please refer to Arudra Burra, The Indian Civil Service and the Nationalist Movement: Neutrality, Politics and Continuity, 48 *Commonwealth and Comparative Studies*, No. 4, November 2010, pp. 404–432.

[96] Zheng Yong Nian, Chapter 2, The Chinese Communist Party as Organizational Emperor: Identity, Culture and Politics, in the book *The Chinese Communist Party as Organizational Emperor: Culture, Reproduction and Transformation*, Routledge Taylor & Francis Group, Landon and New York, 2010, p.200.

[97] Larry Cata Backer, Party, People, Government, and State: on Constitutional Values and the Legitimacy of the Chinese Party-State Rule of Law System, 30 *Boston University International Law Journal*, 2012 Summer, p. 343.

executive, judiciary, and military. The judiciary is a law-applying body, which has no power to check the legislative but has some power to check the executive through administrative litigations filed by citizens. The mechanism for the CPC as the ruling party to work with other democratic parties and stakeholders is called a "multi-party political consultation" system. Markets and civil society are slowly being released from the control of government after 1978.

Some scholars have summarized the Chinese political system as "democracy at the bottom and meritocracy at the top."[98] Above the town level, functionaries are selected among bureaucrats through supposed merit-based criteria, while at the grassroots level functionaries are elected through votes. That means bureaucrats and politicians are not separated clearly in the Chinese context but go through the same track. Compared to electoral democracy, functionaries selected through meritocracy will not have the issues of going through beginners' lessons or of tyranny of the majority, but have the challenge to build a sustainable meritocracy in a country with a huge population and diversity.

The different structure of the political system has a profound impact on government accountability and policy entrepreneurship. Both India and China claim to have a form of accountable government: India for having democratic institutional settings and China for identifying itself as serving the people's interests. However, government accountability functions in a very different way in each. In China, government accountability is mainly through internalization and self-reflection. Checks from external stakeholders such as other political parties, the judiciary, media, and civil society are very weak. The CPC, as the only ruling party since the establishment of the PRC, has tried to keep legitimacy and competency to rule the country by frequent self-disciplining and absorptive adaption. In turn, the CPC tries to internalize this reflection on their members to align personal interest with party interest and public interest. The CPC's accountability to the people is more outcome-based than procedure- or participation-based. In India, government accountability is mainly through external channels such as opposition parties, judiciary, media, and civil society, which are effective in checking politicians but may be less effective in checking bureaucrats.

4.3 Constitutional Enforcement: Citizens' Rights vs. State Power

In addition to allocating power vertically and horizontally for the function of the state, it is also important to look at how the constitution enforces citizens' rights. The Indian Constitution and Chinese Constitution both enumerate a long list of

[98] Daniel Bell, extracts from Chapter 4, *The China Model: Political Meritocracy and The Limits of Democracy*, Princeton University Press, 2015 p. 168.

rights including civil and political rights and economic, social, and cultural rights for their citizens. Whereas most of the rights are similar in wording, there are some evident differences in terms of their enforcement mechanism and relationship with duties.

India's Constitution differentiates rights into two groups based on the enforcement mechanism. It places most of the civil and political rights under fundamental rights in Part III with the right to constitutional remedies through the Supreme Court while placing most economic, social, and cultural rights under Part IV "Directive Principles of State Policy."[99] Some scholars have even criticized that the "Constitution incorporated civil-political rights with great gusto but stood silent on social rights."[100] Some rights such as access to education for children at the ages of 6–14 have become a fundamental right through judicial activism. Through expansive judiciary interpretation of the "right to life" under Article 21, more and more economic and social rights such as the right to clean air, right to health, etc. are being recognized.[101] India's Constitution is very right-based. For example, in order to improve the access to primary education, the Supreme Court of India has made access to education for school children (6–14 years) a fundamental right first. Parliament has also passed the Right to Education Act to endorse this right through legislative power. Even for compulsory education, the duty is for the state to provide education, while parents and school children have only the right but no duty to receive education.

In China, Chapter 2 of the Constitution concerns "fundamental rights and duties." It does not differentiate civil and political rights from economic, social, and cultural rights in terms of enforcement. The Constitution is enforced by the National People's Congress (NPC) and its Standing Committee (NPCSC). Article 62 prescribes that the NPC shall "supervise the enforcement of the Constitution." Article 67 empowers the NPCSC to "interpret the Constitution and supervise its enforcement." Although the judiciary cannot check the legislature under the parliamentary sovereignty, the Supreme People's Court (SPC) has experimented to make some constitutional rights justiciable, such as the right to education in the *Qi Yuling* case in 2001.[102] However, the SPC repealed it later in 2009 for being controversial.[103] In addition, the enforcement of constitutional rights in China is more toward collectivism and always with an eye on duty. In Chapter 2 of the Chinese Constitution, on top of the general

[99] Bhatia, *supra* note 61, p. 645.

[100] Khosla, *supra* note 62, p. 126.

[101] Vidhan Maheshwari, Article 21 of The Constitution of India—The Expanding Horizons, http://www.legalserviceindia.com/articles/art222.htm

[102] Tong Zhiwei, A Comment on the Rise and Fall of the Supreme People's Court's Reply to *Qi Yuling* Case, 43 *Suffolk U. L. Review* (2010), pp. 669–680.

[103] Keith Hand, Resolving Constitutional Disputes in Contemporary China, 7 *East Asia Law Review*, 2011, pp. 112–115, and 106–112.

fundamental rights, two specific rights, namely, the right to education[104] and right to work,[105] are closely followed by duties.

While India is more rule-based China is more policy-oriented, such as experimentation-based policymaking[106] with the "focus on finding innovative policy instruments rather than defining policy objectives,"[107] especially after the era of reform and opening up era. In China, law is very general and leaves broad of leeway to policymakers, where legal issues are easily taken as political ones decided by the CPC. The governance function in China is more like a forum of policy, where in many circumstances experimentalism and policy orientation create space for entrepreneurship, such as the special economic zones in the 1980s, and recent pilot free trade zones.[108] However, low priority for the rule of law also creates economic insecurity for the middle-class and business owners. The limited capacity in dealing with conflicts and diversities causes a law-stability paradox in legal reform and social transformation.[109] "[D]ecentralization of power combined with central control over personnel and promotion plays in Chinese governance"[110] which enables China to "have more decisive policy initiative and execution than in India."[111] But "China is still far from establishing a comprehensive rule-based system and institutionalizing a credible set of checks and balances,"[112] which will lead to "low capacity for conflict management [and] make it more brittle in the face of a crisis than the messy-looking system in India."[113]

India's system has "more institutionalized outlets," which enables the enforcement of fundamental rights against government through an independent judiciary. However, its inability to deliver social service and take collective action despite populist hindrance cannot be overcome in a short period.[114] "[The] over-politicized

[104] Article 46 provides that "Citizens of the People's Republic of China have the duty as well as the right to receive education," http://www.npc.gov.cn/englishnpc/Constitution/2007-11/09/content_1372846.htm

[105] Article 42 provides that "Citizens of the People's Republic of China have the right as well as the duty to work" (http://www.npc.gov.cn/englishnpc/Constitution/2007-11/09/content_1372846.htm).

[106] Sebastian Heilmann, From Local Experimentation to National Policy : The Origins of China's Distinctive Policy Process, The China Journal No. 59, Jan. 2008, pp.1–30.

[107] Heilmann, p. 3.

[108] Such as the Pilot Free Trade Zone in Shanghai and the Hainan Pilot Free Trade Zone. For more information, please refer to http://en.china-shftz.gov.cn/ and Xinhua News report, http://www.xinhuanet.com/english/2018-04/13/c_137109244.htm

[109] Benjamin Liebman, "Legal Reform: China's Law-Stability Paradox," *Dadlus*, Spring 2014, Vol. 143, No. 2, pp. 96–109 (2014), Online access http://www.mitpressjournals.org/doi/abs/10.1162/DAED_a_00275#.U1B7ZldWiO8, p. 96.

[110] Bardhan, *supra* note 9, p. 356.

[111] Bardhan, *supra* note 9, p. 353.

[112] Bardhan, *supra* note 9, p. 356.

[113] Bardhan, *supra* note 9, p. 357.

[114] Ibid.

administration and decision-making processes, and its clogged courts and corrupt police and patronage politics that make a mockery of the rule of law for the common people all will continue to hobble the process of economic growth and alleviation of its still massive poverty."[115]

5 The Impact of Constitutional Governance on Economic Development Path and Innovation Strategy

In this part, the impact of constitutional governance on economic development path and case studies of innovation capacities in India and China will be discussed.

5.1 Impact on Economic Development Path

Both China and India have regarded the centralized planned economy of the former Soviet Union as their role model for economic development from the late 1940*s*. *China* has tried to combine the party state with a planned economy and most unfortunately learned tragic lessons when millions of people starved to death. From 1978 onward, China started its groundbreaking economic reform, which combined the party state with a market economy. India has tried to combine democracy and a planned economy. The logic behind this is that India needs political freedom to break the societal inequality and believes that a centralized planned economy has helped boost economic development for its starving people by the millions.[116] The end of the emergency period in 1976–1977[117] led to multiple parties competing for power in India. However, India still followed the planned economy together with multiparty elections until 1991. Even today, the role of the state in India's market economy continues to be very distinctive, different from the ones in liberal democracies or those in China and other East Asian countries.

In theory, there are different frameworks to understand the developmental stages of innovation. Some conceptualize a three-stage framework, namely, the stage of

[115] Ibid.

[116] Viswanathaiah, *supra* note 28, p. 94.

[117] According to Article 352 of the Indian Constitution, the Indian president has the power to announce that the country is in a state of internal emergency. During the emergency, fundamental rights shall be suspended. When Indira Gandhi served as prime minister, she felt the threat of internal disturbance and imposed emergency on the whole country, which was conducted through President Fakhruddin Ali Ahmed. The emergency period started from June 26, 1975, and lasted for 21 months. During the period, all fundamental rights of citizens were suspended. This was also called the darkest period of Indian democracy. For more information, please refer to India Emergency Era, *The Times of India*, June 25, 2015, https://timesofindia.indiatimes.com/india/indian-emergency-era/photostory/47812701.cms. Also see Amrith Lal, 40 years on, those 21 Months of Emergency, *The Indian Express*, July 20, 2015, https://indianexpress.com/article/explained/40-years-on-those-21-months-of-emergency/

individual entrepreneurship (Shumpeter Mark I),[118] the stage of big corporations as the main driver of innovation and economic growth (Mark II), and the stage where "a broader set of actors and institutions [shape] the innovation process" (Mark III).[119] Some others divide economic development into a factor-driven stage, efficiency-driven stage and innovation-driven stage, and further distinguish necessity entrepreneurship from opportunity entrepreneurship, and also test their respective impact on economic development.[120] Necessity entrepreneurship means there is very limited access to wage jobs, and entrepreneurship is the way to make a living. "The relationship between necessity entrepreneurship and economic development is usually negative in low-income countries, while the relationship in high-income countries is most likely positive."[121] Economic studies have also shown that "opportunity entrepreneurship has a big impact on economic development, whereas necessity entrepreneurship has no effect."[122]

China's economic model has been framed by many scholars as state capitalism, which is the combination of a market economy and strong government. The state has a strong hand in directing economic development and also heavily intervenes in markets and other issues related to NIS such as education, and geography of innovation. The three stages experienced by China are very much in line with the Western model of development, which is from factor driven, to efficiency driven and then to innovation driven.

In order to move to the efficiency-driven stage, "countries must increase their production efficiency and educate the workforce to be able to adapt in the subsequent technological development stage,"[123] which is "marked by decreasing self-employment."[124] To move to the third stage, the economy will "shift from large corporations to entrepreneurial firms, marked by decreasing the share of manufacturing in the economy."[125]

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[118] Scholarship attributes the theory development of entrepreneurship to the economist Joseph Schumpeter. His two theories on entrepreneurship sometimes were called Mark I and Mark II. In Mark I, "Schumpeter argued that the innovation and technological change of a nation come from the entrepreneurs, or wild spirits." In Mark II, "he asserted that the actors that drive innovation and the economy are big companies which have the resources and capital to invest in research and development. Both arguments might be complementary today." Introduction to Joseph Schumpeter, https://www.saylor.org/site/wp-content/uploads/2011/03/JosephSchumpeter.pdf

[119] Lundvall, *supra* note 1, p. 7. (Mark III was not from Schumpeter, but it was used to show the theoretical trend of entrepreneurship developed by Schumpeter.)

[120] Zoltan J. Acs, Sameeksha Desai, and Jolanda Hessels, Entrepreneurship, economic development and institutions, 31 *Small Business Economics*, No. 3, Special Issue: Entrepreneurship, economic development, and institutions, Oct. 2008, pp. 219–234. (Opportunity entrepreneurship refers to "starting a business to exploit a perceived business opportunity," while necessity entrepreneurship refers to "starting a business because you were pushed into it" (p. 222).)

[121] Acs et al., *supra* note 121, p. 222.

[122] Acs et al., *supra* note, 121, p. 219. Also from Zoltan J. Acs and A. Varga, Enterprises, Agglomeration, and Technology Change, 24 *Small Business Economics*, No. 3, 2005, pp. 323–334.

[123] Acs et al., *supra* note 121, p. 221.

[124] Ibid.

[125] Ibid.

China and India have experimented with different paths of economic development. "China has experienced explosive growth in its industrial sector, whereas India's growth has been fueled by the expansion of service-producing industries."[126] One of the consequences from lack of large-scale manufacturing in India is that India's economic development path is the distinctive role of the service sector, which has resulted in big employment in the informal sector.[127] For example, by 2008–2009, in India, the service sector contributed 57% of GDP, agriculture 17% (55% in 1950–1951[128]), and the manufacturing sector the remaining 26%.[129] Data show that India has been on a fast track of moving people out of low-productivity agriculture into the manufacturing and service sectors.[130] However, workers released from agriculture have not been employed in large-scale manufacturing or the formal service sector but are mostly in the self-employment sector. In India, even during the period of the heavily planned economy, "The growth of entrepreneurship was autonomous, brought about without state initiative."[131] It seems that even today, India is still dominated by individual entrepreneurship, which is more necessity entrepreneurship than opportunity entrepreneurship.

Why did India and China take different economic paths? From the perspective of constitutional governance, many factors can be brought into the discussion.

First is how to deal with cost factors such as land, labor, and tax which are critical for attracting foreign direct investment (FDI) at the initial development stage. Let's take the example of land. In India, land reform has been critical for the social and economic liberation of farmers in rural areas. Nehru has fought several battles over land reform with the judiciary, who as gatekeeper for the constitutional democracy has substantially checked the ambition of Nehru.[132] The land reform was only half implemented, which created barriers for developing a large-scale manufacturing sector in terms of land supply and stable labor supply. In contrast, in China, through bloody revolution and the Cultural Revolution, farmers were completely "liberated." Through several steps, land ownership is finally in the form of state ownership in urban areas and collective ownership in rural ones, which made access to land much easier.

Second, NIS scholars believe that "a key to transform technical innovation into economic results is training and organizational change."[133] Lack of educated labor

[126] Barry Bosworth and Susan M. Collins, Accounting for Growth: Comparing China and India, *NBER Working Paper Series*, Working Paper 12,943, February 2007, http://www.nber.org/papers/w12943.pdf, p. 2.

[127] Barry Eichengreen and Poonam Gupta, The Service Sector as Indian's Road to Economic Growth, *NBER Working Paper Series*, Feb. 2011, available at: http://www.nber.org/papers/w16757.pdf, p. 1.

[128] Eichengreen and Gupta, *supra* note 126, p. 3.

[129] Ibid.

[130] Ibid.

[131] Medhora, *supra* note 31, p. 580.

[132] Mate, *supra* note 85, pp. 179–181.

[133] Lundvall *supra* note 1, p. 8.

is challenging for developing large-scale employment in manufacturing and also undermines the transformation of technical innovation into economic results in India. Primary education was initially within the power of state government, whereas higher education was in the hands of the union government. Nehru's ambition for developing science and technology through developing advanced higher education at the union level neglected primary education at the state level, which makes access to primary education very problematic in India even today, with nearly one third of adults illiterate, while China prepares educated labor for manufacturing through more aggressive compulsory education policy.

Third, labor mobility is important for employment and the learning capacity of ordinary citizens. Even if the social equality in India is slowly developing, still largely influenced by religion and traditional culture. Indian family life is under the personal law, which is mainly based on religion, such as Hindu Law, Muslim Law, Christian Law, Jewish Law, and Parsi Law. Therefore, marriage, adoption, and inheritance and related social life are subject to religion and traditional culture. That means that, although the Constitution tries to remove the barrier of social inequality, the personal law allows and even strengthens the role of religion and caste culture to differentiate personal status. This permeation of personal law in daily life undermines the constitutional ambition to remove caste-based discrimination and thus hinders labor mobility for large-scale employment and the learning capacity of ordinary citizens.

Last, access to global markets is also influenced by a country's constitutional governance. As a comparatively mature and liberal democracy with less aggressive government, India gets more trust from developed countries than China can get, which makes India's access to global markets much easier, especially in providing service. For example, lack of government censorship and more freedom of technical connection with the world could be the reasons that India is more competitive in software service, which better connects India with the global market. China, however, will continue to face the dilemma of promoting globalization while restricting the information connection with the world. In addition, the low level of institutionalization of checks and balances in China will cast doubt on and cause uncertainty for its political establishment and its capacity in dealing with unexpected dramatic social changes, which is negative for sustainable innovation in the globalized context.

5.2 Case Study on ICT of the Impact on Innovation Strategy

There are some similarities between India and China in their catching-up process. "The large and growing internal market and the enormous capital accumulation resulting from long periods of fast growth give government and firms exceptional power to purchase, negotiate and trade…."[134] Also, India and China share some similarities for innovation strategy, such as embedding themselves in the "global

[134] Altenburg et al., *supra* note 4, p. 328.

value chain" and connecting with "global professional work." [135] However, they vary significantly in terms of how to use their bargaining power in the catching-up process. The innovation strategy in the information and communication technology (ICT) sector serves as an example for analysis.

ICT has been a hot topic for comparative studies of innovation in India and China. This sector involves some key stakeholders such as communication equipment manufacturers, service providers, and consumers. It also involves the standards setting of 3G, 4G, and 5G. The ICT sector started developing in the early 1990s in India and China, right after economic liberalization.[136] Despite similar opportunities and challenges of developing 3G in India and China, they took very different strategies for developing the 3G standard, "with China heavily investing in a homegrown standard TD-SCDMA and India preferring the international standard."[137] The homegrown standard in China was not initiated by the government, but was a joint initiative by the Chinese Academy of Telecommunication Technology (with funding from government) and a US firm named Cwill in 1995, which was later joined by Siemens.[138] From 2003 onward, the Chinese government realized its strategic importance for national innovation capacity and started investing in its commercialization by providing research subsidies and loans and also asking the state-run mobile service provider China Mobile to adopt the homegrown standard.[139] A similar strategy has been used for the upgrading of 3G to 4G (TD-LTE)[140] and now for standard setting of 5G (Polar).[141] In addition, domestic equipment manufacturers such as Huawei and Datang benefited greatly from the homegrown standard setting. Some even believes that "The TD-SCDMA is not a standard policy, but a subsidy policy to nurture domestic companies into

[135] Ibid.

[136] China started the Open up and Reform policy from 1978. However, it was at the 14th Congress of CPC in 1992 that the goal of economic reform was formally set to build a market economy with socialist character. Due to its debt crisis, India started the economic reform mainly by ending license permits and decreasing government intervention in business from 1991, pushed by Finance Minister Manmohan Singh. See Hu Jiayong, The Development and Framework of Market Economy with Socialist Character in China, People. Com, Sep. 2, 2016, http://theory.people.com.cn/n1/2016/0902/c148980-28685995.html, and Aprameya Rao and Kishor Kadam, 25 Years of Liberalization: A Glimpse of India's Growth in 14 Charts, The Firstpost, July 7, 2016, https://www.firstpost.com/business/25-years-of-liberalisation-a-glimpse-of-indias-growth-in-14-charts-2877654.html

[137] Chun Liu and Krishna Jayakar, Globalization, Indigenous Innovation and National Strategy: Comparing China and India's Wireless Standardization, paper presented at TRIC 2013, pp. 17–18.

[138] Liu and Jayakar, *supra* note 138, p. 6.

[139] Liu and Jayakar, *supra* note 138, pp. 6–8.

[140] Liu and Jayakar, *supra* note 138, p. 9.

[141] Xiang Ligang, What 5G Means to China (in Chinese), *China Economic Weekly* No. 20, 2018, reposted by Ifeng Finance on May 22, 2018 at http://finance.ifeng.com/a/20180522/16301597_0.shtml

international champions."[142] By 2018, Huawei became the no. 1 communication equipment manufacturer in the world.[143]

In contrast, India adopted the international standard, which is a reasonable decision from the perspective of service providers and consumers. However, it doesn't mean India has not thought of having its own homegrown technology. In a comparative study of the telecom industry in India and China in 2005, Sunil Mani attributed the lower development of ICT in India to the fact that India followed a rigid policy of domestic development of technology such as "establishing a stand-alone public laboratory which was charged with the responsibility of developing a family of digital switching equipment and then transferring this generated technology to domestic public and private sector telecom equipment manufacturers,"[144] while China went from the stage of depending on multinational enterprises' technology to encouraging in-house R&D in state-owned enterprises and private firms for technology competition.[145]

Later research by Chun Liu and Krishna Jayakar explored the reasons of no homegrown standard in India in greater depth. First, it was very challenging to coordinate the commercialization of the less favorable homegrown standard in India. After the economic liberalization, the two remaining state-owned companies were not competitive, while private service providers were diversified and too competitive.[146] In many areas, there were 11–16 service operators competing for service.[147] In China, the reform of state-owned service providers has been through managed competition, with a smaller number, three to five, of state-owned companies. This has made commercialization much easier. Second, India didn't have big equipment manufacturers to take advantage of the homegrown standard in the early 2000s.[148] Finally, Indians generally don't trust government. The 2G spectrum license scandal in 2009[149] drew more public suspicion toward government in telecommunication management.[150] This has made the adventurous option of developing homegrown standards even more impossible.

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[142] Liu and Jayakar, *supra* note 138, p. 17.

[143] Xiang, *supra* note 142.

[144] Sunil Mani, The Dragon v. the Elephant, Comparative Analysis of Innovation Capacity in the Telecom Industry of China and India, 40 *Economic and Political Weekly*, Vol. 40, No. 39, Sep. 24–30, 2005, pp. 4271–4283, p. 4281.

[145] Ibid.

[146] Liu and Jayakar, *supra* note 138, pp. 15–16.

[147] Liu and Jayakar, supra note 138, p. 16.

[148] Liu and Jayakar, *supra* note 138, pp. 14–15.

[149] "The 2G spectrum scam involved politicians and government officials in India illegally undercharging mobile telephony companies for frequency allocation licenses, which they would then use to create 2G subscriptions for cell phones." For more information, please refer to What is the 2G spectrum scam? *India Today,* October 19, 2012, https://www.indiatoday.in/india/story/what-is-the-2g-scam-all-about-102224-2012-10-19.

[150] Liu and Jayakar, *supra* note 138, p. 11.

This example demonstrates that contextualized factors, including "problem identification, policy objective, implementation philosophies, points of intervention, policy for data and informational needs, political and institutional contexts, key events and public policies,"[151] will decide different strategies for China and India. Specific to this case, the reform of state-owned enterprises, the R&D strategy, the role of government, and the interaction with the global value chain became deciding factors for strategic differences in the ICT innovation strategy in India and China.

6 Conclusion

Innovation is not just about technical and organizational change at the firm level but also about the socially and spatially interactive learning process between firms and the wider institutional support. As Lundvall emphasized in his research, "shared value" and the "power structure" should be factored into in research on NIS, since they constitute important barriers to competence building for innovation in developing countries. This chapter has tried to explore these factors in a non-quantified but analytical way.

Broadly speaking, following its non-violent strategy of civil disobedience for the independence movement, the social revolution after independence in India is also through non-violent means, mainly through universal adult suffrage. In pursuing social justice, India adheres to the idea of transcendental institutionalism and has institutionalized a credible set of checks and balances through electoral democracy plus independent judicial review.

China has followed Leninism, with violent revolution for social emancipation. The radical social transformation has helped China build a wider setting for innovation such as strong awareness of social equality, access to health and education, and rapid development of physical infrastructure. For the idea of justice, China is more in line with the idea of realization-based comparison. Its centralized power and policy-oriented administration make government responsive and flexible in promoting innovation, but at the costs of insecurity and uncertainty caused by the low level of rule-based institutionalization.

The design of vertical and horizontal power distribution as well as the boundary setting between state and citizens in India and China is very much in line with their respective political philosophies. In India, the horizontal power with strong checks helps it to build a rule-based governance. Elections also serve as the means to hold politicians accountable and sanction them when necessary. However, the dual tracks of politicians and bureaucrats, reservations and quotas as fundamental rights in education and employment, and the disparity among institutional settings and social

[151] Daniel A Mazmanian, Michael E Kraft, The Three Epochs of Environmental Movement, in Daniel A. Mazmanian and Michael E. Kraft (ed.) *Toward Sustainable Communities: Transition and Transformations in Environmental Policy,* Published on University Press Scholarship Online, 2009, DOI:https://doi.org/10.7551/mitpress/9780262134927.001.0001, p. 12.

disparity make government accountability and policy entrepreneurship problematic. The quasi-federal system gives the union government comprehensive power to coordinate with states or even to dominate states. However, the diversity of languages, political parties, and cultures as well as the freedom of religion in India limits the chances of scaling up entrepreneurial policies.

China uses the decentralization of power for local entrepreneurship and the central control of personnel promotion for the constitutional principle of democratic centralism. The state plays a more aggressive role in resource allocation and mobilization for innovation. In the geography of innovation, China has a top-down development model, creating a hierarchy of subnational innovation, thereby limiting the spillover effect. Fortunately, in the last several years, the boom of private businesses has helped make geographical distribution of innovation more equitable.

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Part II

IT Industry

Information Technology Industry in China

Xiangdong Chen, Ruixi Li, Miaochen Lv, Dian Chen, and Lingzi Yang

Abstract

By summarizing research literature in both international sources and Chinese local journals on the information technology (IT) industries, and comparing the progress and development between China and India, this chapter provides a picture of the development patterns and their similarities and differences in the IT industries in the two countries. There are two kinds of IT industries, namely, hardware-based IT (primarily manufacturing and strongly protected by IP, especially patents) and software-based IT (primarily service, either separate or combined with manufacturing sectors, partially protected by the patent system), while Chinese firms are well developed in the first, Indian firms specialize in the second. In addition, the industrial culture (training system and language used, etc.) and organizational structure embedded in the industries provide unique advantages to Indian firms, making them internationally competitive but less so in the domestic market. In contrast, Chinese companies are developing faster in the domestic market and comparatively weak internationally. Throughout the chapter, a 2×2 situation is analyzed to contrast differences in terms of manufacturing vs. service, and of upstream sectors (industrial market) vs. downstream sectors (consumer market), with particular focus on IT software industries and on finding explanations for different IP functions in the two countries: IP functions in IT industry may be comparable with the pharmaceutical industry in China; however, this function is totally different from the situation in the pharmaceutical sector in India.

Keywords

IT · IP · Patent · Hardware · Software

X. Chen (✉) · R. Li · M. Lv · D. Chen · L. Yang
School of Economics and Management, Beihang University, Beijing, People's Republic of China
e-mail: chenxdng@buaa.edu.cn

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_4

1 Introduction

China established a new republic and India became independent during the 1940s. Both countries are the most populous in the world; they implemented significant economic reforms during the 1970s and 1980s and achieved great success. According to the World Bank,[1] China's economic development measured by GDP was US$59.2 billion in 1960 and US$1.09 trillion in 2015, while the Indian GDP was US$37.7 billion in 1960 and US$0.21 trillion in 2015, representing 18.4 times and 5.6 times growth, respectively. According to the World Economic Forum (WEF) annual report[2] on global competitiveness between 2016 and 2017, China was ranked at the 28th position for three consecutive years, while India's position improved from the 55th in 2015 to the 39th in 2016. In terms of commodity and service export ratio to GDP from 1992 to 2013, China's ratio grew from 19.5% to 20.6%,[3] while India's grew from 9% to 28.1%. Service exports have increased significantly in India.

There are strong connections and similarities between China and India on many fronts, such as historical exchange, geographical proximity, and similar population size and economic development level. However, on the other hand, there are also dissimilarities and strong competition between the two countries, commonly known as competition between the "Dragon and Elephant," especially in their IT industries. This chapter aims to answer the following two research questions:

1. What are the differences between China and India in the development of their IT industries and also in terms of IP?
2. What are the explanations for such differences between the two countries in their IT industries, particularly in the IT software sectors?

2 Economic Development Patterns and Characteristics in General

2.1 Development Patterns

Shi (2010)[4] summarized the economic development patterns of China and India as follows:

- Most industrial countries develop through the following stages: agricultural → light industries (or consumer industries) → heavy industries → high-tech industries → IT-oriented industries. China is developing through the traditional route but with

[1] State Statistical Bureau, International Statistical Yearbook 2015 (Chinese version) [DB/OL].

[2] https://www.weforum.org/reports/the-global-competitiveness-report-2016-2017-1

[3] Chen, P., 2007. Study on Clusters of Information Technology Sectors in Bangalore in India (in Chinese). Commercial Report, 11, pp. 125–128.

[4] Shi, Y., 2010. Nature of Indian Pattern and Its Impact on Chinese Economic Development (in Chinese). Economic Development in SEZ (Special Economic Zone), 03, pp. 86–87.

faster speed than other industrialized countries, while India is developing from an agricultural economy directly to service-oriented industrial status.

- The market mechanism under the Chinese system emphasizes stronger government orientation, leading to larger-scale infrastructure rollout and manufacturing industries as leading sectors. China has a high domestic saving rate and phenomenal foreign reserves through international trade.
- The market mechanism under Indian system could be described as domestic-consumer-oriented rather than investment-oriented, driven by local market demand rather than by exports, a fairly weak manufacturing sector, a dominant service sector, and a stronger software exports. It is therefore a dual economy, in which both tech-intensive high-tech and labor-intensive low-tech sectors exist, especially in IT industries.

2.2 Economic Development Characteristics

The economic development characteristics in the two countries can be summarized in the following table (Table 1).

In terms of growth pattern, according to Chen (2014)[5], India's economy has structural factors conducive to high growth, which has been surging during the past 10 years. Therefore, India too is on a fast growth trajectory. Conversely, China's development route is approaching a turning point – i.e., transforming from the existing quantitative-scale-based fast growth to qualitative-innovation-based growth, the success of which is dependent upon economic, social, and political factors.

Regarding IT industries, both countries have achieved tremendous progress, with Indian companies outperforming their Chinese counterparts by a fairly large volume. According to United Nations Conference on Trade and Development (UNCTAD),[6] in China computer and IT service exports experienced an increase of 32 times, from US$0.46 billion in 2001 to US$15.4 billion in 2013, while Indian computer and IT service exports experienced an increase of 82 times, from US$5.9 billion in 2001 to US$495.2 billion in 2013.

2.3 Identifying and Explaining Similarities and Differences

Pye et al. (2006)[7] did a multi-angle comparative study, which indicates that the similarities between the two countries are more significant than the differences. However, Zhao (2008)[8] indicates that it is difficult to fully assess the real differences and

[5] Chen Y. TMT Industry-Trans-Boundary Integration of Traditional Industries: Accelerated Economic Transformation, Rising Cross-Border Integration Model. Shanghai: Qilu Securities Research Institute, 2014.

[6] UNCTAD conference database [DB/OL] http://unctadstat.unctad.org/EN/, 2016.

[7] Pye L W, et al., 2006. Asia's Giants: Comparing China and India. Foreign Affairs, (5), pp. 177.

[8] Zhao, J., 2008. Rational Thinking on Comparative Study on Economic Development between China and India (in Chinese). Journal of South East Asia Research, (3), pp. 32–36.

Table 1 Typical economic indicators in China and India

	2000		2005		2010		2011		2013		2014	
	China	India	China	India	China	India	China	India	China	India	China	India
GDP per capita (US$)	955	457	1740	740	4515	1417	5445	1489	6992	1487	7594	1631
Capital formation[a] (% of GDP)	34.9	24.1	41.9	34.3	47.3	36.5	48.5	35.5	46.5	32.5	46.1	31.4
Consumption rate (% of GDP)	47.4	64.2	39.4	57.6	36.6	56.4	34.4	58.0	37.3	59.2	37.7	59.2
Government revenue against GDP (%)	7.1	11.5	9.7	12.1	11.3	12.9	11.3	11.4	/	/	/	/
Commodity trade (billion US$)	474.3	93.9	1421.9	242.5	2974.0	576.6	3641.9	767.2	4159	780.2	4303	777.8
Sets of mobile phones (per 1000)	66.6	3.4	298.5	80.0	/	/	/	/	/	/	922.7	744.8
Internet service (per million population)[b]	/	/	0.33	0.58	1.92	2.16	2.42	2.90	3.87	3.91	7.04	5.66

[a]Capital formation is an important indicator initiated from Western countries, to be used to reflect net investment on fixed assets, including investment on factories, equipment, transporting vehicles, and so on, usually capital-based assets. In financial report, capital formation (T period) = [total investment – physical depreciation] = newly increased assets. Capital formation is fundamental for future production expansion, with great impact on further economic development

[b]Internet service per million population is an indicator to reflect Internet service coverage in certain region, measured by Internet service access (lines) among every million population

judge which progress pattern is better from an economic development research perspective, and it appears that a more meaningful way for both countries to better achieve their goals is to learn from each other. In addition, regarding important driving forces, there are other studies emphasizing the differences between the two economies. Huang and Khanna (2003)[9] reported that the Chinese economy has primarily developed through foreign direct investment (FDI), rather than through domestic private investment, which is very different from the Indian case. The Indian economy developed primarily through local companies' market power. Besides, the local banking system is more efficient in India. Therefore, local entrepreneurs can develop with the help of an efficient banking system and related capital markets. This market-based strength might be so competitive that India may outperform the Chinese economy. Research by Farrell et al. (2004)[10] indicates that the Chinese economy is driven primarily by the manufacturing sector, with support from a higher rate of bank savings, larger-scale investment in fundamental facilities, and FDI, while India is lagging behind China in economic reform, national savings, and FDI, as well as facilities construction; however, India can attract foreign capital in the long run, based on its free and loosely controlled private business sector.

Quan (2006)[11] and Li (2006)[12] opine that the Indian economy may follow a greener type of development route, without too much government intervention, based on local intellectual and financial resources, and software-backed service industries; conversely, the growth of the Chinese economy is expected to happen under more direct and significant government intervention and a manufacturing-industry-backed system, which might be less dynamic and competitive in a micro-level business world. Shi (2007)[13] points out that the economic growth path of India is consumption-based, in which the government has less control, while China's economic growth involves a more investment-based and stronger government-oriented development path.

To explain the differences between the two countries,[14] a number of studies strive to provide some clues. For example, differences might be attributed to industrial restructuring and its evolution and be explained in terms of historical change and economic policy tools used in the two countries, which have strong influence on their economic reforms (Rahman and Andreu 2006)[15]. Difference in the governance

[9] Huang Y. and Khanna T., 2003. Can India Overtake China. Foreign Policy, (137), pp. 74.

[10] Farrell D. et al., 2004. China and India, pp. The race to growth. The McKinsey Quarterly, pp. 110–11.

[11] Quan H., 2006. Comparative Study on Economic Development Mode between China and India – "World Factory" and "World Office" (in Chinese) Scientific Decision (12), pp. 34–36.

[12] Li, M., 2006. The Different Development Path – Comparative Study between China and India (in Chinese). Journal of HU BEI Inst. Of Engineering, 26(4), pp. 28–31.

[13] Shi, L., 2007. The Dragon and Elephant – Comparative Study on Pattern of Economic Growth between China and India (in Chinese). China Statistic Journal, (1), pp. 22–23.

[14] Chen, J.D and Chen, J. Z., 2005. Comparative Study on Pattern of Economic Development and Transformation between China and India (in Chinese). South Asian Research Quarterly, (2), pp. 7–15.

[15] Rahman R.D and Andreu J.M., 2006. China and India: Towards Global Economic Supremacy? Academic Foundation.

environment and conditions in the initial stage of development can also be important (Hua 2006)[16], primarily shown through market mechanism transformation, economic openness, and ways of economic growth. Differences in the choice of economic development paradigms (Shen and Sheng 2009)[17], in the social systems and ways of related economic reforms (Zhang and Gu 2009; Yang 2011)[18,19], and in timing of the economic reform and international environment can also be decisive (Zhou 2016)[20].

In sum, the dichotomy of software vs. hardware[21] can provide key concepts for understanding the differences in the two countries:[22]

- "Software" problems in China: less efficient market mechanisms during economic reform, including less efficient market regulation, a less efficient financial system, weak social integrity, and so on. Stronger government intervention, less space for private companies, and less efficient governance of fair market operation
- "Hardware" problems in India: less developed infrastructure, insufficient transportation highways, less developed urban facilities, etc.

3 IT Industries: Two Kinds of Technical and Business Sectors

Before discussing IT industry, there are a number of conceptual or definition issues to be addressed first. Such conceptual work is mainly related to the understanding of the technological nature (manufacturing or service related) and business nature

[16] Hua, M., 2006. Comparative Study on Pattern of Economic Development between China and India – Similar Principle but Different Methodologies (in Chinese). Journal of FU DAN Academic (Social Science Edition), (6), pp. 36–50.

[17] Shen, K.Y. and Sheng, W., 2009. China and India: Thinking of Economic Reform and Development (in Chinese). Guang Dong Social Science, 1, pp. 19–25.

[18] Yang, Y. S., 2011. How to Explain Differences in Economic Growth between China and India – Review from Perspective of Systematic Change (in Chinese). Economic Theories and Economic Management, (5), pp. 82–89.

[19] Yang, Y. S., 2011. How to Explain Differences in Economic Growth between China and India – Review from Perspective of Systematic Change (in Chinese). Economic Theories and Economic Management, (5), pp. 82–89.

[20] Zhou, X., 2016. Comparative Study on Pattern of Development between China d India (in Chinese) Commercial Report, (27), 206.

[21] Please notice that so-called software and hardware are not the same terminology used in IT sectors, but rather more general as terms for indicating social relationship-based working communities as "software," and for indicating embedded technology and engineering capitals/equipment or working facilities as "hardware," and may also more generally for indicating tangible output-based facilities, such as transportation highway, or industrial fixed assets.

[22] Zhang, Y.T. and Yang, W.W., 2012. Study on Nature of Industrial Structure in Indian Economy (in Chinese). South Asian Research Quarterly, 2, pp. 50–56, 111.

Table 2 OECD classification of IT industry

Sub-sectors	Code	Sub-sectors
Manufacturing	3000	Office machines, accounting, and computing devices
	3130	Insulating circuits and cables
	3210	Electronic tubes, kinescopes, and other electronic components
	3220	Televisions, radios, radio transmitters, line telephone and telegraph equipment, etc.
	3230	Television receivers, radio receivers, video and audio recording and playing devices and other equipment
	3312	Measuring, monitoring, testing, and navigating devices and their accessories, other than industrial manufacturing devices
	3313	Industrial manufacturing equipment
Service	5150	Wholesale of machines, mechanical equipment, and materials
	6420	Telecommunication
	7123	Renting of office machines and other related devices
	72	Computers and related activities

(local or outsourcing market), which may further explain IP functions in the industries.

According to Yu and Yuan (2012)[23], there are different ways of classifying IT industry, for example, North American Industrial Classification System, NAICS (2012) and OECD (2007). Of great importance is the classification of the industries in the manufacturing and services sectors (Table 2).

In fact, the IT service sector includes software development, information system integration, integrated circuit design, etc.; and it can also be classified based on organizational structures, such as IT consultancy, system integrators, vertical integration organizations, contracted software developers, management service, business outsourcing firms, etc. (Wang et al. 2014).

Generally speaking, for an analytical framework on IT industries, there is clearly a 2 × 2 pattern which could be applied to this study.

The First "2": Manufacturing vs. Service

There are clearly manufacturing sectors under the IT industry-producing equipment or devices, i.e., hardware, which are needed for IT services. On the other hand, there are clearly also service sectors under the IT industry which connect certain networks or software to customers in either the industrial or consumer market.

The Second "2": Industrial vs. Consumer Market

For IT hardware industry, particularly service/software development sector, there are also two other layers, one for industrial buyers in intra- or interindustrial service

[23]Yu, C.H and Yuan, Q.J., 2012. Classification and Evolution of Information Technology and Communication in International Standard Industrial Classification System (in Chinese). Statistics and Decisions, 06, pp. 12–15.

or connections, such as software of Enterprise Resource Planning II (ERP II),[24] or accounting software, and another layer for the consumer market, which could range from individual communication networks to software for education and computer games.

It should be noted that in the case of comparing Chinese IT industry with Indian IT industries in terms of global value chain, domestic and international markets need to be further specified, as companies in the two countries can perform highly differently in domestic and international markets in both 2 × 2 situations.

4 Comparing the Two Countries

According to a report by the WEF in 2010, in the ranking list in worldwide IT sectors during 2004 and 2005, India fared slightly better than China, with two positions ahead: China's position was upgraded from its previous 51 to 41, while India was upgraded from 43 to 39. This ranking is composed of three parts, IT environment (further divided into another three, market environment, government policy orientation, and infrastructure), IT current stature, and IT adoption rate (again split into a further three, individual, commerce, and government).

In addition, financial data of IT service companies of China and India can be collected to contrast the two countries (Table 3).

In the international market, Indian firms are more competitive than their Chinese counterparts. This is reflected in the collaborative partners of IT software companies in each country. According to study by Wang and others (2014),[25] Chinese IT service firms collaborated more with local IT manufacturing firms or hardware companies (about 62% of the investigated companies), while Indian firms only accounted for 2.9% among the investigated firms; furthermore, in terms of overseas collaborations, Indian firms closely collaborated with larger multinational software companies such as Oracle and SAP, while Chinese firms were highly linked with larger IT hardware multinational enterprises, such as Motorola, Panasonic, and Microsoft, which clearly explains the software-oriented nature of Indian companies and

[24] ERP II is a concept initiated by an American consulting company – Gartner Group – based on ERP. According to the company, this concept is to support and optimize companies' internal and external relation, particularly their operation and accounting procedure, in order to create better value for customers and shareholders. The ERP II is a system combined with operation and strategic planning in particular sectors, during which computer software is used as supporting tool and embedded elements for the system.

[25] Wang et al. (2014) did an IT service networking study and found that Chinese and Indian firms collaborated with different types of partners, e.g., while Chinese firms collaborated more with their domestic partners, Indian IT service firms more actively collaborated with a wider range of partners, particularly overseas partners. The larger ratio of collaboration with local manufacturing companies in Chinese firms' case is also highly meaningful, showing that Indian firms are much less connected with IT hardware companies in both domestic and overseas firms. See Wang, Jian/Kouassi, Dazi Conet Theodore/Liu, Huixia/Wu, Zhongsheng/Wu, Qiong, Analysis on Network of IT Service Innovation System: A Comparative Study between China and India, <Science and Technology Progress and Policy> (In Chinese), Vol 31, No. 4, 2014.

Table 3 Financial data of IT service companies – China and India – compared with US companies (unit: million US dollar, %, person)

Company	Country	Annual sales (A)	Overseas sales(B)	Overseas ratio (B/A)	Operating income (C)	OP Margin (C/A)	*Software sales (D)*	*Software ratio (D/A)*	Staff number (1000)	Service type	Accounting time
Infosys	India	4367	4320	98.7	1524	34.80	4.245	**97.0**	104.85	Software service	2009.3
TCS		6216	5681	91.4	1660	26.70	5.719	**92.0**	160.43		2010.3
Wipro		5.630	4328	76.9	1066	18.90	5123	**91.0**	91.70		2010.3
HUAWEI	China	24,065	14,535	60.4	2952	12.20	8962	37.2	110.00	Hardware and software	2010.4
ZTE		9721	4818	49.6	396	4.08	4001	41.2	70.00		2010.4
Hisense		2968	661	22.3	80	2.71	219	7.4	12.68		2010.3
Haier		21,887	5500	26.0	1000	4.57	1084	5.0	34.69		2011.1
Digital China		6475	1684	26.0	106	1.64	1775	27.4	10.00	Distribution, software	2010.7
IBM	USA	89,467	57.560	64.3	19,408	21.70	49,207	55.0	399.41	Hardware and software	2009.12
HP		107.026	68,426	63.9	9470	8.80	17,124	16.0	304.00		2009.10
Accenture		20,158	11,374	56.4	2470	12.30	20,159	100.0	177.00		2009.8

Source: Wang et al. (2014)

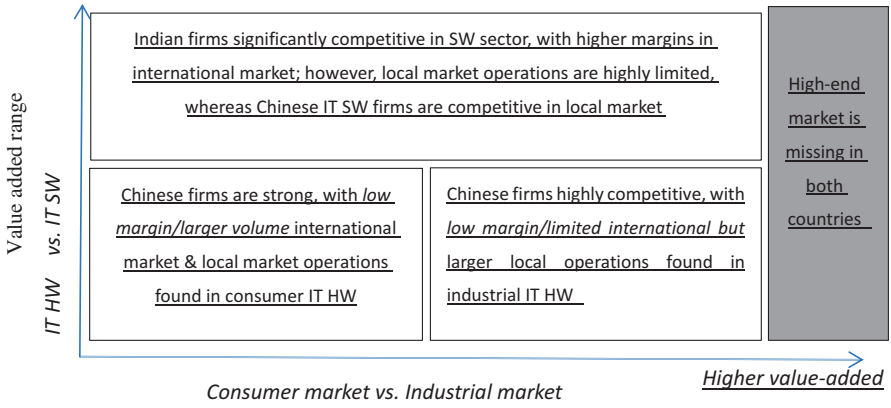

Fig. 1 Different position of Chinese and Indian IT companies. (Note: *HW* hardware, *SW* software)

hardware-oriented nature of Chinese firms. Fairly larger typical multinational enterprises (MNEs) in the IT software sector invested in India, especially in R&D centers, such as IBM with 6 billion US dollar in 3 years, Intel with more than 1 billion US dollar, Cisco with 1.1 billion US dollar, Microsoft with 1.7 billion US dollar, etc.[26]

Chinese companies have been falling behind their Indian counterparts by far in terms of international segmentation, sector profit margins, and particularly on macro-level international trade surplus since late 1990s. While Indian companies' software export ratio was only 4% in 1998, this increased to 22% in 2011, and the profit gains on IT service by Indian firms were even 90% greater than the total service export from India.

Based on the 2 × 2 investigation framework, an explanation model is designed to summarize the major differences between Chinese and Indian IT companies, as shown in Fig. 1.

The Y axis represents the development character of the IT industries in manufacturing as well as in service. This may involve two types of sub-sectors, namely, IT service and software only and IT hardware manufacturing only. Further investigation may focus on areas where IT hardware and software merge together, such as the popular field of AI (artificial intelligence). Here we would rather focus only on separate fields. The X axis, on the other hand, represents the range of the product market, which includes industrial market and the consumer market. Clearly, Chinese IT firms are more competitive than Indian firms in hardware manufacturing, but focus more on the consumer market, with comparatively thinner profit margins, while Indian firms are more competitive than Chinese firms in software industrial sectors, and particularly in industrial and consumer markets, and have higher or

[26] Saeed Khan, Recession and India Impact of Recession on Indian IT Industry [EB/OL], http://ssrn.com/abstract=1506961, 2010-04-16.

larger profit margin. However, companies in both countries may have difficulties in competing in higher-value-added sections in both the IT hardware and software sectors with companies in more economically advanced countries such as North American and Western European countries.

Indian companies are highly competitive in the software sector in the international market and in mostly higher-value-added market segments, while Chinese software firms are competitive only in the domestic market. On the other hand, Chinese manufacturing companies are highly competitive in the international market on IT hardware products and in mostly mid- and lower-end market segments. However, connections from low- and mid-end manufacturing IT devices and equipment sectors to mid- and high-end service sectors in China do exist, implying further developmental strength to improve both sectors. It is the same situation in China's electric vehicle market, with many multinational corporations dominating the high-end market segments, such as Volkswagen, Toyota, Tesla, and BMW (see Chap. 17). However, in the case of Indian companies, there are clear disconnections between local manufacturing companies and IT software and service companies, which are also emphasized by Biswajit Dhar and Reji Joseph in Chap. 5. There are disconnections between manufacturing and design capabilities in India as well. Therefore, Chinese companies may combine increasingly updated manufacturing with relevant service sectors, while Indian companies may have to develop different paths and related markets for connecting software with hardware production in domestic manufacturing industries.

4.1 Government Policies on IT Industries

Although governments of both countries have IT industry policies, their individual choices are different.

4.1.1 China

China is more focused on applications of IT technologies in industries, especially telecommunications, and considers the software sector to be affiliated to those application fields. Another feature of Chinese economic development is the rollout of high-tech zones or parks. Since 1991, the so-called High-Tech Industrial Development Zones have made great progress. The number of High-Tech Industrial Development Zones approved by the State Council reached 156 in 2017, while the National Independent Innovation Demonstration Zones built by the High-Tech Industrial Development Zones has increased to 17. The total GDP value of the High-Tech Industrial Development Zones was reported as RMB 8.77 trillion yuan, accounting for 11.8% of China's GDP and for 18.6% of the total export of trade and services. Some 126,000 overseas returnees, 67,000 permanent residents, and 18,000 foreign experts have been reported to be working in those zones.[27]

[27] http://news.sciencenet.cn/htmlnews/2017/12/397289.shtm

Among 54 of the first group of such high-tech zones approved during the mid-1990s, the Xi'an High-Tech Industries Development Zone has been one of the most successful, especially in terms of mechanical, electronic, and software sectors, and naturally, together with other related zones for comprehensive innovation reforms, such as Free Trade Pilot Zones. According to the evaluation by the Ministry of Science and Technology in 2016, the Xi'an High-Tech Industries Development Zone is in the third place in high-tech knowledge creation and technological innovation and the fourth in sustainable development in China.[28]

Regarding software industries in Xi'an, more than 50,000 enterprises have been registered. In 2017, the total operating income reached RMB 1.45 trillion yuan, with a total foreign trade value of more than RMB 200 billion yuan. Nowadays, the software park (entitled *New Software Town*) in Xi'an acts as one of the four pillar industries (viz., information, advanced manufacturing, biomedicine and modern service industry) and is in fact the leader of the "Star Software Towns."[29]

Furthermore, the strength of the Xi'an Software Park is in the joint development of the software and information services industry with the cultural creativity industry of Xi'an High-Tech Zone. In 2017, the total income of the Xi'an High-Tech Industries Development Zone in software and information services has reached RMB 240 billion yuan, with an average growth rate of 20%. The exports realized a total amount of 1.446 billion US dollars, with annual average growth of 41%.

The development of Xi'an High-Tech Zone and Software Park has mainly benefited from the continual supply of talented software programmers. By 2017, there were 180,000 people working in the software and information services industry, with an annual addition of more than 10,000, among which over 65% are fresh college graduates.[30]

4.1.2 India

India is more focused on software as a priority or leading sector for other IT sectors, which may be easier to connect further with traditional industries. On the other hand, a study by Xu et al. (2010)[31] indicates that there is a "satellite" style of high-tech surrounding cities in India. Such selectively developed "satellite economies" (such as Bangalore, New Delhi, Mumbai, and Hyderabad) might be too narrow for deepening national economic development. On the other hand, this knowledge-intensive and service-industry-oriented development mode may possess structural advantages for the international market, yet may suffer from less active local market demand.

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[28] www.xinhuanet.com/chanye/2016-08-10/c_1119366106.htm

[29] *Star Software Town* is a special name for those software parks in China with better performance. According to authors' visit and interview with Xi'an High-Tech Zone Software Park in 2018. Also refer to https://baike.baidu.com/item/西安软件新城/7707267

[30] https://baike.baidu.com/item/西安高新区软件园/16916451?fr=aladdin, also http://tech.hexun.com/2014-10-29/169824715.html

[31] Xu, J.W. et al., 2010. Advantages, Innovations, and Breakthrough in Value Chain – Cases from Software Industries in Ireland and India (in Chinese). Economic Geography, 02, pp. 193–199.

Comparatively speaking, Indian policy on IT industries has been much more encouraging domestic IT firms than Chinese policy, which can be shown in the following aspects (Hao and Song 2004):[32]

- Larger tax deduction: according to related policy of the Indian Ministry of Information Industries in 2003, companies with 100% software exports would have 100% tax deduction or zero tax for any company as long as it exported exclusively software till 2010.
- Larger benefit for overseas companies: foreign software companies can invest in India with 100% shares if they have software export operations.
- Larger import tax deduction: 216 different products related to IT industries could be imported without tax.

These aggressive policies toward the IT industry (particularly on the software sector) might be attributable to accumulated experiences of Indian firms in the international market, due to India's earlier entry (about 1997) into the Information Technology Agreement (ITA) (6 years earlier than China).[33]

4.2 Comparative Advantages of Chinese IT Companies

By using a logistic model on an S curve (technology life cycle theories), based on US Patent and Trademark Office (USTPO) data (competitive patent volume), Liu, F.C. et al. (2014)[34] conducted a comparative study in relation to G7 countries and with China, for nine sub-industries in IT: three sectors in mature stage, namely, (1) mobile communication and remote information processing, (2) integrated circuits, and (3) intelligent robot; three sectors in growing stage, namely, (4) radio-frequency identification (RFID) and sensor network, (5) wideband and home use network, and (6) computer software; and three other sectors, namely, (7) digital TV and broadcasting, (8) panel display, and (9) personal computer (PC).

The research provides important findings on technology characters in those nine sub-industries by evaluating patent saturation level: both USA and China are in a comprehensive progress modes on most of the nine sub-industries in IT sectors. However, the development stages are different; the USA is developing in a fast growing pace in almost all sectors, particularly in six of those nine sub-industries,

[32] Hao/Sumin/Song/Lin, 2004, A comparative study of China's and India's IT industry policies and commitments. International Business – Journal of Foreign Economic and Trade University (in Chinese), No. 4, 2004.

[33] ITA is a multilateral agreement under World Trade Organization (WTO), effective since 1997. The agreement involves more than 200 different products classified into six categories (viz., computer, telecommunication products, semiconductor, devices for manufacturing semiconductors, software, and scientific instruments). China became the 43rd member of the ITA on April 24, 2003.

[34] Liu, F.C. et al., 2014. Comparative Study on Technology Development Trajectory among G7 countries and China – Patent Analysis with USTPO data. (in Chinese), China Soft Science, 09, pp. 22–33.

i.e., (1), (2), (4), (5), (6), and (7), while China is developing in a fast growing pace in sub-industries (3), (4), (6), (7), (8), and (9) (refer to the footnotes). This shows that China is on a growing development route on typical sectors in IT industries.

What are the comparative advantages of the Chinese IT companies? According to a study by Li and Zhong (2013)[35], which surveyed 15 countries:[36]

- Both China and India belong to the second group among the 15 sample countries, including Canada, Japan, and Singapore, with better capability for industrial growth. In terms of overall capacity measure (mainly the value-added production in IT against the total value-added production in second or third industries,[37] trade contribution, and human resource structures), China has a slightly higher capacity than India (there is only about 1% difference), while in terms of IT investment strength (investment to total national income), India has a better score than China (there is a about 29% difference).
- In terms of mobile phone popularity rate, security on Internet servers, Internet popularity rate, etc., China's scores are much lower than India (about 50% lower). However, if measured by annual mobile phone communication time per person, China is much higher than India, which indicates that the consumption capacity is larger in China and may also imply higher potential of the IT market in China. Patenting volume in IT is much larger in China, when compared with other manufacturing sectors, even with pharmaceutical industries.

Research by Zuo and Chou (2003)[38] answers why Chinese companies are not performing as well as Indian companies, although the infrastructure for IT industry is much more well established in China than in India due to larger demand in the Chinese domestic markets (both industrial and consumer) for the computer software industry:

- On average, the firm size in the Chinese software industry is smaller than that of Indian companies. Most Chinese software companies are start-ups. Even larger software companies are not so efficient if compared with Indian companies.
- In terms of production output efficiency, productivity in Indian firms was higher on average (US$10,000 more per person than the level in Chinese firms).
- Human resources: staff turnover is higher (10%) in Indian firms than in Chinese firms. However, low-end labor power cost is higher in Chinese firms than in

[35] Li, H.C. and Zhong, W.R., 2013. Evaluation of Development Capabilities in IT Industries in China (in Chinese). Science and Technology Management, 06, pp. 119–125.

[36] According to Li and Zhong (2013), the evaluation framework is primarily composed of three groups of indicators, namely, IT facilities and operation, ICT production performance, and potentiality of ICT further progress.

[37] According to rather traditional industrial classification, the second industries involve manufacturing sectors, while the third industries are related to service sectors, both of which may be relevant to IT industries.

[38] Zuo, D.X. and Chou, X.Y., 2003. Export Strategies in Indian Software Industries and their Implications to Chinese Firms (in Chinese). Managerial Operation and Management, 04, pp. 50–52.

Indian firms. Since there is greater blue-collar labor supply in India, Indian firms can continue to compete in the world market over a longer period of time.

4.3 Comparative Advantages of Indian IT Companies

4.3.1 Strengths

Indian software companies are indeed much stronger in the international market. Based on three measures from the World Bank on export scale, quality, and cost, India's software industry ranks higher than China. With R&D centers from a number of famous international IT companies located in the country, India is only second to the USA as a software supplier, with 16.7% of the world market share.

In addition, a number of local software companies in India, including TCS, Infosys, and Wipro, have already developed as global firms. Most outsourcing service companies in India have achieved Capability Maturity Model for Software[39] (CMM5)[40] certification, and in a globally operated market, 65% of the CMM5-certified companies are located in India. Significant progress of India's software industry can be shown also by the following facts, according to the Nationwide Association of Software Service Companies:

- The Indian software industry's annual growth rate reached almost 50% during the 1990s, much faster than the world average (15%); export volume increased from US$4 million in 1980 to US$49.6 billion in 2010, penetrating 91 countries.
- almost all large MNEs have service demand for Indian firms, typically more than 400 Fortune 500 MNEs order related software products from Indian firms each year.
- Production and export volume rank within the top 5 in the world, and one of the top 5 software companies in the world is an Indian company.

As is mentioned later in Chap. 5, the outcomes of foreign direct investment (FDI) in R&D are significant in Indian IT industry. Hundreds of companies have invested in FDI in R&D in India, certainly it will bring opportunities for Indian domestic IT industry, however, with stronger IP power dominated by overseas firms.

The service sector in the IT industry in India is especially important. By applying trade (import and export) data on computer and information services in China and India, between 2005 and 2013, Guo and Zhang (2015)[41] conducted a series of studies

[39] CMM (SW-CMM) is a measurement model for degree of operation functions of software organizations (usually such functions include definition range, operational effectiveness, etc.). The key role of CMM is to monitor software development as a procedure, controlling its quality through such procedure-based examination. In this way, the quality control via procedure could be more scientific and standardized.

[40] CMM5 indicates five key functions of the system, namely, optimizing, defect prevention, technology reformation management, and process reformation management.

[41] Guo X., Zhang X., 2015. Comparing the Competitive Power of China-India's Computer and Information Services Trade. Business Economics, 11, 92–94.

combining RCA (Reveal Comparative Advantage), TC (Trade Competitive, expressed as trade volume (trade exports + trade imports)/GDP (TIS (Tes + Tis)/GDP), an international openness index, and MS (market share), as a synthetic form of competitiveness evaluation framework to compare China and India. The study provides important conclusions: China is far behind India in the computer and IT services industries in both a single competitive index and synthetic competitive measures. Innovation strength in Indian companies can typically be listed as follows:

Besides advantages in language, cost, and readiness-to-serve (as India is 8–12 h ahead of the time in the USA, software problems occur in the US market can be quickly solved overnight by software companies operating in India), another important reason for the faster development of the Indian software industry is the higher concentration of the industry. Higher market concentration provides larger companies with better positioning to control the market and achieve higher margin. In contrast, with a lower concentration level, Chinese companies face a narrow domestic market and weakness in the international market.

Pillar industries usually enjoy higher production efficiency and higher growth, and such industries will have stronger externality effects on other industries. The software industry in India is a sector that already enables other sectors to develop, such as telecommunications, education, and others.[42]

According to a theory by Humphrey and Schmitz (2000),[43] the value-added value chain in IT industry includes, from lower- toward higher-value-added sections, (1) coding, programming, testing, operating, and maintaining, (2) software project operating, (3) software package operating, (4) system operating, (5) IT consultancy and strategy design, (6) customer demand analysis, and (7) product design. Based on the real effect of the development of IT industry in global segmentation, (6) and (7) can be highly value-added and are usually controlled by MNEs in North America or Europe. Indian firms started from coding/programming via OEM for MNEs and developed increasingly as world-level outsourcing suppliers. However, they are still in section (2) and moving to section (3) (Zhou 2012).[44]

4.3.2 Reasons Attributed to Stronger Competitiveness

Surprisingly, there is a paucity of studies on the reasons, positive or negative, for the state of the IP industry in China. However, several major reasons have been attributed for the stronger competitiveness of India's IT software industry, as follows (Huang 2011):[45]

[42] However, the software industry in China is less effective in that role (Wang and Su 2000).

[43] Humphrey, J.; Schmitz, H; Governance and Upgrading: Linking Industrial Cluster and Global Value Chain [J] IDS Working Paper 120, Brighton: Institute of Development Studies, 2000.

[44] Zhou, Daqi, Indian IT development strategies in the post-financial crises era, <World Economic Research>, No. 2, 2012.

[45] Huang, Li, Yan, Analysis of the role of India software information industry in economic development. "South Asia Quarterly" (In Chinese), Vol 147, 2011, No. 4.

– Stronger market and policy resources (including local firms and institutions, such as IT software export associations) for exports, and correspondingly, stronger demand from international companies via their outsourcing. As discussed in Sect. 5.2.3, Chap. 5, the electronics industry benefitted from proactive government policies ever since the mid-1980s: the New Electronics Policy (NEP), Computer Software Export, and Software Development and Training have facilitated the development of the software industry. Therefore, it can be inferred that those policy resources played an essential role in Indian software industry.
– Stronger skilled workforce and just-in-time training system (6 publicly owned and nationwide universities and 25 regional colleges on IT for technicians and engineers as qualified human resources for the IT software sector in general). In fact, other efficient professional training programs and schools in India may play even more important roles, not to mention many other training programs arranged by larger IT companies themselves. For example, the largest private computer training network company, APTECH, owns more than 1000 online training centers nationwide in India and has maintained an average annual growth of 50% (Zhang and Zhang 2014).[46] Boundary labor supply could be found in Indian IT software sectors. For example, in 2000, Indian employees in this sector were only estimated at 284,000, which increased to 2.3 million in 2010, with indirect employment of 8.2 million people. According to a report by Electronics and Computer Software Export Promotion Council (ESC),[47] during 2012–2013, the IT service and ITeS (Information Technology Enabled Services) hired more than 2.97 million specialists and indirectly hired more than 9 million employees.
– The higher quality of this IT software workforce is also mentioned by Chinese researchers in explaining the strength of Indian firms (Lin, 2006).[48] According to Lin, these might be implied by a number of important facts: as of 2002, almost all larger software companies had achieved ISO9000 quality certificates, and among the 54 global software companies with CMM5 certificates, 27 were in India. Software packages contracted from Indian firms are usually highly trusted internationally, due to Indian firms' 95% satisfactory, on-time completion rate, with international qualification.
– A better and stronger environment for excellent IT software companies to grow and develop into world-level enterprises as solution providers to integrate IT software into larger international platforms. Tata Consultancy Services, Infosys Technologies Ltd., and Wipro Technologies are good examples.
– A stronger international financing mechanism for Indian IT software companies via primarily three channels: overseas direct investment in the IT software sector in India, overseas financial investment in India via stock markets, and direct financing by Indian companies in overseas markets.

[46] Zhang, Tinghai; Zhang, Qingliang, The experience of IT vocational education in India and Its Enlightenment to China. China Higher Education (in Chinese), No. 12, 2014.

[47] ESC, India's Overall Exports Scenario[EB/OL](2014-10-29), available at http://www.escindia.in/index.php/export-scenario/indias-overall-exports.html

[48] Lin, Changjie, Software and IT services outsourcing industry and India modernization mode. South Asia Research (in Chinese), No. 2, 2006.

– A higher level of well-developed IT software science parks in India, which is similar to what has been developed in China. The authors in Chap. 5 also mention that the setting up of Software Technology Parks (STPs) have facilitated the growth of information technology enabled services (ITES) sector. In our view, those science parks are definitely strong supports to boom this industry.

4.3.3 Challenges

The Indian software outsourcing business is dominated by the four biggest IT software outsourcing companies (TATA, Infosys, Wipro, and Satyam) (JU 2011),[49] with almost 60% of buyers from North America. In this case, Indian companies might be overly exposed to the international market in the event of big losses, such as the 2008 financial crisis.[50] According to Huang et al. (2014),[51] since the outsourcing market is fully based on the international market, Indian IT software firms face risks and possible obstacles in the future on the following points:

– Highly limited domestic market demand for the software service industry. Although India is the country with the second biggest population in the world, and its continuously growing working population has spurred domestic demand for many industries – the rising demand for automobiles is one such example (see Chap. 18). The lower level of information use and exchange in domestic industries limit local market development for the software service. It is estimated that contribution of Indian information service to local market was only less than 60% of total supplies, while India has larger demand for hardware due to lower level of IT facilities in India (Huang et al. 2014).
– Demand for information service is missing, which led to less intermedia product input to connecting hardware and software sectors in India. According to macro-level input-output data in India, the intermedia demand in information service sector is the lowest if compared with the USA, Japan, and China.
– Less information facilities support for the IT software industry in India. For example, Internet connection users per 100 inhabitants was 12.6 in India compared with 42.3 in China and 81.0 in the USA. Other facility shortage problems lie in electricity supplies and less capacity in hardware or device productions for IT devices.

[49] JU, Zllian, Analysis and forecast of IT outsourcing industry in China and India. China Market (in Chinese), Volume 45.

[50] In China, the majority of outsourcing software suppliers were rather small, and 60% of buyers were from Japan (Japanese software outsourcing volume accounted for only 10% of global volume, JU 2011). Chinese software companies are primarily driven by the local market.

[51] Huang, Yeqing; Quan, Heng; Li, Xiaoyan, Sustainable development in IT service outsourcing sector in India – from industrial value chain perspective. World Economic Research, No. 5, 2014.

5 IP Factors in China and India

5.1 National-Level Patent Strategies

The "Indian Miracle"[52] would not have occurred without the support of strong IP strategies. There are national-level patent strategies in India, for example, promoting public-welfare-based litigation for Indian firms in the international community, and maintaining a preventive patent database etc., which protected Indian firms from patent snatching by non-Indian entities (Yi 2014). With such effective strategic preparation in terms of IP function, India can also respond quickly and effectively to IP infringement claims from foreign companies through a highly protective IP system locally. For example, in the case of Bayer suing a local company – Natco Pharma – in India (Yi 2014),[53] a compulsory license against Bayer was granted and upheld by the Indian Supreme Court.

In terms of national-level patent strategies on the part of the public sector, China seems to lag behind India, as China's National IP Strategy (2008–2020) emphasizes more the creation and exploitation of IP rights by private sectors.

5.2 Firm-Level IP Strategies

A research by Wang et al. (2014) has also revealed that Indian IT service firms invest less in R&D (only 3.7% of their business revenue) than Chinese firms (7.2% of total revenue) in their operations, which can be clearly attributed to the nature of outsourcing-dominated operations in Indian firms.

There are bigger differences in IT R&D and IP assets (patents, in particular) in companies in the two countries. Indian firms are weaker in self-owned IP assets in IT industries, in both hardware and software. In fact, based on the high volume of outsourcing arrangements by Indian firms, self-owned IP assets are not important for Indian companies in IT industries, particularly in the software sector. This is especially true if compared with Chinese firms. However, Indian firms are stronger and more efficient in operation of foreign patent resources via outsourcing arrangements. Although IP and especially patent resources are increasingly addressed by most IT companies in China, especially by large leading firms, competing directly with IT companies in North America and European MNEs, there is still a clear lag.

Indian firms' patenting in China is very limited, if compared with local Chinese IT firms. According to Li and Lu (2017),[54] up to April 2014, there were only 2337

[52] During the mid-2000s, Indian economy was growing at a growth rate of 8 percent per year, and its exports of goods and services have more than doubled in three consecutive years. Economists tend to dub such rapid growth as Indian Miracle; see Bhagwati, Jagdish N. (EDT)/Calomiris, Charles W. Sustaining India's Growth Miracle, 2018. Columbia Business School.

[53] Yi, Jigang, 2014. Patent public policy – take India's first patent compulsory license as an example (in Chinese). Journal of Hua Zhong University.

[54] Li, Yongjing/Lu, Xinrui, India of BRICs: viewing India's investment in China through patent applications in China. Science, Technology, and Industries (in Chinese), Volume 17, No. 11, 2017.

patent applications filed by Indian companies with the Chinese National Intellectual Property Administration (patent office); among them, 2124 were invention patents. Six sectors, namely, pharmaceuticals, chemical material and manufacturing, special equipment manufacturing, computer and electronic device manufacturing, electrical and mechanical engineering, and instrument manufacturing, were the largest in patenting volume by Indian firms.

6 Conclusion

China and India have followed different development paths in IT evolution. In China's case, it is defined as forward integration, as it has combined the domestic market with international market. In India's case, it is defined as backward integration, as it started from international markets and developed back to the domestic market. Also, based on heavy involvement of Indian firms in IT software outsourcing arrangement by MNEs, the IP or patent resources are not important, unlike the Chinese firms' case. However, since both countries are developing rapidly following their own chosen economic developmental paths, IP resources and the function of IP capital will play an important role in the near future.

Typical differences among IT companies in the two countries include (1) Indian companies enjoy high international market penetration (high-end international markets) in the IT service sector, while Chinese companies control low- and mid-end international markets in the manufacturing sectors; (2) there are close connections between manufacturing and service sectors in China, which are lacking in India and may further determine the potential competitiveness of companies in the industries in India. Due to limitations of advanced technologies of companies in both countries, India and China lack competitiveness in higher-value-added areas in both the manufacturing and service sectors in IT industries.

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India's Information Technology Industry: A Tale of Two Halves

Biswajit Dhar and Reji K. Joseph

Abstract

This chapter provides an account of the development of the information technology (IT) and information technology-enabled services (ITES) in India. The IT sector was developed from the early 1960s, wherein only the government-owned companies were allowed to operate in this sector. In the later decades, the industry was opened to the private sector, both Indian and foreign. There is, however, no evidence that this open-door policy helped the IT industry to develop.

In contrast, the ITES sector received a major boost when Indian private companies took advantage of the increasing demand for these services towards the end of the previous millennium. Subsequently, the ITES have expanded phenomenally, establishing India as one of the ITES powerhouses of the world. Although India's ITES sector was an unqualified success, there is not much evidence that this sector, or its hardware counterpart, contributed to indigenous technology development. India's R&D spending remained sluggish, which remains a major source of concern.

A major uncertainty faced by the R&D system arose from India's patent regime. The amendment of India's patent law undertaken in the year 2000 to bring it in conformity with the TRIPS Agreement excludes "computer programme per se" from patenting. Initially, there was lack of clarity about the interpretation of the phrase. Later, the Controller General of Patents, Designs and Trademarks, the authority responsible for implementing Patents Act, 1970, and

B. Dhar (✉)
Centre for Economic Studies and Planning, School of Social Sciences, Jawaharlal Nehru University, New Delhi, India

R. K. Joseph
Institute for Studies in Industrial Development, New Delhi, India
e-mail: rejikjoseph@isid.org.in

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_5

the Judiciary have both provided a degree of clarity as to what "computer programme per se" really means.

Keywords
Information technology · Information technology-enabled services · Electronics · Software · Outsourcing · Patents · R&D

1 Introduction

Since the end of the previous millennium, India has been able to establish itself as a major player in the information technology-enabled services (ITES). In 1999–2000, India's exports of software services[1] were just less than US$ 3 billion, which had expanded to nearly US$ 100 billion by 2016–2017.[2] WTO informs us[3] that in 2015, India's exports of computer services were nearly 16% of global exports.

While the ITES segment of the Information Technology (IT) sector has performed exceptionally well, the other component of the industry, the Indian computer electronics industry, has not been able to establish itself as a distinct entity, despite its emergence in the early 1960s. The IT sector is, therefore a tale of two contrasting halves in terms of their performances.

This contrast notwithstanding, there is a common thread that runs through the performances of the two segments of the IT industry, and this is the role of policy. While the computer electronics industry was sought to be established through a series of policy initiatives, the ITES sector, too, depended on government's policy support, even though the trigger for its growth was provided by the market forces, in particular the global market conditions at the turn of the millennium. Given the overwhelming presence of "policy" determining the growth of the IT industry, it seems hardly surprising that neither segment of the industry was driven by continuous process of innovations. Thus, the dynamics of the Indian IT industry has been remarkably different from those of the global hubs of the industry, where the innovation systems together with intellectual property regimes have played decisive roles in driving their growth.

This chapter has three parts: the first discusses the evolution and the subsequent developments in the computer electronics industry, the second discusses the performance of the ITES sector, and the third discusses the approach towards patenting of computer-related innovations (CRIs). The discussion in the final part reflects the ambivalence of the policy makers in deciding on the patent regime appropriate for CRIs.

[1] Software service includes IT services exports and exports on account of Business Process Outsourcing (BPO). RBI (2010).

[2] RBI (2017).

[3] Authors' calculations from WTO Statistics Database; figures for computer services do not include data for BPO activities.

2 The Computer Electronics Industry in India

2.1 Triggering the Development of the Industry

The seeds of the Indian electronics industry were sown by the Electronics Committee set up in 1963. The Committee, better known as the "Bhabha Committee",[4] gave a 10-year (1966–1975) roadmap for building domestic capacities for the manufacture of computers and components. Its recommendations for the components sub-sector were that domestic manufacturing should focus on producing in large quantities in order to reap the economies of scale and that adequate research and development support was made available to the manufacturing units in order to keep them abreast with the advances in technology in this highly dynamic industry. Immediately after the Bhabha Committee submitted its report, the government constituted another Electronics Committee under the chairmanship of Vikram Sarabhai, the doyen of the Indian space programme. The Sarabhai Committee was tasked to take account of the most urgent needs of the electronics industry, to keep track of the research being done in design and development and to give guidance and direction, where necessary, identify sectors where indigenous production could be built up, and promote the speedy building up of such capacity.[5]

Armed with the recommendations of the two Committees, the government initiated the process of building a self-reliant electronics industry in the country. The Department of Electronics (DoE) was established in 1970 and in the following year, the Electronics Commission was set up to lay down policies and to guide the future development of the electronics industry in India. The thrust of the policies adopted since the early 1970s was to promote a state-led electronics sector, with the involvement of both the Central government as well as the state governments.

Bhabha Committee's emphasis on the development of an indigenous computer industry and the endorsement of this view by the Sarabhai Committee, led to the establishment of computer production facilities in the public sector. The Electronics Corporation of India Limited (ECIL) was already in existence since 1967 under the Department of Atomic Energy (DAE) and was entrusted to commercialise electronic systems developed at the Atomic Research Centre under the Department. By 1971, ECIL became a computer manufacturing enterprise that was fully supported by the DoE.[6]

The 1970s was marked by government's resolute pursuit of developing local expertise in the computer industry. This endeavour had two distinct phases. In the first phase which lasted until the middle of the decade, the clear emphasis was on giving the ECIL the status of the dominant firm in the emerging domestic industry. This strategy was strongly endorsed by the Minicomputer Panel, a study group set up by the Electronics Commission in 1974,[7] which concluded that ECIL would be

[4] Agarwal (1985), p. 283.

[5] Agarwal (1985), p. 283.

[6] The following account is taken from, Rajaraman (2012).

[7] Brunner (1991), p. 1742.

able to meet domestic demand for minicomputers, both in terms of production and technology. Having satisfied itself that small computer systems could be designed and assembled in India on the basis of imported components and peripherals, the government initiated a variety of policies to support the fledgling industry.[8]

However, the government's schema of putting ECIL as the lead firm in the Indian industry had, at best, mixed results. Rajaraman points out the company had two sets of weaknesses[9]: the company "worked more like a cottage industry" and its sales efforts being poor, and the company was unable to find ready markets for its products. ECIL mostly served a captive market that included government departments and agencies like the atomic energy establishments and universities funded by the government. According to Brunner, "by about 1976, it had become obvious that ECIL was not able to meet domestic computer demand with competitive prices and technology". These two factors combined together, increased the gap between the demand and supply of computers in the country.[10]

These were compelling reasons for the government to open the doors for increased private sector participation in the computer industry. The turnaround on the part of the government came in 1978 with the announcement of the Minicomputer Policy, which opened up the hitherto restricted area of computers to private sector companies. The government relaxed the norms for obtaining industrial licences, which facilitated the entry of three private sector enterprises in the industry.[11] Before the turn of the decade, a fourth company had also started operations (Table 1).[12]

2.2 Facilitating the Growth of the Electronics Industry in the 1980s

In the 1980s, the emphasis shifted to encouraging the private sector to play a pivotal role through a number of key innovation-boosting initiatives.

The New Electronics Policy (NEP) unveiled in January 1984 had four main objectives: (i) facilitating technology transfer in the electronics industry, (ii) import of computers for government departments, (iii) establishing "science cities"/science parks to encourage expatriate Indian technicians to return to the country, and (iv) setting up free trade Export Processing Zones.

[8] Grieco (1982).

[9] Rajaraman (2012), p. 25.

[10] Brunner (1991), p. 1742.

[11] These companies were Hindustan Computers Limited (HCL), a joint venture between a private Indian firm and the Uttar Pradesh state government; DCM Dataproducts (DCM), a subsidiary of Delhi Cloth Mills and Operations Research Group (ORG), a subsidiary of Sarabhai Enterprises. See, Grieco (1982), p. 614.

[12] The fourth Indian enterprise was the International Data Machines (IDM, founded by former IBM employees with the assistance of IBM),which marketed and serviced a microsystem designed and assembled by the Indian firm National Radio and Electronics Company, a subsidiary of Tata Enterprises.

Table 1 Production of electronics industry (1973–1983)

Categories	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Consumer electronics	640	780	845	1030	1035	1575	1790	2140	2460	3370	3300
Communication and broadcasting	580	700	970	1100	1260	1275	1285	1845	1540	2550	2700
Aerospace and defence	330	470	490	500	550	620	605	680	690	1085	1260
Computer, control and instrumentation	220	340	585	640	1025	1190	1310	1600	1885	2420	3290
Components	510	720	750	800	905	1170	1360	1630	1730	2140	2300
SEEPZ			5	30	40	75	115	165	255	485	750
Total	2280	3010	3645	4100	4815	5905	6465	8060	8560	12,050	13,600

Source: Agarwal (1985)

A New Computer Policy (NCP) was announced in 1984 for removing the institutional barriers to "transforming the industry into a 'virtuous circle' of competitive prices/costs-higher demand-higher scale of production-higher efficiency-competitive prices/costs". It marked a departure from the erstwhile policy that restricted entry of companies that were part of "monopoly houses"[13] and those that were covered by the Foreign Exchange Regulation Act (FERA). Imports of technology and capital goods were liberalised, and although domestic manufactures were initially given import protection from competitors of similar products, they were progressively exposed to international competition.

The NEP and NCP introduced policies markedly different from the policies in the 1970s; the key departure was the freedom given to the private sector to drive the industry. Simultaneously, existing public sector organisations were strengthened, and new institutions like the Centre for Development of Advanced Computing (C-DAC) Technology Development Council and Centre for Development of Telematics (C-DoT) were established to expand the domestic capabilities in the electronics sector.

2.3 Technology Imports and Domestic R&D Behaviour

The leverage of foreign firms in the Indian electronics industry declined in the 1970s. The share of these firms in domestic production declined from 10% to 3% between 1972 and 1977. However, the participation of foreign firms increased in the later 1970s through strategic alliances and collaborations, which increased from 16 in 1977 to 210 in 1985. Technology was increasingly sourced from four major countries: the USA, Japan, West Germany and the UK.

The data for the Indian electronics industry during the liberalisation phase (the 1980s) shows low bargaining power of Indian firms (no definite trends, the cases involving both lump sum payment and royalty), royalty rates close to 5% and increase in the proportion of cases with higher lump sum payments (the share of cases with lump sum payments exceeding Rs. 5 million were 6% in 1982 and 29% in 1991). It resulted in the increase of cost of technology per collaboration and more foreign exchange outflows.

2.3.1 Domestic R&D Behaviour: C-DAC and Param Supercomputer

As regards domestic R&D, organisations like Technology Development Council, C-DoT, C-DoM and C-DAC were responsible for technology development on behalf of DoE. Agencies like Defence Research and Design Organisation (DRDO) and Council of Scientific and Industrial Research (CSIR) also undertook R&D activities in electronics. But R&D sponsored by the government was "not linked to

[13] In 1969, the Monopolies and Restrictive Trade Practices Act was enacted to control the growth of "monopoly houses". The Indian corporate sector was then dominated by the so-called monopoly houses or business groups. The expressed intent of the legislation was to curb concentration of corporate power.

the manufacturing system in the country, and hence the outcome of the R&D activities of these organisations remained mostly unutilised".

Denial of supercomputers to India by the USA and Japan led to the development of indigenous supercomputers, which remains as the most successful R&D foray by an Indian enterprise. The countries of Western alliance had established a strict regime for the export of electronic items citing "dual uses", i.e. those that could be employed both for civilian and defence-related purposes. Exports of these items were regulated by the Coordinating Committee for Multilateral Export Controls (CoCoM). Indeed, this Cold War mechanism affected India, a traditional ally of the Soviet Union.

The DoE established the C-DAC with an initial investment of Rs. 300 million to build high-performance computers. The project was successfully completed in 1991, and the Param supercomputer was unveiled. From its very first generation, Param supercomputer was ranked among the best machines in the world.[14]

2.4 Electronics Industry in the Period of Economic Reforms

Since 1991, the key reforms benefiting the electronics sector were elimination of tariffs on IT products, abolition of industrial licencing system[15] and dropping of entry barriers for FDI.

In 1991, the telecom sector was fully opened for FDI. Five leading multinational companies (MNCs) set up their manufacturing facilities in India – Alcatel, Lucent Technologies, Ericsson, Siemens and Fujitsu. When the de-licencing of telecom services was notified in 1999, the demand for telecom equipment moved in favour of cellular mobile and internet services. This shift away from fixed switches benefitted the global players.[16]

Impact of opening up of this sector for FDI had only a limited impact. The study conducted by Rao and Dhar showed that the "realistic FDI" in the electronics sector were quite small, including office, accounting and computing machinery; radio, television and communication equipment; and medical, precision optical instruments and watches.[17] Francis concludes that the Information Technology Agreement of 1997 (ITA-1) did not help in attracting FDI into this sector. Ernst points out that during 2010 and 2013, FDI inflows into the electronics sector was "extremely low": it ranked 24 out of 26 sectors in terms of cumulative FDI during this period.[18]

However, Mrinalini et al. points out that software and IT is the second leading sector in terms of FDI inflows. Out of the total FDI inflow of US$350.47bn during 2003–2009, 13.8% was into the software and IT sector. In terms of FDI in R&D,

[14] Rajaraman, History of Computing in India (1955–2010), 2012, p. 37; Karunakaran, God, Man and Machine, 2009.

[15] Industrial licences for the consumer electronics were done away with in 1996 (Ernst 2014).

[16] Francis (2016).

[17] Rao and Dhar, The Tenuous Relationship between Make in India and FDI Inflows 2016, p. 3.

[18] Ernst (2014).

Table 2 Details of FDI inflow during the period 2003–2009

	FDI inflow (US$bn)	FDI in R&D (US$bn)
Total	$ 350.5	$ 29.2
In software and IT	$ 48.3	$ 14.7
Share of total inflows	13.8%	50.4%

Source: Computed and compiled by authors based on Mrinalini et al. (2013)

Table 3 Details of patents obtained by MNCs having R&D centres in India

	Number of firms	Number of Indian patents granted for MNCs with R&D centres in India	Global patents granted for MNCs with R&D centres in India	Indian patents as percentage of global patents
FDI in R&D firms	74	1166	214,686	0.5%
FDI in R&D firms in software and IT	54	749	129,385	0.6%
Software and IT (share of total)	72.9%	64.2%	60.3%	

Source: Compiled by Authors based on Mrinalini et al. (2013)

this sector received more than half of the inflow. Out of the FDI in R&D, more than 50% was into this sector (Table 2).[19]

Outcomes of FDI in R&D are significant. Mrinalini et al. (2013) find that out of 706 firms, companies investing in FDI in R&D in India, only 74 have obtained Indian patents, taking up 0.5% of their global patents. Of these firms, 54 were in software and IT sector (Table 3).

It is found from the above table that FDI in R&D firms in India have negligible share of patents in India as compared to their global patent profile. Mrinalini et al. (2013), however, have not gone into the factors contributing to this phenomenon.

2.5 Manufacturing

Government of India estimated that in India, demand for electronic products in 2008–2009 was about US$45 billion, while domestic production was only about US$20 billion. Projections for the year 2020 showed that the demand would be US$400 billion, while domestic supply would be only US$100 billion, indicating a substantial demand-supply gap. In electronics hardware production, India's share was only 1.3% of the global production in 2011, with imports accounting for 64% of India's consumption of electronic products and 51% of electronic components.[20]

[19] Mrinalini et al. Foreign Direct Investment in R&D in India, 2013, p. 769.

[20] Ernst, Upgrading India's Electronics Manufacturing Industry, 2014, p. 2.

Ernst argues that India's production base for components was declining. For example, printed circuit boards (PCBs) accounted for 90% of the cost of strategically important telecom equipment production, and two-thirds of its PCB requirements were met through imports. India's share in world PCB production was only 0.7%. While the liberalisation of telecom services boosted demand for electronic products, it did not result in an increased opportunity for domestic manufactures but came as an opportunity for foreign companies.[21]

Ernst identified three major challenges facing India: (i) lack of a vibrant domestic component industry[22]; (ii) disconnect between manufacturing and design capabilities; and (iii) a broken innovation system.

Elaborating on the second challenge, Ernst pointed out that India had acquired capabilities in integrated circuit (IC) designs, but most of the IC design work done in India was for MNCs, which were transferred to their manufacturing location in other countries, especially in China. IC design capabilities in India were not linked to manufacturing in India. Moreover, investment in R&D in India was at a very low level, below 1% of GDP. Larger foreign companies were reluctant to invest in full-scale manufacturing R&D in India. The foreign original equipment manufacturers typically conducted only the final assembly here.

The table below summarises the key facets of major non-government companies operating in India's IT and ITES sectors (Table 4).[23]

The main area of concern, in our view, is that the R&D spending of the industry still remains at a relatively low level. R&D spending increased nearly sevenfold between 2004–2005 and 2012–2013 but fell away quite appreciably in the last 2 years of the period covered in the above table. These numbers were also reflected in the data on patenting activity in the sector, which we will discuss in a later section.

2.6 Strategic Role of Standards

The 2012 National Policy of India on Electronics deals with the development of Indian standards for technical quality and safety of electronic products. Ernst argued that technical standards are as important as patents for an economy. Technical standards contribute to productivity growth as it promotes diffusion of technological knowledge. A study conducted by the German Institute of Standardization found that 1% increase in stock of technical standards would contribute to 0.7–0.8% economic growth.[24]

[21] Ernst, Upgrading India's Electronics Manufacturing Industry, 2014, p. 15.

[22] ELCINA Country Report on the Indian Electronics Sector, 2007, p. 7 argues that substantial resources are yet to be allotted for semiconductor or chip manufacturing despite the modest government support since 1980s to cater for defence and communications.

[23] Prowess database includes all non-government companies with a market capitalisation of over Rs. 1 billion, a PE ratio between 5 and 10, a dividend yield of over 2 per cent and a debt/equity ratio of less than 1.

[24] K. Blind, A. Jungmittag, and A. Mangelsdorf (2011), *The Economic Benefits of Standardization*, German Institute for Standardization, quoted by Ernst (2014).

Table 4 Summary of some key indicators of the IT and ITES sectors

	(US $ million)					As % share of all companies in the dataset			
Years	Sales	R&D	Import of capital goods	Export of services	Export of goods	R&D	Import of capital goods	Export of services	Export of goods
2004–2005	12969.9	54.4	294.3	10314.3	169.3	0.4	2.3	79.5	1.3
2005–2006	15897.0	69.7	329.0	12835.6	275.4	0.4	2.1	80.7	1.7
2006–2007	21855.5	98.9	486.4	17628.9	245.9	0.5	2.2	80.7	1.1
2007–2008	29494.5	102.5	541.5	23488.4	214.5	0.4	1.8	79.6	0.7
2008–2009	27829.1	115.3	394.7	24653.1	172.8	0.4	1.4	88.6	0.6
2009–2010	31204.8	172.0	373.1	25639.3	146.3	0.6	1.2	82.2	0.5
2010–2011	36455.3	265.9	420.3	28339.1	393.9	0.7	1.2	77.7	1.1
2011–2012	43864.4	307.4	404.7	32684.6	858.7	0.7	0.9	74.5	2.0
2012–2013	46023.4	353.8	402.7	38837.2	926.6	0.8	0.9	84.4	2.0
2013–2014	61531.5	334.8	627.3	48657.9	745.7	0.5	1.0	79.1	1.2
2014–2015	65693.5	287.5	640.0	52933.5	1108.9	0.4	1.0	80.6	1.7
2015–2016	61733.5	257.8	366.4	37358.0	288.8	0.4	0.6	60.5	0.5

Source: Prowess Database

Standards are so vital a strategy in industrialisation for latecomers that Ernst called it their "lifeblood". Defining standards is a knowledge-intensive activity which involves cooperation between industry, government, academia and non-governmental organisations representing larger interests of society. However, latecomers are often takers of standards rather than creators of standards, which adds to the vulnerability of their efforts to industrialise.

India's standardisation system is beset with a number of problems, stemming, in particular, from the presence of several standards development organisations (SDO), whose objectives, mandates and spheres of authority were often overlapping. For instance, the Quality Council of India is mandated to establish and operate national accreditation structure for bodies which confirm compliance of standards, while the National Accreditation Board for Testing Calibration Laboratories (NABL) provides accreditation to testing laboratories in accordance with ISO/IEC 17025. Besides, the National Accreditation Board for Certification Bodies (NABCB) recognises those bodies applying for accreditation based on the criteria set by NABCB. There are also a number of SDOs in the electronics sector – the Electronics and Information Technology Division Council of the Bureau of Indian Standards and Telecommunications Engineering Centre, the Global ICT Standardisation Forum for India.

3 India's Information Technology-Enabled Services

A convenient way of identifying the ITES is to refer to the classification provided by the General Agreement of Trade in Services of the World Trade Organization.[25] According to this classification, the category of Computer and Related Services includes the following services: (i) consultancy services related to the installation of computer hardware; (ii) software implementation services; (iii) data processing services; (iv) database services; and (v) other related services. The following discussion would relate to the above-mentioned services.

3.1 Evolution of the ITES Industry in India

The ITES industry in India, currently one of the largest earners of foreign exchange, developed in three distinct phases. The industry emerged in the 1960s, and its export prospects were recognised as early as the early 1970s.[26] The government adopted suitable policies to develop the export potential of this sector, the most important of which was to allow duty-free import of computer systems for software export purposes. One hundred percent foreign-owned enterprises were permitted, for software exports operations, in Santa Cruz Electronics Export Processing Zone (SEEPZ).[27]

[25] WTO (2001), Services Sectoral Classification List: Note by the Secretariat, MTN.GNS/W/120, 10 July 2001.

[26] Sharma (2015), Chapter 6.

[27] Department of Electronics (1972).

The second phase follows the announcement of the New Electronics Policy and the New Computer Policy, both in 1984. In this phase, the most important development was the establishment of the software technology parks with government support that acted as the springboard for the consolidation of the software sector.

The third phase was ushered in by the Y2K problem (more on this in 2.5.). The ability of the Indian ITES sector to respond to the challenges posed by the Y2K heralded its presence in the global market.

3.2 The Beginnings of a Global ITES Hub

Although the Tata Consultancy Services (TCS) was the first enterprise to enter the industry in 1968,[28] the beginnings of this industry was made when pioneering professionals identified data conversion as the area in which jobs could be undertaken in India at a much cheaper cost, stemming from the low wage bill.[29] By the middle of the 1970s, the industry started taking a distinct shape. TCS collaborated with an American firm, Burroughs, resulting in the formation of the Tata-Burroughs. The early pioneers, too, had their own enterprise, the Patni Computer Systems (PCS). The SEEPZ, which began functioning in 1973–1974, led to the establishment of several ITES companies.[30]

By the 1970s, the demand was large enough for the entry of new companies like Infosys, which took over the reins of the industry in the subsequent period. However, much of their jobs were provided by foreign entities (mostly from the USA) as introduction of computers in India faced intense opposition. The buoyancy of the ITES industry was reflected in the steady increase of software exports from the mid-1970s. From only Rs 8.50 million in 1975, software exports increased to Rs. 44 million in 1981. Within the next 5 years, software exports had jumped nearly fourfold to Rs 420 million.[31]

3.3 Consolidation of the Industry Since the Mid-1980s

As discussed earlier, the electronics industry went through rapid changes from the mid-1980s triggered by proactive government policies. The first of these was the slackening of government controls over the industry, which took place through the New Electronics Policy (NEP) of 1984. This was the precursor of the liberal economic policies adopted in the 1990s.[32] Complementing the NEP was another important development that changed the future course of the software sector quite considerably. The Foreign Trade Policy for 1984–1985 contained a specific clause

[28] Patibandla et al. (2000).

[29] Sharma (2015), Chapter 6.

[30] Sharma (2015), Chapter 6.

[31] Lakha (1990), p. 50.

[32] Girdner (1987).

that said: "software exports shall also be permitted through satellite-based data links with overseas computers".[33] The significance of this policy change was felt soon after. In 1985, Texas Instruments (TI) became the first major firm to establish its presence in Bangalore where it set up a dedicated satellite link to connect with its offices in the United Kingdom and the USA.

The *Policy on Computer Software Export, Software Development and Training* announced in 1986 facilitated the development of the software industry. This policy underlined five key objectives: (i) software exports to achieve a quantum leap and obtain a sizeable share of the global software market; (ii) to target an integrated development of software for national and export markets; (iii) simplification of procedures in order to accelerate the growth in the industry; (iv) establishment of a firm base within the national software industry; and (v) increased utilisation of computers in decision-making and enhancing efficiency.[34]

The key strategy of the policy was "flood in, flood out", which meant that Indian firms were to be provided with advanced software and technology to enhance the international competitiveness of Indian exporters.[35] To meet this strategy, licencing requirements were removed on software imports, and the import duty was reduced to 60% under the 1986 policy. This was further reduced to 25% for computers and software used by software producers in 1990. Additional measures for promotion of software exports include a 100% tax exemption to profits from software exports.[36] Also, the specialised electronics Exports Processing Zones (EPZ) and other multi-industrial EPZs were set up in Bombay, Noida, Kandla, Calcutta, Madras and Kochi.[37] All these measures resulted in a major boost to India's exports of software.

3.4 Software Technology Parks and IT Clusters

A proactive government took another major decision to facilitate the growth of the ITES sector in 1990 through the setting up of Software Technology Parks (STPs), allowing several software units to operate using shared communication links. The STPs provided the necessary infrastructure, including uninterrupted power supply to software companies. Most importantly, the STPs established satellite communication links that the software companies could use to develop software on the computers of their overseas clients from access terminals located in their respective premises in STPs. As the initial investment required to set up a software company was low, the STPs allowed many small entrepreneurs to enter the lucrative software export market. The first of the STPs were established in Bangalore 1990. Six more

[33] Sharma (2015), p. 163.

[34] Lakha (1990), p. 49.

[35] Parthasarathy (2004), Dedrick and Kraemer (1993).

[36] Dedrick and Kraemer (1993).

[37] Lakha (1990).

STPs were set up under an umbrella organisation, the Software Technology Parks of India (STPI) controlled by the Department of Electronics.[38]

The advantages of locating units in STPs include single-window clearance system, tax holiday with no value addition requirements, and duty-free imports. In 2000, an STP was set up in Silicon Valley in the USA to facilitate exports by small and medium enterprises of India into the USA.[39]

3.5 India as an ITES Leader in the New Millennium

Two extraneous factors provided massive stimuli to the ITES sector in the new millennium. The first was the "millennium bug", the more common, Y2K problem. The new millennium posed an unexpected problem for the software as the programmes were not enabled to read the date in the new millennium. The second problem was to accommodate the emergence of the Euro as the currency of the single European Market. Accommodating the two changes involved labour-intensive processes, but the countries that had developed the programmes did not have the necessary manpower to fix the bug. The jobs had to be outsourced, and this provided an opportunity to the Indian software companies. Many of these companies secured their businesses by not only fixing the Y2K bug but also by providing subsequent improvements in the software, at no extra cost to the customers.[40]

The windfall made by the Indian companies can be gauged from the fact that between 1998–1999 and 2000–2001, software exports from India increased nearly 2.5 times in dollar terms. As a result, many software service companies entered the Fortune 500 list in the following years.

Over the past decade, the ITES industry had acquired a distinct character of its own by expanding at an unprecedented pace. Its presence in the global markets was particularly noteworthy. If the millennium had ended with the ITES industry exporting US$ 6 billion, over the next decade, exports of this sector had expanded more than tenfold. India was given the epitaph "office of the world".

3.6 Current Status

ITES accounts for 90% of the IT industry in India, with hardware making up for the remaining 10% (Table 5).

India has more than 5000 ITES companies, with a maturity of more than 25 years. According to the A.T. Kearney Global Services Location Index (2014), India had topped the list of countries for "global off-shoring destination".[41] The industry also moved from mere "body-shopping" (on-site service in export market) service

[38] Rajaraman (2012), p. 39.

[39] Kumar and Joseph (2004).

[40] Rajaraman (2012), p. 46.

[41] Malik and Velan (2016).

Table 5 Indian IT industry in 2015 (US $ billion)

	Information technology and business process management (BPM) industry 2015					
	IT services	BPM	Packaged software (incl. R&D)	Total (excl. hardware)	Electronics hardware	Total (IT-BPM + hardware)
World	650	186	1884	2720	1075	2795
Indian IT industry	68.64	26.4	23.76	118.8	13.2	132
	(52)[a]	(20)[a]	(19)[a]	(90)[a]	(10)[a]	(100)[a]
% in world	10.56	14.19	1.26	4.36	1.22	4.72
Indian IT industry – domestic market	13	3	4	20	13	33
Indian IT industry – exports	55.64	23.4	19.76	98.8	0.2	99

Note: [a]Figures in brackets are % share in India's total (IT-BPM + Hardware)
Source: Compiled by authors from NASSCOM (2016)

provider to producing "niche product market segments" by mid-1990s. Still, lower wages and lack of spending in R&D kept the industry's productivity at a low level fuelled by excessive focus on low-end services.[42] To move up the value chain, the industry needs to invest in R&D and provide effective intellectual property protection.[43]

3.7 R&D, Innovation and Intellectual Property Rights

R&D, innovation and intellectual property rights (IPRs) are areas in which most studies on ITES industry are not adequately focused. Among the few studies that do consider these areas, Kumar and Joseph argued that the weak India's copyright regime facilitated proliferation of software piracy, which in turn acted as disincentive for firms to develop software products.[44] The study does not make it clear as to whether piracy resulted from deficiencies in law or on account of lax enforcement.

Basant and Mani analysed the patenting behaviour of foreign R&D centres and concluded that "India has fair amount of innovation capability in the ICT software and in some cases in hardware too".[45] They based their conclusion on the patenting activities of foreign companies located in India. The ICT firms had a share of 86% of the total 1969 patents which were granted to the 59 firms during the period between 2006 and 2010. Basant and Mani excluded "electronics and medical

[42] Mukherjee (2016).

[43] Patibandla et al. (2000).

[44] Kumar and Joseph (2004).

[45] Basant and Mani (2012), p. 19.

devices" from the category of ICT. If these firms are included in the category of ICT firms, the share of ICT firms in total number of patents granted increases to 95%. This indicates that foreign R&D activities are concentrated in ICT.

R&D operations in India accounted for 46% of total patents granted by multinational companies (MNCs) such as Symantec. MNCs are keen to operate R&D centres in India as the cost of R&D professionals in India is much lower; wage advantage drives investment into R&D in India. Basant and Mani also surveyed R&D centres operated by foreign firms in India and found (a) utilising human resources in India was the most important motive for foreign investment. Another important motive was development of new technologies for world market rather than for adapting their products to Indian market, (b) basic research and new product development is the relatively more important type of R&D activity, and (c) focus of R&D in India was on research that can be used immediately, long-term research had low priority.[46]

Another important observation made by Basant and Mani, is that "while India focuses on pharmaceuticals and chemistry related technologies, China has an important share of electronics and telecommunications, areas that are more amenable to design innovations".[47] This means that intellectual property protected under designs law could be an indicator for innovations in the ITES sector, especially in the hardware sector. None of the studies reviewed here considered design innovations. Annual Report 2014–2015 of the Office of Controller General of Patents, Designs, Trademarks and Geographical Indications (CG Office) reports that while the share of Indian applicants in patents is only 28%, their share in design applications is 70%. This probably indicates that India has strengths in design innovations.

4 Patentability of Computer-Related Inventions in India

Prior to the second amendment of Patents Act, 1970, that was undertaken for making it compatible with the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), there were no explicit exclusions in the statute for inventions in the field of CRI.[48] "Invention" was defined under Section 2.1(j) of the Act as "any new and useful (i) art, process, method or manner of manufacture; (ii) machine, apparatus or other article; (iii) substance produced by manufacture. CRIs could be patented like inventions in all areas which could be patented upon fulfilment of the novelty and usefulness criteria.[49] Inventions relating to "methods" or "processes" were limited to "manner of manufacture". For a "method" to be considered patentable, it had to undergo the scrutiny of whether or not it is a "manner of

[46] Basant and Mani.

[47] Basant and Mani (2012), p. 17.

[48] The term has been used by the CG Office while providing the guidelines for the examination of patents.

[49] CG Office 2013 Guidelines for Examination of Computer Related Inventions (CRIs). p. 4.

manufacture". Subject matters relating to mental acts, mathematical methods, business methods, algorithms and computer programmes were not covered by the category, "manner of manufacture", and were hence not considered as inventions under the statute and were therefore not patentable.

This unambiguous application of India's patent law to CRIs has changed significantly since the adoption of the second amendment of Patents Act, 1970. While the regime for patenting computer hardware followed the standards set by the TRIPS Agreement, India adopted its own patenting standards as regards computer programmes. The Patent (Second Amendment) Bill introduced in 1999 proposed in its amendment of Section 3 of the Patents Act dealing with exclusions from patentability, a new Section 3(k), which reads that "a mathematical or business method or a computer program or algorithms" were not inventions and hence not patentable. Thus, while the Patents Act was silent about patentability of computer programmes or software, the amendment Bill disallowed patenting of all mathematical or business methods, computer programmes and algorithms.

However, the Joint Parliamentary Committee (JPC) of the Indian Parliament to which the Bill was referred to took a different view of the proposed Section 3(k). In its recommendations, the JPC rejected the complete exclusion of computer programmes from being patented, and it did so by inserting the words "per se".

4.1 Yardsticks Followed by the CG Office to Deal with Section 3(k)

Applicability of the provisions of Section 3(k) of the Patents Act, 1970, has been detailed by the Manual of Patent Practice and Procedure ("Patent Manual") and the Guidelines for the Examination of Computer Related Inventions ("Guidelines").

4.1.1 The 2013 Guidelines

Since 2013, the CG Office has been issuing Guidelines that have dwelled on the approaches patent examiners could adopt on this vexed issue. The first set of Guidelines pointed out that applications relating to CRIs could be included under the following three categories: (i) method/process, (ii) apparatus/system, and (iii) computer programme product.[50]

According to the Guidelines, claims relating to mathematical method or business method or computer programme per se or algorithm or mental act are claimed in "method/process" format. The Guidelines stated that patent examiners have a very critical role in ascertaining whether the invention belongs to one of such categories and hence falls under excluded subject matter. This view implies that an element of ambiguity is involved in the patenting of methods and processes.

The Guidelines allude to the fact that claims involving apparatus/system requires the examiners to properly construe whether the claimed subject matter relates to any apparatus which is novel, inventive, having industrial applicability or is just

[50] CG Office 2013. Guidelines for Examination of Computer Related Inventions (CRIs). p. 12–16.

formatted to appear so. The apparatus claim should clearly define the inventive constructional/hardware features. The claim for an apparatus may incorporate a "process limitation" for an apparatus, where "limitation" means defining the specific application and not the general application.

Claims relating to computer programmes product that are nothing but computer programme per se simply expressed on a computer readable storage medium and are as such not allowable. However, the Guidelines argue that the scope of the exclusion of computer programmes from the ambit of Patents Act, 1970, or, in other words, the remit of exclusion defined by the phrase "computer programme per se" needs careful consideration by patent examiners.

The question, according to the Guidelines, is whether a computer programme loaded on a general-purpose computer or related devices can be patented. While the spirit of law should lead to an answer in the negative, in an application for patent for a new hardware system, the possibility of a computer programme forming part of the claims cannot be ruled out. In this case, too, the examiner has to carefully consider as to how integrated is the novel hardware with the computer programme. A further consideration for the examiners is whether the machine is programme specific or the programme is machine specific.

The Guidelines suggested that patentability of computer programmes should be assessed in combination with the features of the relevant hardware; the hardware must be something more than general-purpose machine. In cases where the novelty resides in the device, the machine or the apparatus and if such devices are claimed in combination with the novel or known computer programmes to make their functionality definitive, the claims relating to these devices may be considered patentable, but only if the invention can pass the triple test of novelty, inventive step and industrial applicability.[51]

4.1.2 The 2015 Guidelines

If the Guidelines issued in 2013 had given indications of the possibilities of computer programmes to be patented through creative interpretations that could be used to work around the phrase "computer programme per se", the following set of Guidelines issued in 2015 pushed the possibilities further.[52] The 2015 Guidelines clarified that in order to be patentable, CRIs must have (i) novel hardware, (ii) novel hardware with a novel computer programmes or (iii) novel computer programmes with a known hardware which can go beyond the normal interaction with such hardware and can affect a change in the functionality and/or performance of the existing hardware. Based on the above criteria, the 2015 Guidelines stated that computer programmes, when running on or loaded into a computer, going beyond the "normal" physical interactions between the software and the hardware on which it is run, and is capable of bringing further technical effect, may not be considered as exclusion under these provisions.

[51] CG Office 2013. Guidelines for Examination of Computer Related Inventions (CRIs). p. 19–21.

[52] CG Office 2015. Guidelines for Examination of Computer Related Inventions (CRIs). p. 13.

The 2015 Guidelines suggested that while examining CRI applications, the examiner must confirm that the claims have the requisite technical advancement. An indicative list of questions was provided using which the examiner could determine the technical advancement of the CRIs. These were[53]:

(i) Whether the claimed technical feature had a technical contribution on a process which was carried on outside the computer
(ii) Whether the claimed technical feature operated at the level of the architecture of the computer
(iii) Whether the technical contribution was in the nature of change in the hardware or the functionality of hardware
(iv) Whether the claimed technical contribution resulted in the computer operating in a new way
(v) Whether the programme made the computer a better computer, i.e. running more efficiently and effectively, in case of a computer programme linked with hardware
(vi) Whether the change in the hardware or the functionality of hardware amounted to technical advancement

If answer to any of the above questions was in affirmative, the Guidelines suggested that the invention may not be considered as exclusion under Section 3(k) of the Patents Act, 1970.

4.1.3 The 2017 Guidelines

The latest set of Guidelines, issued in March 2017, while providing further clarity to the patentability of computer programmes, raised questions regarding the scope of exclusion of Section 3(k).

The Guidelines pointed to the fact that patents on computer programmes are often claimed in the form of method claims or system claims with some "means" indicating the functions of flow charts or process steps. Algorithm-related claims are much wider than the computer-programme claims as a single algorithm can be implemented through different programmes in different computer languages. If claims in any form, including methods or processes, or apparatus, systems or devices, or computer programme product or computer readable medium, belong to the excluded categories, they cannot be patentable.[54]

As regards the exclusion of "computer programme per se", the Guidelines suggest that it is important to ascertain from the nature of the claimed CRI whether the invention is of a technical nature involving technical advancement as compared to the existing knowledge or having economic significance or both.

The 2017 Guidelines clarify that patent claims which are directed towards computer programmes per se are excluded from patentability, such as (i) claims directed at computer programmes/set of instructions/routines and/or subroutines and (ii)

[53] CG Office 2015. Guidelines for Examination of Computer Related Inventions (CRIs). p. 13–14.
[54] CG Office 2017. Guidelines for Examination of Computer Related Inventions (CRIs). p. 13–14.

claims directed at "computer programme products"/"Storage Medium having instr uctions"/"Database"/"Computer Memory with instruction" stored in a computer readable medium.

Although Section 3(k) excludes algorithms from patentability, the Guidelines point out that computer programmes are often claimed in the form of algorithms as method claims or system claims with some "means" indicating the functions of flow charts or process steps. A suggestion is therefore made that while establishing patentability, the focus should be on the underlying substance of the invention and not on the particular form in which it is claimed.

According to the new Guidelines, mere presence of a mathematical formula in a claim, to clearly specify the scope of protection being sought in an invention, does not make it a claim involving a "mathematical method". However, such exclusion may not apply to inventions that include mathematical formulae and resulting in systems for encoding, reducing noise in communications/electrical/electronic systems or encrypting/decrypting electronic communications.

The above discussion indicates that over the past decade and a half since the adoption of the second amendment of the Patents Act, 1970, the CG Office has tried to provide a degree of clarity over the critical issue of patenting computer software. The efforts of the CG Office have been complemented in recent years by the Courts that have adjudicated the cases involving FRAND (fair, reasonable and non-discriminatory) licences between the telecom companies. Brief accounts of the two judgements which referred to the patenting of computer programmes are given below.

4.2 Court Decisions on Patenting of Computer Programmes

Over the past few years, the High Court of Delhi has passed its orders in two cases, both of which were petitioned by the global telecom giant, Ericsson, against the violation of its patents registered in India.

In the first case involving Ericsson and Intex Technologies, the Court, in its interim judgement,[55] provided a new interpretation of the exclusions provided under Sections 3(k). In the dispute, Intex Technologies argued that Ericsson's patents were computer programmes and were hence not patentable. The Court observed that the novelty and inventive step of the disputed Ericsson patent lay in an encoder specifically developed and designed by the company. In order to perform its functions, the encoder required several hardware components. The fact that while performing these functions certain predetermined guidelines are followed does not mean that the claimed invention is a mere algorithm or computer

[55] *Telefonaktiebolaget Lm Ericsson V. Intex Technologies (India) Ltd.,* IA No. 6735/2014 in CS (OS) No. 1045/2014, judgement delivered on 13 March 2015, p. 133.34.

programme per se. The Court added that Ericsson mentioned the term "algorithm" in the complete specification, which was a "search algorithm" used for determining the best mode of transmitting the signals. Mere reference to the use of a "procedure" or a "method" or an "algorithm" in an apparatus, which comprised of various network or hardware elements so as to bring about a technical effect or to perform a technical process did not reduce the claimed invention an algorithm or computer programme per se or even a mathematical method or formula as contemplated under Section 3(k) of Patents Act, 1970.

In the second case in which Ericsson similarly litigated Lava International Ltd. over violation of its patents by the latter, the High Court of Delhi ruled that Lava's assertions that an encoder used in Ericsson's technology was a mere mathematical method or an algorithm is misleading. Encoder and decoder are practical realisations of a speech coding and decoding method with a physical effect and as such were much more than just an algorithm. Mere mention of an algorithm or a mathematical formula in a patent document should not be inferred to mean that the invention is nothing but an algorithm.[56]

These decisions by the Court, together with the progressively refined interpretations given by the CG Office, will ensure that Section 3(k) is implemented in its letter and spirit. More importantly, the inventor would be encouraged to file for patents in India, especially on software innovations.

The trends in patent grants in computer hardware and computer programmes in India are presented in Tables 6 and 7. The trends capture the essence of patenting standards that exist in the two domains. Table 6 shows that the patent grants in

Table 6 Patents granted in India on computer/electronics

Years	Total number of patents granted	Patents granted in computer/electronics	Share of computer/electronics in total granted patents (%)
2006–2007	7539	237	3.1
2007–2008	15,316	1357	8.9
2008–2009	16,061	1913	11.9
2009–2010	6168	1195	19.4
2010–2011	7509	892	11.9
2011–2012	4381	584	13.3
2012–2013	4126	510	12.4
2013–2014	4226	690	16.3
2014–2015	5978	835	14.0
2015–2016	6326	810	12.8

Source: Annual Reports, CG Office, Government of India

[56] *Telefonktiebolaget LM Ericsson v. Lava International Ltd.* 2016. CS (OS) 764/2015, judgement pronounced on 10 June, 2016. p. 52.

Table 7 Patents granted in India on computer programmes/software

Years	Finland	Germany	India	Japan	Netherlands	Sweden	Switzerland	USA	Others	Total
2002				1			1	1		3
2003				1						1
2004				1						1
2005			1		3	1		1	2	7
2006		1		2		1	1	6		11
2007		2			1		2	3	2	11
2008		1	2			1	1	6		11
2009		1	2	1				9	3	16
2010		1					1	7	2	11
2011								2	1	3
2012								1	1	2
2014		1		2				3		6
2015	1			3	1		1		1	7
2016	2	2	1	4	1	1		4	1	16
2017	3	2		4		1		4	1	15
2018				1		2		2	1	6
Total	6	11	6	20	6	7	7	49	15	127

Source: Indian Patent Advanced Search System, available at: http://ipindiaservices.gov.in/publicsearch/

computer hardware have been within a range in most of the years for which data are presented. This is possibly a reflection of the fact that patentability standards offered by India's patents regime to innovators in hardware are relatively more predictable than in the case of computer programmes.

Patent grants on computer programmes, including software (Table 7), show an interesting trend. In the previous decade, when there was lack of clarity regarding the interpretation of the contentious phrase, "computer programme per se" in Section 3(k) of Patents Act, 1970, software patents were being granted. However, in the subsequent period, which is the period that saw considerable efforts being made to interpret the contentious phrase by the CG Office and the Courts, only one computer programme has been patented.

5 By Way of Conclusions

The objective of this chapter was to provide an account of the development of the IT and ITES in India. The first part of the study that focused on the development of the industry until the 1990s traced the origins of the two sectors. The IT sector developed under government controls, wherein only the government-owned companies were allowed to expand in this sector. In contrast, the ITES sector was mostly developed through private initiatives, the non-resident Indians, in particular.

By the 1980s, it became clear that the model for the growth of the IT sector adopted by the government through its own entities was a non-starter. The policy framework for the expansion of the industry was completely changed with the government inviting foreign players to take the lead. In fact, the IT sector became the first sector, which was opened for foreign investment well before the government officially adopted the policy of economic reforms in early 1990s.

During the period of economic reforms, the government chose the path of rapid opening of the sector. India was one of the few developing countries that endorsed the Information Technology Agreement in 1997, whose objective was to eliminate tariffs on IT products.

There is no evidence that this open-door policy helped the IT industry to develop. In contrast, the ITES sector received a major boost when Indian companies were able to take advantage of the increasing demand for these services towards the end of the previous millennium. Subsequently, the ITES has expanded phenomenally, establishing India as one of the ITES powerhouses of the world.

Although India's ITES sector was an unqualified success, there is not much evidence that this sector, or its hardware counterpart, showed any dynamism in the realm of technology development. India's R&D spending remained sluggish, a major source of concern.

One uncertainty faced by the R&D system was India's patent regime. In the second amendment of the Patents Act, 1970, undertaken to make India's patent law conform to the TRIPS Agreement, "computer programme per se" was excluded from patenting. There was complete lack of clarity as to the interpretation of the phrase. However, in the more recent years, both the Controller General of Patents,

Designs and Trademarks and the Courts are providing a degree of conceptual clarity as to what "computer programme per se" really means.

Our study has shown that India's IT and ITES sectors face considerable challenges as the government has taken a series of step to enhance the level of integration of the Indian economy with its partners. Our analysis has shown that there are significant deficiencies in the two sectors, especially in their abilities to put forward efficient innovation systems, which would have to be addressed for them to compete meaningfully in the global markets.

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Part III

Film Industry

Chinese Film Industry Under the Lens of Copyright, Policy, and Market

Lizhou Wei and Yanbing Li

Abstract

The development history of the Chinese film industry can generally be divided into three stages: early cinema, policy-controlled cinema, and contemporary cinema. The Chinese cinema is an instructive story. On the one hand, it had been under the radar of the copyright law for 95 years, and its main constraints were underdeveloped technology, private capital deficiency, wartime disruption, and ideological and political concerns. On the other, contemporary Chinese film copyright has been greatly influenced by both the author's right system and the copyright system. Despite high piracy and weak enforcement, it managed to complete a dramatic shift from a policy-controlled to market-driven and even copyright-based industry within just decades. This chapter will place the film industry under the lens of copyright, policy, and market in the context of China.

Keywords

Film industry · Marketization · Industrialization · Film policy · Film copyright

1 Early Cinema (1896–1930)

The early cinema in China consisted of two periods – the last 15 years of the Qing Dynasty and the golden age of the silent films. Shortly after Louis Lumière brothers' first commercial public screening in Paris back in 1895, motion pictures made

L. Wei (✉)
Zhejiang University, Guanghua Law School, Hangzhou, China

Y. Li
Shanghai University of Finance and Economics, School of Law, Shanghai, China

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_6

their first public appearance in Shanghai in 1896.[1] Ten years later, the first Chinese film was produced by a Chinese photo studio, which recorded selected parts of the Beijing opera "The Battle of Ding Jun Mountain" in 1905.[2] Although the early movies were greatly constrained by the undeveloped economy and cinematographic technology, the public showed great interest in this new media, which combined traditional arts with entertainment.[3] This alarmed the Qing government.[4] As the first regulation on films in China, the provisions of the 1911 Shanghai Cinema Regulation focused on cinema administration, such as cinema permits, screen time, and seat arrangement, rather than corrective measures in connection with the content of the films.[5] With the Revolution of 1911 putting an end to Chinese feudalism, China stepped into the period of the Republic of China in 1912.[6] While European countries were heavily involved in World War I (1914–1918), the Chinese cinema together with industry and commerce under national capitalism was able to catch up and develop. Shanghai became the center of the early Chinese cinema.[7]

Early filmmaking in China primarily began with recording traditional Chinese operas.[8] The first-generation Chinese directors actively involved themselves in experimenting with short fiction films adapted from modern plays.[9] These efforts not only accumulated the filmmaking skills and private capital for further development but also cultivated professionals and strengthened the ability of motion pictures to elevate from faithfully recording spectacular attractions to visualizing expressive narrations.[10] Motion pictures possessed the potential to reflect social reality and convey messages through cinematographic language to the audiences in a less preaching and yet very influential way.[11] However, this led to divergences among filmmakers in defining the primary function of films as either leisure entertainment or moral cultivation. For example, as two representatives of the first generation of Chinese directors, while Zheng Zhengqiu deeply believed in "serious feature plays" that could "express critical opinions for social revolution and public

[1] Zhang (2004), 14.

[2] Cheng et al. (1998), 13–14.

[3] Lu and Shu (1998), 6.

[4] At the 70th birthday ceremony of Empress Dowager Cixi in 1904, a film projector exploded during screening. Cixi therefore treated film as unsafe and ominous and banned film screening in the prohibited palace after that. Cheng et al. (1998), 10.

[5] The Cinema Regulation was adopted by the Shanghai Municipal Public Office in 1911, before the end of the Qing Dynasty, followed by Shanghai City Hall during the early period of the Republic of China. Cheng et al. (1998), 11.

[6] The Republic of China (ROC) was established in 1912 and originally based in mainland China. It was governed by the Beiyang Government (northern warlords of China) from 1912 to 1926 and by the Kuomintang (KMT) Government from 1927 to 1949.

[7] Lu and Shu (1998), 6. Wang (2001), 218.

[8] Lu and Shu (1998), 2; Zhang (2004), 15–16.

[9] The short fiction films emerged and developed from 1913 to 1922. Lu and Shu (1998), 6–10.

[10] Lu and Shu (1998), 8. Zhang (2004), 16–37.

[11] Wang (2001), 205.

education," Zhang Shichuan was solely motivated by box office considerations and emphasized pure entertainment.[12]

The Chinese cinema entered its first golden age in the mid-1920s, when silent films reigned.[13] However, this golden age did not last long. The shortage of private capital weakened filmmakers' ability to explore new themes or genres that were yet to be accepted by the market. As a result, three types of commercial films – the history drama, martial arts movies, and movies of immortals and demons – flooded the market from 1926 to 1930.[14] Movies were filled with violent, sexual, and vulgar content, cheap dream-making, visual sensation, and attractiveness. Destructive market competition not only accelerated the downfall of the once thriving film industry but also invoked moral panic about the film content. In particular, criminal cases were reported to have dramatically increased after the import of a series of American detective films after World War I, as well as the release of domestic detective films, such as Yan Ruisheng,[15] because detailed film scenes had allegedly become the textbooks for crimes.[16] Chinese audiences even protested and called for banning foreign films, which often connected the image of Chinese with murderers, the intellectually disabled, drug addicts, or other indecent characters.[17]

Considering the negative impact of films on public security and social mores, as well as the growing nationalism and patriotism, the Education Committee in Jiangsu province was the first to establish a local Film Censorship Committee in 1923, which heralded the beginning of the film censorship system in China[18] and adopted a single and yet unclear criterion of whether the content violated standards of morality and decency.[19] Then, the Film Review Committee was established in Beijing for the central government in 1926 by the General Education Board,[20] which expanded the review criteria from "immorality and indecency" to include "public security," "obscenity," "social mores," and "disgrace on Chinese and other content that would prejudice other countries' diplomatic relations with China."[21] However, as the then

[12] Zheng and Zhang found a balance between profit-making and social enlightening in their film "Orphan Rescues Grandfather," which was the first film that gained both artistic and market success in 1923, Zhang (2004), 23–28.

[13] Lu and Shu (1998), 11–16.

[14] Lu and Shu (1998), 25–31; Zhang (2004), 37–47.

[15] The motion picture department of Commercial Press made the first full-length feature film, "Yan Ruisheng," in 1921 based on a criminal case which happened in Shanghai in 1920. The makers of this detective film conducted bold experiments and tried to present the original circumstances of the case with rather brutal scenes. Wang (2001), 206–208; Li and Hu (1996), 67–71; Cheng et al. (1998), 44, 58–59.

[16] Wang (2001), 206.

[17] Wang (2001), 206–208, 216.

[18] Wang (2001), 216.

[19] Wang (2001), 217.

[20] The General Education Board was established in 1915, consisting of members commissioned by the education ministry, Beijing Police Department, university professors, and other specialists, Wang (2001), 212.

[21] Wang (2001), 220–221.

Beiyang Government's reach did not extend much beyond Beijing, the actual coverage of the Film Review Committee was limited.[22] The initial film censorship in China was decentralized, unofficial, non-binding, and ex post, with particular emphases on the moral cultivation and public education functions of film.[23]

While films had long been subject to control and regulations since introduction to China, there was no copyright law at all in China at the time when copyright protection was for the first time accorded to cinematographic productions in 1908 as literary or artistic works at the Berlin Conference of the Berne Convention.[24] China in the 1920s generally considered copyright protection and accession to the Berne Convention unnecessary and even harmful to the progress of education, culture, and knowledge.[25] When the first copyright statute was adopted in 1910, the protected subject matter only covered literary works, works of fine arts, photographs, etc.,[26] excluding motion pictures from copyright protection. The 1928 Copyright Act of the Republic of China (ROC)[27] also did not include films in the non-exclusive list of copyrightable work categories under Article 1.[28]

2 Wartime Cinema (1930–1949)

Due to the Japanese invasion of China in 1930–1945 and the civil war that immediately followed (1945–1949), China entered a 19-year period of wartime cinema while transiting from silent to sound films in the 1930s,[29] and the dramatic social unrest and national crisis turned Chinese cinema into a political and ideological battlefield.[30] In dealing with the emergence of leftist films and the following large-scale "Left-wing Cinema Movement" (1932–1937),[31] the KMT Government set up centralized, mandatory, and nationwide film censorship as a significant part of its

[22] Wang (2001), 221–222.

[23] Wang (2001), 218–219 and 223.

[24] Article 14(1)(2) of the Berne Convention Berlin Act 1908, Ricketson and Ginsburg (2005), para 8.31–8.41, Kamina (2016), 16–18. For the history of film protection in European countries prior to the Berne Convention Berlin Revision 1908, see Kamina (2016), 7–16.

[25] Shanghai publishers petition against acceding to the Berne Convention, Shanghai Xin Wen Bao, 8 December 1920, cited from Zhou and Li (1997), 151–153.

[26] The Copyright Law of the Qing Dynasty, adopted in 1910, was the very first copyright act in Chinese history and was replaced by the Copyright Law of the Beiyang Government in 1915.

[27] Copyright Act of ROC, adopted by the Nationalist Government in 1928.

[28] Arguably, film scripts could be protected as literary works by then already; see Zhou and Li (1997), XII.

[29] Lu and Shu (1998), 37–39.

[30] Zhang (2004), 58; Lu and Shu (1998), 39.

[31] The leftist films refer to "those anti-imperialist, anti-feudal films produced between 1933 and 1935 by the leftist film movement engineered by the underground Communist film group under the leadership of the Cultural Alliances of Chinese Leftists"; and "the term should be extended to include films released in 1937, and the movement's starting date be pushed back to account for film criticism that anticipated the emergence of leftist films," Zhang (2004), 63 and 66.

overall scheme of national cultural policy and ideological control.[32] The Film Censorship Law was adopted in 1930, and the Film Censorship Committee (FCC) was established in 1931 to consolidate the ideological domination of the Three Principles of the People – the Principle of Nationalism, Principle of Democracy, and Principle of People's Livelihood.[33] The film censorship applied to both domestic and imported films and deployed four criteria to prohibit: (1) films giving humiliating portrayals of the Chinese people, (2) films opposing the Three Principles of the People, (3) films corrupting good traditions and customs or impairing public order, and (4) films advocating superstition and heresy.[34]

At its initial stage from 1931 to 1934, the FCC conducted film censorship primarily from the social and moral aspects based on the third and fourth criteria. Many domestic films of martial arts and fantasy subjects that advocated "superstition"[35] and some domestic and foreign films that featured "obscene sensuality"[36] were banned or required to edit or delete certain content before screening. While the FCC's censorship accelerated the death of the ill-timed commercial films, it did not engage in direct interference in film production.[37] To minimize the "huge losses" because of banning films, in particular to the small film studios which already were suffering great financial hardships due to the wartime, the FCC allowed the release of some "problematic" films after necessary cuts and changes.[38] Also, the FCC even showed some "sympathy for or tolerance of" certain leftist films, because the FCC was under the Ministry of Education, not the KMT Party, and was thus "less politically sensitive."[39] Later, the Central Film Censorship Committee (CFCC) was established in 1934 under direct supervision of the Film Industry Guidance Committee of the KMT Central Propaganda Committee,[40] which was more politically oriented, to strengthen the Nationalist government's ideology, and it adopted much stricter criteria to "block those 'ideologically incorrect' films," namely, the "left-wing films."[41]

After the outbreak of Japan's full-scale invasion of China on July 7, 1937, the Film Censorship Law and the CFCC became ineffective in the areas occupied by Japan.[42] Throughout the occupation, the Japanese military and its puppet

[32] Wang (1997), 60–61.

[33] Wang (2006), 141.

[34] Film Censorship Law, Articles 1 and 2. Wang (1997), 61, the English text cited from Wang (2006), 144.

[35] It was reported that 70% of the domestic films banned by the FCC in the first 3 years were films of martial arts and fantasy subjects, Wang (1997), 63.

[36] Wang 1997, 62–64; Wang (2006), 141 and 148.

[37] Priest (2015), 26.

[38] Zhang (2004), 70.

[39] Zhang (2004), 70, and Wang (2006), 142.

[40] Wang (1997), 66. Wang (2006), 144.

[41] Wang (1997), 66. Wang (2006), 143–145,149.

[42] Wang (2006), 150.

governments[43] adopted film censorship to mollify the Chinese awareness and suppress any nationalist flames of resistance[44] and even became active and monopoly players themselves in producing and screening propaganda films in the occupied areas.[45]

3 Socialist Cinema (1949–1978)

Socialist cinema started from the founding of the People's Republic of China (PRC) in 1949 and ended with the beginning of reform and opening up in 1978. Cinema was chosen by the Communist Party of China (CPC) as an essential part of the people's revolution and a construction pillar of socialist China. In comparison to the early and wartime cinema, socialist cinema was centrally planned and subordinated to politics.[46]

3.1 State-Owned and Policy-Controlled Cinema

On the one hand, taking reference of the Soviet Union model,[47] a national studio system, within which movies were exclusively produced by state-owned studios and based on state funding and planning, was formed and lasted for almost half a century until its disintegration by the end of the twentieth century.[48] For film distribution and exhibition, the Central Film Bureau (CFB) was put in place in 1949 to take charge of the nationwide distribution, display, export, and import of films and of supervising films before screening.[49] Up to 1958, the state-owned China Film Corporation (CFC) monopolized the nationwide film distribution and exhibition, with a dual function of administrative governance and business management.[50] Although the state-run studios and the CFC operated as an industry after the pattern of business management, the production and distribution of films were not market based at all.[51]

On the other hand, the socialist cinema was entirely policy-controlled,[52] which for the first three decades of the PRC was neither stable nor systematic, but capricious, and followed the zigzag pattern of political campaigns, struggles between

[43] In occupied territory of China, Japan established the Wang Jingwei Government in Nanjing and the state of Manzhouguo in Northeast China.

[44] Wang (2002), 48–49.

[45] Wang (2002), 25–27, 45–48; Zhang (2004), 84.

[46] Hu and Yao (1989), 7.

[47] Liu (2009), 7.

[48] Yin and Ling (2002), 2–3. Hu and Yao (1989), 14–15.

[49] Zhang (2004), 190–191.

[50] Li (2017), 6–19.

[51] Hu and Yao (1989), 15.

[52] Hu and Yao (1989), 8–11. Jin (2014), 73–78.

classes and cultural turbulence.[53] Too often, the overemphasis on the ideological and instrumental function of the movie kept compressing the artistic latitude of filmmakers.[54] It is hardly possible for filmmakers to maintain balance between artistic creation and political needs.[55] During the Cultural Revolution (1966–1976),[56] the most aggressive film policy was adopted, which conceptualized and standardized the fundamental principles for filmmaking[57] and the rules for film shooting[58] and imposed them on all filmmakers,[59] which clearly violated the basics of artistic creation and cultural goods production. As a result, Chinese cinema suffered a decade of "devastation."[60] It was with the end of the Cultural Revolution in 1976 that film production and distribution gradually resumed.[61]

3.2 Film Copyright Remained Unattended

During the age of policy-controlled cinema in China, international film copyright made tremendous progress. Cinematographic works, including assimilated works expressed by a process analogous to cinematography, have been explicitly enumerated as a category of "literary and artistic works" in Article 2(1) of the Berne Convention at the Brussels Revision in 1948.[62] Following the international trend, the amendment of the Copyright Act of the ROC in 1944 for the first time recognized motion pictures as a category of copyrightable works,[63] granting the copyright owner of films the exclusive right of public performance or rehearsal for a protection

[53] Zhang (2004), 189.

[54] Yin and Ling (2002), 10.

[55] Yin and Ling (2002), 19–20.

[56] During the Cultural Revolution, film production and criticism were not a matter of art or business but a purely political concern. In particular, films that were produced in the previous 17 years were disapproved as "evil films," *The Development History of the Chinese Film authored by* Cheng Jihua was labeled as the most anti-socialist book about film theory and criticism, filmmaking and technical professionals were dismissed, and the Beijing Film Academy was forced to close. Yin and Ling (2002), 84–85; Zhang YJ, 217.

[57] The fundamental principles for filmmaking during this period were the "three principles of prominence," that is, "give prominence to positive characters among all the characters, to heroes among the positive characters, and to the principal hero among the heroes," Zhang (2004), 219; Yin and Ling (2002), 86–87.

[58] Specific rules for film shooting had been compulsorily standardized as follows: "In frame composition, the hero must be located at the center and the villain at the fringes; in camera positioning, the hero must be shot from a low angle and the villain from a high angle; in proportions, the hero must appear large and the villain small; in color scheme, the hero must be bathed in warm colors and the villain in cold tones; in lighting, the hero must be bright and the villain dark," Zhang (2004), 219; Yin and Ling (2002), 90–92.

[59] Jin (2014), 88–92.

[60] Zhang (2004), 217.

[61] Jin (2014), 108–109.

[62] Ricketson and Ginsburg (2005), para 8.31.

[63] 1944 Amendment of the Copyright Act of the ROC, Article 1 (1) No. 4.

term of 10 years.[64] However, this Copyright Act was not very operational due to the Sino-Japan war, and became obsolete upon the founding of the PRC in 1949, which did not protect films until the first copyright law entered into force in 1991. In a word, copyright concerns with motion pictures remained unattended during the period of policy-controlled cinema in China, and movies functioned as important political and ideological tools for propaganda instead of cultural or entertainment products.

4 Contemporary Cinema (1979–Present)

After the 3rd Plenary Meeting of the 11th Central Committee of the CPC (CCCPC) in 1978 ushered China back on the course of economic reform and modernization,[65] Chinese cinema entered into a new era of contemporary cinema with three phases – recovery period of internal reform (1979–1990), transitional period of marketization (1990–2000), and industrialization (2001–present).

4.1 Recovery Period of Internal Reform

From 1979 to 1990, Chinese cinema embarked on a period of internal reform. The national policy of economic reform and opening up brought both new opportunities and severe challenges to the state-run studios and centralized distribution system. The tension between politics, cultural policy, and films was relaxed, allowing more diversified and individualized artistic expression. The liberalized film policy revived the film market. Film directors contributed to the free and versatile advancement in filmmaking from various aspects, and film production reached its golden age by the mid-1980s.[66]

The reform mainly took place to fix the unreasonable purchase arrangement between state-owned studios and the CFC and revenue/profit sharing ratios among the CFC and its local branches and screening units.[67] First, there were growing conflicts between the state-owned studios and the uniform distribution system and pricing mechanism controlled by the CFC. In fact, the CFC had always purchased movies from state-owned studios at a fixed price from the 1950s to 1979, regardless of the quality and the theatrical revenue of the individual film.[68] However, with rising production costs and filming infrastructure costs, the profits that the studios could retain were squeezed out dramatically.[69] In addition, film studios received no share from the revenue generated by the repeated distribution of the same film, as

[64] 1944 Amendment of the Copyright Act of the ROC, Articles 1 (2) and 9(2).

[65] Jin (2014), 103. Zhang (2004), 226. Yin and Ling (2002), 101.

[66] Yin and Ling (2002), 101–142. Lu and Shu (1998), 170–179.

[67] Tang (2009b), 5.

[68] Shen (2005), 203.

[69] Xu and Shi (2007), 41.

the CFC bought out the copyright.[70] Therefore, the pricing mechanism switched in the 1980s from a fixed buyout price to a floating price (RMB 9000 per copy times the number of copies distributed), and the studios retained the copyright in feature films themselves for repeated distribution and screening.[71]

Secondly, the average sharing ratio of the box office revenue between the local distribution branches, which were under dual supervision of both the CFC and local cultural departments, and the CFC was raised to 3:7 in 1979, twice as much as it was in the 1960s, and the profit-sharing ratio of the local distribution branches and screening units, which were established with the financial support of local distribution branches and local financing, with the local cultural departments was raised to 8:2 in support of the reconstruction and enhancement of the local film projection infrastructures.[72] Lastly, a floating price mechanism for movie tickets was allowed for the first time in 1985, after having been kept in the range of RMB 0.2 to 0.35 for 35 years.[73]

The measures mentioned above were merely partial adjustments and were unable to solve the institutional defects of the planned economy. The unified cinema system was still of an actively administrative nature and failed to optimize the allocation of resources and interests.[74] The 16 state-owned studios still monopolized the production of feature films.[75] It is true that, since cinema was redefined as an industry rather than a government sector and the state funding for film production was stopped in 1984, the state-owned studios were forced to raise funds for film production on their own through bank loans and to assume sole responsibility for profits or losses.[76] However, a sudden disintegration of the state-funded production model that had lasted for 30 years[77] could hardly achieve a successful transition to a profit-oriented industry, when its deficiencies such as overstaffed structure[78] remained unsolved, the necessary mechanism of market competition missing, and the state-monopolized distribution and multilayer exhibition system unchanged.

Moreover, the development of new media technology and the market competition with other cultural and entertainment industries exacerbated the difficulties of the film industry. The CFC had run at a massive loss from 1981 to 1984 on the

[70] Xu and Shi (2007), 41.

[71] Ministry of Culture, (Document No. 1558), 1980. Liu (2015), 108.

[72] State Council, Report on the Reform of the Film Distribution and Exhibition Management System, Guo Fa [1979] No. 198, 01.08.1979. Liu (2015), 109. Prior to the Cultural Revolution, the local distribution branches received 8–15% of the distribution revenue on average in the 1960s. Liu (2009), 11.

[73] Tang (2009b), 5. Liu (2015), 111.

[74] Jin (2014), 110–111. Tang (2009b), 5–6. Liu (2015), 108–110.

[75] Jin (2014), 108.

[76] CCCPC, Decision Concerning the Reform of the Economic System, 20 October 1984. Liu (2015), 109.

[77] Jin (2014), 110–111.

[78] Ji (1999), 343.

distribution of domestic films.[79] In particular, the rapid rise of television, KTV, and the home video industry hit the movie market badly and diverted hundreds of millions of audience members.[80] In response, film studios started producing entertainment films in 1988 in the hope of a fast and high return on investment in face of huge market and financial pressure.[81] In addition, special state funding was established to promote the production of mainstream films.[82]

In terms of management of the film industry, a couple of administrative adjustments were made. In dealing with the sexual, violent, and other types of adult content in films, the Ministry of Radio, Film, and Television (MRFT) issued detailed measures and rating criteria to classify films based on the content suitability for children under 16 years old.[83] As co-production of films with foreign investment became popular after the end of state-funded film production in 1984, oversight over film co-production was strengthened by the review and approval process.[84] From 1986 onward, the CFB and CFC were put under the administration of the MRFT, while local branches of the CFC remained under the supervision of the local cultural departments until 1993.[85] However, while the film market in the 1980s was flooded with pirated videos and VCD of foreign films and TV series, the market management under multiple jurisdictions of the MRFT, Ministry of Culture, and General Administration of Press and Publication[86] failed to rectify market disorder, which in turn triggered the legislation of copyright law and film regulations in the 1990s.

[79] Ji (1999), 228.

[80] From 1984 to 1985 alone, the number of movie viewers dropped sharply to 5.2 billion; see Jin (2014), 110–111.

[81] Lu and Shu (1998), 192–193. Just in 1988, 60% of the films produced were commercial entertainment films. Jin (2014), 14.

[82] MRFT and Ministry of Finance, Provisional Measures Concerning the Use and Management of the Special Fund for the Development of National Cinemas, 19 March 1991. Liu (2015), 110; Lu and Shu (1998), 180–185; Jin (2014), 115–116.

[83] MRFT and CFC, Management Measures Concerning Films Unsuitable for Exhibition to Children, Guang Fa Ying Zi [1989] No. 824, 2 November 1989; Notification of the MRFT concerning the Censorship and Rating System for Certain Films, Guang Fa Ying Zi [1989] 201, 25 March 1989. Liu (2015), 111.

[84] Publicity Department of the CCCPC, MRFT and General Administration of Customs, Notification to Further Strengthen the Management of Film Production with Foreign Cooperation, Guang Fa Wai Zi [1989] No. 190, 23 March 1989, Liu (2015), 110.

[85] Jin (2014), 111. This twisted administrative management regime was rooted in the competing interests among different administrative departments. The revenue of local film distribution and exhibition consisted of the biggest financial source for local cultural departments, which was then used to support subsidies for other cultural sectors in the region. Therefore, they refused to give the administrative power back to the MRFT. Ji (1999), 234.

[86] Tang (2009a), 281.

4.2 Cinema Marketization

The establishment of the so-called socialist market economy with Chinese characteristics has opened up full-scale legal and institutional reform of cinema and led to transition to its marketization, which inevitably has been accompanied by conflicts, disorder, and crisis due to the long-existing marriage between films and politics and the state monopoly and administrative control over filmmaking.

4.2.1 The 1990 Copyright Law Set Up Basic Copyright Framework for the Film Industry

Most significantly, the PRC adopted its first copyright law in 1990, and a basic copyright framework was thus set up for the film industry.[87] Notably, the copyright system in China is neither a pure author's rights system nor a copyright system, but of a hybrid, pragmatic, and issue-based nature. This nature is critical to the understanding of film copyright in China. For the subject matter, under great influence from the German author's right system,[88] the Chinese Copyright Law expressly listed "original films" as a category of works eligible for copyright protection,[89] while the producers of unoriginal "video recordings" were only granted neighboring rights protection.[90] Besides, the specialties of film have been addressed by copyright rules. In dealing with the multiple right holders in film production, special rules for the authorship and ownership in film works were foreseen. For example, a distinction was made between film works and pre-existing works from which the film had been adapted, such as novels or dramatic works. To protect film producers' substantial investment and to guarantee a full and active commercialization of film, the authors' moral rights in pre-existing works were restricted. Article 13 Implementing Regulations (IR) 1991 stated, where the copyright owner has authorized the film adaption based on his or her work, that permission to make necessary alteration should be implied, in so far as such alteration does not distort or mutilate the original work. In addition, authors of those works that were included in a

[87] Standing Committee of the National People's Congress, Copyright Law of the PRC [CL 1990], issued on 7 September 1990, effective 1 June 1991. This Chinese Copyright Law has been revised twice in 2001 and 2010, respectively. For a comphensive overview of the modifications made in the 2001 revision, see Li and Zhou (2001), 1–23. The 2010 revision was due to the failure on a WTO dispute between the US and China for China not protecting audiovisual works with ilicit or immoral content and those pending content review. WTO, China-Measures Affecting the Protection and Enforcement of Intellectual Property Rights: Report of the Panel, WT/DS326/R (26 January 2009). For an overview of this issue, see Zhang and Li (2015).

[88] The German Copyright Act makes a distinction between original film works (§§2 I lit.6 and 2 II) and unoriginal moving images (§95).

[89] "Cinematographic, television and video works" in Article 3 No. 5 of the CL 1990. The legal definition was given in the Implementing Regulations of the Copyright Law of the PRC [IR 1991] issued by National Copyright Administration, 30 May 1991, Article 4 No. 9.

[90] Article 41 I of the 2001/2010 CL, previously in Article 39 I of CL 1990.

cinematographic work but can be exploited separately, such as a script, music, etc., were allowed to exercise their copyright in such works independently.[91]

Concerning the authorship of cinematographic works per se, the director, script-writer, lyricist, composer, cameraman, and other authors were expressly identified as authors of a cinematographic, television, or video work and enjoy the right of authorship.[92] However, instead of strictly following the German author's rights principle,[93] the film producer, primarily the state-owned film studios, was designated as the initial copyright owner of film works in China,[94] partly referencing the US work-for-hire doctrine.[95] The film producer enjoyed all other copyrights vested in the cinematographic works, including the economic rights, which are subject to limitations and exceptions.[96] While the economic rights of publication, exploitation, and remuneration in cinematographic works last for 50 years after the first publication,[97] the remaining moral rights therein remained perpetual and inalienable,[98] quite similar to the French approach.[99]

Indeed, the CL 1990 neither spelt an end of the state-monopolized film production and distribution system overnight nor eradicated the problem of piracy once and for all. Nonetheless, it was vital for the film industry, because it for the first time confirmed in the form of law that the film studios as the film producers should be the copyright owner of films they produced and enjoy the proprietary rights of exploitation and receiving remuneration derived from films. As a brave first step, the CL 1990 at least provided the essential legal basis for the film copyright owner to fight against piracy, administrative interference, and other giant copyright exploiters. For example, national television stations and broadcasting organizations used to broadcast films even before their public screening, and acquired very well-paid advertising revenues, but returned only a pitiful portion thereof to film studios, as the administrative authorities had treated the issue as no more than putting the money from one's right pocket into the left. Article 44 CL 1990 at least provided the film studios with the specific legal basis to grant the broadcasting right and claim fair and reasonable royalties from national television stations and broadcasting organizations.[100]

[91] Article 15(2) CL 1990.

[92] Article 15(1) CL 1990.

[93] The author's rights principle (Schöpfersprinzip) was expressly recognized by §7 of German Copyright Act.

[94] Article 15(1) CL 1990.

[95] 17 USC §101.

[96] Article 22 CL 1990.

[97] Article 21(3) CL 1990.

[98] Article 20 CL 1990.

[99] Article L 121-1 French IPC.

[100] According to Article 44 CL 1990, a television station which broadcasts a cinematographic, television, or video work produced by others should obtain permission from, and pay remuneration to, the producer of the cinematographic, television, or video work. This was certainly a big favor for film studios in comparison to Articles 40(2) and 43 CL 1990, where the TV stations had statutory licensing in the exploitation of other types of published works for the production of a radio or television program and had no obligations of securing permission or paying for broadcasting a published sound recording for noncommercial purposes.

4.2.2 Further Reform in Film Distribution, Import, and Production

In implementing the CL 1990, the right to distribute and export feature films was given back to the studios, so that studios were able to conclude distribution contracts directly with local distributors, removing the intermediate link of the CFC.[101] Previously, a four-layer distribution network had been in operation from 1949 to 1992: the CFC → provincial level→ municipal level→ county level.[102] The unified purchase and distribution system monopolized by the CFC was finally revoked in 1993. However, given that there was only one distribution channel within each province at that time, the studios then had to sell feature films to 31 local distributors at the provincial level separately.[103] The monopoly of the provincial distributors was abolished in 1994, as studios were allowed to sell films to local distributors at all levels[104] in the hope that competitive distribution would reduce local access barriers and transaction costs. However, such measures were not as effective as expected, primarily because local distributors and theaters remained state-owned companies under the direct administrative control of the provincial distributors.

The CFC started to import ten foreign films every year from 1994 onward to revive the ailing domestic box office and shared net box office revenues of imported films with foreign film producers and the provincial and municipal distributors and exhibitors.[105] The strategy to import ten foreign blockbusters did boost the sluggish film market, as they immediately became the major contributors to the domestic box office revenue despite the small quota. For example, Titanic alone hit RMB 360 million, accounting for 40% of total box office revenue for the whole year of 1997, a record held for more than 10 years until *Avatar* in 2010.[106] In addition to the protective measure of the import quota, the screening time of imported films was limited to no more than one-third of the overall screening time to protect domestic films.[107]

With regard to film production, efforts were made to prevent the already stagnant domestic film production from being completely knocked down by imported blockbusters. The reform of feature film shooting took place in the mid-1990s. In addition to the first expanding film production from 16 approved national studios to include certain state-owned film studios at the provincial level in 1995, private entities were allowed to be named as "joint producer" if their investment in feature film production accounted for more than 70%, although still without an independent filmmaking

[101] MRFT, Several Opinions to Further the Contemporary Reform of the Cinema System, Guang Fa Ying Zi [1993] No. 3, 5 January 1993. Tang (2009a), 282.

[102] SARFT and Ministry of Culture, Implementation Rules for the Reform of the Film Distribution and Exhibition Regime, Guang Fa Ban Zi [2001] No. 1519, 18 December 2001. Liu (2012a), 4.

[103] Weng (2009), 57.

[104] MRFT, Notification on the Further Deepening Reform of the Cinema System, Guang Dian Zi [1994] No. 348, Weng (2009), 57. Tang (2009a), 277, Footnote 1.

[105] The import quota of ten revenue-sharing films lasted from 1994 to 2000, with the internationally conventional sharing ratio of 35% for CFC, 17% for foreign film producers, and 48% for provincial and municipal distributors and exhibitors. Jin (2014), 129. Weng (2009), 57–58.

[106] Jin (2014), 129–130.

[107] 1996 Regulation on Administration of Films, Article 45(2).

permit.[108] Then in 1997, all state-owned provincial film studios, certain qualified municipal film studios, TV stations, and TV series makers were allowed to apply for the single feature film production license.[109] However, domestic film production still heavily relied on state subsidies.[110] More than 70% of the domestic films could hardly recover the production costs, let alone compete with imported blockbusters. As a result, only about 40 feature films were produced from 1997 to 1998.[111]

4.2.3 A Comprehensive Prior Approval System for Films

Due to domestic social and political unrest and international pressure, the government re-emphasized the stability of the social and political structure[112] and reinforced the control of films by administrative and economic means after the 1996 National Cinema Conference in Changsha.[113] Above all, the State Council issued the first special regulation on films in 1996 – the Regulation on Film Administration[114] – to establish a comprehensive prior approval system for production, distribution, exhibition, import, and export of films, including the conditions and process for approval and legal consequences of approval and disapproval. Moreover, the ex ante and ex post film censorship system and explicit criteria for content review were put in place.[115] In particular, film scripts must be filed on record before shooting, the completed film submitted for content review, and the Film Public Screening Permit be issued upon approval by the censors.[116]

In addition to administrative intervention, the government also subsidized the 9550 Project of producing 50 mainstream films in 5 years from 1996 to 2001 to strengthen the ideological and propaganda function of cinema.[117] Again in 1998, special funding for the production of films on important subjects was provided for the celebration of the 50th anniversary of the founding of the PRC.[118] Moreover, the mainstream ideology became a more and more important criterion for the three most prestigious film awards in China, namely, the "Huabiao Awards," "Golden Rooster Awards," and "Hundred Flowers Awards."[119]

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[108] MRFT, Rules for the Reform on Feature Film Shooting Management, Guang Fa Ying Zi [1995] No. 001, 05 January 1995.

[109] Tang (2009a), 285.

[110] Tang (2009a), 285.

[111] Zhang (2004), 284; Yin (2001), 27 and 31–32. Liu and Wang (2012), 5.

[112] Yin and Ling (2002), 160.

[113] Yin and Ling (2002), 199.

[114] State Council, Regulation on Film Administration, [1996] No. 200, 19 June 1996. It was revised in 2001, [2001] No. 342, 25 December 2001.

[115] 1996 Regulation on Film Administration, chapter 3; MRFT, Rules for Film Censorship, [1997] No. 22, 16 January 1997.

[116] 1996 Regulation on Film Administration, Articles 25–28.

[117] Yin and Ling (2002), 199.

[118] Tang (2009a), 285.

[119] Yin and Ling (2002), 153–154.

4.3 Industrialization

4.3.1 Further Liberalization of Import and Distribution of Foreign Films

Since the start of the twenty-first century, the industrialization of Chinese cinema has made significant progress. Far-reaching reform has continued. The film import quota of foreign movies increased from 10 to 20 each year in 2001 when China acceded to the WTO. Under pressure from Hollywood, the annual quota was raised to 34 in 2012, 14 of which must be 3D or IMAX films. The revenue-sharing ratio of the American companies increased from 13% to 17.5% to 25%.[120] Besides, with the launch of the Huaxia Film Distribution Co. in 2003, the film distribution market of foreign films turned from monopoly by the CFC[121] to duopoly. To date, CFC and Huaxia remain the only two that possess SARFT-conferred licenses to distribute foreign films in China.

4.3.2 Nationwide Cinema Chains

A new cinema chain regime that built several movie theater chains across different regions was established in 2002[122] to further reduce the transaction costs created by unnecessary intermediaries within the same region and bring competition in cross-region distribution.[123] Further, it was finally possible in 2003 for private companies to operate as legitimate independent distributors, after 7 years as agents of such distributors.[124] Private companies are currently the leading force in distributing domestic films. In 2015, the top ten private distribution companies had an 84.9% share of the market in domestic film distribution, contributing RMB 22.98 billion in box office revenue, 52.1% of the total box office revenue in 2015.[125] The M&A and restructuring from 2004 to 2008 have formed nationwide cinema chains and led to concentration.[126] The booming screening market and the intense competition have created a tremendous driving force for the expansion of cinema chains to cover small and medium cities and rural areas.[127]

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[120] China-US Memorandum of Understanding resolving the WTO film-related issues, Geneva, 25 April 2012.

[121] SARFT and Ministry of Culture, Implementation Rules for the Reform of the Film Distribution and Exhibition Regime, Guang Fa Ban Zi [2001] No. 1519, 18 December 2001. Weng (2009), 58; Liu (2012b), 8.

[122] State Administration of Radio, Film, and Television ("SARFT") and Ministry of Culture, Implementation Rules for the Reform of the Film Distribution and Exhibition Regime, Guang Fa \ Ban Zi [2001] No. 1519, 18 December 2001.

[123] Weng (2009), 58.

[124] Although the 1996 Regulation on Administration of Films allowed private capital to be invested in the film distribution channel, it was not until 2003 that the legitimate status of the seven private companies was confirmed as independent distributors for the first time. Weng (2009), 59.

[125] Wisdomfish, China's Film Industry Annual Report 2015, 1.1.1 and 1.1.5.

[126] Tang (2009a), 288–289. Liu (2012a), 6–7.

[127] Liu (2012a), 4–5.

In addition, a new era of digital film distribution started in 2004 when SARFT announced the development pillars of film digitization from 2004 to 2010 to promote the digitization of film production, to establish the digital distribution network, to improve the construction of digital cinemas, and to accelerate the localization of the manufacture of related equipment and software.[128] In exploring the multimedia network of distribution via television, Internet and mobile terminals, and theatrical distribution, China's cinema is approaching the age of mega-industry.[129] The number of cinema screens increased to 41,179 in 2016, which was for the first time more than those in the USA.[130]

4.3.3 Further Liberalization of Film Production

Most importantly, the threshold for filmmaking was lowered, and investment sources were diversified to allow private and foreign capital.[131] In particular, the 2001 Regulation on Film Administration provided non-film studios with the Single Film Production Permit, so that private entities could obtain independent qualification for filmmaking[132] and soon became key players in domestic film production. In 2002 alone, five private companies obtained 58 permits, and 32 out of the 100 domestic films produced in that year came from private companies such as Huayi Brothers Media Corporation and Beijing New Pictures.[133] Besides, the restrictions on Sino-foreign film co-production were further relaxed.[134] Also, the 2006 Rules for Film Script (Outline) Filing and Film Administration[135] simplified the script review and filing process, as the film script or outline merely needed to be filed for the record, only the completed films had to go through the review and approval process, and the centralized film censorship power was partly transferred to the provincial level. This film censorship system has been generally reconfirmed by the 2016 Film Industry Promotion Law.[136]

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[128] SARFT, Development Outline of Film Digitization, Guang Fa Ying Zi [2004] No. 257, 18 March 2004.

[129] Weng (2009), 59.

[130] Wisdomfish, China's Film Industry Annual Report 2016, 2.1.1. Entgroup, China Film Industry Report 2015–2016 (In Brief), 5.1.1.

[131] Yin and Liang (2012), 5. Ministry of Commerce and Ministry of Culture, Provisional Rules for Foreign Investment in Cinemas, [2003] No. 21, 25 November 2003; SARFT and Ministry of Commerce, Provisional Rules on the Entry Criteria for Operating Film Enterprises, [2004] No. 43, 10 October 2004.

[132] State Council, Regulation on Administration of Films, [2001] No. 342, 25 December 2001, Article 16. SARFT, Interim Provisions on the Access Qualifications for Film Production, Distribution and Exhibition, [2003] No. 20, 29 October 2003, Article 3.

[133] Yin and Liang (2012), 7.

[134] SARFT, Measures for Administration of Sino-Foreign Film Co-Production, [2003] No. 19, 10 August 2003. For rules governing co-production between Mainland China and Hong Kong, see 1.2.

[135] SARFT, Rules for Film Script (Outline) Filing and Film Administration, [2006] No. 52, 22 May 2006.

[136] Standing Committee of the National People's Congress, Film Industry Promotion Law, Order No. 54 of the President, 7 November 2016, chapter 2.

The abovementioned macro reforms improved the productivity and market adaptability of Chinese film production. The number of produced feature films increased ten times from around 40 in 1997 to 402 in 2007, and annual production ranked third worldwide after the USA and India.[137] However, the growth rate of film production has slowed down due to the saturated screening market starting in 2008.[138] While the rapid increase in film production from 2002 to 2011 indicated robust market demand and the optimism of investors, blind investment in films and unprofessional filmmaking by small- and medium-sized private enterprises (SME) became a serious problem. For example, SME produced 354 of 558 films (63.44%) in 2011, only 13.84% of which were released in movie theaters, and only one of which generated box office revenue above RMB 100 million.[139]

Therefore, the industrial reform in film production was then transformed and continues to focus more and more on enhancing the quality, market performance, and diversity of feature films, rather than on increasing the quantity. As a result, seven major state-owned film groups that integrated film production, distribution, and exhibition channels across different regions were established between 1999 and 2008.[140] After determined and dedicated efforts for a decade since 2002, private film studios were facilitated by the capital market and became core players in domestic film production.[141] In 2012, large private film studios produced only 22 films, yet had a high theatrical release rate of 95.45%, and seven films generated box office revenue above RMB 100 million.[142] Currently, films produced by large state-owned film group corporations, large private film studios, and films co-produced by domestic and foreign capital are the main contributors to domestic box office revenues.

From 2002 to present, industrial standards and market order have been built up through the rule of laws and regulations, rather than through administrative instructions and cultural policies. In 2006, the film industry was named the number one of the nine critical cultural industries by the Culture Development Program of the 11th Five-Year National Plan (2006–2010).[143] In 2009, the revitalization of the film industry became one of the national strategic development programs.[144] In 2010, a new objective was set up to realize the historical transformation from a large-scale to a robust and competitive Chinese cinema industry.[145] In the same year, the total

[137] Yin and Liang (2012), 5–6.

[138] Yin and Liang (2012), 6.

[139] Liu and Wang (2012), 11 and 13.

[140] SARFT and Ministry of Culture, Several Opinions on Further Deepening the Reform of the Film Industry, Guang Fa Ying Zi [2000] No. 320, 6 June 2000. Tang (2009a), 287. In particular, the China Film Group Corporation (CFGC) replaced the CFC in 1999.

[141] Yao and Li (2017), 19.

[142] Liu and Wang (2012), 11 and 13.

[143] General Office of the CCCPC and General Office of State Council, "Culture Development Program during the 11th Five-Year National Plan Period" (2006–2010), 13 September 2006.

[144] General Office of the State Council, "Plan on the Reinvigoration of the Cultural Industry", 26 September 2009.

[145] General Office of the State Council, Guidance Opinions for Promoting the Prosperity and Development of Film Industry, Guo Ban Fa [2010] No. 9, 21 January 2010.

box office revenue of domestic cinema surpassed RMB 10 billion for the first time.[146] In 2014, favorable economic and tax policies were issued to support further development of the film industry.[147] Eventually, the 2016 Film Industry Promotion Law confirmed and updated the ongoing development directions of Chinese cinema in the form of law.

4.3.4 Internet Giants Are Swarming into the Film Industry

In China, the film industry and other upstream and downstream interested parties are adapting themselves to the digital audiovisual market by resorting to creative market solutions within the copyright regime. A good example is that major Internet giants such as Baidu, Alibaba, and Tencent (the so-called BAT) have been swarming into the film industry, bringing with them big data, technology, funding, platforms, and fundamental changes to audiovisual services, transforming their business models from providing illegal content to legal but free (ad-sponsored) content and to legal and paid premium content. As a result, they not only provide instantaneous access to quality films and make enforcement of copyright against piracy easy but also fundamentally change consumers' behavior and habits in digital content consumption and help to set up an industrial code or self-regulation for the digital film market.[148]

4.3.5 Film Copyright

To date, a comprehensive copyright framework in line with the international obligations (concerning cinematographic works and copyright protection in general) has been established. Moreover, copyright enforcement has been further enhanced by the addition of protection for rights management information[149] and against the circumvention of effective technological measures,[150] the imposition of criminal liabilities for film piracy that prejudices public interests,[151] and the clarification of

[146] Liu (2011), 17.

[147] Ministry of Finance, the General Administration of Press, Publication, Radio, Film and Television and other Departments, Notice on Several Economic Policies for Supporting Film Development, Cai Jiao [2014] No. 56, 31 May 2014.

[148] This could be an instructive example to overcome the dilemma of copyright enforcement against online piracy. See also Banerjee A (2019), XXX. In this way, the role of video platforms or search engine providers has been changed from pirates or intermediaries to stakeholders. As a result, the copyright enforcement measures are now taken to safeguard their own interests instead of fulfilling legal obligations.

[149] Article 47 No. 7 CL 2001 (currently Article 48 No. 7 CL 2010): anyone who commits any of the following acts of infringement… (7) intentionally deleting or altering the electronic right management information of a work, sound recording or video recording, without the permission of the copyright owner or the administrative regulation.

[150] Article 47 No. 6 CL 2001 (currently Article 48 No. 6 CL 2010): anyone who commits any of the following acts of infringement… (6) intentionally circumventing or destroying the technological measures taken by a right holder for protecting the copyright or copyright-related rights in his work, sound recording or video recording, without the permission of the copyright owner or the owner of the copyright-related rights, unless otherwise provided in law or in administrative regulations.

[151] Article 47 CL 2001 in conjunction with Articles 217 No. (1) and 218 of the Criminal Law, Li and Zhou (2001), 167–187.

calculation methods for damages.[152] More and more, copyright law is playing a significant role in the furtherance of cinema industrialization. To avoid overly complicated rules on film authorship and ownership, Article 15(1) CL 2010 makes some modifications and provides that the film producer is the initial and sole copyright owner who can exercise and enforce the copyright attached to the film with full competence, except for the right of authorship. The exclusive rights of the film producer expanded to include the rental right,[153] the right of screening,[154] and the right of communication to the public through the information network.[155] In addition to the right of authorship, the 2001 Copyright Law accorded the authors of cinematographic works the right to receive remuneration.[156] Nonetheless, physical and online film piracy remains one of the biggest threats to the film industry in China, as box office revenue constitutes "the vast majority" of the total revenue for the film industry.[157]

5 Challenges Ahead

The initial illustrative listing of copyright-protected works included "cinematographic, television and video works" (Article 3 No. 5 CL 1990).[158] In addition, those which do not qualify as copyright-protected video works were recognized as "video recordings" and enjoyed neighboring right (Article 39(2) CL 1990). The terms "cinematographic, television, and video works" were replaced by the more generalized term "cinematographic works and works created by a process analogous to cinematography" in 2001,[159] under the condition that those works were "recorded on a certain medium material."[160] Yet, the filming technology per se should be irrelevant in determining the copyright protection eligibility of a work.[161] It is therefore proposed in the third draft of the third revision of the Chinese Copyright Law in 2014 to replace the distinction between "cinematographic works and works created by a process analogous to cinematography" and video recordings altogether with a general work category of "audiovisual works" and to abandon the "recorded on a

[152] Calculation methods of damage include actual losses, infringer's profits, and statutory damages with a ceiling of RMB 500,000, Article 48 CL 2001 (currently Article 49 CL 2010).

[153] Expressly in Article 10 (1) No. 7 CL 2001/2010, in accordance with Article 11 TRIPS.

[154] Article 10 (10) No. 7 CL 2001/2010.

[155] Article 10 (1) No. 12 CL 2001/2010, in accordance with Article 8 WIPO Copyright Convention (the right of making available to the public).

[156] Article 15 (1) CL 2001/2010.

[157] For studies on copyright enforcement against film piracy, both online and offline, and alternative solutions in practice, see Priest (2006) and (2014).

[158] The illustrative expressions of "cinematographic, television and video works" were initially used in proximity of daily language, Zheng and Pendleton (1991), 76. Zheng CS (2009), 127–128.

[159] Article 3 No. 6 CL 2001/2010.

[160] Article 4 No. 9 IR 1991, and Article 4 No. 11 IR 2002/2013.

[161] Wang (2015), 107; Li and Xu (2003), 41.

certain medium" requirement.[162] However, the revision of the Copyright Law does not seem to be high on the agenda of the National People's Congress, and no enactment can be expected in the near future. Currently, some court decisions have set rather high "originality" and "fixation" standards for films, which worries the industry and academics.[163]

Another challenge is how to design the rules of authorship and ownership in film works. There are commonly three approaches in this regard. The first treats a film as a pure authorial work, and the film producer is neither author nor initial copyright owner of the film. For example, the German Copyright Act adopts the general creator's principle and provides no exceptions for film works.[164] As a result, natural persons who have made intellectually creative contributions to film works should be (joint) authors. With respect to the protection of the film producer, the German Copyright Act merely provides that in cases of doubt, joint authors of the film work should be assumed to have granted the producer of the film the exclusive right to use in all manners the cinematographic work in Article 89(1) and grants the film producer further protection of neighboring rights in video recordings in Article 94.

Alternatively, motion pictures can be considered entrepreneurial works, and the film producer is the sole author and copyright owner. In this regard, the "work made for hire" doctrine is the cornerstone in the US Copyright Act. In particular, § 201(b) of the US Copyright Act provides that in the case of a work made for hire, the employer or other person for whom the work was prepared is considered the author for purposes of this title, and, unless the parties have expressly agreed otherwise in a written instrument signed by them, owns all of the rights comprised in the copyright. As a result, film producer can be recognized as the initial copyright owner of film and other audiovisual works in the USA.

The third approach recognizes films as "a hybrid of entrepreneurial and authorial works."[165] On the one hand, the British Copyright Act specifies the producer and the principal director as statutory joint authors for films made on or after 1 July 1994.[166] On the other, where a film is made by an employee in the course of employment, the employer (often the film producer) is assumed to be the first owner of the copyright in the film, subject to any agreement to the contrary.[167] Hong Kong follows the same rules.

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[162] Article 5 No. 12, Revision Draft 2014.

[163] For example, (2015) Jin Zi Min Zhong 1818 decision by the Beijing IP Court (decided on March 30, 2018).

[164] The German Copyright Act applies strictly the creator's principle (Schöferprinzip) in Article 7 that only a natural person who actually creates a work can be the author of the work. The creator's principle applies to commissioned works and works made for hire. Dreier/Schulze, UrhG, §7 paras 2, 4, and 7.

[165] Bently and Sherman (2014), 128.

[166] CDPA 1988, ss 9(2)(ab) and 10(1A).

[167] CDPA 1988, s 11(2).

China has chosen the third approach in Article 15 CL 2010.[168] Article 15(1) specifies the film producer as the statutory copyright owner in cinematographic works and at the same time expressly recognizes the scriptwriter, director, cameraman, lyricist, and composer as film authors. Notably, all three approaches provide merely legal assumption of ownership. However, a single statutory rule such as Article 15(1) is questionable, considering that the allocation of copyright in films is mostly dealt with using contractual agreement in practice. Therefore, a flexible legal assumption that prioritizes the contractual agreement among the interested parties on the ownership in films would be more desirable.[169] In addition, despite the fact that the British hybrid approach is a compromise in compliance with Article 2(1) of the Term Directive,[170] both German and the US rules of authorship and ownership in film works are consistent with their traditional copyright theories and the existing copyright systems. In comparison, the CL 2010 has already introduced both the rules for works of joint authorship in Article 13(1), like the German approach, and the rules for works made in the course of employment in Article 16, similar to the US and UK approaches. Nonetheless, an additional provision – Article 15 – was made to solely deal with the authorship and ownership issues for film works, which however would cause overlaps and even competing rules in practice. It would be dogmatically clearer and more precise to first resort to the existing rules in line with the copyright theories, and only make an exceptional rule should the application of the existing rules be insufficient or cause confusion. This is undoubtedly a higher requirement in terms of legislative wisdom and technique.

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[168] Article 15 provides: (1) The copyright in a cinematographic work or in a work created by a process analogous to cinematography shall be enjoyed by the producer of the work, while its scriptwriter, director, cameraman, lyricist, composer, and other authors shall enjoy the right of authorship therein and shall be entitled to receive remuneration in accordance with the terms of the contracts concluded between them and the producer. (2) The authors of the script, the musical works, and the other works which are included in a cinematographic work or in a work created by a process analogous to cinematography and which can be exploited separately shall be entitled to exercise their copyright independently.

[169] Bently and Sherman (2014), 129.

[170] Directive 2006/116/EC of the European Parliament and of the Council of 12 December 2006 on the term of protection of copyright and certain related rights. Article 2(1) prescribes: 1. The principal director of a cinematographic or audiovisual work shall be considered as its author or one of its authors. Member States shall be free to designate other co-authors.

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Reminiscing About the Golden Age: An Analysis of Efforts to Revive the Hong Kong Film Industry Through the Lens of Copyright Protection

Yahong Li, Weijie Huang, and Celine Melanie A. Dee

Abstract

The Hong Kong film industry portrayed itself as an international film powerhouse during its golden age. Its light was dimmed on account of the industry's director-centered production system, prevailing investor pressure, weak infrastructure, political and economic conditions, popularity of foreign films, and rampant piracy. The Hong Kong government established infrastructural solutions and financial remedies to alleviate the industry's plight. Despite those laudable efforts, success has been limited. The key to restoring the film industry to its former glory lies in reforming the traditional Hong Kong copyright framework, including reconstructing the copyright ownership rule, providing breathing space for secondary creation, and decriminalizing individual, noncommercial online sharing.

Keywords

Hong Kong film industry · Copyright reform · Joint authorship · Fair dealing · Decriminalization

All online information was last accessed before Aug. 11, 2018

Y. Li (✉)
Faculty of Law, The University of Hong Kong, Hong Kong, Hong Kong

Intellectual Property Research Institute, Jinan University, Guangzhou, China
e-mail: yali@hku.hk

W. Huang
Faculty of Law, The University of Hong Kong, Hong Kong, Hong Kong

C. M. A. Dee
Faculty of Law, The University of Hong Kong, Hong Kong, Hong Kong

Legaspi Rosales Law Office, Makati City, Philippines

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_7

1 Introduction

Once celebrated for its strong cultural identity and dynamism,[1] the Hong Kong film industry's popularity has declined since its prime in the 1980s and the early 1990s.[2] The decline was rooted in various political, economic, and social factors. This chapter shall explore the rise and fall of the Hong Kong film industry as well as Hong Kong's efforts to revive its film industry and examine the inadequacies of the traditional Hong Kong copyright framework and the role of copyright law in establishing a better future for the Hong Kong film industry.

2 Hong Kong Film Industry: Growth and Decline

The Hong Kong film industry finds its roots in Cantonese opera.[3] The earliest films – *Stealing a Roasted Duck* (1909), *Right a Wrong with an Earthenware Dish* (1909), and *Zhuangzi Tests His Wife* (1913) – were based on notable operatic scenes.[4] Later on, Mandarin features from China influenced the local film industry as a result of the Second World War and Chinese civil war (1945–1949).[5] Under British colonial rule, Hong Kong was deemed a safe haven of "social order and freedom,"[6] thus attracting capital, talent, and "sophisticated production techniques from the Mainland."[7] This led to the development of Mandarin production powerhouses such as the Shaw Brothers and Motion Picture and General Investment Company Limited in Hong Kong.[8] However, the elaborate production value of Mandarin films proved to be detrimental to smaller local Cantonese films,[9] resulting in the gradual absence of the latter in the film industry. Despite this, the industry flourished in the 1950s and 1960s "with an average production of over 200 films a year."[10]

The local film industry experienced a shift in the 1970s. After the stoppage of Cantonese film production in 1971–1973,[11] the local film industry not only turned around but achieved international fame with the introduction of Cantonese *kung fu*

[1] Joseph M. Chan, et al., Policies for the Sustainable Development of the Hong Kong Film Industry 9 (Hong Kong Institute of Asia-Pacific Studies, 2010).

[2] *Id*. at 17.

[3] *Id*. at 14.

[4] Yi Tang, A Bird Known By Its Note: Identity Legitimacy, Network Dynamics, and Actor Performance in the Hong Kong Film Industry, 1970–1997, at 15 (May 2009) (unpublished PhD dissertation, The Hong Kong University of Science and Technology).

[5] Chan, supra note 1, at 14.

[6] *Id.*

[7] Tang, *supra* note 4, at 16. Chan, *supra* note 1, at 15.

[8] *Id*.

[9] Robert Chi, *Hong Kong Cinema Before 1980*, in A Companion to Chinese Cinema 80 (Yingjin Zhang ed., 2012).

[10] Chan, supra note 1, at 15.

[11] Chi, supra note 9, at 80.

films.[12] The introduction of homegrown talents Bruce Lee, Sammo Hung, and Jackie Chan forever changed the landscape of the industry.[13] It characterized *kung fu* as the "signature brand of Hong Kong films."[14] The late 1970s welcomed "New Wave" directors in the likes of Ann Hui, Yim Ho, Tsui Hark, Patrick Tam, Allen Fong, and Alex Cheung.[15] This new generation of innovative directors "brought about a fresh, more personal approach"[16] which vastly improved the quality of domestic films.[17] It likewise catapulted the industry to international and critical acclaim at film festivals.[18]

The golden age of the industry took place in the 1980s to the early 1990s. During this period, it earned the moniker "Hollywood of the Far East"[19] by producing an average of 400 films a year[20] and surpassing India as the largest exporter of films in Asia.[21] It experienced rapid commercial success in both local and overseas markets.[22] It produced immensely popular movies such as *The Shaolin Temple* (1982), *Project A* (1983), *Police Story* (1985), *City on Fire* (1987), *Rouge* (1987), *A Chinese Ghost Story* (1987), *The Greatest Lover* (1988), *Bullet in the Head* (1990), *Once Upon in China* (1991), *Full Contact* (1992), and *Chungking Express* (1994). This period likewise saw the rise of independent production companies and domestically focused cinema circuits[23] and the emergence of idol-actors who "established a commanding presence at regional box offices."[24]

However, the mid-1990s witnessed the drastic decline of the industry. In its efforts to meet the skyrocketing demand of the market, the industry sought to appease its principal investors by inhibiting creativity and resorting to unpolished formulaic productions.[25] This led to overproduced films devoid of any "sensational impact and visceral stimulation,"[26] thus causing dwindling profits and loss of international acclaim at foreign film festivals.[27]

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[12] Chan, supra note 1, at 15.

[13] *Id*. at 16.

[14] *Id.*

[15] Gina Marchetti, *The Hong Kong New Wave*, in A Companion to Chinese Cinema 96 (Yingjin Zhang ed., 2012).

[16] *Id.*

[17] Chan, supra note 1, at 17.

[18] e.g. *Id.;* Marchetti, supra note 16, at 97.

[19] *Mainland Offers Hong Kong's Film Industry A Chance for a Brighter Future*, South China Morning Post, Mar. 18, 2018, *available at* https://www.scmp.com/comment/insight-opinion/article/2137677/mainland-offers-hong-kongs-film-industry-chance-brighter

[20] *Id.*

[21] Tang, supra note 4, at 15.

[22] Chan, supra note 1, at 17. "The annual box office takings of local films soared from HK$184 million in 1980 to HK$878 million in 1989 and reached an apex of HK$1.2 billion in 1992.".

[23] *Id.*

[24] *Id.*

[25] *Id.* at 18.

[26] *Id.*

[27] *Mainland Offers Hong Kong's Film Industry a Chance for a Brighter Future*, supra note 19.

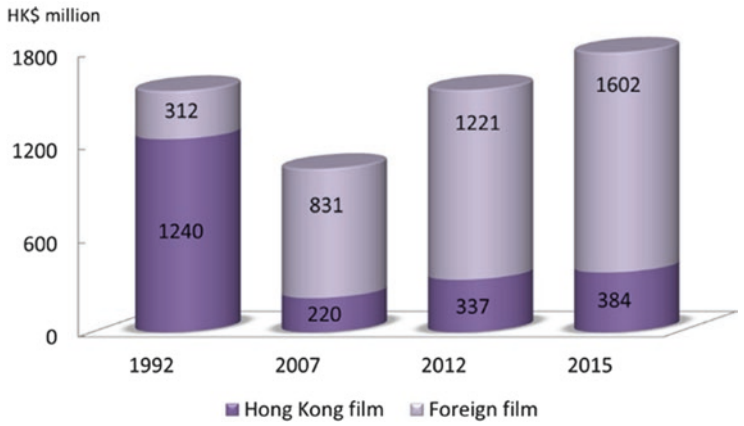

Fig. 1 Box office in Hong Kong by film category. (Data sources: Census and Statistics Department and Commerce and Economic Development Bureau)

The industry has yet to recover, as manifested in the fraction of films produced and the drop in box office receipts. Production output declined to 242 films in 1993, 92 films in 1998, and eventually a record low of 55 films in 2005.[28] In 1992, the total box office receipts reached HK$1552 million, with HK$1240 million contributed by Hong Kong films and HK$312 million contributed by foreign films.[29] The revenues declined to HK$1051 million in 2007, with HK$831 million from foreign films and HK$220 million from local films.[30] After a slow recovery, the receipts increased to HK$1558 million in 2012 and to HK$1986 million in 2015[31] (Fig. 1). The number gradually increased to HK$1947 million in 2016 and HK$1853 million in 2017[32] (Fig. 2).

Although the total box office receipts in recent years have been higher than at the industry's peak in 1992, it should be noted that the increase is attributable to receipts of foreign films, and not domestic films. In fact, foreign films contribute nearly 80% of the total revenue.[33]

The decline in box office receipts is further manifested in the top ten box office results. *First Strike*, a film produced by Hong Kong-based Golden Harvest movie

[28] Chan, supra note 1, at 12, 14.

[29] Legislative Council of the Hong Kong Special Administrative Region of the People's Republic of China (LegCo), Challenges of the Film Industry in Hong Kong, *available at* https://www.legco.gov.hk/research-publications/english/essentials-1516ise13-challenges-of-the-film-industry-in-hong-kong.htm.

[30] *Id.*

[31] *Id.*

[32] HKTDC, Film & Entertainment Industry in Hong Kong (Mar. 15, 2018), *available at* http://hong-kong-economy-research.hktdc.com/business-news/article/Hong-Kong-Industry-Profiles/Film-Entertainment-Industry-in-Hong-Kong/hkip/en/1/1X000000/1X0018PN.htm (last accessed Aug. 8, 2018)

[33] *Id.*

	2016	2017
Number of local films released	62	53
Number of foreign films released	287	278
Total box office receipts (including foreign film) (HK$ million)	1,947	1,853

Fig. 2 Number of films released and box office receipts. (Source: Hong Kong Box Office Ltd.)

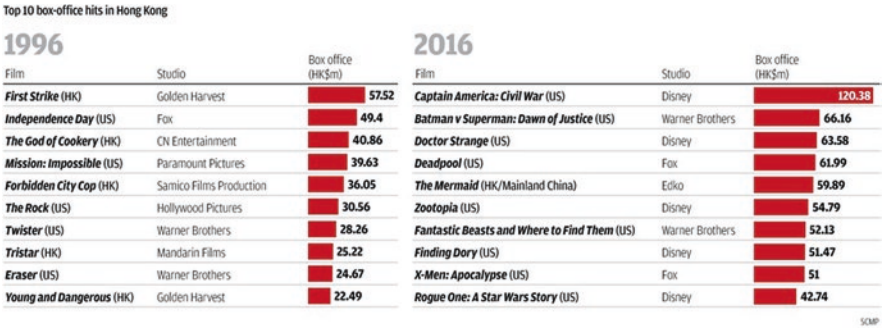

Fig. 3 Top 10 box office hits in Hong Kong for 1996 and 2016. (Source: Box Office Mojo, Hong Kong Box Office)

studio, ranked as the highest-grossing film in the domestic market in 1996. In the same year, four other Hong Kong films placed in the top ten box office list. In contrast, only one Hong Kong film (*The Mermaid*), co-produced with the Mainland, appeared on the 2016 top ten box office list[34] (Fig. 3).

The Hong Kong film industry's performance at international film festivals was likewise affected. The film industry last submitted entries to the Cannes Film Festival in 2009, to the Berlin International Film Festival in 2008, and to the Venice Film Festival in 2011.[35]

The decline is attributable to the core model of the Hong Kong film industry and several external factors. The "conservative and opportunistic outlook"[36] of the industry inhibits innovation, thus resulting in overproduction. The lack of infrastructure in both production[37] and distribution[38] aspects hinders the development of

[34] Celine Ge, *It's Fade Out for Hong Kong's Film Industry as China Moves into the Spotlight*, South China Morning Post, Jul. 28, 2017, *available at* http://www.scmp.com/business/article/2104540/its-fade-out-hong-kongs-film-industry-china-moves-spotlight

[35] Hong Kong Free Press, A Glimmer of Hope for Young Filmmakers in Hong Kong's Fading Industry, *available at* https://www.hongkongfp.com/2017/11/05/glimmer-hope-young-filmmakers-hong-kongs-fading-industry

[36] Chan, supra note 1, at 22.

[37] *Id.* at 21.

[38] Legislative Council of the Hong Kong Special Administrative Region of the People's Republic of China, supra note 29.

the film industry from within. Moreover, its "director-centered production system"[39] causes a drain in technical and artistic talent.[40] External factors include the political and economic landscape after Hong Kong's handover to China,[41] strong competition from foreign films,[42] and rampant piracy.[43]

2.1 Factors Within the Core Model of the Hong Kong Film Industry

The core model is characterized by a director-centered production system coupled with investor pressure and a weakening industry infrastructure. These factors resulted in the decrease in the quality of local films.

From previously well-established production houses, the film industry production style is now that of "a cottage industry compris[ing] independent productions known for its filmmakers' frantic work style."[44] The director-centered production system results in a form of "guerrilla filmmaking," in which directors dive into the filmmaking process armed with solely a general plot or storyline.[45] He or she improvises throughout the process without any completed scripts.[46] This process undermines the value and the creative integrity of scriptwriters,[47] which often results in a

[39] David Desser, *Triads and Changing Times: The National Allegory of Hong Kong Cinema, 1996–2000,* 26 QRFV 179, 186 (2009) ("The director-centered nature of boutique production"); Mirana M. Szeto & Yun-chung Chen, *To Work or Not to Work: The Dilemma of Hong Kong Film Labor in the Age of Mainlandization*, 55 JUMP CUT 1, 3–4, 12 (2013), *available at* https://www.researchgate.net/profile/Yun_Chung_Chen2/publication/258967573_To_work_or_not_to_work_the_dilemma_of_Hong_Kong_film_labor_in_the_age_of_mainlandization/links/5670d2fe08ae2b1f87acf85a/To-work-or-not-to-work-the-dilemma-of-Hong-Kong-film-labor-in-the-age-of-mainlandization.pdf ("The 'director subcontracting' model features a mixed system (1970–1990), under which "apart from controlling the basic theme and the budget limit, studios remain hands-off, leaving hiring and other decision making to the director." "The flexible independent system (1990s) and the following cross-border production (2000s) were featured by the 'director-centered' model." "Traditionally, the director-centered production system has dominated Hong Kong film production, making collective creativity difficult."); Cindy S. C. Chan, *Housekeeper of Hong Kong Cinema: The Role of Producer in the System of Hong Kong Film Industry*, 2 WIDE SCREEN 1, 1–2, 7–8 (2010) ("directors routinely started shooting without completed scripts and improvisation on the set was the norm... the directors, instead of the producers, [were] centers of power and creative control... In Hong Kong cinema, the producer, not positioned in [a] vertical relationship with the director, is no auteur or brand name.").

[40] Chan, supra note 1, at 21.

[41] Vivienne Chow, *Handover Hangover: Hong Kong's Film Industry Faces an Uncertain Future,* VARIETY (May 17, 2017), *available at* http://variety.com/2017/biz/news/wong-kar-wai-1202430867-1202430867

[42] LegCo, supra note 29.

[43] *Id.*

[44] Chan, supra note 39, at 1.

[45] *Id.*

[46] *Id.*

[47] *Id.*

drain of talent. Directors, investors, and even actors participate in "script-butchering,"[48] often diluting the storyline. Despite the establishment of the Hong Kong Screenwriters' Guild (HKSWG) in 1991, scriptwriters remain weak and unprotected due to the absence of the right to collective bargaining.[49] Famous actors like Chow Yun Fat have vowed never to return to Hong Kong unless the scripts are better.[50]

Additionally, many filmmakers have succumbed to investors' pressure on decisions over cast and content.[51] This has proved to be detrimental to the industry, since it has inhibited creativity and resulted in an "over-heated and over-exploited" market.[52] The pressure to create one blockbuster hit after another has led to lackluster and formulaic films. As a result, the interest of the viewing public has waned, ultimately affecting the demand for Hong Kong films.[53]

The overall poor infrastructure of the industry, particularly in terms of education, production, and distribution, explains the industry's inability to keep up with their foreign counterparts. Hong Kong lacks educational facilities for film staff,[54] which leads to brain drain. The production infrastructure is marked by a lack of technical facilities for postproduction and distribution.[55] This has forced the industry to outsource these services to foreign countries,[56] thus affecting Hong Kong's position as a leading film hub. With regard to distribution, the dearth of local cinemas has also greatly spurred the decline of the industry. Cinemas have dramatically declined in number from 119 in 1993 to 47 in 2015 (Fig. 4), and the number of screens available per 100,000 persons ranks second lowest compared to other major Asian cities (Fig. 5).[57]

2.2 External Factors

Apart from issues within the industry, external factors have likewise contributed to the decline. A fundamental reason is the changes arising from the political and economic climate in Hong Kong. Hong Kong's reunification with China in 1997

[48] Szeto & Chen, supra note 39, at 12.

[49] *Id*. at 5

[50] *Hong Kong Movie Industry, Martial Arts Films, Triads and Ghosts*, Facts and Details, *available at* http://factsanddetails.com/china/cat7/sub42/item244.html

[51] Chan, supra note 1, at 18.

[52] *Id.*

[53] *Id.*

[54] Ge, supra note 34.

[55] Chan, supra note 1, at 21. LegCo, *supra* note 29.

[56] Chan, supra note 1, at 21.

[57] Legislative Council Brief on Facilitating Cinema Development, LC Paper No. CB(4)801/16–17(05), *available at* https://www.legco.gov.hk/yr16-17/english/panels/itb/papers/itb20170410cb4-801-5-e.pdf (last accessed Jul. 26, 2018).

Year	Number of cinemas	Number of screens	Number of seats
1993	119	188	121 885
1994	112	179	125 231
1995	104	177	103 504
1996	100	181	95 468
1997	89	183	77 844
1998	77	172	73 407
1999	70	185	75 092
2000	63	178	69 237
2001	62	184	57 372
2002	60	179	57 376
2003	60	188	52 440
2004	57	197	51 340
2005	57	207	50 686
2006	48	181	42 530
2007	48	190	41 332
2008	48	192	40 635
2009	49	201	40 906
2010	49	208	41 157
2011	48	204	40 033
2012	48	206	39 485
2013	45	194	35 937
2014	47	208	37 781
2015	47	209	37 779

Fig. 4 Number of cinemas, screens, and seats in Hong Kong from 1993 to 2015. (Source: Legislative Council Brief Facilitating Cinema Development LC Paper No. CB(4)801/16-17(05))

signified its access to and economic integration with the Mainland market.[58] However, the onslaught of the 1998 Asian Financial Crisis and the SARS epidemic heavily affected the Hong Kong film industry, causing an economic crisis.[59]

The Mainland offered to boost Hong Kong's economy and strengthen trade relations between the two sides and entered into the Closer Economic Partnership Arrangement (CEPA) in 2003 with Hong Kong.[60] Under CEPA, Hong Kong and the Mainland developed bilateral rules governing the quota limitations and co-productions of Chinese language motion pictures produced in Hong Kong and the Mainland.[61]

[58] Chi, supra note 9, at 81.

[59] Chow, supra note 41.

[60] Mainland and Hong Kong Closer Economic Partnership Arrangement (CEPA), TRADE AND INDUSTRY DEPARTMENT, *available at* https://www.tid.gov.hk/english/cepa/further_liberal.html

[61] Closer Economic Partnership Agreement, Annex 4, 2. Communication Services.

City (Year)	Number of screens	Size of population (million)	Number of screens per 100 000 persons
Taipei (2014)	183	2.7	6.8
Seoul (2015)	511	10.3	5.0
Shenzhen (2014)	527	10.8	4.9
Singapore (2015)	223	5.5	4.0
Shanghai (2014)	765	24.3	3.2
Hong Kong (2015)	**209**	**7.3**	**2.9**
Tokyo (2015)	358	13.5	2.6

Fig. 5 Comparison with some major cities in Asia. (Source: Legislative Council Brief Facilitating Cinema Development LC Paper No. CB(4)801/16-17(05))

Chinese language motion pictures produced in Hong Kong may be imported for distribution in the Mainland on a quota-free basis, after vetting and approval by the relevant Mainland authority.[62] The benefit does not apply to every Hong Kong film. CEPA defines "Chinese language motion pictures produced in Hong Kong" as those "made by production companies which are set up or established in accordance with the relevant laws of the Hong Kong Special Administrative Region, and which own more than 75% of the copyright of the motion pictures concerned."[63] It further requires that more than 50% of the total principal personnel involved in the particular film be Hong Kong residents.[64]

CEPA introduced co-productions between Hong Kong and the Mainland. Co-produced films are considered to be "Mainland motion pictures for the purpose of distribution in the Mainland."[65] No limits are imposed on the "percentage of principal creative personnel from Hong Kong."[66] However, it requires that "at least

[62] *Id.*

[63] *Id.*

[64] *Id.*

2. Chinese language motion pictures produced in Hong Kong refer to those motion pictures made by production companies which are set up or established in accordance with the relevant laws of the Hong Kong Special Administrative Region and which own more than 75% of the copyright of the motion pictures concerned. Hong Kong residents should constitute more than 50% of the total principal personnel in the motion pictures concerned.

[65] *Id.*

3. Motion pictures jointly produced by Hong Kong and the Mainland are treated as Mainland motion pictures for the purpose of distribution in the Mainland. Translated versions of the motion pictures in languages of other Chinese ethnic groups and Chinese dialects, which are based on the Putonghua (Mandarin Chinese) version, are allowed to be distributed in the Mainland.

[66] *Id.*

one-third of the leading artistes must be from the Mainland."[67] It also requires that storylines and main characters to be associated with the Mainland.[68]

The Hong Kong film industry believed that CEPA would revitalize the film industry. While CEPA opened the massive Mainland Chinese market to Hong Kong-produced films, increased investments, and generated more jobs,[69] it also inhibited freedom in the creative process by means of censorship. This translated to revising plot lines and casting actors appealing to the massive Mainland market, regardless of their allure to the local market.[70] Ultimately, the appeal of the massive Mainland Chinese market drove some Hong Kong filmmakers to forfeit their artistic integrity and creative freedom, to the detriment of the Hong Kong film industry's distinct identity.[71]

The ease of co-production improved the business performance of the Hong Kong film industry. At least 50% of Hong Kong films were co-productions with filmmakers from the Mainland, and these co-produced films generated more box office receipts, at HK$234 million.[72] However, co-production comes with the price of regulation by Mainland film censorship authorities.[73] This effectively restricted expression and creativity shared through film, diminishing the distinct flavor of locally produced films. Consequently, the interest of local audiences waned due to the absence of cultural relevance and diversity in Hong Kong films.[74]

Another contributing factor is the influx and rising popularity of foreign films from Hollywood, as well as Bollywood and other neighboring countries. On account of Hollywood's "newly aggressive push…in the Asian market,"[75] local films had great difficulty in sustaining its market size.[76] In 2015, 80% of box office receipts were held by foreign films, while only 20% were held by local films.[77] This demonstrates consumers' loss of interest in Hong Kong films and increasing appetite for "fast-paced and star-studded Hollywood mega productions."[78]

The decline is also attributable to piracy. The Hong Kong film industry has been a victim of rampant piracy. Bootlegged VCDs and DVDs collectively contributed to

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[67] Closer Economic Partnership Agreement, Annex 4, 2. Communication Services.

[68] *Id.*

4. For motion pictures jointly produced by Hong Kong and the Mainland, there is no restriction on the percentage of principal creative personnel from Hong Kong, but at least one-third of the leading artists must be from the Mainland; there is no restriction on where the story takes place, but the plots or the leading characters must be related to the Mainland.

[69] LegCo, supra note 29.

[70] Hong Kong Free Press, supra note 35.

[71] *Id.*

[72] Legislative Council of the Hong Kong Special Administrative Region of the People's Republic of China, supra note 29.

[73] Chan, supra note 1, at 21, 22.

[74] Chow, supra note 41.

[75] Chi, supra note 9, at 81.

[76] LegCo, supra note 29.

[77] *Id.*

[78] Chan, supra note 1, at 22.

a loss of around HK$300 million to the industry in 1998.[79] Illegal streaming and peer-to-peer file-sharing platforms, such as BitTorrent, are threats to the film industry.[80] These internet streaming services resulted in an industry loss of US$308 million in 2012.[81] Rampant piracy has allowed consumers to easily access films, both classic and newly released, at no cost or for a minimal fee.[82] If eliminated, it will contribute to a 15% increase in box office receipts.[83] But if left unchecked, piracy may deter investors, affect the quality of films produced, and cause the ultimate downfall of the Hong Kong film industry.

Overall, the inherent weaknesses of the core model of the film industry and other external factors have gravely crippled the growth of the industry and contributed to the decline in the film industry and the loss of its competitive edge in the global market.

3 The Road to Revival of the Hong Kong Film Industry

The Hong Kong government has played a pivotal role in the revival of the Hong Kong film industry. While it is incumbent upon filmmakers to improve the quality of films and upon viewers to support local film culture, the government is in a crucial position to protect and promote the local film industry. For this reason, the government has developed and institutionalized several policies to promote the creative industries which ultimately affect Hong Kong's economy and cultural identity.[84]

3.1 Hong Kong Film Development Council

The Hong Kong Film Development Council (FDC) is the government's arm geared toward the promotion and development of the film industry.[85] Established in 2007, the FDC acts as an advisory body on various policies and strategies put in place for the sustainable development of the film industry.[86] Through the FDC, industry stakeholders, primarily producers, directors, and film critics collectively collaborate with the government to revive the film industry.

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[79] LegCo, supra note 29.

[80] Carnegie Mellon University "The Dual Impact of Movie Piracy on Box-Office Revenue: Cannibalization and Promotion", Hong Kong's Piracy Landscape 2018, Feb. 2017 http://hkisa.film/contenthtml/Information_Material/2018/Hong-Kong-Piracy-Landscape-2018_v4.pdf

[81] *Hong Kong Film Industry Furious at YouTube 'Piracy'*, Asia One, Apr. 25, 2012, *available at* http://www.asiaone.com/News/Latest%2BNews/Showbiz/Story/A1Story20120425-342040.html

[82] *Id.*

[83] Hong Kong's Piracy Landscape 2018, supra note 80.

[84] Chan, supra note 1, at 83.

[85] Hong Kong Film Development Council, Home Page, *available at* http://www.fdc.gov.hk/en/home/index.htm

[86] Chan, supra note 1, at 82.

3.2 Hong Kong International Film and TV Market and Hong Kong International Film Festival

In an effort to promote Hong Kong as a global film production and distribution hub, Hong Kong hosts the Hong Kong International Film and TV Market (FILMART) and the Hong Kong International Film Festival (HKIFF), among other industry highlights. Established by the Trade Development Council in 1997, FILMART promotes linkages across various media and platforms for the industry.[87] This film and TV marketing exhibition is integral to the industry's revival since it advances Hong Kong's status as a core player in the global film industry.[88] Through FILMART, foreign filmmakers are introduced to Hong Kong as a platform to connect with the global market, including that of the Mainland.

While FILMART focuses on the infrastructure of the film industry, HKIFF dedicates itself to promoting film culture and creativity. Set up in 1977, HKIFF is one of the world's oldest film festivals.[89] Through its efforts, HKIFF is now "Hong Kong's largest cultural event" and is aimed at promoting "international appreciation of Asian, Hong Kong, and Chinese film culture."[90] HKIFF is likewise integral to the industry's revival due to its dedication to promoting Hong Kong film culture to the world and recognizing new talents capable of further developing Hong Kong film culture to its fullest.

3.3 Film Development Fund

To further the growth of the industry, the government established a Film Development Fund (FDF) as means of financing small-to-medium productions and locally produced Cantonese films for distribution in the Mainland.[91] Through FDF, the government invested HK$300 million in 2007 and HK$200 million in 2015.[92] Additionally, it infused HK$20 million in 2016 to aid distribution of Cantonese films in the Mainland.[93] The Film Production Grant Scheme (2015) and First Feature Film Initiative (2013) were launched to further encourage production of Hong Kong

[87] Hong Kong International Film & TV Market (FILMART), Fair Report, *available at* http://m.hktdc.com/resources/fair/1819/hkfilmart/s//4129/1527476733800_Fair-Report-FILMART2018-23May-Eng.pdf

[88] FILMART hosted 8000 global visitors and 800 exhibitors from 35 countries and regions, including over 220 exhibitors from Mainland China in 2017.

[89] Hong Kong International Film Festival Society, About Us, *available at* http://www.hkiff.org.hk/society/#/AboutUs/historyCulture

[90] *Id.*

[91] Hong Kong Film Development Council, Services, *available at* http://www.fdc.gov.hk/en/services/services2.htm

[92] *Id.*

[93] *Id.*

films.[94] The Film Production Grant Scheme awards cash subsidies to films with a budget of $ten million or less in order to reduce the risk of film producers and "create nurturing opportunities for practitioners of the film industry."[95] The First Feature Film Initiative offers support to filmmakers without experience in commercial filmmaking by creating jobs for "new on-screen talents and first-timer recruits to film production crews."[96] Through these endeavors, the government provides support to filmmakers and equips them with the financial capacity to produce quality films and tap into the Mainland Chinese and overseas markets.

3.4 Create Hong Kong (CreateHK) and Hong Kong Arts Development Council

CreateHK and the Hong Kong Arts Development Council focus on driving the creative and art industries, including film.[97] CreateHK, a government agency, aims to "build Hong Kong into a regional creative capital" by facilitating creative development.[98] It assists in film production by coordinating between filmmakers and "over 3,000 organisations on the use of their premises for location filming, and published reference materials on locations for the industry."[99] Hong Kong Arts Development Council endeavors "to establish Hong Kong as a dynamic and diverse cultural metropolis."[100] It aids art practitioners, including those in the film industry, by granting fund allocations, promoting art through policy and development, and establishing cultural exchanges.[101]

3.5 Closer Economic Partnership Agreement

As previously discussed, the CEPA assists in uplifting the Hong Kong film industry by doing away with quota limitations on the distribution of Hong Kong films in the Mainland and by establishing co-production initiatives between Hong Kong and the rest of China.

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[94] Legislative Council Panel on Information Technology and Broadcasting, *Film Development Fund Review*, LC Paper No. CB(4)187/17–18(02), *available at* https://www.legco.gov.hk/yr17-18/english/panels/itb/papers/itb20171113cb4-187-2-e.pdf

[95] *Id.*

[96] *Id.*

[97] Hong Kong Free Press, supra note 35.

[98] Create HK, About Us, *available at* https://www.createhk.gov.hk/en/about.htm#

[99] Create HK, Services, *available at* https://www.createhk.gov.hk/en/service_film.htm

[100] Hong Kong Arts Development Council, Cultural Exchange, *available at* http://www.hkadc.org.hk/?p=435&lang=en

[101] *Id.*

4 The Implications of the Hong Kong Copyright Framework on the Film Revival

While the above efforts aiming at the revival of the film industry are laudable, they fail to address the issue at its core. A common thread among the government's undertakings is the focus on developing infrastructural solutions and improving financial support. However, the means to fully propel the industry to greater heights lies in creating innovative, diverse, and quality Hong Kong films that celebrate the industry's creativity and ingenuity. Despite the government's efforts, the current mechanisms to develop state-of-the-art films continue to face legal barriers in the form of stringent copyright protection.

While movies can be easily pirated as intangible intellectual products, their production and distribution require huge investment. Therefore copyright is paramount in the film industry. According to the statistics published by the Motion Picture Association of America (MPAA) in 2007 (the last year in which the MPAA collected this information), the total average budget for releasing a feature film is US$106.6 million.[102] Compared to creators of other categories of cultural products, copyright holders of films have a stronger demand for copyright that allows them to exclusively exploit their films and to recoup investment. Like other jurisdictions, Hong Kong also includes films in copyright law and grants the copyright owners exclusive rights to copy the work;[103] to issue copies of the work to the public;[104] to rent copies of the work to the public;[105] to make available copies of the work to the public[106] to perform, show, or play the work in public;[107] and to broadcast the work or include it in a cable program service,[108] among others. These rights expire at the end of the period of 50 years from the end of the calendar year in which the death occurs of the last to die of the following persons: the principal director, scriptwriter, author of the dialogue, or the composer of music created for and used in the particular film.[109] However, as we will discuss in the following sections, some Hong Kong copyright rules are inconsistent with the nature of the film and impede the development of Hong Kong's film industry.

[102] MPAA, Entertainment Industry Market Statistics (2007) at 7, available at https://wikileaks.org/sony/docs/03_03/Mktrsch/Market%20Research/MPAA%20Reports/2007%20Market%20Statistics.pdf

[103] Copyright Ordinance of Hong Kong (Cap. 528) (2009 amended), section 23.

[104] *Id.* section 24.

[105] *Id.* section 25. (Section 25 The rental of copies of any of the following works to the public is an act restricted by the copyright in the work – (a) a computer program, (b) a sound recording, (c) a film, and (d) a literary, dramatic, or musical work included in a sound recording.)

[106] *Id.* section 26.

[107] *Id.* section 27.

[108] *Id.* section 28.

[109] *Id.* section 19.

4.1 Co-authorship of Films

Hong Kong copyright law regards a film as a work jointly authored/owned by the producer and the principal director,[110] unless the film is made by an employee in the course of his employment, in which case the employer will be the copyright owner but the producer and the principal director remain the co-authors.[111] Figure 6 shows how this approach differs from many other major film-producing countries.

The major difference between Hong Kong and other jurisdictions is that Hong Kong, which follows the British tradition, allows the director to jointly exploit the film with the producer, while in other countries it is the producer who is solely entitled to exploit the film. Despite the difference of authorship rules, many countries including Italy, France, Germany, China, and Korea grant the right of exploitation to the producer exclusively. Though the USA and Japan subject the film ownership to the work-for-hire doctrine like Hong Kong, they concentrate the exploitation right on a single party, often the producer, when the film is not an employee's work. Under Japanese copyright law, the exploitation right belongs to either the production company in the case of a film made for hire (Art.15) or "the person that makes a creative contribution to the overall shaping of the work through responsibility for its production, direction, staging, filming, art direction, etc." (Art. 16), which most likely refers to the film producer according to the definition of "producer" in other countries (see Fig. 6). In the USA, if a film does not fall into the scope of a work made for hire, the producer will be regarded as the sole author because of the stringent conditions of joint authors.[112]

In Hong Kong, nevertheless, a film is co-owned by the producer and the principal director unless it constitutes an employee's work under a contract of service or of apprenticeship.[113] However, the film labor system in Hong Kong that changed from contract labor (1930–1970), then a mixed mode of contract and noncontract labor (1970–1990), to flexible, noncontract labor (since 1990) might reduce the number of films that can be considered employee works.[114] Even if there is a contract, it might be between the director and other employees due to the long-standing

[110] *Id.* sections 12(2) and 11(2) (b).

[111] Id. section 14. TSE MUI CHUN v. HKSAR – [2003] HKCU 1408 ("As to ownership of copyright, the 'author' of the work is, prima facie, the first owner of the copyright (s.13). But if the 'author' has made the work as an employee in the course of his employment, the employer is the first owner of the copyright (s.14). Note that the employee remains the 'author' but the employer owns the copyright.")

[112] In *Casa Duse v. Alex Merkin*, the Second Circuit court rejected a film director's claim to be the copyright owner of the film and held the producer to be the sole author ("A co-authorship claimant in the Second Circuit generally must show that each of the putative co-authors (1) made independently copyrightable contributions to the work; and (2) fully intended to be co-authors." 791 F.3d 247, 255 (2d Cir. 2015). Some courts added a "control" criterion, requiring the putative co-authors to exercise control over the work as a whole and serve as its "superintendent" or "mastermind." *See Aalmuhammed v. Lee,* 202 F.3d 1227, 1234 (9th Cir. 2000).

[113] Copyright Ordinance of Hong Kong (Cap. 528) (2009 amended), section 198.

[114] Szeto & Chen, supra note 39, at 3–4.

countries	author(s) of a film	copyright owner(s)	definition of the film "producer"
US	the employer[a]	the employer	
Italy	the author of the scenario, the composer of the music and the artistic director[b]	the producer[c]	the person who has organized the production of the work[d]
France	the author of the script, the author of the adaptation, the author of the dialogue, the author of the musical compositions, and the director[e]	the producer[f]	The natural or legal person who takes the initiative and responsibility for making the work[g]
Germany	persons who have jointly created a work without it being possible to separately exploit their individual shares in the work[h]	the producer[i]	
Japan	the person that makes a creative contribution to the overall shaping of the work through responsibility for its production, direction, staging, filming, art direction, etc., other than the author of a novel, scenario, music, or other work that is adapted into or reproduced in the cinematographic work, unless it is a made-for-hire work[j]	the same as the author[k]	
China	the producer[l]	the producer	
Korea	the producer[m]	the producer	the person who plans and takes responsibility for the production of a cinematographic work[n]
Hong Kong /UK	the producer and the principal director[o]	the producer and the principal director, unless it is an employee's work[p]	the person by whom the arrangements necessary for the making of the film are undertaken[q]

Fig. 6 Comparison of the rules of authorship and ownership in a film

[a]17 USC § 101 "Motion picture" was introduced to US copyright law in 1912 as a category of made-for-hire work

[b]Law for the Protection of Copyright and Neighboring Rights in Italy (2010 amended), article 44

[c]Id. article 46

[d]Id. article 45

[e]Intellectual Property Code of France (2003 amended), article L113-7

[f]Id. article L132-24

[g]Id. article L132-23

[h]Act on Copyright and Related Rights of Germany (2017 amended), article 8

[i]Id. *articles* 89 and 94

[j]Copyright Law of Japan (2009 amended), article 15(1) and article 16

[k]Copyright Law of Japan (2009 amended), article 15(1) and article 16

[l]Copyright Law of the People's Republic of China (2010 amended), article 15

[m]Copyright Act of the Republic of Korea (2009 amended), articles 75 (1) and 76

[n]Id. article 2

[o]Copyright Ordinance of Hong Kong (Cap. 528) (2009 amended), section 12(2) and section 11(2)(b). Copyright, Designs and Patents Act 1988 of UK (Chapter 48) (2017 amended), section 9(2)(ab) and section 10(1A)

[p]Copyright Ordinance of Hong Kong (Cap. 528) (2009 amended), section 14. Copyright, Designs and Patents Act 1988 of UK (Chapter 48) (2017 amended), section 11(2)

[q]Copyright Ordinance of Hong Kong (Cap. 528) (2009 amended), section 198. Copyright, Designs and Patents Act 1988 of UK (Chapter 48) (2017 amended), section 178

director-centered production system,[115] whereas the judges have tended to hold films to be co-owned by the producer and director rather than being an employee's work owned by the director.[116] However, joint ownership is prone to conflicts, including conflicts between the interests of the producer and principal director and the conflicts of applicable laws when the joint owners are from different jurisdictions such as in the case of co-production.

Further, joint ownership adds to the difficulties and costs of identifying copyright owners. Neither "principal director" nor "director" is defined under Hong Kong law.[117] Departing from the definition of "producer" in other countries normally featured by responsibility (Fig. 6), the Hong Kong counterpart, defined as "the person by whom the arrangements necessary for the making of the film are undertaken,"[118] is confusing in regard of the "necessity" of the arrangements. For example, in *Century Communications v Mayfair Entertainment*,[119] a film made in China (under the control of the plaintiff) was held to be produced by a Hong Kong company (the defendant). Despite the plaintiff's arrangements such as engaging directors and employing actors, the court ruled in favor of the defendant, reasoning that it was the defendant who initiated the filmmaking and paid for it.[120] In *Beggars Banquet v Carlton Television*, the court decided that the person directly responsible for finance, rather than the person who paid the money, should be the producer.[121] In *A &M Records Ltd. v. Video Collection International Ltd.*, the person who initiated the process and contracted conductors, rather than the conductor who booked and paid for the orchestra and the studio, was considered the producer who makes necessary arrangements.[122]

As a special feature of Hong Kong film, the co-authorship, or the co-ownership enjoyed by the producer and director, suited the "director-centered production system"[123] very well. The advantage of this system was especially evident in the

[115] *Id.* at 4.

[116] *Century Communications v Mayfair Entertainment*, [1993] EMLR 335. Although this is a British case, the Hong Kong Copyright Ordinance inherits it and adopts the same copyright rule as Britain.

[117] Though Laddie, Prescott, and Vitoria's Fourth Edition indicates that the principal director is "likely to be the person who has creative control of the making of the film" (para 7.41), it is not a Hong Kong authority.

[118] Copyright Ordinance of Hong Kong (Cap. 528) (2009 amended), section 198.

[119] [1993] EMLR 335. Although this is a British case, the Hong Kong Copyright Ordinance inherits the British tradition and also regards a film as a work of joint authorship.

[120] [1993] EMLR 335.

[121] [1993] EMLR 349.

[122] [1995] EMLR 25l. Although this is a case of sound recording copyright, the definition of "producer" applies to both sound recordings and films. Cap 528, § 198.

[123] *See* supra note 39.

kung fu genre[124] and brought Hong Kong's film industry to the golden age from the 1980s to the early 1990s. However, a wide range of films that spawned later, from adventure films and comedies to dramas and musical films, rely heavily on other talents such as scripters and composers, not only directors.[125] The privilege of directors may hold up the collaborative filmmaking process and may even drive homegrown talent to seek greener pastures in the film industries of foreign countries.[126] Perhaps concentrating the exploitation right on a single party with a clear definition of ownership can reduce the cost of negotiation, clarify the scope of film copyright, and facilitate co-production with other regions. In fact, the Law Reform Commission in Hong Kong suggested that the producer should become the sole copyright owner of a film, although the proposal failed to be finally adopted.[127]

4.2 Unclear Scope of "Copy" and Insufficient Protection for Secondary Creation

Section 7(4) of Hong Kong Copyright Ordinance explicitly claims that "copyright does not subsist in a film which is, or to the extent that it is, a copy taken from a previous film."[128] Undoubtedly, copyright "does not subsist in a copy taken from a previous film" because originality is the basic requirement to attract copyright protection. Disputes arise because of the ambiguity contained in the provision "copyright does not subsist in a film which *to the extent is a copy* taken from a previous film." Specifically, "to the extent is a copy" is a gray area between a verbatim, exact copy without any change to the previous film and a derivative, new film which gains copyright protection because of its originality and substantial difference from other works. Hong Kong Copyright Ordinance acknowledges that both copying a whole work and copying any substantial part of the work constitute a copy[129] but fails to

[124] Many kung fu directors are turned from martial arts actors or instructors and play significant roles in arranging the entire filmmaking process. Sek Kei, Rolanda Chu, and Grant Foerster, A Brief Historical Tour of the Hong Kong Martial Arts Film, January 1, 2001, Bright Lights https://brightlightsfilm.com/wp-content/cache/all/brief-historical-tour-hong-kong-martial-arts-film/#.W3rD4egzY2x ("Most professional directors were not actually familiar with martial arts techniques, and … required the help of martial arts directors such as Sammo Hung and Han Ying Chieh. With the emphasis on martial arts techniques as the new backbone of the genre, contributions from actual martial artists became increasingly significant.").

[125] F. Jay Dougherty, *Not a Spike Lee Joint--Issues in the Authorship of Motion Pictures under the US Copyright Law*, 49 UCLA L REV 225, 285 (2001).

[126] Chan, supra note 1, at 21.

[127] The Law Reform Commission of Hong Kong Report: Reform of the Law Relating to Copyright (Topic 22), p 22, 63 https://www.hkreform.gov.hk/en/docs/rcopyright-e.pdf ("3.4 The 'maker' of a cinematography film is the owner of the copyright (section 13(4)), in this case defined as "the person by whom the arrangements necessary for the making of the film are undertaken (section 13(10)" … "7.10 The employee has no right to be identified as author. A film director is treated in a similar fashion if he is an employee.").

[128] Copyright Ordinance of Hong Kong (Cap. 528) (2009 amended), section 7(4).

[129] *Id*. section 22 (3)(a).

define "substantiality." Hong Kong case law, although it lacks clear guidance regarding the boundary of substantial taking in the field of films,[130] indicates that even a small amount of taking, such as taking a short musical snippet from another's song,[131] reproducing a smaller version of the front page of a rival newspaper,[132] and copying a small part of a questionnaire,[133] will fall into the scope of copyright infringement.

Following this reasoning, a film created from several clips of one or more previously existing films, a remixed film, a colorized or extended version of a film, a director's cut (namely, an edited version of a film that is supposed to represent the director's own approved edit[134]), or a digitally enhanced or restored print will likely be classified as "a copy" in which copyright does not subsist.[135] The indiscriminate, bald opposition against copying crucially misunderstands the nature of films. As a transnational cultural product,[136] a film appeals to its audience by providing a novel experience of a new culture. However, the new product and experience should not be too far away from knowledge that the audience already has. This is a sophisticated balance between similarities and differences,[137] between unknown cultural secrets and easy accessibility.[138] As Abraham Drassinower notes, culture is copying, and copying per se is not wrong.[139] It is copying that makes the connection between similarities and differences, which explains the continual popularity of movie series such as the Harry Potter series and the Marvel series.

Some may argue that this provision merely prohibits the copying of expression, while the idea is still in the public domain, freely available for everyone. But the boundary between idea and expression is as vague as the boundary between copying and recreation. For instance, Steven Chow, the director for *Shaolin Soccer*, might exclude others from making a similar *kung fu* soccer film by arguing that he created his own original *kung fu* expressions based on the idea of soccer playing, but it is also reasonable to regard soccer as an expression (action and speed) and *kung fu* as an idea (power, strength of will, hard work, and dignity).[140] The real cultural

[130] Doreen Weisenhaus, Hong Kong Media Law: A Guide for Journalists and Media Professionals 235 (Hong Kong University Press, 2004).

[131] *Ladbroke (Football) v William Hill (Football)* [1964] 1 WLR 272.

[132] *Group Ltd v Apple Daily Ltd* [1999] 4 HKC 131.

[133] *Lam Tai Hing v Koo Chih Ling, Linda* [1993] 2 HKC 1.

[134] Wikipedia's interpretation of "Director's Cuts", *available at* https://en.wikipedia.org/wiki/Director%27s_cut

[135] Pascal Kamina, Film Copyright in the European Union 106 (Cambridge University Press, 2016).

[136] Laikwan Pang, Cultural Control and Globalization in Asia: Copyright, Piracy, and Cinema 10 (New York: Routledge, 2006).

[137] *Id*. at 6.

[138] *Id,* at 55.

[139] Abraham Drassinower, What's Wrong with Copying? 1, 9 (Harvard University Press, 2015).

[140] Pang, supra note 136, at 53.

copying practice is more complex than what is written in copyright law.[141] Actually, as Laikwan Pang noted, the artificial dichotomy of idea/expression is designed more for satisfying capitalist interests than for promoting creativity and culture.[142] It enables Hollywood to rapidly and effectively appropriate other cinematic traditions, to remake films, and then to exclude others from exploiting the same stories.[143] But for the domestic industry, the blurred boundary between idea and expression, along with the difficulty in distinguishing copying and recreation, will obstruct the production of movies of the same style and hinder Hong Kong films from forming a collective identity.[144]

The prohibitive effect of copyright law is even exacerbated by the lack of copyright exceptions providing some breathing space for secondary film creation.[145] This is extremely crucial in the Internet age, where various kinds of user-friendly tools empower a large number of untrained ordinary people to engage in filmmaking themselves such as DIY cinema, newsreel films,[146] short films,[147] and microfilm.[148] As section 2 of the chapter shows, Hong Kong's government has made great efforts in promoting filmmaking, both professional and amateur, whereas legal support is still to be desired. Encouraged by the open-ended fair use doctrine in the USA,[149] the Australian initiative incorporating parody and satire into fair dealing exception, the Canadian exception for noncommercial user-generated content, and the UK fair dealing exception for parody, caricature, and pastiche,[150] Hong Kong's Copyright (Amendment) Bill 2014 introduced a safety valve for "parody, satire, caricature, or pastiche."[151] Nevertheless, the Hong Kong bill ultimately failed to be adopted into law, mainly because copyright owners insisted on the existing copyright ordinance

[141] *Id.*

[142] *Id*. at 51.

[143] *Id*. at 70.

[144] *Id*. at 98.

[145] Joseph P. Liu, *Copyright and Breathing Space*, 30 Colum. J.L. & Arts 429, 429 (2006).

[146] Newsreels were short films shown in movie theaters, generally along with cartoons and feature films. Princeton University Library, https://libguides.princeton.edu/c.php?g=84226&p=540944

[147] According to the Academy of Motion Picture Arts and Sciences, "a short film is an original motion picture that has a running time of 40 min or less, including all credits" https://www.oscars.org/sites/oscars/files/88aa_rule19_short.pdf. Many websites such as YouTube, Snoovies, CinemaClubby, and Vimeo encourage the creation and distribution of user-created short films.

[148] Microfilm, or microcinema, "refers to a gathering of video and filmmakers, music video producers, amateurs, and semiprofessionals, to publicly project, exhibit, and share their creations among groups of friends and neighbors." Jesse Drew, A Social History of Contemporary Democratic Media 45 (London: Routledge, 2013).

[149] Though the US fair use doctrine does not explicitly list parody as an exception, many case laws have regarded parody as fair use. e.g., *Campbell v. Acuff-Rose Music*, 510 U.S. 569 (1994), *Leibovitz v. Paramount Pictures Corp.*, 137 F.3d 109 (2d Cir. 1998), *Suntrust v. Houghton Mifflin Co*., 268 F.3d 1257 (11th Cir. 2001), *Mattel Inc., v. Walking Mountain Productions,* 353 F.3d 792 (9th Cir. 2003).

[150] Legislative Council Brief of Copyright (Amendment) Bill 2014, at 7–9.

[151] Copyright (Amendment) Bill 2014 of Hong Kong, section 39A.

with no amendment at all and users feared that the government might imprison users who engage in secondary creation other than "parody, satire, caricature, or pastiche."[152]

In the past, most secondary creations were private and thus remained unregulated by the government or tolerated by copyright holders. However, due to the participatory and hyperconnected web,[153] a transformation which Henry Jenkins called "from home movies to public movies" occurs, and a much wider audience gets involved.[154] The popularity of homemade movies and the big business behind them inevitably move those secondary creations, which were originally in the gray area, to the front, directly facing the challenge of copyright law. If the law insists on illegalizing or even criminalizing these uses, these new modes of filmmaking will be stifled, and the potential of mass creativity unleashed by the Internet age will be inhibited.

4.3 Criminal Liability for Copyright Infringement

Hong Kong copyright law imposes harsh penalties, both civil and criminal, on copyright infringement. As the Court of Appeal of Hong Kong has noted, copyright infringement "is not simply a matter of the private interests of the copyright owners" but "a matter of public interest to Hong Kong generally"; hence "the remedies available for infringement of copyright can be extensive."[155] Civil remedies include compensation in the form of damages, injunction, an account of profits, and an order for delivery up.[156] Criminal penalties include a fine of up to HK$50,000 for each infringing copy and imprisonment of a maximum of 4 years,[157] which specifically pertain to end users who possess, copy, and distribute an infringing copy of certain types of work for the purpose of trade or business.[158] However, if the distribution is to such an extent as to prejudice the copyright owner, the distributor will be subject to criminal sanction irrespective of the types of copyright works and the

[152] Peter K. Yu, *The Quest For A User-Friendly Copyright Regime In Hong Kong*, 32 AM. U. INT'L L. REV. 284, 288 (2016).

[153] Nicholas A Christakis and James H Fowler, Connected: The Surprising Power of Our Social Networks and How They Shape Our Lives 10 (Little, Brown 2009).

[154] David Thorburn & Henry Jenkins, Rethinking Media Change: The Aesthetics of Transition 309 (Cambridge: The Mit Press, 2004).

[155] *Commissioner of Customs and Excise v. Golden Science Technology Ltd*, [1999] 4 HKC 169.

[156] Copyright Ordinance of Hong Kong (Cap. 528) (2009 amended), sections 107–109.

[157] Copyright Ordinance of Hong Kong (Cap. 528) (2009 amended), section 119.

[158] End users engaging in the following two types of copyright infringement will attract criminal liability: (i) unauthorized possession of an infringing copy of copyrighted software, movies, television dramas, and musical (sound or visual) recordings for use in business and (ii) unauthorized copying and distribution of an infringing copy, either an electronic or hard copy, of books, newspapers, magazines, and periodicals for use in trade or business. Hong Kong's Amended Copyright Law: Guidance Note on Prevention of End-User Piracy in Business at 2, available https://www.ipd.gov.hk/eng/intellectual_property/copyright/booklet_piracy_in_business_e.pdf

purpose of distribution.[159] These liability rules are not simply written but also efficiently enforced.[160]

The world's first case imposing criminal liability upon an individual using BitTorrent for P2P sharing, *Chan Nai Ming v HKSAR*,[161] occurred in Hong Kong.[162] The key issue was whether uploading files constitutes "distribution."[163] The defendant used the legal loophole that "distribution" is nowhere defined in Hong Kong Copyright Ordinance, claiming that the prosecutor cannot prove that Chan's act of uploading violates the right of distribution because there is no delivery of "physical copies."[164] As a response, Justice Beeton extended "distribution" to "digital dissemination," reasoning that "'distribution' in its ordinary meaning, is clearly capable of encompassing a process in which the distributor first takes necessary steps to make the item available and the recipient then takes steps of his own to obtain it." Through a liberal interpretation of the Copyright Ordinance, the Court decisively gave the law proper effect in combating piracy. The criminalization of copyright infringement has indeed become an evident character of Hong Kong copyright law. From a case search in Lexis HK,[165] we found 42 cases addressing film copyright, among which 27 cases involved criminal liability of copyright infringement.[166]

However, rigorous liability and harsh punishment from copyright law have failed to fulfill the goal of eliminating piracy. According to a report from Carnegie Mellon University, in 2017 65.9 million BitTorrent movie and TV programs were

[159] *Id.*

[160] e.g., *HKSAR v Elegant Technology Ltd*, [2004] 3 HKC 37; *HKSAR v Ho Hon Chung Danel & ORS,* [2004] 3 HKC 304; *HKSAR v Re Affluence Pictures Ltd,* [2008] HKCU 1807; *HKSAR v SZE Chak Ming & ANOR,* [2006] HKCU 724; *HKSAR v Mega Laser Products (HK) Ltd & ORS,* [1999] 3 HKC 161.

[161] *CHAN NAI MING v HKSAR*, [2007] 3 HKC 255.

[162] Michael Filby, *Big Crook in Little China: The Ramifications of the Hong Kong BitTorrent Case on the Criminal Test of Prejudicial Effect,* 21 Int Rev. Law Comput Tech 275, 278 (2007).

[163] *HKSAR v Chan Nai Ming* [2005] 4 HKLRD 142.

[164] One of the key defenses was that although the Copyright Ordinance stipulates the civil remedies for "making available of copies to the public" in section 26, for imposing criminal liability, the prosecutor should demonstrate that Chan's act of uploading violates the right of distribution, but "distribution" is nowhere defined in the Ordinance. *HKSAR v Chan Nai Ming* [2005] 4 HKLRD 142

[165] By using the term "All Hong Kong Cases" as the source, "atleast3(film) AND atleast3(copyright)," "atleast3(motion picture) AND atleast3(copyright)," and "atleast3(movie) AND atleast3(copyright)" as the search terms respectively three times. "Atleast" is used to search for terms occurring at least so many times in a document. For example, atleast3(film) requires the term "film" to appear in the document at least 3 times. "And" can be used to search for terms located in the same document. For example, "atleast3(film) AND atleast3(copyright)" requires both terms "film" and "copyright" to appear in the document at least 3 times. We used 3 to preliminarily screen cases irrelevant to film copyright.

[166] We obtained 76 cases with "atleast3(film) AND atleast3(copyright)" as the search term, 12 cases with "atleast3(movie) AND atleast3(copyright)" as the search term, and 5 cases with "atleast3(motion picture) AND atleast3(copyright)" as the search term. After reading the decisions of each ease, excluding duplicating cases, we ultimately obtained 42 relevant cases. http://www.lexisnexis.com.eproxy.lib.hku.hk/ap/ui/go.aspx/hk/lexis/default/api?ipf=t

downloaded, and a loss of HK$ 286 million was caused to the Hong Kong box office.[167] Online piracy of films, video clips, music, and animation is leading to a monthly loss of around HK$120 million to Hong Kong's creative industries.[168] Penalties alone are insufficient to deter infringement. The deterrent effects of law depend upon two factors, the probability of being caught and the severity of the punishment.[169] For most private pirates, the probability of being caught is very low because of the high cost of tracing anonymous pirates, each of whom merely causes minimal loss to the copyright owners. As Peter Yu concluded, criminal penalties under Hong Kong copyright law are "likely to be selectively enforced and therefore highly unfair."[170]

The governance of piracy should take an approach integrating the reasons why piracy originated and became popular. Piracy promises consumers easy access to films, both classic and newly released, at no cost or for a minimal fee.[171] However, audiences have to bear a long lag time between a film's first release in theater and the release of pirated DVDs or the release of pirated films online and to endure the low quality of early-release pirated films such as camcorder captures in cinemas.[172] By contrast, authorized films promise the latest movies immediately upon cinema release, an awesome big-screen experience, and sometimes even film appreciation activities such as a face-to-face encounter with film directors or actors and post-screening sharing sessions.[173] But consumers need to pay for the movie ticket.

Assuming the price of a movie ticket remains the same, the best way to solve piracy is to improve the movie theater experience. A film is not only a commodity but a complex system of representation and cultural experience,[174] and this experience highly relies on the equipment. The experience of watching movies with fuzzy images on a small and cheap VCD set or in a small PC screen at home can never compare with the experience of watching HD movies in a cinema with state-of-the-art facilities.[175] This is why Gabe Newell, the CEO and cofounder of Valve, pointed out that "piracy is a service problem."[176] Hong Kong's government seems to recognize the cinema experience approach to combating piracy, making it a policy to

[167] Hong Kong's Piracy Landscape 2018, supra note 80.

[168] Alice Shen, *Online piracy clampdown in Hong Kong deprives errant websites of HK$6.5 million in monthly ad revenue,* South China Morning Post, Mar. 22, 2018, *available at* https://www.scmp.com/news/hong-kong/law-crime/article/2138287/online-piracy-clampdown-hong-kong-deprives-errant-websites

[169] Robert Cooter & Thomas Ulen, Law and Economics 4–5 (Boston: Pearson, 6th ed., 2010).

[170] Peter K. Yu, *Digital Copyright Reform and Legal Transplants in Hong Kong*, 48 U. Louisville L. Rev. 693, 704 (2010).

[171] "Hong Kong Film Industry Furious at YouTube 'Piracy'," supra note 81.

[172] William Fisher, Promise to Keep: Technology, Law and the Future of Entertainment 68 (Stanford University Press, 2004).

[173] Legislative Council Brief on Facilitating Cinema Development, LC Paper No. CB(4)801/16–17(05), supra note 57, at 4.

[174] Pang, supra note 136, at 64.

[175] *Id*. at 91.

[176] Greg Tito, *Valve's Gabe Newell Says Piracy Is a Service Problem*, The Escapist (Nov. 28, 2011) *available at* http://www.escapistmagazine.com/news/view/114391-Valves-Gabe-Newell-Says-Piracy-Is-a-Service-Problem

facilitate the construction of movie sets in commercial complexes, such as incorporating a cinema requirement in land leases to give a hardware boost.[177]

Criminal penalties not only have failed to combat piracy but also have become barriers for individual, noncommercial file-sharing activities which might be considered to occur "to such an extent as to affect prejudicially the copyright owner" due to the hyperconnected Internet and the unprecedented scope of distribution. Criminalizing file sharing violates the long-standing principle that punishment should fit the crime[178] and will gradually breed disrespect for and distrust of the legal system. This partly explains the public's fear about the government's prosecution against users who use online-copyrighted material for secondary creation or mocking politicians[179] even though the Copyright (Amendment) 2014 Bill clarified the threshold of criminal liability regarding the existing prejudicial distribution offenses.[180] Imposing criminal penalties upon file-sharing activities which are common or even popular with the general public also has huge implications for government finance, prison management, and jurisdictional issues.[181] We therefore concur with many scholars and are of the opinion[182] that copyright protection for individual, private, and noncommercial online copying and distribution should be decriminalized. Without such a move, the revival of Hong Kong's film industry will remain a fiction.

5 Conclusion

From its humble beginnings, the Hong Kong film industry catapulted itself to an international film powerhouse status. Through the years, it introduced the world to *kung fu* films of Bruce Lee, Jackie Chan, and the like. However, a variety of factors ranging from the industry's director-centered production system, prevailing investor pressure, and weak infrastructure to political and economic conditions, popularity of foreign films, and rampant piracy all led to its decline. In an effort to revive the industry, the government established infrastructural and financial reforms by means

[177] LegCo, supra note 29.

[178] Yu, supra note 187, at 704.

[179] Stuart Lau, *Five reasons the Hong Kong copyright bill failed,* South China Morning Post, Mar. 4, 2016, https://www.scmp.com/news/hong-kong/politics/article/1920569/five-reasons-hong-kong-copyright-bill-failed

[180] Legislative Council Brief of Copyright (Amendment) Bill 2014 of Hong Kong, supra note 150, para.9–10, at 6–7.

[181] Cooter & Ulen, supra note 169, at 489–491.

[182] Yu, supra note 169, at 217. Yu, supra note 185, at 701. Jojo Y.C. Mo, *The Copyright (Amendment) Bill 2014 in Hong Kong: A Blessing or a Curse?* 38 Stat. L. R. 211, 213 (2017). Christophe Geiger, Challenges for the Enforcement of Copyright in the Online World: Time for a New Approach in Research Handbook on the Cross-Border Enforcement of Intellectual Property 706, 718 (Paul Torremans ed., Edward Elgar Pub., 2014).

of exhibitions, film festivals, and co-productions with the Mainland. While laudable, these efforts remain insufficient to fully propel the Hong Kong film industry to greater heights.

Restoring Hong Kong to its status as the "Hollywood of the Far East" would require the production of innovative, creative, and quality Hong Kong films. However, the traditional Hong Kong copyright framework poses a legal barrier to further innovation and development. The revival of the film industry relies on breaking down these barriers through copyright reform, such as concentrating copyright ownership to a single party who is clearly defined, making copyright exceptions for secondary creation and decriminalizing individual, noncommercial online sharing activities.

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Contemporary Challenges of Online Copyright Enforcement in India

Arpan Banerjee

Abstract

This chapter discusses legal strategies to enforce copyright online in India, with a focus on the film industry. The chapter begins by acknowledging various limitations of online copyright enforcement. Then, in Sect. 2, the chapter provides a broad overview of the landscape concerning film piracy in India. In Sect. 3, the chapter discusses a proposed (and unimplemented) recommendation to target end-users in India. In Sect. 4, the chapter discusses recent developments concerning website-blocking injunctions, which is a strategy that the industry has consistently pursued in recent years. In Sect. 5, the chapter discusses the ad-supported financial model of pirate websites, referencing a study conducted in India. The chapter concludes by reflecting on the efficacy of non-litigious measures, such as the targeting of ad-supported piracy and negotiations with search engines.

Keywords

India · Copyright · Internet · Piracy · Film · Website blocking · Ad-supported piracy

A. Banerjee (✉)
Jindal Global Law School, Sonipat, Haryana, India

University of New South Wales, Sydney, Kensington, Australia
e-mail: abanerjee@jgu.edu.in

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_8

1 Introduction

Legal concerns regarding online copyright infringement date back to the first half of the 1990s, when even dial-up Internet was at a nascent stage. The first Clinton administration—at the initiative of Vice President Al Gore—formed the Information Infrastructure Task Force (IITF), to articulate the US government's vision for the so-called National Information Infrastructure (NII). As a part of this initiative, a working group submitted a report, in 1995, discussing the impact of the Internet (then in its infancy) on copyright law. The report presciently observed:

> The NII has tremendous potential to improve and enhance our lives. It can increase access to a greater amount and variety of information and entertainment resources that can be delivered quickly and economically from and to virtually anywhere in the world in the blink of an eye. For instance, hundreds of channels of "television" programming, thousands of musical recordings, and literally millions of "magazines" and "books" can be made available to homes and businesses across the United States and around the world.[1]

The report acknowledged that the growth of the Internet could "upset the balance" between copyright owners and users but felt that the challenge could be addressed by "no more than minor clarification and limited amendment" to existing copyright legislation.[2] The report's main recommendations were that traditional rights of distribution and performance be widened to include the digital transmission of works.[3] The same year, in one of the earliest law review articles on the subject, Jane Ginsberg advanced a similar view.[4]

Today, nearly 25 years later, the online piracy environment has changed in at least four major ways compared to the early dial-up Internet era, owing to faster and cheaper broadband connection speeds. First, piracy concerns in the dial-up Internet era mostly centred around the sharing of songs in the MP3 format or books in the PDF format, where files were no larger than a few megabytes. Today, the focus has shifted to the sharing of films and television programmes, often in high-resolution formats running into a few gigabytes per file. Second, the growth in websites offering inexpensive (often free) online storage means that vast numbers of such files can be uploaded and shared with ease. This contrasts with the dial-up era, when copying large video files onto CDs and other physical storage devices was the usual and practical method of distributing them. Third, from an era where users could only access low-quality streaming content using software like RealPlayer and Windows Media Player, the Internet has now progressed to a stage where high-resolution content can be easily shared and accessed through YouTube, Dailymotion and Vimeo or local variants of such websites (such as Youku in China). Fourth, Internet

[1] Information Infrastructure Task Force (1995). Intellectual Property and the National Information Infrastructure: The Report of the Working Group on Intellectual Property Rights, p. 8.

[2] Ibid at 14, 17.

[3] Ibid at 213.

[4] Ginsburg, J. 1995. Putting Cars on the "Information Superhighway": Authors, Exploiters, and Copyright in Cyberspace. *Columbia Law Review* 95: 1466, 1482.

access in developing countries and emerging economies has widened greatly, to the point where China ranks first and India second in terms of numbers of Internet users. Other economies in the top ten include Brazil, Russia and Indonesia.[5] This has led to a significant amount of piracy occurring across borders.[6]

Notwithstanding the above, it can be argued that the views advanced by the IITF Working Group and Ginsberg still hold good today. Many copyright laws worldwide date back to the dial-up era, simply expanding the applicability of traditional rights in an online environment. Yet, they are arguably sufficient to target almost every type of major infringing activity online (although sometimes requiring judicial creativity in their application). If there is dissatisfaction with the prevalence of online piracy, it arguably pertains less to "law lag" (i.e. the principle that the law always lags behind technology[7]) than to issues simply beyond the scope of law. The hard reality is that the enormous global scale of global Internet usage and file-sharing means that piracy can at best be curbed in spurts. Furthermore, to quote the High Court of Ireland, "Among younger people, so much has the habit grown of downloading copyright material from the internet that a claim of entitlement seems to have arisen to have what is not theirs for free".[8] In this scenario, there are serious limits to what the law can achieve. For India's film industry, which this chapter will focus on, there are three factors that especially curb the utility of online copyright enforcement—the prevalence of physical piracy, the hosting of pirated content in servers outside India, and, above all, a general deficit of infrastructure in the civil and criminal justice system.

With reference to the first factor, in the late 1990s, when Internet penetration in India was still limited, a government study identified video parlours and cable operators as the major sources for the dissemination of pirated films. The study observed that "[a]ll parties involved in the legitimate transaction of films—from the producers to the theatre owners"—lost "heavily because of widespread video or cable piracy" and that the government also lost potential tax revenues.[9] Nearly a decade later, the government constituted a high-level committee on piracy ("Committee") to examine the issue in more detail. In contrast with the older study, the Committee

[5] International Telecommunications Union (2017). Internet users by region and country, 2010–2016. https://www.itu.int/en/ITU-D/Statistics/Pages/stat/treemap.aspx

[6] For instance, in 2015, China registered the most number of illegal downloads of the popular US TV show House of Cards, followed by the USA and then closely by India. See Spangler, T. (2015). "House of Cards" Season 3 Pirated, With China Top Country for Downloaders. Variety. http://variety.com/2015/digital/news/house-of-cards-season-3-pirated-with-china-top-country-for-downloaders-1201444023/

[7] Hurlbut, B. (2015). Remembering the Future: Science, Law, and the Legacy of Asilomar. In Jasanoff, S. & Kim, S. (Eds.), *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power* (pp. 126–151). Chicago: University of Chicago Press. Hurlbut is generally critical of the concept of law lag, stating: "[T]he notion of law lag is an expression of the imaginary of governable technological emergence. Law inevitably lags, and must lag, if science is to be free to generate novelty".

[8] EMI v. Eircom (2010) I.E.H.C. 108, ¶ 5.

[9] National Productivity Council. (1999). Study on Copyright Piracy in India, p. 14. http://copyright.gov.in/documents/study%20on%20copyright%20piracy%20in%20india.pdf

noted the rise of Internet penetration in India and predicted that piracy was "set to explode" with the growth of broadband Internet in India.[10] But while the number of Internet users in India has no doubt grown exponentially since the 1990s, when expressed as a percentage, it still amounts to merely 30% of India's population. Moreover, connection speeds in India are often slow. In fact, one study estimates that India's 4G download speeds are among the slowest in the world.[11] Thus, in contrast with developed countries, physical piracy, via sales of DVDs by street vendors, is still a popular form of consumption of pirated cinema in India, greatly defeating the purpose of online enforcement.[12]

With reference to the second factor, the Indian film industry earns substantial revenue from the Indian diaspora, especially in developed countries. Most major Indian films are released in theatres in these countries. These audiences even form the primary target audience for some producers, due to higher ticket prices in comparison to India.[13] However, there also exist high levels of consumption of pirated films within this audience.[14] The Indian film industry lacks the resources to enforce its copyright adequately worldwide. While the Indian government has approached foreign governments for assistance on behalf of the film industry, little action seems to have emerged.[15]

With reference to the third factor, as Marc Galanter has observed, Indian laws are "notoriously incongruent" with "attitudes and concerns"[16] and that "[d]elays of *Bleak House* proportions are routine in many sorts of litigation".[17] According to the Indian government's own data, several million cases are pending before Indian courts, and there exists a severe shortage of judges.[18] In the context of criminal copyright enforcement, the matter falls under the jurisdiction of state governments rather than the national governments. As a result, copyright enforcement becomes

[10] Ministry of Information & Broadcasting. (2009). Report of the Committee on Piracy, pp. 45–6.

[11] Dovall, P. 2018. 4G speed in India slowest in world. Times of India. https://timesofindia.indiatimes.com/business/india-business/4g-speed-in-india-slowest-in-world/articleshow/63021612.cms

[12] US Trade Representative. (2014). Out-of-Cycle Review of Notorious Markets, p.16 (listing bazaars in India where pirated DVDs are sold); Liang, L. & Sundaram, R., (2011). India. In Karganis, J. (Ed.), *Media Piracy in Emerging Economies* (pp. 339–398, 348–50). New York: Social Science Research Council.

[13] Banerjee, A. 2011. A Case for Economic Incentives to Promote "Parallel" Cinema in India. *Media & Arts Law Review* 16: 21, 23–6.

[14] For example, according to one report, the hit Bollywood film Kaminey was downloaded illegally 350,000 times within a week of its release, with a third of the downloads originating from outside India. Frater, P. 2009. Online Piracy in India a Global Problem. Hollywood Reporter. http://www.hollywoodreporter.com/news/online-piracy-india-global-problem-92365

[15] Banerjee, A. 2016. Copyright Piracy and the Indian Film Industry: A "Realist" Assessment. *Cardozo Arts & Entertainment Law Journal* 34: 609, 639–40.

[16] Galanter, M. (1967). The Uses of Law in Indian Studies. In *Language and Areas: Studies Presented to George V. Bobrinskoy* (pp. 37–44, 38).

[17] Galanter, M. 2010. World of Our Cousins. *Drexel Law Review* 2: 365, 368.

[18] Government of India (2012). National Court Management Systems, Policy and Action Plan.

weak in less developed regions, with instances of corruption and inefficiency.[19] When criminal cases proceed to trial, complainants face further challenges. One report has observed that criminal copyright cases, "most of the time, have not yielded effective and deterrent results", with problems such as accused being awarded bail easily, lengthy delays, loss of evidence, low conviction rates and low amounts of fines where convictions are awarded.[20] In the context of civil litigation, cases tend to proceed slowly following the interim stage. As the Supreme Court of India has observed, "[I]n the matters of trademarks, copyrights and patents, litigation is mainly fought between the parties about the temporary injunction and that goes on for years and years and the result is that the suit is hardly decided finally".[21]

With the above caveats, this chapter discusses online copyright enforcement in India. In Sect. 2, the chapter provides a broad overview of the landscape concerning film piracy in India. In Sect. 3, the chapter discusses a proposed (and unimplemented) recommendation to target end-users in India. In Sect. 4, the chapter discusses legal issues concerning website-blocking injunctions, which is a strategy that the industry has aggressively pursued in recent years. In Sect. 5, the chapter discusses the issue of ad-supported piracy, which may well be the next battleground for rights owners in India. The chapter concludes by reflecting on the efficacy of non-litigious measures, such as the targeting of revenue-generating ads and negotiations with search engine websites. Although the focus of this chapter is on the Indian film industry, to a great extent it will automatically subsume the Indian music industry. Unlike in many countries, the majority of Indian films are musicals. Most popular musicians in India release songs as part of film soundtracks. Thus, film consumption in India is frequently synonymous with music consumption, and copyright ownership of films and sound recordings often lie with the same entity.[22]

2 The Piracy Landscape in India

The Indian film industry is the world's largest in terms of films produced and tickets sold,[23] third largest in terms of box-office size[24] and fastest-growing overall.[25] Globally, Indian cinema enjoys popularity among the Indian diaspora, as well as

[19] Liang & Sundaram, *supra* note 12, at 342.

[20] International Intellectual Property Alliance (2014), Special 301 Report on Copyright Protection and Enforcement, p. 43 http://www.iipa.com/rbc/2014/2014SPEC301INDIA.PDF

[21] Vardhman v. Chawalwala (2009) 41 P.T.C. 397, ¶ 3 (S.C.).

[22] See generally, Morcom A. (2007). Hindi Film Songs and the Cinema. London: Ashgate.

[23] UNESCO Institute for Statistics (2014). Diversity and the Film Industry: Analysis of the 2014 UIS International Survey on Feature Film Statistics, p. 9. http://uis.unesco.org/sites/default/files/documents/diversity-and-the-film-industry-an-analysis-of-the-2014-uis-survey-on-feature-film-statistics-2016-en_0.pdf

[24] Motion Picture Association of America (2016). Theatrical Market Statistics, p. 7. https://www.mpaa.org/wp-content/uploads/2017/03/MPAA-Theatrical-Market-Statistics-2016_Final.pdf

[25] PricewaterhouseCoopers (2014). Global Entertainment and Media Outlook 2014-2018: India Summary, pp. 3-4. https://www.pwc.com/gx/en/global-entertainment-media-outlook/assets/

among non-Indian populations in certain parts of Asia and Africa, and forms a component of India's global "soft power".[26] However, the industry suffers from high levels of piracy. According to an industry study, piracy causes the Indian film industry annual financial losses of around US$1 billion, along with around 600,000 annual job losses.[27] Even if one may dispute how such figures have been computed, it is undeniable that a culture of piracy is widely prevalent throughout India. Pirated DVDs are openly sold in markets in Indian cities, while illegal file-sharing and downloading are common.

There are multiple ways in which pirated copies of films are produced and distributed online in India (as in many other countries). Of these, four are noteworthy. First, prints of films have been leaked internally by entities within the production and distribution chain.[28] Second, pre-release prints of films (called "screeners") have been leaked via film festivals, industry insiders and even the Indian film classification board.[29] Third, at the post-release stage, film pirates have used camcorders inside theatres to copy films and subsequently distribute them online. With advances in the quality of mobile phone cameras, pirates are increasingly using mobile phones to record films, making them difficult to detect.[30] Fourth, also at the post-release stage, films can simply be copied from legitimate sources and shared online, whether from DVDs or streaming services like Netflix and Amazon Prime.

The motives for the above acts can vary. There have been instances where individuals have shared copyrighted content simply out of enthusiasm and without any apparent financial motive. However, a significant amount of piracy is motivated by financial gain. The Committee has described piracy as a "high rewards" business.[31] Some years ago, a single raid against a prominent pirate in India reportedly yielded pirated DVDs worth over US$ 1 million.[32] Of late, online piracy yields significant revenues through advertising. In 2014, a report by a then British member of

indian-summary.pdf

[26] Thussu, D. (2013). Communicating India's Soft Power: Buddha to Bollywood, pp. 127–154. Palgrave MacMillan: London.

[27] US-India Business Council & Ernst & Young (2009). The Effects of Counterfeiting and Piracy on India's Entertainment Industry, pp. 3, 31.

[28] For example, clips from *Baahubali 2*, a big-budget film, were leaked online before the film's release by a young graphic designer who was a part of the editing team. See Roy, G. 2016. Baahubali 2 War Sequence Leaked, Graphic Designer Arrested. NDTV. http://movies.ndtv.com/regional/baahubali-2-scenes-leaked-graphic-designer-arrested-1628731

[29] For example, a major Bollywood film, Udta Punjab, was leaked online in entirety when the film was pending review with the Indian film classification board. See Datta, A.N. 2016. "Udta Punjab" leak: CBFC claims innocence as all fingers point at them. DNA. http://www.dnaindia.com/entertainment/report-udta-punjab-leak-cbfc-claims-innocence-as-all-fingers-point-at-them-2224252

[30] Pillai, S. 2016. The Piracy Nightmare. The Hindu. http://www.thehindu.com/features/cinema/The-piracy-nightmare/article14593263.ece

[31] Report of the Committee on Piracy, *supra* note 10 at 14.

[32] Selvaraj. A. 2013. CB-CID Unearths Rs 7cr Worth Materials from Video Pirate. Times of India. http://timesofindia.indiatimes.com/city/chennai/CB-CID-unearths-Rs-7cr-worth-materials-from-video-pirate/articleshow/18096084.cms

parliament, serving as intellectual property advisor to Prime Minister David Cameron, quoted estimates that 600 pirated websites generated over US$ 200 million through advertising revenues in 2013, with nearly a third of the advertisements being those of "household" brands.[33] According to the report, most businesses were unaware of their advertisements appearing on such websites.[34] In India, a study by the Federation of Indian Chambers of Commerce and Industry (FICCI) and Strategic IP Information (SIPI) tracked 1143 pirate websites offering Indian films and found 73% to be supported by advertisements. Over half were found to be advertisements of well-known brands.[35]

A section of academicians and activists in India have viewed film piracy as an altruistic activity. For example, Lawrence Liang has declared himself to be "a defender of film piracy",[36] while the Alternative Law Forum (an organisation promoting open access) has dismissed WIPO's advocacy efforts against piracy.[37] The most common justification advanced by sympathisers of piracy is that it facilitates access to culture. This was even an argument once advanced by defendants, accused of running an unlicensed DVD rental, in a copyright infringement case.[38] However, the ad-supported financial model of pirate websites (discussed later in Sect. 5) must bring into question how altruistic the motives of pirates actually are. To illustrate, in 2014, two websites offering pirated versions of a popular Bollywood film were tracked down to pirates based in Latvia, ostensibly with little cultural affinity towards India and motivated entirely by profit.[39] In the FICCI-SIPI study, of the websites tracked, the largest number of server locations was in North America, then Europe and then Asia.[40] Furthermore, unlike a decade ago, there are now many avenues for accessing licensed content in India at nominal prices, through streaming websites like YouTube, Netflix and Hotstar (an India-focused website run by the Star television network).

[33] Weatherley, M. (2014). "Follow the Money": Financial Options to Assist in the Battle Against Online IP Piracy. http://www.olswang.com/media/48204227/follow_the_money_financial_options_to_assist_in_the_battle_against_online_ip_piracy.pdf

[34] Ibid at 2 (stating, "[I]n the majority of instances, display advertising that appears next to infringing material is not intended by the advertiser, its agency or intermediary companies involved in the trading of advertising").

[35] Federation of Indian Chambers of Commerce (FICCI) and Industry & Strategic IP Information (SIPI) (2017). Badversiting. http://verisiteglobal.com/Badvertising_Report.pdf

[36] Liang, L. 2014. Insights on Film Piracy. *Economic and Political Weekly* 47: 29, 30.

[37] Alternative Law Forum. Right02Copy. http://altlawforum.org/productions/right02copy

[38] Warner Bros. v. Santosh 2 M.I.P.R. 25 (2009), ¶ 15. The defendants argued (unsuccessfully) before the court that that they were "solving the problem of an "artificial shortage" of entertainment in India.

[39] Banerjee, *supra* note 15.

[40] FICCI & SIPI, *supra* note 35, at 20.

3 Targeting End-Users: A Graduated Response Proposal

Indian copyright law recognises the rights of reproduction, distribution and communication to the public, as well as their applicability in an online environment.[41] There is an absence of Indian case law comprehensively discussing the liability of end-users for downloading infringing content. Outside India, however, there exists ample judicial precedent supporting liability. For example, in the USA, in a well-known case involving the file-sharing service Napster, it was observed:

> Napster users who upload file names to the search index for others to copy violate plaintiffs' distribution rights. Napster users who download files containing copyrighted music violate plaintiffs' reproduction rights. […] The district court concluded that Napster users are not fair users. We agree.[42]

In a later case, it was reiterated: "[D]ownloading copyrighted songs cannot be defended as fair use, whether or not the recipient plans to buy songs she likes well enough to spring for".[43] In a more recent case, involving movie torrent downloads, the Federal Court of Australia observed that "the downloading of a sliver of the film from a single IP address" constitutes copyright infringement, even if the size of the sliver is "very small", and it infringes the right of communication to the public.[44] In a decision of the European Court of Justice, an exemption has been provided to Internet users who stream content where only a temporary cached copy is created in the user's hard disk.[45] But while this would exempt users from liability from viewing pirated streams on websites like YouTube and Dailymotion, the exemption would seemingly not exist if a user actively downloads these videos (e.g. by using websites such as www.keepvid.com) or if a permanent cached copy is created in the user's disk.

There is no reason why the legal position in India should be any different from that above. However, targeting end-users is always an unpopular and controversial strategy anywhere in the world. It has rarely been followed by rights owners in India. In recent years, some developed countries have adopted the so-called "graduated response" systems as a milder way to target end-users.[46] Graduated response systems can be divided into the "publicly and privately arranged", the former originating in statutes and the latter in agreements between Internet service providers

[41] Copyright Act of 1957, s. 14

[42] A&M Records v. Napster 239 F.3d 1004, 1014–5 (9th Cir. 2001).

[43] BMG Music v. Gonzalez 430 F.3d 888, 890 (7th Cir. 2005).

[44] Dallas Buyers Club v. iiNet (2015) F.C.A. 317, ¶¶ 28–30 (Fed. Ct. Aust.).

[45] Newspaper Licensing Agency v. Meltwater (2014) A.C. 1438, ¶¶ 26, 27, 29, 30, 33–38, 46, 49–52 (Case C-360/13) (Eur. Ct. Justice).

[46] The countries with such a mechanism currently in place include the USA, UK, France, New Zealand, Ireland, South Korea and Taiwan. See Giblin, R. 2014. Evaluating Graduated Response. *Columbia Journal of Law & Arts* 37: 147.

(ISPs) and rights owners.[47] The common feature of these schemes is that they "generally require that the ISP take some action against users suspected of infringing copyright, ranging from issuing warnings, to collating allegations made against subscribers and reporting to copyright owners, to suspension and eventual termination of service".[48] Arguments in favour of graduated response systems hold that such schemes can act as "digital scarecrow[s]" and deter large numbers of Internet users from infringing copyright and that they represent a cheaper and fairer alternative to suing individual Internet users.[49]

At present, ISPs and other intermediaries in India are governed by a set of rules requiring them to inform users not to *host* or *upload* "any information" that "infringes any…copyright or other proprietary rights".[50] In case users breach this policy, the ISP or intermediary "has the right to immediately terminate the access or usage rights of" the user.[51] Although uploading is a natural consequence of using file-sharing software, there is little evidence to suggest that, in the absence of court orders, ISPs have voluntarily disconnected users who upload pirated content by using such software. Indeed, as many subscribers may purchase high-speed Internet connections with the purpose of downloading pirated films, it is questionable whether ISPs even desire to enforce such rules. The Committee accordingly suggested the institution of a "three stage strike model" where "[a]t the first stage, the errant subscriber could be let off with a warning appearing on his screen; at the second stage, a more severe punishment could be given while the third time, the subscriber's services could be disrupted for a few hours or so".[52]

The issue of disconnecting a user is no doubt the most contentious aspect of graduated response systems. The Indian constitution grants all citizens the fundamental right to "freedom of speech and expression", subject only to certain "reasonable restrictions".[53] The Supreme Court has held that this right includes a "right to… information, knowledge and entertainment"[54] and that the "content of the right… remains the same whatever the means of communication including internet communication".[55] Therefore, it could be argued that the right to access information

[47] Ibid at 153.

[48] Suzor, N. & Fitzgerald, B. 2001. The Legitimacy of Graduated Response Schemes in Copyright Law. *UNSW Law Journal* 34:1.

[49] Yu, P. 2010. The Graduated Response. *Florida Law Review* 62:1374, 1381–3.

[50] Information Technology (Intermediaries Guidelines) Rules 2011, Notification No. G.S.R. 314(E), s. 3(2)(d).

[51] Ibid at s. 3(5).

[52] Report of the Committee on Piracy, *supra* note 10 at 35–36.

[53] Constitution of India, Article 19.

[54] Secretary, Ministry of Information v. Cricket Association of Bengal (1995) A.I.R. S.C. 1236, ¶ 91.

[55] Shreya Singhal v. India AIR 2015 SC 1523 ¶ 86.

and entertainment through the Internet is a fundamental right under the Indian Constitution.

Outside India, the High Court of Ireland has observed that while disconnection is a "serious sanction", it does not completely deprive persons of Internet access, as they "have only to walk down to their local town centre" and use a cybercafé.[56] However, France's highest court, the Constitutional Council, struck down as unconstitutional a provision in the first version of France's graduated response system, under which subscribers could be disconnected for up to 1 year and barred from entering into contracts with other ISPs during this period.[57] The fact that the Committee referred to "disruption" for a few hours, rather than a lengthy "disconnection", indicates that the Committee may have been hinting at bandwidth reduction rather than outright disconnection. Such a measure would perhaps be easier to defend as a permissible "reasonable restriction".

It has also been argued that graduated response systems deny "end-users due process by subjecting them to unverified suspicion of infringing activities", and the technology used to identify infringing users is also not accurate.[58] In Ireland, for example, a technical glitch led to an ISP incorrectly sending almost 400 subscribers copyright infringement notifications.[59] In France, the Constitutional Council held that by "reversing the burden of proof" and fixing "presumption of guilt" on Internet user, the first version of France's graduated response system had contravened the French constitution.[60] An easy way to overcome this problem could be to dispense with the penalty of disruption altogether and simply send users persuasive warnings. Such a model has been attempted in the UK. However, the efficacy of such a model is yet to be determined. One critic has described the UK model as "toothless".[61]

Even if a graduated response mechanism may be constitutionally defensible in India, such a measure would still be unpopular among the public, especially as Internet access is still restricted to a minority of India's population and out of reach of economically weak sections. Furthermore, it is not unreasonable to assume that, among poorer sections of the population, several users may share an Internet connection between themselves, meaning that non-infringers may be penalised. It is, therefore, not a surprise that the Committee's proposal has not found legislative or political support. Instead, rights owners have preferred to use website-blocking injunctions as an anti-piracy strategy. However, the question of targeting end-users has again reared its head, following an order of the Delhi High Court in a recent website-blocking case. The court observed that "since website blocking is a

[56] E.M.I. v. Eircom (2010) I.E.H.C. 108, ¶ 9.

[57] Conseil Constitutionnel [Constitutional Court] decision No. 2009–580, June 10, 2009, J.O. 9675 (Fr.) ("HADOPI case"), translated in Act Furthering the Diffusion and Protection of Creation on the Internet, Décision n° 2009–580, 4 (June 10, 2009), ¶¶ 9-10, 19, 39 available at http://www.conseil-constitutionnel.fr/conseil-constitutionnel/root/bank/download/2009580DC2009_580dc.pdf

[58] Yu, *supra* note 49, at 1394-6.

[59] E.M.I. v. Eircom (2012) I.E.H.C. 264, ¶¶ 1.1–1.3.

[60] HADOPI case, supra note 57, at ¶¶ 18, 39

[61] Solon O. (2014). ISPs Launch Toothless Four Strikes Anti-Piracy Initiative. Wired. http://www.wired.co.uk/news/archive/2014-07/21/four-strikes-copyright

cumbersome exercise" and the majority of downloaders are "youngsters" who may be unaware of copyright law, the government should frame a policy where users are warned "if technologically feasible in the form of e-mails, or pop-ups or such other modes", and fined in the event of not heeding the warnings[62].

4 Website-Blocking Injunctions

As mentioned earlier, what most plaintiffs in civil infringement actions in India realistically look for is an interim injunction. Here, the Delhi High Court has been liberal in granting such injunctions speedily and ex parte, through the so-called "John Doe" orders. A John Doe order is an order restraining anonymous infringers. It is often referred to as an "Ashok Kumar" order in India. The first such order in India was passed by the Delhi High Court, in a case involving pirated live broadcasts of the 2002 FIFA World Cup by unlicensed cable operators. The plaintiffs held rights to broadcast the event and had sublicensed those rights to specific cable operators in India. At the time, broadband penetration in India was very low, and streaming technologies were underdeveloped worldwide. Thus, the plaintiffs were focused on curbing television broadcasts. The plaintiffs named a handful of cable operators who were already broadcasting the matches without a licence as defendants but added unknown "Ashok Kumar" parties as remaining defendants. The plaintiffs argued that the "enforcement of rights against cable operators is a virtual nightmare" and that "if they were to wait and identify specific parties and collect evidence of infringement by such specific parties, they would lose a great amount of time".[63] Citing decisions from the USA, the UK, Canada and Australia, the plaintiffs argued for a John Doe order against the additional, unknown defendants. The court agreed with the plaintiffs' contentions and granted the order. Justice Dalveer Bhandari (who would go on to be appointed to the Supreme Court of India and the International Court of Justice) observed:

> The judicial systems of all these countries have basic similarity with our judicial system. Therefore, looking to the extra ordinary facts and circumstances of the case, in the interest of justice the courts in India would also be justified in passing 'John Doe' orders. … Undoubtedly the cable operators in India have a long history of violating copyrights. … The cable operators are encouraged owing to the unique nature of cable piracy and the unstructured nature of the cable industry, the speed with which any trace of infringement can be erased by the cable operators, enforcement of rights in conservative nature is unlikely to effectively redress the plaintiffs' grievance.[64]

In the context of online piracy, a number of rights owners have obtained broadly worded ex parte John Doe orders from the major High Courts (particularly Delhi) to compel ISPs to pre-emptively block infringing websites—a trend visible from 2011 onwards. In what is thought to be the first of such cases, the Delhi High Court

[62] UTV v 1337X.to, Civil Suit No 724/2017, ¶ 104, Delhi High Court, 10 April 2019, https://indiankanoon.org/doc/47479491/.

[63] Taj Television v. Mandal (2003) F.S.R. 22, ¶ 7 (Del. H.C.).

[64] Ibid ¶ ¶ 16, 17.

granted an injunction in connection with a big-budget Bollywood film, *Singham*. Applying Justice Bhandari's decision in an online context, the court stated:

> [D]efendants, and other unnamed and undisclosed persons, are restrained from communicating or making available or distributing, or duplicating, or displaying, or releasing, or showing, or uploading, or downloading, or exhibiting, or playing, and/or defraying the movie "Singham" in any manner without proper license from the plaintiff or in any other manner which would violate/infringe the plaintiff's copyright in the said cinematograph film "Singham" through different mediums like CD, DVD, Blue-ray, VCD, Cable TV, DTH, Internet, MMS, Tapes, Conditional Access System or in any other like manner.[65]

Thus, the court passed a very broad order encompassing various actors in the online piracy chain, from those indulging in camcording to uploaders and downloaders, as well as actors involved in physical piracy. This order was followed by a large number of similar orders in the coming months and years, using similar language.[66]

Unsurprisingly, ISPs did not take kindly to such orders being passed against them ex parte. An association of ISPs wrote to the Indian government complaining that various law firms had been sending ISPs legal notices annexing copies of John Doe orders and that the government's Department of Telecommunications (DoT) notification was the correct authority to instruct a website to be blocked.[67] However, a film company countered this by impleading the DoT as an additional party in a subsequent suit before the Delhi High Court. The court held that even the DoT was required to block "various websites (named and un-named)…primarily indulged in hosting, streaming or providing access to infringing and illegal" copies of the film in question.[68]

The wide ambit of such orders has met with considerable criticism. One of the earliest criticisms was that ISPs were blocking entire websites (such as Vimeo and Daily Motion) instead of specific pages within the website hosting infringing content.[69] In one instance, a consumer court directed an ISP to pay compensation to a

[65] Reliance v. Jyoti Cable, Civil Suit No. 1724 of 2011 (Del. H.C., Jul. 20, 2011), http://delhihighcourt.nic.in/dhcqrydisp_o.asp?pn=135357&yr=2011

[66] See, e.g. Reliance v. Jyoti Cable, Civil Suit No. 2066 of 2011 (Del. H.C., Aug. 26, 2011), http://delhihighcourt.nic.in/dhcqrydisp_o.asp?pn=173116&yr=2011 (similarly worded order concerning the Bollywood film Bodyguard); Reliance v. Multivision, Civil Suit No. 3207 of 2011 (Del. H.C., Dec. 19, 2011), http://delhihighcourt.nic.in/dhcqrydisp_o.asp?pn=269404&yr=2011 (similarly worded order concerning the Bollywood film Don 2). See also John Doe Orders – Stop Piracy, Oct. 8, 2014, NAIK NAIK & CO., http://naiknaik.com/john-doe-orders (contains a table with details of John Doe orders awarded by courts, including the Bombay, Madras and Calcutta High Courts).

[67] Letter from the Internet Service Providers Association of India to the Secretary, DoT (2011). http://www.ispai.in/UI/uploads/submissionAttach/dot(1).pdf

[68] See, e.g. Fox v. Macpuler, Civil Suit No. 2066 of 2011, ¶ 7 (Delhi High Court, May 14, 2015), http://delhihighcourt.nic.in/dhcqrydisp_o.asp?pn=110404&yr=2015

[69] Dua, K. 2012. Confusion Reigns as Indian ISPs Block Vimeo, Torrent Websites. NDTV. http://gadgets.ndtv.com/internet/news/confusion-reigns-as-indian-isps-block-vimeo-torrent-websites-223340. Pawa, N. Update: Files Sharing Sites Blocked In India Because Reliance BIG Pictures Got A Court Order. Medianama. http://www.medianama.com/2011/07/223-files-sharing-sites-blocked-in-india-because-reliance-big-pictures-got-a-court-order

subscriber who could not access a website for over a month.[70] High Courts have since attempted to rectify this flaw. In 2013, the Madras High Court stated that only pages specifically hosting infringing content ought to be blocked, rather than entire websites.[71] In 2016, the Delhi High Court passed a similar order.[72] The same year, the Bombay High Court refused to grant a John Doe order, where the plaintiff requested for a block on 800 websites, finding the plaintiff's suit to be "sketchy and formless".[73] The judge directed the plaintiff to instead produce "a list of individual links to downloads", further stating that "a technically competent officer" of the plaintiff must check "if not all, at least a sufficient sampling of these links so as to warrant the grant of an injunction".[74]

However, the Delhi and Bombay High Courts both later backtracked. The Delhi High Court recalled its order and held that "rogue websites" indulging in "rank piracy" ought to be blocked outright, rather than specific pages within the website.[75] The Bombay High Court, in a subsequent order by the same judge, blocked all websites submitted by the plaintiff in a list, numbering 110.[76] The list of websites included full websites, such as www.limetorrents.cc, www.thepiratebay.org and www.ugtorrents.com, instead of specific pages. Recently, amidst uncertainty regarding the actual legal position, the popular website www.archive.org (which hosts thousands of valuable historical materials in the public domain) was blocked in entirety by ISPs, following a John Doe order of the Madras High Court. Some users had apparently uploaded pirated copies of two films on the website. However, the plaintiffs named the website in entirety in the infringement suit, and the court granted the plaintiffs the relief they sought without any rider distinguishing the website in entirety versus the infringing pages within it.[77]

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[70] Vinay v. Airtel, Consumer Complaint 226 of 2012 (District Consumer Disputes Redressal Forum, Shimoga, Aug. 3, 2012), http://164.100.72.12/ncdrcrep/judgement/18533120803153733968226-202.pdf

[71] Vodafone v. R.K. Productions (2013) 54 P.T.C. 149, ¶ 4 (Mad. H.C.) (quoting an earlier order where the court had stated that "the interim injunction is granted only in respect of a particular URL where the infringing movie is kept and not in respect of the entire website".).

[72] DEITY v. Star, First Appeal Order No. 57 of 2015 (Del. H.C. March 10, 2016), http://delhihighcourt.nic.in/dhcqrydisp_o.asp?pn=54187&yr=2016

[73] Balaji Motion Pictures v. Bharat Sanchar Nigam, Civil Suit No. 694 of 2016 (Bom. H.C. July 1, 2016), ¶ 6, http://spicyip.com/wp-content/uploads/2016/07/Great-Grand-Masti-1.pdf

[74] Ibid at ¶¶ 7-8.

[75] DEITY v. Star, Review Petition in First Appeal Order No. 57 of 2015, ¶ 14(Del. H.C. July 29, 2016), available at http://lobis.nic.in/ddir/dhc/PNJ/judgement/29-07-2016/PNJ29072016REVIEWPET1312016.pdf

[76] Balaji Motion Pictures v. Bharat Sanchar Nigam, Civil Suit No. 694 of 2016 (Bom. H.C. July 8, 2016), ¶ 4, http://s3.documentcloud.org/documents/2944079/Great-Grand-Masti-Order-Dated-8th-July-2016.pdf

[77] Internet Archive blocked in India, thanks to Lipstick Under My Burkha & Shah Rukh Jab Harry Met Sejal. 2017. India Today. https://www.indiatoday.in/technology/news/story/internet-archive-blocked-in-india-thanks-to-lipstick-under-my-burkha-and-shah-rukh-jab-harry-met-sejal-1029036-2017-08-10

5 Ad-Supported Piracy

The prevalence of ad-supported piracy has been highlighted in recent studies. This section discusses the FICCI-SIPI study in more detail. The study is only among a handful conducted on the subject worldwide and perhaps the only one in India. As mentioned earlier, the study tracked 1143 pirate websites offering pirated copies of Indian films. These roughly fell into five categories—torrent and other peer-to-peer file-sharing websites, direct download websites, linking websites and streaming websites. The study found 786 different entities advertising on 835 websites. Of this number, 46% concerned categories such as adult dating, pornography, unregulated products and gambling. The remaining 56% concerned mainstream products and services.[78] The latter spanned industries like telecommunications, automobiles, entertainment and retail and included ads for well-known brands like Lufthansa, AirAsia, Nissan, Hyundai, Religare (an Indian financial services group) and Flipkart (a popular Indian online retail website).[79]

The study blamed the appearance of such ads on the way digital advertisers function. The study reported that up to 85–90% of the digital advertising budget of brands was spent on search engines, social media and legitimate livestreaming platforms. However, the remaining amount was funnelled by ad agencies or marketing teams to "ad networks that provide cheap and efficiency driven media campaigns", such as Google AdSense, DoubleClick (a subsidiary of Google), PopAds, Propeller Ads, BlueKai, AppNexus and Lotam.[80] These networks typically operate on a cost-per-click basis and exercise low levels of control.[81] This means, for example, that an ad for Lufthansa placed through such networks may appear on a pirate website offering a copy of the newest *Avengers* film, rather than a news website, if the former attracts 100,000 visitors a day, while the latter attracts 10,000 a day.

In a report titled *How Google Fights Piracy*, Google has stated that it "takes the challenge of online piracy seriously" and is "a leader in rooting out and ejecting rogue sites" from ad networks.[82] Google has claimed that it has terminated over 11,000 AdSense accounts for copyright violations.[83] However, the FICCI-SIPI study found that Google and DoubleClick collectively provided ad network services to over half the sample websites in the study, with AdSense supplying nearly 20%.[84] This may suggest that either Google has not devoted much attention to concerns of

[78] FICCI & SIPI, *supra* note 35, at pp. 4–5.

[79] Ibid at 40–42.

[80] Ibid at 6.

[81] Ibid.

[82] Google, How Google Fights Piracy 9 (2016). https://drive.google.com/file/d/0BwxyRPFduTN2TmpGajJ6TnRLaDA/view

[83] Ibid at pp. 4, 16.

[84] FICCI & SIPI, *supra* note 35, at p. 7.

Indian copyright owners or that the sheer scale of piracy means that AdSense accounts violating copyright keep proliferating rapidly. Either way, it clearly demonstrates that income is generated from the piracy of Indian films. While this income, as demonstrated by the FICCI-SIPI study, only draws a small chunk of the digital advertising budget of corporations, it may be considered large in relation to the minimal investment made by pirate websites and the large number of viewers such websites may attract (thus maximising returns from a cost-per-click ad policy).

Yet, even if Google and reputed brands address the problem more seriously and choke funding for pirate websites, it is important to remember that, per the FICCI-SIPI study, almost half the ads were from dodgy businesses. In India, for example, pornography is technically illegal, while gambling is banned in virtually every Indian state. It is doubtful whether a pornography or gambling website would be as conscious of its brand reputation and prestige as a mainstream corporation would. For such businesses, pirate websites may actually be the best way to advertise their products and services to the youth. Thus, attempting to curb piracy by throttling ad revenues may only be a partly successful strategy.

6 Conclusion

The chapter began by drawing attention to the fact that there are limits to how the law can curb online piracy. Enforcement in India presents additional obstacles. In this context, rights owners have carved out website-blocking injunctions as a convenient strategy, which has certainly yielded benefits. Nevertheless, this is still not an ideal remedy. In the absence of judicial authority, especially a Supreme Court decision, laying down the exact criteria for blocking websites in entirety versus specific infringing pages, it is still open to judges to be cautious and insist on blocking specific infringing pages only. In such a situation, a pirate can easily migrate to a different, unblocked page within the same website. Furthermore, even if judges block websites in entirety, this can still allow the blocked website to shift to a different website altogether. For example, a pirated music website blocked by the Calcutta High Court did precisely this. The court ordered the blocking of the website www.songs.pk, with the rider that the "order of blocking should be confined to" that specific website and "should not otherwise interfere with internet service".[85] The website subsequently migrated to the website www.songspk.pk.[86] In the time that a rights owner approaches a court for a second time to block a new website, a substantial amount of piracy may already have occurred.

[85] Sagarika v. Dishnet, Civil Suit 23 of 2012 (Cal. H.C., Jan. 27, 2012).

[86] Saxena, A. 2012. Songs.Pk Relaunched as Songspk.pk. Mediaama http://www.medianama.com/2012/03/223-songs-pk-relaunched-as-songspk-pk-ad-networks

Additionally, questions should be raised about the manner in which legitimate websites, such as www.archive.org., were blocked. Although it is probable that many judges are not expert Internet users and tend to give plaintiffs the benefit of doubt, the blocking of legitimate websites can constitute a violation of consumer rights and even a violation of the right to freedom of expression.

Amidst this dilemma, rights owners can perhaps explore non-litigious strategies as a more efficient and less contentious measure. For instance, online piracy is increasingly being viewed as a money laundering and tax evasion issue, where pirates profiting from advertisements can use payment gateways to stay anonymous. In the UK, the government has established the Police Intellectual Property Crime Unit (PIPCU). The PIPCU performs a range of anti-piracy functions, notable among which are efforts to disrupt the revenue stream of pirate websites.[87] Recently, following reports of the widespread piracy of Telugu-language films, the state of Telangana in India established the Telangana Intellectual Property Crime Unit (TIPCU), modelled on the PIPCU.[88] Following Telangana, the state of Maharashtra (which is home to Bollywood) announced the establishment of the Maharashtra IP Crime Unit (MIPCU).[89] By bypassing courts and working with police officials likely to be more knowledgeable about cybercrime and technology, the industry can possibly counter piracy more efficiently.

Another strategy for rights owners could be to approach the Advertising Standards Council of India (ASCI), a self-regulatory body monitoring misleading advertisements, and alert well-known corporations to the problem of their advertisements appearing on pirate websites. Legally, there is no requirement regarding the medium through which traders can advertise their products in India, and the matter would not directly be under the ASCI's ambit. But this does not preclude rights owners from lobbying with the ASCI to initiate discussion among advertisers. In the USA, a joint effort by the Association of National Advertisers, the American Association of Advertising Agencies and the Interactive Advertising Bureau has resulted in the formation of the Trustworthy Accountability Group. This initiative has, according to one study, significantly reduced ad revenues for pirate websites in the USA, curbing revenues by over US$ 100 million.[90] Possibly, the ASCI could initiate a similar measure.

[87] Weatherley, *supra* note 33, at 7–9.

[88] TIPCU to Tackle Online Piracy. 2016. The Hindu. http://www.thehindu.com/news/national/andhra-pradesh/tipcu-to-tackle-online-piracy/article8771496.ece

[89] Parmar, M. 2017. FICCI Frames'17. Maharashtra to form IP Crime Unit to fight online piracy. Indian Television. TIPCU to Tackle Online Piracy, THE HINDU, June 25, 2016, http://www.thehindu.com/news/national/andhra-pradesh/tipcu-to-tackle-online-piracy/article8771496.ece

[90] Ernst & Young, Measuring Digital Advertising Revenue to Infringing Sites. (2017) https://www.tagtoday.net/hubfs/Measuring%20digital%20advertising%20revenue%20to%20infringing%20sites.pdf?t=1518474032751

Yet another strategy for rights owners could be to tackle what is arguably the elephant in the room—Google and its ad networks. Recently, Google has initiated measures to block hate speech websites and prevent advertisements from showing up on these websites. This measure was taken under pressure from corporations displeased at their advertisements inadvertently appearing on such websites.[91] Copyright owners could enter into discussion with Google for similar technological measures with respect to pirated content. However, copyright infringement is undoubtedly viewed much less seriously than hate speech. Moreover, unlike hate speech, there is a greater degree of acceptance and participation among youth in the consumption of pirated content.

In the end, online piracy is best tackled through a series of measures. However, as this chapter has pointed out, rights owners must be realistic about the limitations of each measure and thus at best only hope to curb the extent of piracy.

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[91] Solon. O. 2017. Google's bad week: YouTube loses millions as advertising row reaches US. Guardian. https://www.theguardian.com/technology/2017/mar/25/google-youtube-advertising-extremist-content-att-verizon

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Continued Economic Benefit to the Author: Royalties in the Indian Film Industry – Historical Development, Current Status, and Practical Application

Renuka Medury

Abstract

The chapter traces the stance that Indian copyright law has adopted on the issue of royalty payments to authors of literary and musical works, through the years. It delineates the court judgments that have exerted a significant impact on the subject, the development of the law, and the practical realities and application of the law. The first part of the chapter details the structuring of music production deals in India. The next section explores the relevant judicial precedents and the issues with the copyright societies in India. The third section traces the amendments introduced in 2012, thereby changing the royalties landscape, and the last part assesses the aftermath of these amendments.

The chapter is specific to the Indian law on the subject of royalties and the significance of royalties given the massive scale at which content, i.e., movies, television programs, and now web-based content, is produced and exploited in India. Music production has continued to play an important role in the realm of content production and distribution in India ("In its 103-year-old history, songs have been an integral part of Hindi movies ever since the first talkie, Alam Ara, released in 1931. Over the years, apart from their cultural and aesthetic significance, songs have added tremendous business value to films. …. The industry believes that songs become the identity of films in India, especially due to a marketing culture that relies on film stars and little else." Is Bollywood still wary of 'song-less' films? Mint (April 21, 2016).), and music production, as detailed in the chapter, assumed immense significance in the context of the statutory royalties introduced vide the amendments to the Indian copyright law in 2012.

R. Medury (✉)
ARCIALA, School of Law, SMU, Singapore, Singapore

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_9

Keywords
Copyright royalties · Indian copyright · Content exploitation · Equal royalties · Independent copyright · Copyright societies · Copyright amendments

1 Introduction

> …. one of the plain objectives of the proposed legislation is to ensure that the authors of the works, in particular authors of songs included in cinematograph films or sound recordings, receive royalty for the commercial exploitation of such works.[1]

The importance of music in cinematograph films created in India cannot be overstated. Many films produced in India are identified by the music. A lot of the music that is created in connection with cinematograph films in India is actually incorporated in the films, interspersed at regular intervals throughout the progression of the story. Hence, music holds a special significance in the context of content, in particular, Indian cinema.

Given the immense popularity of film music in India, it is unimaginable that the creation of music and accompanying lyrics would not constitute a lucrative business for the authors of these works. However, a close scrutiny of the status quo establishes that while the musical composition and the lyrics are the intellectual work of the respective authors, the substantial remuneration that accrues from the exploitation of the music actually flows to entities that may have procured the rights to it for a monetary consideration without any intimate involvement in the creative process.

This chapter explores the laws relating to equitable remuneration or "royalties" as the term is understood and used under the Indian copyright law. In particular, it explores the historical position on royalties, the current law on the subject, and the continuing complexities. At the outset, it is appropriate to clarify that the statutory concept of royalties was introduced in the Indian copyright law only in the year 2012. Hence, while prior to 2012, the payment of royalties was recognized as a requirement and an entitlement; there was no statutory mandate on it.

2 Music Deals: Indian Context

Each piece of music amalgamates several independent works. It includes the musical works composed by a music composer and the lyrics authored by a lyricist unless the music constitutes the background score for the particular cinematograph film. The musical work and literary work are fused together in a sound recording by the producer of the sound recording. This sound recording is usually incorporated in

[1] Paragraph 10.20, Clause 7: Section 19: "Mode of Assignment," Two Hundred Twenty-Seventh Report on the Copyright (Amendment) Bill, 2010, Rajya Sabha Secretariat.

the cinematograph film. The musical work, the literary work, the sound recording, and the cinematograph film each constitute a separate and independent class of work. The definition of a "work" as detailed in the Copyright Act, 1957 ("Act"), disambiguates this conceptual differentiation.[2]

While certainly not all, but a large part of the music in India is for incorporation in films or other forms of content such as television programs or web series. The structure of music deals in the Indian film industry[3] usually involves the following processes:

1. The producer of the film "commissions" the music composer to create the musical composition and enters into a separate agreement for the lyrics, whereby the lyricist is similarly commissioned to author the lyrics.
2. The music composer and lyricist are required to assign all their rights in the musical compositions and lyrics to the producer.
3. The music composer is also delegated the responsibility of creating the sound recording for each song and delivering this to the producer. The rights in the sound recordings are assigned to the producer.
4. The music composer is also delegated the responsibility of procuring appropriate assignment of rights from the various singers, musicians, who render services in relation to a particular song.
5. The producer of the film assigns the rights in the songs to a music label that ultimately exploits the music rights in a film.

The spectrum of rights that is assigned to the producer of the film, and subsequently to the music label, usually assumes the format of an "all inclusive" assignment including all rights of exploitation and the entire copyright in the music. The music label is hence entitled to exploit the music through all modes and mediums of exploitation, including those that are only anticipated to be invented at a future date. The constant evolution and development of technology have expanded the scope of the modes through which music can be exploited. While earlier, the most commonly used medium for accessing and listening to music in India was the radio, cassettes, and later compact discs, in the present day the most ubiquitous medium is digital platforms. It is also important to bear in mind that digital platforms have supplemented, not supplanted radio and compact discs, which continue to be used by many people in India. Further, music companies also exploit the songs in audio-visual format, through authorizing various television and digital platforms to exhibit either the full-length songs or snippets from the songs.

[2] Section 2(y) of the Act provides that "work" means any of the following works, namely—(i) a literary, dramatic, musical, or artistic work; (ii) a cinematograph film; and (iii) a sound recording.

[3] While this chapter refers to the "Indian film industry," it is important to note that there is no "a" Indian film industry. Bollywood is undoubtedly India's most prominent and internationally recognized film industry. However, apart from Bollywood, there are several regional film industries in different parts of India.

The equal right to royalties[4] accruing from exploitation of literary and musical works arose in the context of the rampant monetization of music by producers of films and music companies and the concomitant exclusion of music composers and lyricists, from a share in this commercialization. The amendments introduced in 2012 to the Act attempted to address three interrelated concerns of authors of literary and musical works incorporated in cinematograph films and sound recordings:

1. Authors would be entitled to receive an equal share of royalties each time the works are exploited as part of a cinematograph film, except in the case of distribution of the film in a cinema hall or in a sound recording not forming part of a cinematograph film. The royalties would be payable regardless of the medium of exploitation.
2. The assignment of the copyright in the works cannot be construed to extinguish the author's right to receive royalties accruing from the exploitation of such works. While the copyright can be assigned, the right to receive royalties cannot be assigned by the author to any person other than to the author's heirs or a copyright society for collection and distribution of royalties.
3. The proviso to Section 18 of the Act, introduced vide the 2012 amendments, sought to restrict an assignment of copyright in respect of unforeseen modes and mediums of exploitation[5]: "Provided further that no such assignment shall be applied to any medium or mode of exploitation of the work which did not exist or was not in commercial use at the time when the assignment was made, unless the assignment specifically referred to such medium or mode of exploitation of the work." The intent behind the amendment was to ensure a guaranteed stream of royalties to authors upon the advent of new technological formats. "In short, the amendments in section 18 will protect interests of authors in the event of exploitation of their work by restricting assignments in unforeseen new mediums and henceforth author of works in films will have right to receive royalties from the utilization of such work in any other form except to the legal heirs or to a copyright society and any other contract to the contrary shall be void.[6]"

However, since the proviso referred to an "assignment," contracts have employed a "license" from the author to such future modes and mediums.

[4] Introduced vide the Proviso to Section 18 of the Copyright Act, 1957, through the amendments enacted in 2012. Please see infra Note 32.

[5] The historical precedent to the introduction of the proviso was the withholding of "ringtone" related royalties to authors of literary and musical works, a format of music exploitation that garnered immense popularity in India in the early 2000s; see Prashant Reddy T., The Background Score to the Copyright (Amendment) Act, 2012, 5 NUJS L. Rev. 469 (2012).

[6] Paragraph 9.18, Clause 6: Section 18: Assignment of Copyright, Two Hundred Twenty-Seventh Report on the Copyright (Amendment) Bill, 2010, Rajya Sabha Secretariat.

3 Historical Perspective

3.1 Judicial Backdrop to the Amendments

An oft-used argument by producers of cinematograph films to deny royalties to authors related to the commissioned status of the works created by such authors. A work is considered to be "commissioned" under the Act if it is created at the instance of another person. Section 17 of the Act encapsulates the principle of "commissioned" works. The relevant portion of the erstwhile provision as it read prior to the amendments in 2012 is reproduced below:

> (b) subject to the provision of clause (a), in the case of a photograph taken, or a painting or portrait drawn, or an engraving or a cinematograph film made, for valuable consideration at the instance of any person, such person shall, in the absence of any agreement to the contrary, be the first owner of the copyright therein.[7]

The provision operated to vest first ownership of the identified classes of works in the person who extended "valuable consideration" and at whose "instance" the cinematograph film was made.[8] Since one of the enumerated classes of works was cinematograph films, producers of such works argued that the entire copyright in the underlying works, such as musical works and literary works, incorporated in a cinematograph film, was owned by the producer by virtue of the qualifying status of the film as a commissioned work. It is perhaps apposite to explain here that under the Indian copyright laws, authorship and ownership of a work are bifurcated. An author of a work may not be the first owner of the work in all instances. The general proposition is that the author is also the first owner of the work. However, this general principle is defeated in cases of a work created in the course of employment and in the cases of commissioned works.[9] Producers of cinematograph films used the "commissioned" status of the films to argue that by implication, authors were also

[7] Section 17(b) of the Act as last amended by Act No. 49 of 1999.

[8] Section 17(b) of the Act as last amended by Act No. 49 of 1999.

[9] See Section 17 of the Act (reproduced in part):"First owner of copyright.—Subject to the provisions of this Act, the author of a work shall be the first owner of the copyright therein: Provided that—(a) in the case of a literary, dramatic or artistic work made by the author in the course of his employment by the proprietor of a newspaper, magazine or similar periodical under a contract of service or apprenticeship, for the purpose of publication in a newspaper, magazine or similar periodical, the said proprietor shall, in the absence of any agreement to the contrary, be the first owner of the copyright in the work in so far as the copyright relates to the publication of the work in any newspaper, magazine or similar periodical, or to the reproduction of the work for the purpose of its being so published, but in all other respects the author shall be the first owner of the copyright in the work;(b) subject to the provisions of clause (a), in the case of a photograph taken, or a painting or portrait drawn, or an engraving or a cinematograph film made, for valuable consideration at the instance of any person, such person shall, in the absence of any agreement to the contrary, be the first owner of the copyright therein; (c) in the case of a work made in the course of the author's employment under a contract of service or apprenticeship, to which clause (a) or clause (b) does not apply, the employer shall, in the absence of any agreement to the contrary, be the first owner of the copyright therein.".

divested of their right to receive royalties, in conjunction with the copyright in their works, to the producer of the film who would be deemed the first owner of the film including all works incorporated therein. The stance employed by the producers was bolstered by a decision of the Supreme Court of India in Indian Performing Right Society Ltd. v. Eastern India Motion Pictures Association.[10] The Indian Performing Right Society (IPRS)[11] instituted an appeal against the order of the Calcutta High Court which held that the producer of a film could oust the first ownership of the literary or musical works incorporated in a cinematograph film, by the authors of such works, in cases where the film constituted a commissioned work under Section 17(b) of the Act:

> In our opinion, therefore, when a composer of lyric or music composes for the first time for valuable consideration for purposes of a cinematograph film, the owner of the film at whose instance the composition is made, becomes the first owner of the copyright in the composition. The composer acquires no copyright at all either in respect of the film or its sound track which he is capable of assigning.[12]

The Supreme Court affirmed the decision of the Calcutta High Court. The Supreme Court held that when a literary or musical work is commissioned by a producer for incorporation in a cinematograph film, the copyright in the entire film, including the underlying literary and musical works, vests with the producer by virtue of Section 17 of the Act:

> This takes us to the core of the question namely, whether the producer of a cinematograph film can defeat the right of the composer of music … or lyricist by engaging him. The key to the solution of this question lies in provisos (b) and (c) to section 17 of the Act reproduced above which put the matter beyond doubt. According to the first of these provisos viz. proviso (b) when a cinematograph film producer commissions a composer of music or a lyricist for reward or valuable consideration for the purpose of making his cinematograph film, or composing music or lyric therefore i.e. the sounds for incorporation or absorption in the sound track associated with the film, which as already indicated, are included in a cinematograph film, he becomes the first owner of the copyright therein and no copyright subsists in the composer of the lyric or music so composed unless there is a contract to the contrary between the composer of the lyric or music on the one hand and the producer of the cinematograph film on the other…. It is, therefore, crystal clear that the rights of a music composer or… lyricist can be defeated by the producer of a cinematograph film in the manner laid down in provisos (b) and (c) of section 17 of the Act.[13]

[10] 1977 AIR 1443. "The Cinematograph Exhibitors Association of India also filed objections challenging the right of the IPRS to charge fees and royalties in respect of performance in public of the musical works incorporated in the sound track of the films. Besides raising contentions identical to those raised by various associations of producers they averred that copyright in a cinematograph film which vested in the producers meant copyright in the entirety of the film as an integrated unit including the musical work incorporated in the sound track of the film and the right to perform the work in public…".

[11] IPRS is the primary copyright society in India for literary and musical works. It issues licenses and collects and distributes royalties, in respect of literary and musical works.

[12] Paragraph 33, Eastern India Motion Pictures Association v. Indian Performing Right Society Ltd. AIR 1974 Cal 257.

[13] Indian Performing Right Society Ltd. v. Eastern India Motion Pictures Association 1977 AIR 1443. Paragraph 18 of the decision as sourced from Manupatra.

The argument adopted by producers was clearly anomalous given that the "right to receive royalties" is not recognized by the Act as a right flowing from the copyright in a work. Section 14 of the Act[14] details the rights that are construed to be included in the copyright in a work. The right to receive royalties is conspicuously absent from rights enumerated in Section 14. Hence, the right to receive royalties is deducible from the factum of authorship, i.e., it is attendant upon the authorship of a work and not the copyright in a work.

Further, the argument also overlooks the distinction created between the various classes of works in Section 13 of the Act. Section 13 clarifies that literary works, musical works, cinematograph films, and sound recordings are separate classes of works and copyright subsists in each work. The erstwhile Section 17(b) of the Act refers to the commissioning of a cinematograph film, not the independent works that are incorporated in it. The cinematograph film, as a whole, is owned by the person who commissioned it. Conceptually, the provision is inextricably linked to the distinction between the author and the first owner of a work under the Act. Section 2(d)[15] of the Act states that the author of a cinematograph film is the producer of the film. However, by virtue of Section 17(b), the first owner of the cinematograph film could be a person other than the producer, i.e., the person at whose instance and consideration the film was made.

The bifurcation becomes clear when the definitions in the Act are viewed in the context of the reality of film production deals in India. Section 2(uu)[16] of the Act defines a "producer" as a person who takes the initiative and responsibility for making the cinematograph film. The structure of film production deals in India involves multiple parties, frequently commencing at the instance of an entity that possesses the financial resources to commission the development of the film, and this entity usually delegates the responsibility of completing the film to a production house. Since the production house assumes the actual responsibility and initiative for making the film, the production house is recognized as the "producer" under Section 2(uu) of the Act. Conversely, given that the film is made at the instance of and with the aid of the consideration advanced by the financing entity, this entity is ultimately construed to be the "first owner" of the film under Section 17 of the Act.

[14] Section 14(a) of the Act elucidates the various rights comprised in the copyright vesting in a literary or musical work, these include "(i) to reproduce the work in any material form including the storing of it in any medium by electronic means; (ii) to issue copies of the work to the public not being copies already in circulation; (iii) to perform the work in public, or communicate it to the public; (iv) to make any cinematograph film or sound recording in respect of the work; (v) to make any translation of the work; (vi) to make any adaptation of the work; (vii) to do, in relation to a translation or an adaptation of the work, any of the acts specified in relation to the work in sub-clauses (i) to (vi);.

[15] "author" means,—(i) in relation to a literary or dramatic work, the author of the work; (ii) in relation to a musical work, the composer; (iii) in relation to an artistic work other than a photograph, the artist; (iv) in relation to a photograph, the person taking the photograph; (v) in relation to a cinematograph film or sound recording, the producer; (vi) in relation to any literary, dramatic, musical or artistic work which is computer-generated, the person who causes the work to be created" Section 2(d), The Copyright Act, 1957.

[16] "'producer', in relation to a cinematograph film or sound recording, means a person who takes the initiative and responsibility for making the work" Section 2(uu), The Copyright Act, 1957.

While the law reflects the realities of film production in India through conferring appropriate legal status on the various parties involved, the argument advanced by producers and related entities conflates the cinematograph film with the literary and musical works incorporated in it. Ostensibly, the literary and musical works are created for incorporation in the film. However, as stated earlier, under Section 13 of the Act, each work constitutes a separate and independent work. Section 14 delineates the various rights associated with the copyright in each work. Hence, while the cinematograph film in totality is owned by the person that commissioned it, the various works comprised in it continue to retain their independent status and would continue to be owned by the author unless expressly assigned to the producer or the commissioning entity by the author. It is arguable to presuppose that to the extent that the literary and musical works are synchronized in the cinematograph film, they are owned by the commissioning entity to the extent of their synchronization, but to extend the argument to all other rights devolving from the copyright in a work would be counterintuitive to the independent status afforded to each class of work under the Act.[17]

A similar question was raised in Indian Performing Right Society Ltd. v. Aditya Pandey & Ors.,[18] wherein the Delhi High Court considered whether the underlying literary and musical works are also performed each time that a sound recording is performed. The court concluded that when a sound recording is communicated to the public, there is no separate communication of the underlying literary and musical works, since the sound recording fuses the underlying works during the process of production of the eventual sound recording:

> when a sound recording is communicated to the public by whatever means, it is the whole "work" i.e. the lyrics, the score, the collocation of sounds caused by the equipment and the capturing of the entire aural experience which is communicated. The musical or literary work, which is the subject matter of the copyright under Section 14(a) of the Act, per se is not communicated or broadcast; nor is there a method of separating that element, while communicating the entire work, i.e. the sound recording, to the public. The recognition afforded by the Parliament to the content of sound recording itself suggests that the content of a sound recording is perceived in law, as different from that of a musical or literary work, though there may be a coalescence of the two, but not necessarily so, all the time. It is, therefore, unjustified to say that when a sound recording is communicated to the public by way of a broadcast the musical and literary work is also communicated to the public, through the sound recording.

The Delhi High Court hence ruled that a separate license is not required to be procured each time that the sound recording is communicated to the public since there is no separate communication of the underlying literary and musical works.

[17] "It may not be out of place to mention here that Section 17 of the Act specifies the only instances where an author, although engaged under a 'contract for services', loses copyright. Those are the instances of taking photograph, drawing painting or portrait, engraving and making cinematograph film." Gee Pee Films Pvt. Ltd. v. Pratik Chowdhary and Ors., 2002 (24) PTC 392. Paragraph 16 of the decision as sourced from https://indiankanoon.org/doc/1245689/

[18] CS (OS) 1185/2006 and I.A. Nos. 6486, 6487, 7027/2006 and CS (OS) 1996/2009 and I.A. No. 13692/2009. Paragraph 49 of the decision as sourced from Manupatra.

The court also discussed the counteractive provision contained in Section 13(4) of the Act, which essentially states that the copyright in a cinematograph film or a sound recording has no effect on the separate copyright comprised in the underlying works that form a part of the cinematograph film or sound recording.[19] The court, however, dismissed the argument that the clarification enunciated in Section 13(4) could be interpreted to posit a requirement that a separate license from the authors of the underlying literary and musical works would have to be procured each time that a sound recording is communicated. The court's decision was reached based on the reasoning of the Supreme Court in Indian Performing Right Society Ltd. v. Eastern India Motion Pictures Association[20]:

> In other words, the author (composer) of a lyric or musical work who has authorised a cinematograph film producer to make a cinematograph film of his work and has thereby permitted him to appropriate his work by incorporating or recording it on the sound track of a cinematograph film cannot restrain the author (owner) of the film from causing the acoustic portion of the film to be performed or projected or screened in public for profit or from making any record embodying the recording in any part of the sound track associated with the film by utilising such sound track or from communicating or authorising the communication of the film by radio-diffusion, as Section 14(1)(c) of the Act expressly permits the owner of the copyright of the cinematograph film to do all these things.

Recently, the Supreme Court affirmed the decision of the Delhi High Court in Indian Performing Right Society Ltd. v. Aditya Pandey & Ors., with an additional stipulation that subsequent to the enactment of the amendments to the Act in 2012, the authors of literary and musical works incorporated in sound recordings would remain entitled to receive an equal share of royalties accruing from the utilization of the sound recordings.[21]

3.2 The Problems with Copyright Societies in India

The amendments enacted in 2012 were also devised as reactionary measures to the denial of royalties and mismanagement of copyright societies in India by music labels. The parliamentary report on the Copyright (Amendment) Bill, 2010, noted the following in relation to the division of interests and inefficient functioning of copyright societies:

> The Committees notes that there are inherent problems in the administration and functioning of copyright societies which have been continuing since long. Situation has deteriorated

[19] Section 13(4) of the Act provides "The copyright in a cinematograph film or a sound recording shall not affect the separate copyright in any work in respect of which or a substantial part of which, the film, or as the case may be, the sound recording is made."

[20] 1977 AIR 1443. Paragraph 16 of the decision as sourced from Manupatra.

[21] International Confederation of Societies of Authors and Composers v. Aditya Pandey & Ors. CIVIL APPEAL NOs. 9412-9413 OF 2016. Though the suit was decided post the 2012 amendments to the Act, the law was applied as it existed prior to the effective date of the amendments given that the suit was pending prior to the introduction of the amendments.

> to such an extent that the owners of works/music companies are dominating these societies denying equity shares to the performers/authors. The basic reason for such a dismal scenario is obviously entirely different considerations and interests of the owners and authors.[22]

The primary copyright societies in India are the IPRS, which grants licenses for and collects and distributes royalties in respect of literary and musical works, and the Phonographic Performance Limited (PPL), which deals with rights in sound recordings. There was, and continues to remain, a clear demarcation between the repertoire of works managed by both the societies. While the IPRS managed the literary and musical works underlying sound recordings, the PPL managed the sound recording itself. However, the music labels which controlled the PPL, as owners of sound recordings, succeeded in ousting the authors of literary and musical works from the governing body of the IPRS, leading to an establishment of control over both the IPRS and PPL by the music labels.[23]

Following the exclusion of authors from the governing body of the IPRS, the payment of royalties to authors effectively ceased. A series of notices were addressed by the government to the IPRS demanding an explanation on the cessation of the payment of royalties to authors:

> The undersigned is directed to forward a complaint dated 20.12.2010 and 26.12.2010 received by this Ministry from 28 authors and music composers regarding illegalities with respect to administration of Indian Performing Rights Society (IPRS) and non-disbursement of royalties due to them. It has been alleged in the above complaints by these authors and music composers that IPRS is illegally distributing the royalties due to them to its other members.[24]

The emergence of new modes of exploitation of works exacerbated the issues of the authors. With the rise in popularity of ringtones, authors expected a concomitant increase in the royalties since each time that a ringtone was utilized, royalties were payable to the authors of the literary and musical works and to the owners of such works.[25] However, the IPRS claimed that it had assigned the right to grant rights with respect to the utilization of works for ringtones to the PPL, which was managed by music labels:

> Sometime in 2004, IPRS inexplicably and certainly at the behest of its Music Company members decided to terminate existing mobile distribution agreements executed with third

[22] Paragraph 16.11, Clause 22: Section 35: Control Over the Copyright Society by the Owner of Rights, Two Hundred Twenty-Seventh Report on the Copyright (Amendment) Bill, 2010, Rajya Sabha Secretariat.

[23] Supra Note 7, p. 502.

[24] Notice dated January 14, 2011, Complaints by some lyricists and composers regarding illegalities with respect to administration of Indian Performing Rights Society (IPRS), Copyright Division, Department of Higher Education, Ministry of Human Resource Development, Government of India, F. No: 10/2/2010/CRB.

[25] Authors were at the time entitled to 50% of the royalties, whereby 30% was paid to the music composer and 20% to the lyricist. The basis was the 1993 MOU between IPRS and authors. Letter dated December 26, 2010, addressed to Mr. G.R. Raghavendra, Registrar of Copyrights.

party aggregators. It was discovered much later that the said rights were in fact handed over completely without sanction of the author or composer members to the Phonographic Performance Limited or PPL as it is referred to normally and/or the Indian Music Industry or IMI which is the association of the Music Companies.[26]

4 The New Royalties Regime

The 2012 amendments to the Act aimed to usher in a new regime of royalty collection and distribution and to ameliorate the existing condition of authors with respect to royalty payments. The most prominent contribution of the amendments was the introduction of an unwaiveable right to receive royalties[27] by authors of literary and musical works forming part of cinematograph films and sound recordings.[28] The new royalties provision was modelled on the authors' remuneration provision contained in the EC Rental Rights Directive.[29] Article 4 of the aforesaid Directive encapsulates the following principles:

(i) It assures authors of an equitable remuneration.
(ii) The right to equitable remuneration cannot be waived by the authors.
(iii) The administration of the right may only be entrusted to a collecting society.[30]

[26] Letter dated December 26, 2010, addressed to Mr. G.R. Raghavendra, Registrar of Copyrights.

[27] It is important to note that there is no affirmative right to receive royalties in the Act. The right is only deducible from the restriction on authors from assigning or waiving their equal share of royalties, as incorporated in provisos to Section 18 of the Act vide the 2012 amendments.

[28] The right was in the form of an unwaiveable entitlement to an equal share of royalties to authors of literary and musical works incorporated in a cinematograph film and to authors of literary and musical works incorporated in sound recordings to the extent that such sound recordings did not form part of or were exploited independent of a cinematograph film.

The provisions were incorporated in provisos to Section 18 of the Act and read as follows:

Provided also that the author of the literary or musical work included in a cinematograph film shall not assign or waive the right to receive royalties to be shared on an equal basis with the assignee of copyright for the utilization of such work in any form other than for the communication to the public of the work along with the cinematograph film in a cinema hall, except to the legal heirs of the authors or to a copyright society for collection and distribution and any agreement to contrary shall be void:

Provided also that the author of the literary or musical work included in the sound recording but not forming part of any cinematograph film shall not assign or waive the right to receive royalties to be shared on an equal basis with the assignee of copyright for any utilization of such work except to the legal heirs of the authors or to a collecting society for collection and distribution and any assignment to the contrary shall be void.

[29] 92/100/EEC.

[30] The model was envisaged as a panacea to the unequal bargaining powers of authors in comparison with production houses and music labels. Silke von Lewinski, Collectivism and its role in the frame of individual contracts, Max Planck Institute for Intellectual Property and Competition Law, downloaded from Elgar Online, p. 117.

Under the 2012 amendments to the Act, royalties accrue and become payable only upon the utilization of the work. If the work is merely incorporated in a cinematograph film or a sound recording, no royalties become payable unless such work is also communicated to the public as part of the cinematograph film or sound recording. Further, royalties are not payable if the work is communicated as part of a cinematograph film in a cinema hall. It is interesting to note that when the Copyright (Amendment) Bill, 2010, was under deliberation, the proposed language omitted "in any form other than for the communication to the public of the work along with the cinematograph film in a cinema hall" which forms a part of the current language of the proviso to Section 18 of the Act. The draft amendment also excluded an obligation to pay royalties incumbent upon the exploitation of the works as part of sound recordings. The proposed language[31] was amended to alleviate the concerns of the authors that excluding royalties arising on account of exploitation of works as part of cinematograph films and sound recordings would deprive the authors of an important source of revenue:

> Another objection raised by authors pertained to the inclusion of words 'other than as part of the cinematograph film' in sections 18 and 19. Impact of such an amendment would be such that authors would be denied royalties arising out of television/cable broadcast of films and even the distribution/exhibition of films on mobile platforms through 3G technology. They would also be denied their share of the normal license royalty arising out of music used in advertisement films.[32]

It is also interesting to note that the amendment introduces an unwaiveable right to royalties to authors of all literary works forming part of a cinematograph film, which may include the script and the screenplay of the film as well, apart from the lyrics forming part of the songs of the film. However, the intention, as can be gathered from the parliamentary debates on the amendments, was to enact a statutory regime for royalties owed to authors of lyrics forming part of songs. Further, currently, royalties are paid only to lyricists and music composers, and no royalties are collected or distributed to scriptwriters.[33]

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[31] "Provided also that the author of the literary or musical work, included in a cinematograph film or sound recording shall not assign the right to receive royalties from the utilization of such work in any form other than as part of the cinematograph film or sound recording except to the legal heirs or to a copyright society for collection and distribution and any agreement to the contrary shall be void." Proviso to Section 18, The Copyright (Amendment) Bill, 2010, Bill No. XXIV of 2010.

[32] Paragraph 10.10, Clause 7, Section 19: "Mode of Assignment," Two Hundred Twenty-Seventh Report on the Copyright (Amendment) Bill, 2010, Rajya Sabha Secretariat.

[33] "When a song or music is incorporated in a film, it is relating to synchronization right of author and music composer which is assigned to the producer of the film as per section 17(b) or in the absence of agreement, film producer is the first owner. However, film producer is also getting other independent rights of author and music composer of their works envisaged in section 13 of the Act. As per section 17(b), he further assigns these rights to the music companies for upfront lump-sum amount. When the film songs are performed separately and independently through TV/Radio, restaurants, airlines, auditoriums or public functions etc. film producer becomes the first owner and authors/music composers lose economic benefits of exploitation of their works to music

As a response to the circuitous argument adopted by producers and music labels that the commissioning of a cinematograph film also signified the extinguishment of all copyright ownership of the authors of the underlying works, the amendments also introduced a reiteration of the principle that the incorporation of a work in a cinematograph film cannot be construed to affect the author's independent copyright in the work.[34] From a contractual perspective, this would mean that unless the author specifically assigns all rights to the work created by such author, the rights will continue to be owned by the author.[35] The commissioning of a work for inclusion in a cinematograph film will not affect the myriad of other rights that are encompassed in the copyright owned by the author as the first owner of the work. The clarification also serves to ensure that the author's right to receive royalties pursuant to the exploitation of the work is not impacted by the commissioning of the work for incorporation in a cinematograph film.

The amendments also sought to introduce greater clarity and transparency in the operations of copyright societies. Section 33A[36] introduced by the amendments mandates that every copyright society would be required to publish its tariff scheme in the prescribed manner and that a person aggrieved by the tariff scheme could appeal to the Appellate Board. Section 35(3) alludes to the exclusion of authors from the IPRS and enunciated that the governing body of every copyright society should have an equal number of authors and owners of works.[37] Section 33(3A) also, inter alia, requires all pre-existing copyright societies to register themselves

companies who become ultimate owners of these works." Clause 6: Section 18: Assignment of Copyright, Two Hundred Twenty-Seventh Report on the Copyright (Amendment) Bill, 2010, Rajya Sabha Secretariat.

The construct of the discussions was intended to secure royalty rights to lyricists and music composers. However, a consequence of the usage of "literary works" by default scriptwriters was also encompassed.

[34] Proviso to Section 17 of the Act provides "Provided that in case of any work incorporated in a cinematograph work, nothing contained in clauses (b) and (c) shall affect the right of the author in the work referred to in clause (a) of sub-section (1) of section 13.".

[35] Reiterating the overarching principle encapsulated in Section 17 of the Act that subject to the provisions of the Act, the author will be recognized as the first owner of the work.

[36] Section 33A of the Act provides "Tariff Scheme by copyright societies.—(1) Every copyright society shall publish its tariff scheme in such manner as may be prescribed.

(2) Any person who is aggrieved by the tariff scheme may appeal to the Appellate Board and the Board may, if satisfied after holding such inquiry as it may consider necessary, make such orders as may be required to remove any unreasonable element, anomaly or inconsistency therein:

Provided that the aggrieved person shall pay to the copyright society any fee as may be prescribed that has fallen due before making an appeal to the Appellate Board and shall continue to pay such fee until the appeal is decided, and the Board shall not issue any order staying the collection of such fee pending disposal of the appeal: Provided further that the Appellate Board may after hearing the parties fix an interim tariff and direct the aggrieved parties to make the payment accordingly pending disposal of the appeal."

[37] Section 35(3) of the Act provides "Every copyright society shall have a governing body with such number of persons elected from among the members of the society consisting of equal number of authors and owners of work for the purpose of the administration of the society as may be specified.".

with the central government within a period of 1 year from the date of commencement of the amendments.[38]

5 The Aftermath of the Amendments

The copyright societies refused to comply with the dictates of the amendments.[39] Moreover, since the central government declined to re-register the IPRS and the PPL, as copyright societies, these societies utilized the denial of re-registration as a gambit to evade various investigations initiated by the government in relation to their operations and functionings.[40] An illustrative argument adopted by the IPRS is reproduced below:

> To our utter shock and surprise we were informed by an email/letter dated 25th May 2014 from Office of Retd Justice Mukuk Mudgal that an "Inquiry Officer" has been appointed in exercise of powers under Section 33 of the Copyright Act, 1957 (Act) reas with Rule 50 of the Copyright Rules 2013 (Rules) under the impression that we are still a Copyright Society within the meaning of Section 2(ffd)/Chapter VII of the Act. IPRS is a company under the Company's Act limited by Guarantee…..We have been directed to inform you by Governing Council (based on legal opinion), that we are not a Copyright Society within the meaning of Section 2(ffd) of the Act….we were to be registered on or before 21.6.2013. Since, the Central Government failed to register the Indian Performing Rights Society (IPRS) as a Copyright Society, the old Registration Certificate…. is deemed to have lapsed.[41]

[38] "The registration granted to a copyright society under sub-section (3) shall be for a period of 5 years and may be renewed from time to time before the end of every 5 years on a request in the prescribed form and the Central Government may renew the registration after considering the report of Registrar of Copyrights on the working of the copyright society under Section 36:

> Provided that the renewal of the registration of a copyright society shall be subject to the continued collective control of the copyright society being shared with the authors of works in their capacity as owners of copyright or of the right to receive royalty: Provided further that every copyright society already registered before the coming into force of the Copyright (Amendment) Act, 2012 (27 of 2012) shall get itself registered under this Chapter within a period of 1 year from the date of commencement of the Copyright (Amendment) Act, 2012." Section 33(3A), The Copyright Act, 1957.

[39] IPRS was also expelled from CISAC because of its failure to comply with CISAC's professional rules. Achille Forler, My Songs, my royalties, available at http://www.thehindu.com/todays-paper/tp-opinion/my-songs-my-royalties/article17692046.ece (March 28, 2017).

[40] Shamnad Basheer, The Day the Music Died: In the "Company" of Collusive Collecting Societies, available at https://spicyip.com/2014/10/the-day-the-music-died-in-the-company-of-collusive-collecting-societies.html (October 23, 2014).

[41] Letter dated June 2, 2014, addressed to central government, Ministry of Human Resources Development, Department of Secondary & Higher Education.

Section 33(1) of the Act also mandates that the business of issuing and granting licenses can only be undertaken by a registered copyright society.[42] As stated above, the IPRS and the PPL were denied re-registration as copyright societies. Further, entities such as Novex Communications Private Limited have been engaged in the business of granting and issuing licenses, in the capacity of private entities. Despite the lack of registration, these entities have claimed to possess the power to issue licenses in respect of the repertoire of works managed by them in their capacity as the owners of the works or the authorized agents[43] of the owners. The statutory authority for this stance has been Section 30 of the Act, which entitles the owner of the work to issue licenses in respect of the work or to designate an authorized agent to grant licenses.[44] The stance assumed by these entities was bolstered by various judgments of the courts in India, which attempted to harmonize the principles reflected in Section 30 and Section 33(1) of the Act. The Bombay High Court in M/s. Leopold Café & Stores & Anr. v. Novex Communications Pvt. Ltd.[45] ruled that that entities, not registered as "copyright societies," could issue licenses for works as "authorized agents," as long as they issued such licenses on behalf of the owner of the works:

[42] Section 33(1) of the Act provides "No person or association of persons shall, after coming into force of the Copyright (Amendment) Act, 1994 (38 of 1994) commence or, carry on the business of issuing or granting licences in respect of any work in which copyright subsists or in respect of any other rights conferred by this Act except under or in accordance with the registration granted under sub-section (3).".

[43] Novex Communications Private Limited, for instance, states that it is the authorized agent of Yash Raj Films Pvt. Ltd. "Yash Raj Films Pvt. Ltd. (YRF) has appointed M/s Novex Communications Pvt. Ltd. (Novex) as its Authorised agent as per Section 30 of copyright Act as amended where Novex is allowed to enter into non-binding Deal Terms with Third Parties (as specified in Annexure 1) to enable YRF to issue licenses to such Third Parties who wish to use the Content (Sound Recordings)…" Authorization Letter from YRF, dated January 17, 2018, available at http://www.novex.in/rights-of-novex/. Further, it states that it is the assignee of "On Ground Performance Rights" in certain other sound recordings: "…. The Assignor, as beneficial owners, hereby agree to transfer and assign the On Ground Performance Rights in respect of Sound Recordings of the Songs…." Section 2.1 of agreement dated March 9, 2017, between Shemaroo Entertainment Ltd. and Novex Communications Pvt. Ltd., available at http://www.novex.in/rights-of-novex/. "'On Ground Performance Rights' are defined as the communication of the Sound Recordings to the public during on-ground live events or in commercial establishments including but not limited to communication of such Sound Recordings in clubs, hotels, restaurants, playing of such Sound Recordings by disc jockeys like in discotheques or during on ground live events or using the Sound Recordings as a background to any other performances like dance or other performances during any ground live events, parties etc….." Section 1(c) of agreement dated March 9, 2017, between Shemaroo Entertainment Ltd. and Novex Communications Pvt. Ltd., available at http://www.novex.in/rights-of-novex/, last visited on April 5, 2018.

[44] Section 30 of the Act provides "The owner of the copyright in any existing work or the prospective owner of the copyright in any future work may grant any interest in the right by licence in writing by him or by his duly authorised agent:".

[45] SUIT (L) NO. 603 OF 2014. Paragraph 13 as sourced from https://indiankanoon.org/doc/44713127/

> It is not, I believe, the mere "carrying on of business" that is interdicted by Section 33. It is the carrying on of the business of issuing or granting licenses in its own name, but in which others hold copyright. Every agent also "carries on business", but that is the business of agency, with the functioning as such, i.e., clearly indicating that it is acting on behalf of another, one who holds the copyright. This is the only manner in which both Section 33 and Section 30 can be harmonized. An absolute bar even on agency, invoking Section 33, would undoubtedly run afoul of the plain language of Section 30 and render the words "or by his duly authorized agent" entirely otiose.

In a similar instance, the Bombay High Court ruled that the IPRS would not be precluded from granting licenses if such licenses are issued in the capacity of an owner or authorized agent of the owner of the works:

> … This means that despite existence of a registered Copyright Society, an Author/Owner is free to be not part of it and can always license his own rights/works independently. Thus, there is no restriction on owner of copyrights in issuing or granting licenses in respect of such literary and musical rights.[46]

Apart from the ability of unregistered entities to engage in the business of issuing licenses in respect of works, another concern has stemmed from the legal entitlement of such entities purporting to act as the authorized agents of the owners, to initiate infringement actions. Under Section 55 of the Act,[47] only an owner of the work or an "exclusive licensee" can undertake actions to curb infringement of works. An authorized agent is neither an owner nor an exclusive licensee of the work.[48] Recently, the Bombay High Court restrained Novex Communications Private Limited from undertaking any coercive action against a hotel chain.[49]

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[46] Indian Performing Right Society Ltd. v. Harsh Vardhan Samor, Suit (L) No. 1345 of 2015. Paragraph 7 of the decision as sourced from Manupatra.

[47] Section 55 of the Act provides "Civil remedies for infringement of copyright.—(1) Where copyright in any work has been infringed, the owner of the copyright shall, except as otherwise provided by this Act, be entitled to all such remedies by way of injunction, damages, accounts and otherwise as are or may be conferred by law for the infringement of a right." Section 54 of the Act provides: "Definition.—For the purposes of this Chapter, unless the context otherwise requires, the expression 'owner of copyright' shall include—(a) an exclusive licensee; (b) in the case of an anonymous or pseudonymous literary, dramatic, musical or artistic work, the publisher of the work, until the identity of the author or, in the case of an anonymous work of joint authorship, or a work of joint authorship published under names all of which are pseudonyms, the identity of any of the authors, is disclosed publicly by the author and the publisher or is otherwise established to the satisfaction of the Appellate Board by that author or his legal representatives."

[48] Prashant Reddy, Novex Muzzled by Bombay High Court in Recent Threats Action by Gulraj Hotels, available at https://spicyip.com/2018/02/novex-muzzled-by-bombay-high-court-in-a-recent-threats-action-by-gulraj-hotels.html, (February 13, 2018).

[49] Gulraj Hotels Pvt. Ltd. v. Novex Communications Pvt. Ltd., COMIP (L) NO. 166 OF 2018. It is pertinent to note that previously the Delhi High Court issued an order restraining the IPRS, PPL, and Novex Communications Pvt. Ltd. from issuing licenses in contravention of Section 33(1) of the Act, which requires the business of issuing and granting licenses in respect of works to be undertaken only by a registered copyright society. M/s. Event and Entertainment Management Association v. Union of India & Ors. W.P.(C) 12,076/2016.

Certain anomalies in the language of the amendments have also been exploited contractually by various parties:

1. The proviso to Section 18 does not specify which entity is responsible for the payment of the royalties to authors. The natural corollary would be that the entity utilizing the works should also assume the responsibility for payment of royalties, since the royalties become payable only upon utilization of the works. However, contractually, this lacuna has been utilized by assignees or licensees of the works to state that they are not responsible for the payment of statutory royalties. The author is, however, not asked to waive his/her right to receive royalties, since the same would violate the restriction embedded in the proviso to Section of the Act, resulting in the contract being declared void. However, simultaneously, the restriction in the proviso to Section 18 has not acted to preempt assignees or licensees from disclaiming the responsibility to pay the royalty. In many instances, the principle that has been emulated is to clarify in the contract that despite being the assignee or licensee of the works, royalties would be payable only by the entity that eventually utilizes the works.
2. When the amendments were enacted, several contracts between the assignees and authors required authors to agree that the royalties could only be collected through a registered copyright society of which the author was a member. As explained in the preceding sections, owing to the managerial control of copyright societies by the owners of the works, the societies were not distributing any royalties to authors. Further, several societies in India were not re-registered or registered at all as "copyright societies" in accordance with the requirements of the amendments. The contractual provision hence operated to practically forestall the payment of royalties to authors.
3. There is also some ambiguity surrounding what is intended by the "equal share" of royalties mandated by the proviso to Section 18. While ostensibly this would entail a one-third share to each author, i.e., the authors of the literary and musical works, forming part of the cinematograph film or sound recording, and the remaining one-third share to the assignee of the works, contractually the provision has been interpreted to mean the relegation of 50% of the share to the assignee of the works and the apportionment of the remaining 50% between the authors of the literary and musical works.

6 Conclusion: The Way Forward

The future of the royalties regime in India will be determined to a large extent by the manner in which the operations of copyright societies take shape. The IPRS recently re-registered as a copyright society.[50] The annual report of the society stated that the

[50] Prashant Reddy, IPRS Gets Re-registered as a Copyright Society – Akhtar & Saregama Bury the Hatchet, available at https://spicyip.com/2017/12/iprs-gets-re-registered-as-a-copyright-society-akthar-saregama-bury-the-hatchet.html (December 21, 2017).

governing body now includes an equal number of authors and owners of works.[51] However, the society's future course of conduct will determine its compliance with the requirements stipulated by the amendments. As a precursor to the streamlining of the collection and distribution of royalties in India, greater transparency is needed in the operations of copyright societies. Copyright societies are after all establishment for the collective management of rights, given the benefits of collective management. Further, certainty is also required in the interpretation of the several provisions introduced by the amendments to curtail the myriad explanations and applications of the provisions. The disambiguation of these provisions will undoubtedly introduce finality in an important area of copyright law in India.

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Part IV

Pharmaceutical Industry

Pharmaceutical Industry in China: Policy, Market and IP

Xiangdong Chen, Shaofang Xue, Miaochen Lv, and Ruolan Wang

Abstract

This chapter provides a three-prong investigation framework on Chinese pharmaceutical industry, namely, policy structure, market structure and IP (patent-based) structure. The Chinese pharmaceutical industry has been developing fast in market size and revenue volumes. However, the scale of Chinese pharmaceutical companies is relatively small, and the market concentration is low. Therefore, local pharmaceutical companies with higher R&D input are generally less profitable. Although there is increase in the number of patented drugs in the pharmaceutical industry in China, patents have made relatively low contribution to the industrial values, and IP held by Chinese firms is less competitive compared with that of foreign companies. Most of the pharmaceutical enterprises in China still focus on generic drugs. Market regulation of the pharmaceutical industry in China is relatively strict, especially market entry and price control. A detailed comparison between Chinese and Indian industry is given by this chapter.

Keywords

Pharmaceutical industry · Intellectual property · IP · Patented drugs · Generic drugs · China · India

X. Chen (✉) · S. Xue · M. Lv · R. Wang
School of Economics and Management, Beihang University, Beijing, People's Republic of China
e-mail: chenxdng@buaa.edu.cn

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_10

1 Approaches and Framework

The best way to understand the development of pharmaceutical industry and its ancillary industries in China is by analyzing the literature authored by the Chinese scholars and gaining insights into major research topics and findings. The data analyzed in this chapter is derived from about 60 research articles, publicly released information and PhD theses in Chinese academic journals and literature databases. We provide a three-prong investigation framework on Chinese pharmaceutical industry, namely, policy structure, market structure and intellectual property (IP) (patent-based) structure in the industries.

Prong 1 deals with government policy framework or structure for pharmaceutical industries in China, primarily market entry policy, pricing policy, monitoring and regulation policies, which may bring positive and negative influence on industrial development. Prong 2 deals with market structure of Chinese pharmaceutical industries, primarily competition and monopolistic characters, driven by multiple influencing factors. Prong 3 focuses particularly on IP (patents) resource structure in Chinese pharmaceutical industries and market.

This three-prong investigation framework is much relevant in the Chinese context, since Chinese economies have been continually developed by policy and market, where foreign investment and multinational enterprises are especially significant in pharmaceutical industry. Moreover, IP and patents in Chinese market are crucial, as in any other countries, especially emerging economies. R&D and patent resources often prove to be key for market competition.

This chapter first starts with an overview of China's pharmaceutical industry, which covers both historical development and current market characters, especially problems, in pharmaceutical industries. It then proceeds to examine the policy structure, market structure and IP (patent-based) structure in the industries. The findings about Chinese market will be compared and contrasted with Indian ones on a number of important issues before this chapter ends with a conclusion.

2 Overview of China's Pharmaceutical Industry

2.1 The Historical Development

The historical development of pharmaceutical industry in China from 1949 onwards can be summarized as below (see Table 1).

2.2 Current Status

2.2.1 Expansion of Total Industrial Scale

According to the China Statistical Yearbook, the output of China's pharmaceutical industry has been increasing year by year, from RMB 137.27 billion in 1998 to RMB 944.33 billion in 2009. Although the proportion of pharmaceutical

Table 1 The historical development of China's pharmaceutical industry (Wang 2013)

Phase	Period	Description
Founding	1949–1978	With primitive and unproductive facilities, chemical pharmaceutical industries mainly imported raw materials and then processed them into simple preparations. In 1950, China could only produce several tons of active pharmaceutical ingredients (APIs[a]). The first 5-year plan stated that "The pharmaceutical industry will focus on the development of APIs". In light of endemic and infectious diseases, the strategies adopted by China combined self-development with introduction from the Soviet Union, focusing on the development of anti-infective drugs, antipyretics, analgesics, vitamins and so on. Unfortunately, in the 1960s and 1970s, a chaotic situation developed under the influence of "Leftism", where pharmaceutical factories were managed in a disorderly manner and drugs were produced indiscriminately. In the early 1970s, DNA recombination technology began to be applied to medicine, showing a big gap with developed countries (Sun 2016)
Developmental	1978 on wards	At the beginning of opening up policy implementation, the State Pharmaceutical Administration was established, under which four state-owned pharmaceutical companies were set up to encourage medical institutions to generate profits. Thus, the number of pharmaceutical manufacturers increased rapidly, from 1000 in 1985 to 6300 in 1995. However, most pharmaceutical companies operated on a small scale, facing ubiquitous and cut-throat competition. In 1998, the State Food and Drug Administration was established to gradually regulate the development of the China's pharmaceutical industry, enforce Good Manufacturing Practice (GMP) and control the creation of new pharmaceutical companies. After the year 2000, with the influx of multinational and private enterprises, mergers and acquisitions in the pharmaceutical industry increased. In 2011, the number of pharma companies in China increased to 5674, with total turnover of RMB 1.53 trillion (or about US$243 billion in price), among which 2110 were chemical pharma companies, with revenue of RMB 0.72 trillion. The market concentration level was low (share of top 10 pharma companies accounted only 15–18% of the market), which indicates larger proportion of medium and smaller companies

[a]APIs are pharmaceutical raw materials, according to CHI (International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use) Q7A, APIs are any substance or material that can be used in pharmaceutical manufacturing, provided that the substance can be one of active composition, being pharmacologically effective in diagnostic procedure, medical treatment, and symptom release of certain disease, or influential to function or structure of human body

manufacturing industry in overall GDP dropped slightly in 2004, the industry was still showing a minor growth, from 1.63% in 1998 to 2.77% in 2009 (Liu 2012). Meanwhile, it had been also showing significant increase from 2006 to 2010, the average annual growth rate of China's pharmaceutical industry amounted to 23.9%, the fastest growing in the world. In 2010 alone, China's pharmaceutical industry achieved sales of US$ 41.1 billion, making it the third largest sales worldwide (IMS 2015).

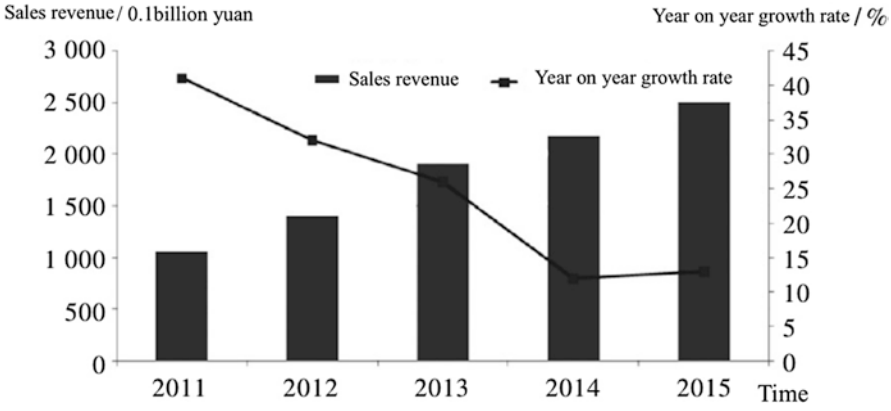


Fig. 1 China's biopharmaceutical manufacturing sales revenue (2011–2015) (Li and Yang 2016)

In 2016, the business income of large-scale industrial enterprises[1] in China's pharmaceutical industry reached RMB 2.96 trillion, an increase of 9.92% over the previous year. In the first quarter of 2017, the revenue of the listed companies in the pharmaceutical industry increased by 14.64%, an increase of 0.04% over the same period of the previous year (Chen and Wang 2017).

In the field of biopharmaceuticals, the domestic sales revenue was at a relatively high level, but the growth rate slowed down. In 2013, the gross industrial output value reached RMB 229 billion, an increase of 24.24% over the previous year; and the annual value of industrial sales reached RMB 128.6 billion, up by 17.12%. As shown in Figs. 1 and 2, in 2015, China's biopharmaceutical manufacturing revenue from product sales was RMB 186.4 billion, and the total profit was RMB 31.0 billion, up 14.8% and 21.6%, respectively, over the previous year.

According to Zhang (2009), who applied the C-D Production Function and Solow/Romer's model on empirical investigation over industrial competitive advantages in Chinese medicine manufacturing sectors, the industry was still on production factor-oriented session, which revealed that technological innovation was one of the key factors in upgrading pharmaceutical industries in China.

2.2.2 Improvement in Industrial Capacity

In terms of industrial capacities, the production of Chinese pharmaceutical companies covers APIs, intermediates, preparations, pharmaceutical excipients, pharmaceutical packaging and pharmaceutical machinery. Among them, about 1300 kinds of chemical APIs and more than 4500 kinds of preparations were manufactured.

[1] According to National Economic Industrial Classification, 2017, GB/T 4754—2017, larger-sized industrial enterprises are classified based on two basic conditions: annual turnover larger than RMB 400 million and staff number more than 1000. As an example, the tenth largest pharmaceutical companies in China in 2016, Ha Yao Manufacturing Group, achieved annual revenue of RMB 12 billion, with 407 million net profit and 198 million R&D investment, supported by 17,895 staff (http://www.hayao.com).

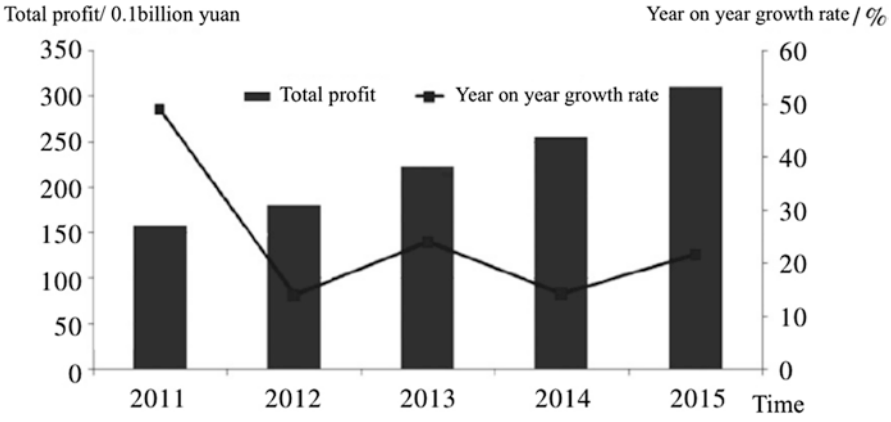


Fig. 2 China's biopharmaceutical manufacturing total profit (2011–2015) (Li and Yang 2016)

The output of chemical APIs reached 430,000 tons in 1999, of which 260,000 tons were APIs in 24 major categories. China became the second largest producer of APIs in the world. Its penicillin and P-Lactam drugs and vitamins accounted for 30% of the world's total output, making China the world's largest producer and exporter with 205.07 million tons in 2007. In biological pharmacy, China currently produces more than 300 kinds of biological products such as vaccines, toxoids, blood products and diagnostic reagents in vitro and in vivo (Liu 2012). According to recent website information, both domestic market and export market increased despite 2009 world financial crises. The trade volume in pharmaceutical and health product in China in 2017 was US$116.76 billion, increased 12.64% year-on-year, among which US$60.8 billion export, the highest growth within a 5-year interval, and US$55.88 billion import, with a growth rate of 16.34%, and US$4.9 billion trade surplus, a 34.60% drop compared with previous year (Sohu website 2018). The domestic market increase might be related to medical service reform since 2009, when RMB850 billion has been invested by government on medical social welfare system.

2.2.3 High Degree of Market Opening Up, Strong Market Shares by Foreign-Funded Enterprises

Another notable feature of China's pharmaceutical industry is its opening up to the world. According to Mu and Cai (2001), both openness and innovative capacity were basically lower than overseas companies in 2000, if measured by four-dimension models (competitiveness, competitive potentiality, competitive environment and competitive position). However, the industry has been opened up since then.

At present, the top 20 multinational pharmaceutical companies in the world have all set up joint ventures, which are transforming into holding or wholly owned business models that occupy the key regional and high-end product markets in China. There are more than 1800 joint pharmaceutical enterprises and dozens of imported pharmaceutical enterprises in China, and they account for about one third

of China's chemical market. Among the top 50 best-selling drugs on the market in China, imported drugs and joint-stock drugs account for 40 species (Wang 2008).

Multinational pharmaceutical companies have large-scale deployment of R&D centres in China, such as AstraZeneca, Eli Lilly, GlaxoSmithKline and Roche (Liu 2012).

As for opening to the world, in June 2008, the Academy of Military Medical Sciences and Phytopharm, a British company in plant medicine, signed a cooperation agreement on "NJS" (a new type of Chinese medicine) with "patent licensing", marking the first time that a Chinese patent for innovation in traditional Chinese medicine went abroad. This is also the first time that China has authorized the use of IP of Chinese medicine by international companies (Liu 2012).

2.2.4 Administration of Pharmaceutical Industries in China

Currently, the administrative oversight over pharmaceutical manufacturing industries in China involves government agencies in vertical as well as horizontal relationship, which includes National Food & Medicine Monitoring and Administration Bureau and its local sublevel branches in different regions, State Family Planning Commission, National Development and Reform Commission and Ministry of Human Resource and Social Welfare. There are responsible departments and sections within the above-mentioned government organizations.

2.3 Problems in the Development of China's Pharmaceutical Industry

2.3.1 Low R&D Investment in Pharmaceutical Companies

There are some advantages for drug R&D in China. For example, R&D investment in the chemical pharmaceutical industry is relatively low, and the cost of experimental and clinical studies on animals is only about 20% and 10%, respectively, of the cost in developed countries (Liu and Wang 2007). According to the IMS Pharmaceutical Industry Data Report, in 2007 the R&D intensity[2] in China was 1.77% on average, while the R&D intensity of top 10 pharmaceutical companies in the United States was 35.3% (IMS 2008), which may imply that Chinese pharmaceutical companies are more focusing on close-to-current-market operations, rather than longer-term drug development for future market.

According to the data of "pharmaceutical managers" in the United States in 2015, the top 50 global pharmaceutical companies invested 10% or more on R&D against their total turnover (William 2016). According to statistics from China Pharmaceutical Industry Information Centre, in 2015 only three of the top 100 China's pharmaceutical enterprises invested more than 10% in R&D.

There are three main sources of R&D funding: government, enterprises and financial institutions. By far, number 1 source is self-financing (see Fig. 3).

[2]The R&D intensity means the ratio of R&D investment over their production value by pharmaceutical enterprises.

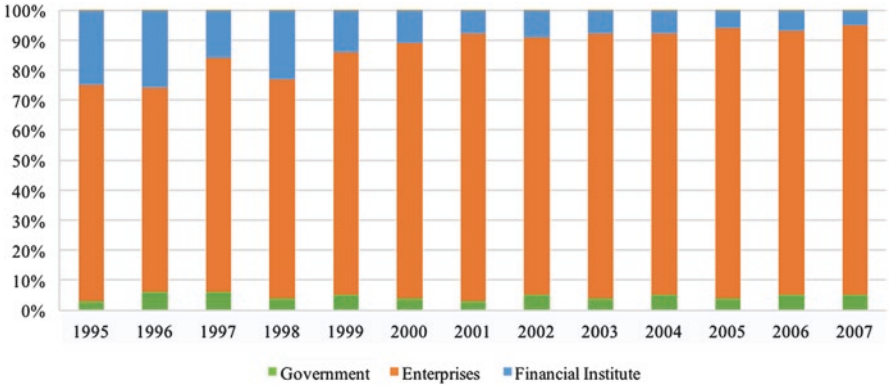


Fig. 3 Proportion of R&D sources for pharmaceutical enterprises in China (1995–2007) (Liu 2012)

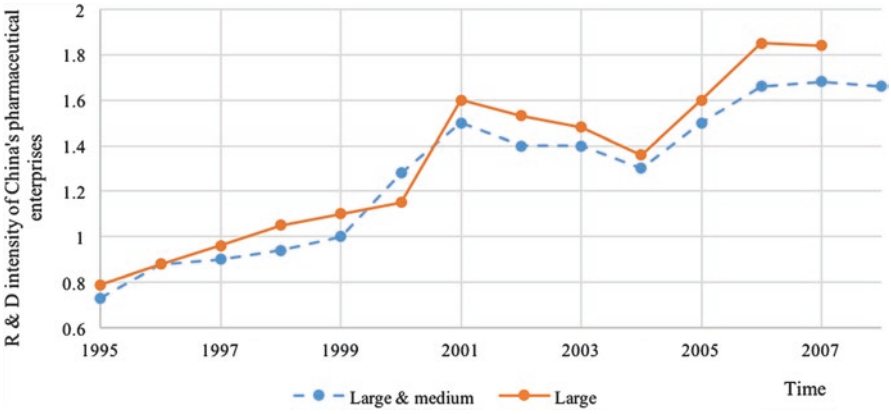


Fig. 4 R&D intensity of China's pharmaceutical companies (1995–2007) (Liu 2012)

In the past 10 years, China's pharmaceutical companies have gradually increased their R&D intensity. Although some pharmaceutical companies have paid great expenditure on R&D, the R&D level is still relatively low compared to international companies (see Fig. 4)

In terms of full-time R & D personnel in China's pharmaceutical industry, it is almost in line with the overall change in the pharmaceutical industry (see Fig. 5). Generally speaking, R&D efficiency in pharmaceutical industries in China is still low.[3]

[3] According to Ji and Zhou (2010), the overall R&D efficiency slightly declined between 1997 and 2008, with quite significant fluctuations based on the empirical examination via non-HMB Productivity Index (or Malmquist Index). Another study, via a stochastic frontier production function method by Zhang et al. (2011), proved that the overall R&D efficiency in Chinese pharmaceutical industries was lower, although with a positively graduate growth, based on an examination of impact from government investment, technology reformation expenditure, company size and market structure.

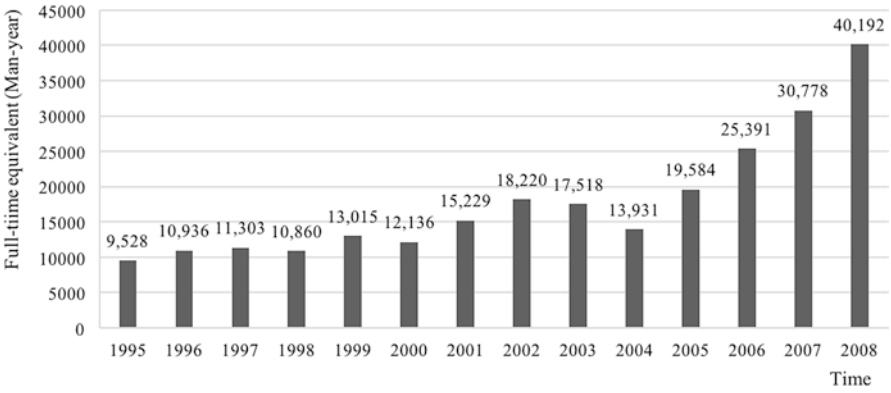


Fig. 5 Full-time R&D personnel in China's pharmaceutical enterprises (1995–2008) (Liu 2012)

2.3.2 Vehicle for New Drugs R&D Is Research Institutions, Not Enterprises

At present, China's main vehicle for new drugs R&D is still research institutions, not enterprises (Liu 2012), through the following approaches:

1. Research institutions and pharmaceutical companies jointly declare new drugs after achieving results in a mode where pharmaceutical companies funded study by the research institutions.
2. The development of new drugs is completed by the research institutes, then transferred to pharmaceutical companies after the new drug eligibility approval.
3. Research institutions have their own pharmaceutical manufacturers to produce the new drugs they developed.

Accordingly, the legal owners of pharmaceutical patents are mostly research institutes and small high-tech businesses.

2.3.3 Lack of Advanced Technology and IP Rights by Chinese Pharmaceutical Companies

Among the pharmaceutical products currently manufactured in China, less than 3% have IP rights. More than 97% of the domestically produced drugs are generic drugs (Yu 2008). At present, there are mainly two types of generic drugs produced in China: one that imitates drugs patented by foreign enterprises and have expired or are about to expire and another that imitates listed drugs by domestic enterprises. Even imitating others' drugs, most pharmaceutical companies in China mainly focus on producing generic drugs with relatively lower technical requirements and mature technologies and involve less high-tech and high value-added pharmaceutical products. Often there are some 70–80 enterprises producing the same drug in China (Liu 2012).

By September 2006, there were 1172 enterprises producing compound sulfamethoxazole files, 1049 enterprises producing analgene, 1049 enterprises producing vitamin C (Wei 2009) and more than 300 enterprises producing amoxicillin in China. This means serious overcapacity of China's pharmaceutical industry. The utilization rate of production capacity of tablets, capsules, powder injection and water injection were less than 45%, 40%, 27% and 50%, respectively (Wu 2006).

2.3.4 Small-Scale Pharma Companies, Low Market Concentration and Substantial Percentage of Enterprises in Deficit

According to China Statistical Yearbook, from 1995 to 2008, the share of small-scale enterprises in the pharmaceutical industry in China was high at 70–80%. By 2008, there were 6524 pharmaceutical companies in China. Only 1003 are medium- and large-scale enterprises and the rest small businesses. By 2009, there were 6807 pharmaceutical companies in China, of which 5787 were small- and medium-scale enterprises (Liu 2012). In 2004, China's pharmaceutical industry concentration ratio of the ten biggest companies (CR10) was 15.10%, while the world pharmaceutical industry CR10 had reached 55% (Jin et al. 2007). In 2008, the top 100 enterprises in the pharmaceutical industry achieved a total sales revenue of RMB 246.937 billion, accounting for only 40.59% of the total sales of the industry (Cai 2009).

Pharmaceutical companies have lower economies of scale and larger losses. According to the "Statistical Yearbook of China's Industrial Economy", from 1999 to 2009, among China's pharmaceutical enterprises, the number of loss-making enterprises ranged from 739 to 1248, accounting for about 18.3%. Overall, from 1999 to 2007, the proportion of loss-making enterprises in all pharmaceutical enterprises in China was 20%−26%, 18% in 2008 and 15% in 2009 (Liu 2012).

2.3.5 Increasing but Low Export of Traditional Chinese Medicine

Traditional Chinese medicine is the most advantageous pharmaceutical field in China and has developed greatly over the years. However, due to lack of innovation, larger market shares are still held by Liuwei Dihuang Wan and other traditional Chinese medicines (Liu 2012).

In 2012, there were more than 1500 traditional Chinese medicine manufacturers in China, with 2772 products and 6310 varieties and specifications, total sales of which amounted to RMB 60 billion. The development of traditional Chinese medicine in different disease treatments is not balanced, accounting for more than 30% in therapeutic areas like cardiovascular, urinary, respiratory and skeletal muscle systems.

However, compared to the sales in the domestic market, the export value of traditional Chinese medicine is relatively low, and its share in the international market has not been high. It is reported that in 2012, the export of traditional Chinese medicine products from China was only US$2.499 billion, of which Chinese herbal medicines US 265 million, extracts US1.164 billion, in total with US$ 3 million deficit.

3 Policy Structure of China's Pharmaceutical Industry

Unlike the genetically modified food discussed in chapter "Genetically Modified Foods in China: Regulation, Deregulation or Governance?", there are relatively detailed legislation in China's pharmaceutical industry. On the whole, the pharmaceutical industry policy in China mainly involves two aspects: First, the management of the pharmaceutical market, including market access and approval of drugs. Second, the macro-management of the pharmaceutical industry, including drug pricing policy, drug regulatory policies on industrial structure and layout policy, drug procurement policies and even medical science and technology policy. This section will only deal with the issues of market access and approval of drugs, drug pricing policy and regulatory policies on industrial structure and layout.

3.1 The Access to Drug Market and Approval of Drugs

3.1.1 Approval of New Drugs

The access to pharmaceutical market reflects the regulatory requirements of the pharmaceutical industry, particularly for new drug products, which mainly include the registration and administrative approval of new drugs and technical review requirements. According to Chen (2014), such market entry starts from the initial research stage and goes through seven phases in total:

1. The discovery and screening phase of new drugs: Pharmaceutical companies will first identify a new composition with certain pharmacological properties and then select the best compound to be used as a new chemical entity (NCEs) during ongoing optimizations.
2. Preclinical research phase: research drug synthesis, which generally studies the extraction method, purity, dose, pharmacology, toxicology, etc.
3. Clinical trial phase: start to form a regular procedure.
4. The enterprise shall fill in *The Application Form for Drug Registration* and submit the relevant information to the drug regulatory department of the province, autonomous region or municipality.
5. The State Food and Drug Administration will make the examination and approval decision. Those enterprises in line with the provisions will be issued *Drug Clinical Trial Approval Document*, those not in line with the requirements will be issued *Notice of Trial Opinion* and explained the reasons.
6. Drug Clinical Trials (Including Bioequivalence Trials): This process requires the implementation of *Quality Management Specifications for Drug Clinical Trials*. Clinical trials are divided into I, II, III and IV. After the approval, the clinical trial must be implemented within 3 years; otherwise the original approval documents shall be abolished. For the applications of overseas pharmaceutical companies, the drugs must have entered phase II or phase III clinical trials.
7. Applying for the production and sale of new drugs: the drug approval number shall be issued after the technical review by the drug administration department

so as to obtain the legal qualification for the production of the new drug. Even after the approval of new drugs, the national drug administration needs to monitor safety of the drugs, but not for more than 5 years.

For new chemical drugs, it takes approximately 17–18 months to get the clinical permit after the application. Even if the new drug is listed, it also has to face market access problems and must go through the provincial access (drug bidding) and hospital access. The process depicted in Fig. 6 shows that the average bidding period of 31 provinces and autonomous regions in China is 14 months. After winning the bid, the drug should be purchased by the hospital. If it needs to become a new drug which can be reimbursed, entering the national and provincial health insurance directory is necessary. Overall, it takes at least 3 years for new drugs to be listed in China (Chen 2014).

As a whole, the current system of examination and approval of new drugs has unclear and overbroad regulations. Meanwhile, the lack of related professionals and the lengthy process of approving new drugs have resulted in loss of revenue for innovative pharmaceutical products (Chen and Wang 2017).

3.1.2 The Generic Drug Application Procedure and Its Incentive System

The process of approving generic drugs in China is similar to the approval of new drugs, which takes about 3 years (Chen 2014) (Fig. 7).

Due to lengthy and complex processes, current market access mechanism also lacks incentives for the development of generic drugs.

3.2 Drug Pricing Policies

Regulations particularly on pricing in the industries are summarized in Table 2.

After thorough development of pricing policies in pharmaceutical industries for so many years, the current pricing system in the industry can be summarized in Table 3.

In 2011, the cost of purchasing drugs by residents accounted for 50%−62% of the total health expenditure in China, much higher than the world average of 20%−30% (Yao 2011). At present, there are three ways of pricing the drug market in China: (Liu 2012).

A. *Government-guided pricing*

Drugs included in the *Catalogue of National Basic Medical Insurance* shall be priced in the following ways: the central government is responsible for setting prescription drug prices, and local governments set the prices of over-the-counter medicines.

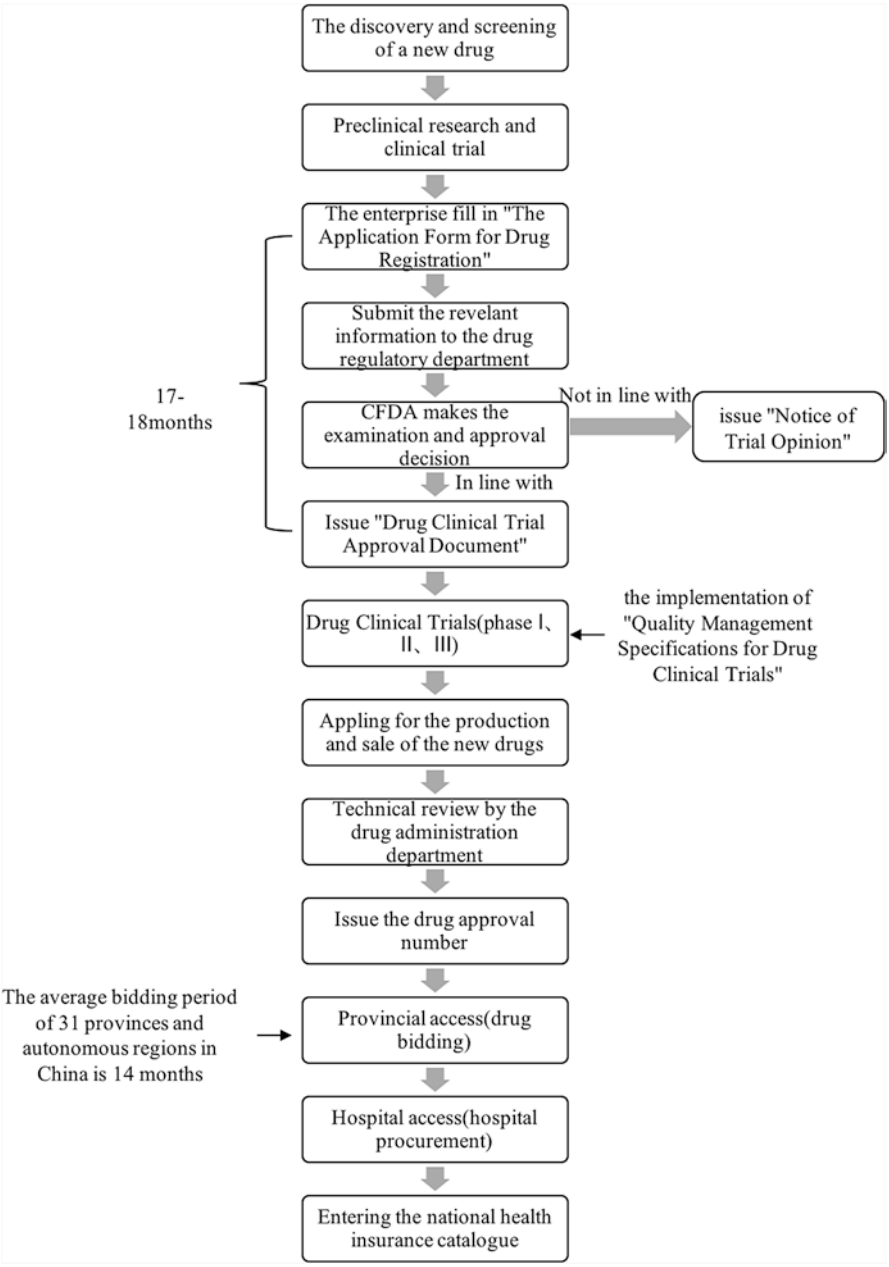


Fig. 6 Flow chart of new drug listing in China

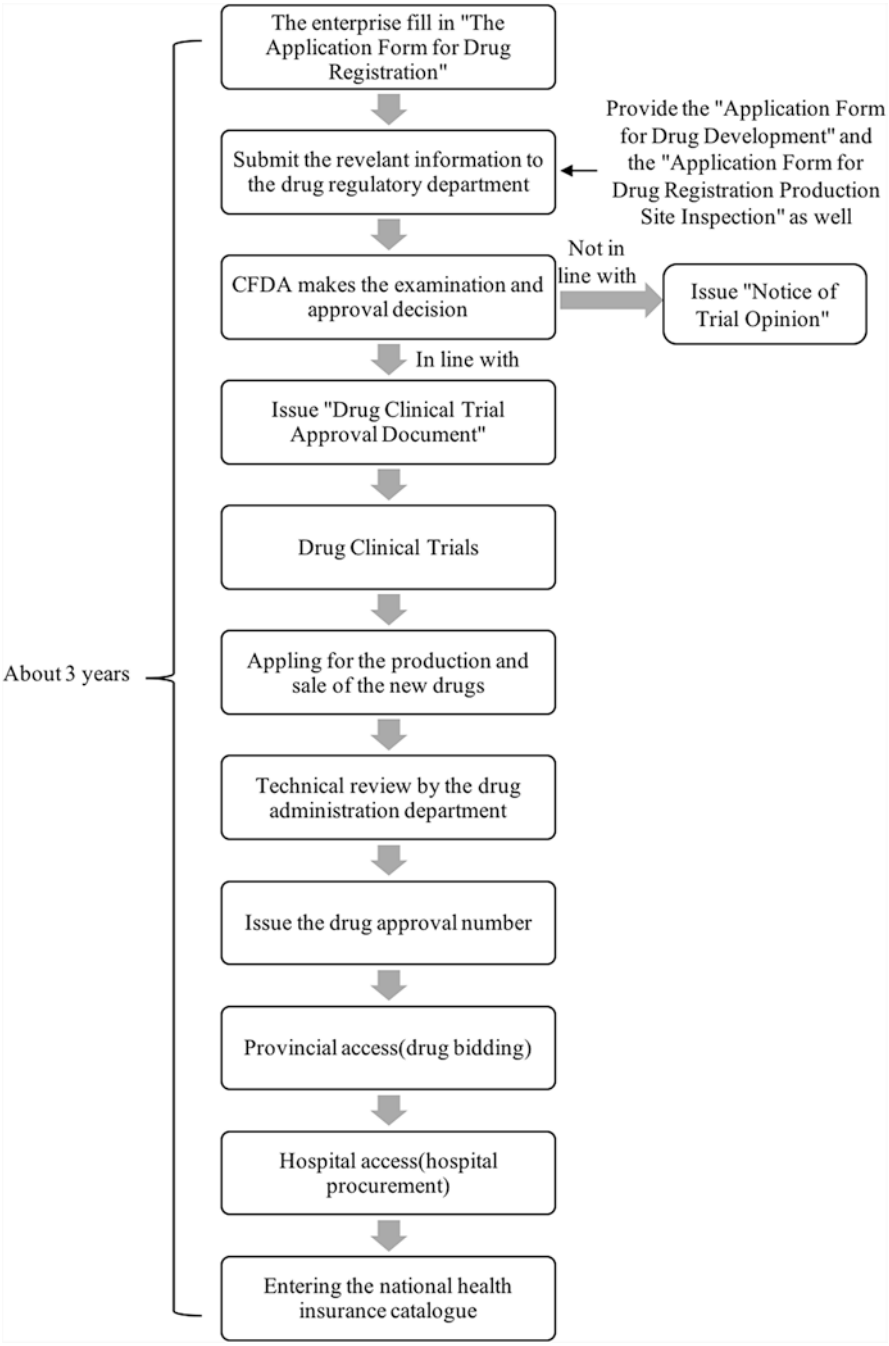


Fig. 7 Flow chart of generic drug registration and approval process in China

Table 2 Summary of China's drug price management policies

Year	Policies and regulations	Relevant content
1954	Additional drug price policy for hospitals (Yuan 2005)	An addition of price on the basis of the purchase price when selling drugs to allow the hospital to form a retail price for drugs. Additional rate of drugs: Western medicine shall not exceed 15%, traditional Chinese medicines shall not exceed 16%, Chinese herbal medicines shall not exceed 29% (Sun 2001)
2000	Government drug pricing method (Wang 2012)	–
2000	Notice on issues related to the development of separate pricing drugs	If the same type of drugs on the domestic market are produced by a number of enterprises, as long as one of those companies provides evidence that their product quality, effectiveness, safety treatment cycle or treatment costs were significantly better/lower than that of other companies, and therefore not suitable to follow pricing policy, this company can apply for a separate pricing. In addition, the original drug owner that has IP rights whose protection period expired may also apply for separate pricing
2001	Notice on issues related to the development of separate pricing drugs	Separate pricing application needs to be submitted to local or provincial price administration department, which would be further transferred to National Development and Reform Commission
2005	National Development and Reform Commission: directory for fixed price drugs	–
2009	Opinions on deepening the reform of medical and health system	Reforming the mechanism of drug price formation and using price leverage to encourage enterprises to innovate independently (Wang 2012)
2009	Opinions on reforming the mechanism of price formation for pharmaceuticals and medical services (State Council)	Original drugs whose IP protection period has expired were renamed model for generic drugs. Measures were proposed to gradually narrow the price gap with generic drugs (Wang 2012)
2009	Price law	–
2009	Rules of price parities between drugs	–
2010	Management measures of drug prices (Draft)	For the original drug whose IP protection period has expired, the government department in charge of price can have price adjustment every 2–3 years, during which the government-guided price reduction is generally no less than 15% (Wang 2012)
2010	Notice on reducing the highest retail prices of some drugs such as ceftriaxone	Reducing the maximum retail price of some separate pricing drugs, and disqualifying separate pricing of some separate-priced medicines (Wang 2012)

(continued)

Table 2 (continued)

Year	Policies and regulations	Relevant content
2011	Notice on adjusting the highest retail price of certain antimicrobial and circulatory system drugs	–
	Notice on adjusting the price of hormones, regulating endocrine and nervous system drugs and relevant issues	
2015	Start of the first pilot project on drug price negotiations	Five varieties, including patented drugs for the treatment of hepatitis B, lung cancer and multiple myeloma, were selected as pilot drugs for price negotiation, of which three varieties have went through successful negotiations
2015	Notice on Issuing Some Opinions on Controlling Unreasonable Growth of Medical Expenses in Public Hospitals	–
2016	Announcement of the result of the first negotiations over drug prices	Tenofovir disoproxil (brand name, Viread), icotinib (brand name, Conmana) and gefitinib (brand name, Iressa) were the three varieties successfully negotiated, whose prices fell by more than 50%
	Catalogue of national basic medical insurance, industrial injury insurance and maternity insurance drugs (2017 edition)	Identified 44 products to enter the negotiation for the new national directory of Medicare and added a new list of 45 to-be-negotiated drugs

Table 3 Three-stage development of price controls on drug (Liu 2012)

Stage	Period	Content
Stage-I	1978–late 1980s	1. The comprehensive control of drug prices was changed into partial liberalization. The government adjusted the ex-factory price, the selling price and the distribution rate of the drug whose prices deviated from its true value too much
		2. Unrealistically high prices of drugs appeared: the state-controlled drug production price is based on the reported production costs plus 5% profit margin, the wholesale price is the production price plus 15%, the retail price is the wholesale price plus 15%. Due to the fixed additional rate, wholesalers and retailers prefer expensive drugs. Registration of new drugs has also been used as a means of obtaining high prices
Stage-II	Late 1980s–mid 1990s	By 1994 most drug prices were handed over to market mechanism from the government. As a result of soaring pharmaceutical prices, poor quality control, corruption and kickbacks, pricing control was reintroduced by the government in 1997
Stage-III	Since late 1990s	Re-regulating part of the drug prices and continuing to launch a wide range of mandatory price-cutting operations. Since 1997, the government has been continuously reducing drug prices of different ranges. At present about 60% of the drug prices are under the government's control

B. *Government pricing*

The drugs included in the government's pricing range shall be priced by the government except for a few special varieties, and enterprises may not adjust prices on their own. The government uses the traditional cost-plus pricing method to set the maximum retail price and stipulates the sales profit margin and the circulation rate. Pharmaceutical companies can apply for separate pricing of government-priced drugs.

C. *Enterprise autonomous pricing*

As for the enterprise autonomous pricing drugs, the price should be submitted to corresponding price control administration department[4] to undergo examination and then publish relevant price online.

3.3 Regulatory Policies on Industrial Structure and Layout

The relevant policies and regulations on pharmaceutical industry mainly focus on plant environment, business sites, equipment and facilities, storage conditions, personnel qualifications, management organization system, industrial structure and layout policies (see Table 4). Those policies and regulations made clear the structural adjustment and developmental direction of the pharmaceutical industry, rationalized the industrial structure of pharmaceutical enterprises and regulated the regional spatial planning and layout adjustment of pharmaceutical enterprises.

4 The Market Structure of China's Pharmaceutical Industries

4.1 The High Expenditure Rate Under China's Medicare System

By the end of 2010, under China's Medicare system (National Basic Medical Insurance System), people participating in urban basic medical insurance totalled 432.06 million and participants in the new rural cooperative medical care reaching 835.6 million, with a participation rate of 96%.

However, as shown in Fig. 8, the annual expenditure of basic medical insurance funds for urban workers exceeded 70% of the total income. The fund expenditure of the new rural cooperative medical care showed a more alarming annual increase trend, reaching as high as 97.72% of fund revenue in 2009. The high expenditure rate is a serious threat to the ability of Medicare funds to withstand risks (Wang 2012).

[4] Prior to 2015, price control administration in China was generally conducted by National Price Administration Bureau and later changed to Price Control Administration Department under National Development and Reform Commission.

Table 4 Summary of China's pharmaceutical industry structure and layout policies

Year	Policies and regulations	Relevant content
2007	Biological industry development under the "Eleventh Five-Year Plan"	Planning to speed up the development of biopharmaceutical industry (Li and Yang 2016)
2009	A number of policies to promote the development of biological industry	The biopharmaceutical industry will be nurtured as a pillar industry in the high-tech field (Li and Yang 2016)
2010	Guiding opinions on accelerating the structural adjustment of the pharmaceutical industry	–
2011	Pharmaceutical industry under the "Twelfth Five-Year" plan	Relevant departments appropriated about RMB 40 billion for research, development and creation of major new drugs in the biomedical industry. The central government allocated RMB10 billion, and the remaining funds were provided by local governments and enterprises. The total amount is more than double of the amount of the "Eleventh Five-Year" (Li and Yang 2016)
2012	Bioindustry development plan	–
2016	Pharmaceutical industry "Thirteenth Five-Year" plan	The state will start to set up a policy environment that adapts to the original medicine research from the perspectives of finance, examination, approval, bidding, insurance and patents
2016	Pharmaceutical industry development planning guide	Attach importance to the international registration of new drugs, generic drugs, traditional Chinese medicines and bio-analogues. Take priority over making 3–5 new drugs and over 200 chemical generic drugs in the market in developed countries (Meng 2017)

4.2 The Dominant Mode of Monopoly by Hospitals

Hospitals in China almost monopolized the drug sales market, whose market share was once as high as 95% (Wu 2006), and nowadays they still control about 4/5 of the market (Sun et al. 2008). The reasons for such a monopoly are as follows:

4.2.1 The "Hospital and Pharmacy Together" Model Facilitates Drug Sales by Hospitals

The hospital has its own pharmacy; most patients are accustomed to receiving medical treatment in hospitals and purchasing medicines in hospital pharmacies (Liu 2012).

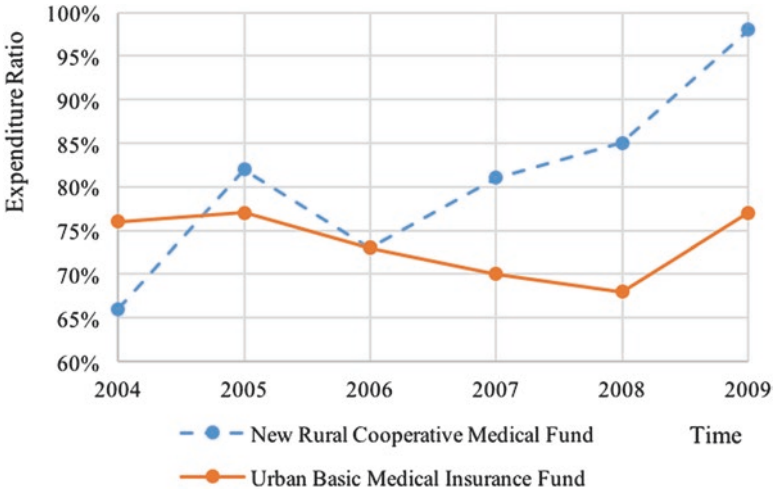


Fig. 8 Expenditure of Medicare fund in China (2004–2009)
National Health Commission of the PRC, *2011 China Health Statistics Summary*, http://www.nhfpc.gov.cn/cmsresources/mohbgt/cmsrsdocument/doc12294.pdf. National Bureau of Statistics, *China Statistical Yearbook 2007* http://www.stats.gov.cn/tjsj/ndsj/2007/indexch.htm

4.2.2 The "Hospitals Supported by Medicines" Phenomenon Provides Hospitals with Monopoly Power

From 2003 to 2010, China's medical institutions have a price increase of 15% on drugs, and the proportion of drug revenues in the revenue composition of public hospitals[5] is only slightly behind that of medical revenues, with a stable rate of over 40% (see Fig. 9). According to China Statistical Yearbook 2010, the total revenue of government-run medical institutions in China reached RMB 74,569,116 million in 2009, of which drugs revenue was RMB 31,360,277 million RMB, accounting for 42.1% of the total (Liu 2012).

4.2.3 Drug Management Policies Conducive to Monopoly

Prescription drugs are generally controlled by doctors when patients go to the hospital for treatment. Hospitals usually take various measures to control the outflow of prescriptions drugs. In most cases, patients can only buy prescription drugs from hospital pharmacies, resulting in hospitals becoming the dominant drug distributors. In addition, the site-specific restrictions by Medicare also make patients buy medicines at hospital pharmacies in most cases (Liu 2012) (Table 5).

[5] In China, public hospitals (or government-run hospitals, which are established and supported by regular government budget) and private hospitals are the two major resource of medical service. Although they are similar in number (13,069 public vs. 14,509 private ones in 2015), the public hospitals are far more important than private ones in terms of practical service (public hospitals provided service up to 2.71 billion person/times in 2015, private ones only 0.37 billion person/times, which primarily could be attributed to higher quality and professionalism of the public hospitals. Available via http://www.360doc.com/content/17/0610/13/38907157_661600475.shtml

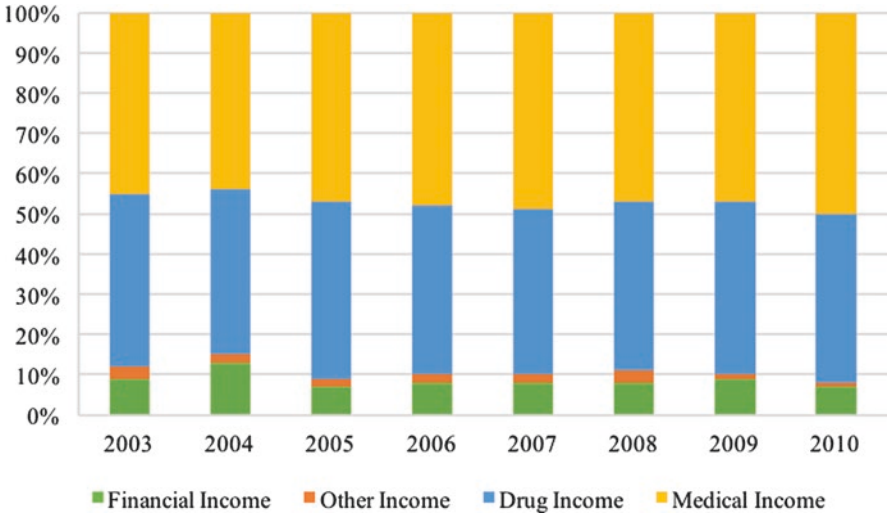


Fig. 9 Revenue in government-run hospitals in China (2003–2010)
The website of Ministry of Health Statistical Information, 2004–2010 Health Statistics Yearbook, 2011 Health Statistics

Table 5 China's drug administration policies leading to hospital monopoly (Liu 2012)

Year	Policies and regulations	Relevant content
1999	Pilot work of prescription drugs and non-prescription drug circulation	Officially launched
1999	Provisional regulations on the circulation management of prescription drugs and non-prescription drugs	Requiring drug administration at all levels to effectively promote drug classification management
2001	Drug administration law	The government implements the system of the classification and management of prescription drugs and non-prescription drugs, the specifics of which are formulated by the State Council
2004	–	About 400 kinds of antibiotics, amines, antituberculosis, antifungal and norethindrone shall be prescribed by a licensed practitioner
2006	The second national drug classification management conference	Drug retail outlets across the country shall not sell nine types of drugs, such as narcotic drugs. Drug retailers must place prescription drugs and non-prescription drug over different counters. And no advertisements or advertisements in disguise may be published in the mass media for prescription drugs

Table 6 *Top*10 medicines in terms of sales value in 2015

Drug name	Sales value (RMB billion)	Year-on-year growth rate (%)
Sodium chloride injection	15.85	9.77
Glucose injection	10.37	16.90
Clopidogrel hydrogen sulphate tablets	9.24	3.62
Pantoprazole sodium for injection	9.23	7.50
Omeprazole sodium for injection	8.94	16.51
Ceftizoxime sodium for injection	8.33	11.28
Human albumin	8.21	8.65
Injection thrombus	8.04	–4.32
Monosialotetrahexosylganglioside sodium injection	7.80	4.73
Cefoxitin sodium for injection	7.50	5.60
Total	93.51	

Source: Zhong Kang CMH: http://drug.39.net/a/160318/4792071.html

4.2.4 The Supply and Demand Characteristics of the Medical Industry Conducive to Monopoly

Patients lack relevant information on the choice of drugs, and their price elasticity of demand for medicines is low. The hospital is both a provider of medical products and a determinant of the demand for medical products; the doctor has the ability to conduct supplier-induced needs. There is serious information asymmetry between doctors and patients in the medical industry. Patients have obvious information disadvantages in the selection of treatment plans and drug efficacy. The hospital has the initiative on the treatment plans and drug selection (Liu 2012).

4.3 China's Generic Drug Market

4.3.1 Generic Drugs Occupy the Drug Markets

According to statistics, global sales of the patent-expired drugs amount to US$77 billion during 2011–2015 (Liu 2010). According to *China Health-Care Industry 2016 (Blue Book)*, the total revenue of China's pharmaceutical market (covering chemical medicine, Chinese traditional medicine and biopharmaceuticals) reached RMB 1335.4 billion, of which chemical drugs were RMB 888.0 billion, accounting for 66.5%, while revenue of Chinese traditional medicines accounted for 25.3% and biopharmaceutical 8.2%. Among all the chemicals, generic drugs have a market share of 95%, while the market share of patented drugs and original drugs is only about 5% in total. The market of patented drugs is only RMB 12 billion, less than 1% of the domestic pharmaceutical market.

Following typical medicines are on the top lists of market sale, also typical in generic drugs (see Table 6).

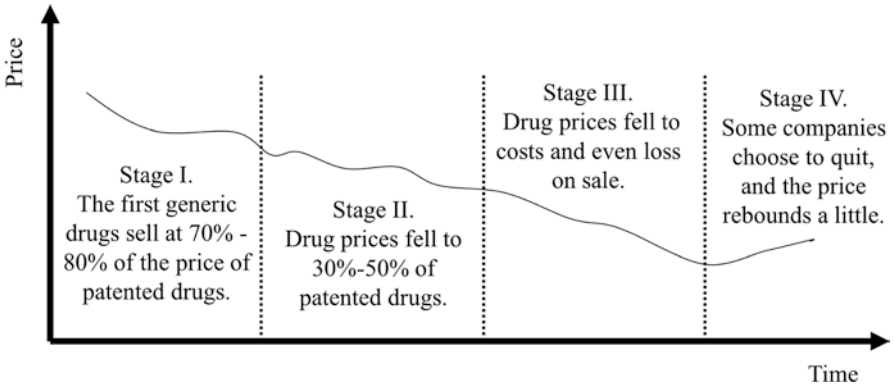


Fig. 10 Generic drugs' price movements after the expiration of the patent (Wang 2013)

4.3.2 The Opportunities upon Patent Expiration

The expiration of the protection term of a patented drug gives generic manufacturers huge opportunities for profit-making. However, with the passage of time, this opportunity will gradually diminish and eventually vanish (Fig. 10). This is due to "price competition only" when the market is filled with too many competitors whose products in the market are almost the same. Figure 10 illustrates this scenario in I to IV stages.[6]

There are interesting movements in pharmaceutical-related stock markets during the patent expiration period. For example, some 16 companies have possessed the opportunity to avail themselves of the benefits of timely expiration of patents in the specialty pharmaceutical business and experienced a dramatic price hike (see Table 7).

The most successful case was Hisun Pharmaceutical, whereby the company obtained a huge profit in 2003 and 2004 when the patents of simvastatin and pravastatin (which were the main products of the company) expired (see Table 8).

[6] These four stages can be further explained: I *Right Entrance period*, to produce drugs just after the expiration of the patent, with producer enjoying 70% to 80% of original price on the previous patented drugs; II *Crowded Market period*, long after the expiration of the patent, with producer enjoying 30% to 50% of the patented drugs; III *Crowding Out period*, when the drug price drops to almost production cost or even lower, with some producers having to quite or leave the market; and IV *Recovery period*, after some companies leave the market, fewer producers and productions may raise the drug price again.

Table 7 Stock price change of 16 sample companies around patent expiration date (Wang 2013)

Company name	Six months before patent expiry	Three months before patent expiry	Patent expiry date	Three months after patent expiry	Six months after patent expiry	Expiry date of patented drugs
Hisoar Pharmaceutical	3.86	6.34	7.67	7.72	13.72	2010/4/13
Huahai Pharmaceutical	4.31	5.07	5.60	6.79	11.08	2006/12/22
Huahai Pharmaceutical	7.62	7.14	12.79	14.55	15.92	2009/11/15
Hisun Pharmaceutical	4.49	9.57	9.76	7.64	14.03	2007/8/28
Hisun Pharmaceutical	11.91	15.09	15.79	14.90	24.43	2010/4/12
Hengrui Medicine	3.17	4.33	4.89	6.45	9.79	2006/9/8
Hengrui Medicine	14.76	16.21	16.42	18.24	22.25	2009/3/22
Hengrui Medicine	25.93	24.63	27.54	25.34	36.71	2010/5/25
Jincheng Pharmaceutical	12.00	11.48	13.80	16.01	–	2012/7/18
Topfond Pharmaceutical	5.27	5.80	5.86	7.94	11.26	2009/10/27
Livzon Group	22.30	27.60	31.63	37.58	47.81	2009/10/26
Baiyunshan Pharmaceutical A	9.23	11.60	14.32	12.26	18.40	2010/4/30
NHWA	13.61	16.71	19.72	22.72	23.63	2010/5/17
Salubris	18.43	23.36	25.47	39.50	37.61	2010/2/12
Joincare	4.10	5.32	5.99	8.13	8.60	2009/10/8
Beilu Pharmaceutical	10.53	8.81	9.34	14.10	12.71	2012/5/15

Data sources: WIND, FDA and companies' announcement
Note: the stock price boom cases here are generally for special API drugs and imitating drugs

5 IP Structure in Pharmaceutical Industries in China

5.1 The Patented Drug Market

5.1.1 The Demand for Drugs Against Infectious Diseases Relies on Patented Drugs

The key public health issues in China are infectious diseases and chronic diseases (Li and Lv 2002). According to statistics from National Bureau of Disease Prevention and Control of the National Health Planning Commission, the incidence of notifiable infectious diseases reported by China in 2015 was 470.35/100,000, and the reported death rate was 1.23/100,000. Now in China the treatment of most infectious diseases such as chronic hepatitis B, AIDS and other diseases depends on imported patented drugs, which are expensive due to their clinical efficacy (Jiang et al. 2017).

Table 8 Events which Hisun that seized the opportunities upon patent expiry (Wang 2013)

Year/month	Event	Responses of Hisun Pharmaceutical	Effective
2003/05	The patent of Merck's second largest drug Simvastatin registered in the European Union (EU) expired	They finished the R&D of the production process ahead of schedule and started mass production. They received a large number of orders after multiple negotiations with Merck, and their sales increased rapidly	The growth rate of the main business income is 103.45% in 2003, which ranked the fifth in "Top 10 enterprises in the chemical raw material manufacturing industry"
2004/08	The patent of the pravastatin (owned originally by Daiichi Sankyo, a Japanese pharmaceutical company) in the EU market expired	Hisun's pravastatin patents passed Certificate of Suitability (COS) certification earlier than patent expiration. After the product patent expired, Hisun conducted a wide range of sales before the process patent expires	The company's stock price rose from 4 RMB in February 2004 to over 5 RMB at the end of 2004, while the pharmaceutical bio-index dropped nearly 30% over the same period

Note: The process patent expiry is generally later than the product patent expiry

According to the data from *Publicity Department of the National Health Planning Commission*, in 2012, the national statistics on the death rate of chronic diseases was 533/100,000, accounting for 86.6% of the total number of deaths. Almost all of the clinical standard medicines used in these areas of chronic diseases are patented drugs or patent-expired drugs (Jiang et al. 2017).

5.1.2 Patented Drugs Are More Profitable Than Generic Drugs

Patentees of patented drugs enjoy the market exclusivity to the products for a long time. The ultra-high profits during the market exclusivity period are the targets pursued by the pharmaceutical companies (Chen and Liu 2006).

In 2010, there were 303 varieties of patent-expired drugs in China, which were produced or distributed by 315 pharmaceutical companies, including 253 foreign-owned enterprises (81%), 61 joint ventures (19%) and only 1 domestic enterprise. Compared with the generic drugs companies, the 116 foreign and joint ventures that produced the corresponding patent-expired drugs accounted for 56.4% of the market sales and 52.1% of the total sales (PAC 2010).

5.1.3 National Drug Price Negotiations Increased the Sales of Patented Drugs

National drug price negotiations have brought huge market gains to patented drugs. The drop in the price of patented drugs has enabled more patients to pay for medicines, and the clinical demand for patent drugs has increased. So the sales of patent drugs have risen (Jiang et al. 2017).

5.1.4 The Patent Linkage System Is Imperfect

Patent linkage means that when a drug manufacturer applies for registration of generic drugs with China Food and Drug Administration (CFDA), CFDA will have to consider the status of the patent involved to balance the interests of all parties (Xiao 2017).

A. *Strict restrictions on the registration of generic drugs*

Article 19 of *Provisions for Drug Registration* provides that "Applicants other than the patentee may submit the application for registration two years prior to the expiry date of the patent", "After the expiry date of the patent, check and issue the drug approval number, *Import Drug License* or *Pharmaceutical Product License* if the application conforms with the provisions", respectively, made rules on generic drug registration application time and the effective date of the provisions. However, can the regulations promote the generic drugs listed timely and increase the availability of public medicines? There are many questions in academia about this (Fang 2013).

B. *Imperfect patent information registration requirements*

Some imperfections exist in Article 18 of the *Provisions for Drug Registration*, such as "The applicant shall provide the applicant's or others' patents in China with their prescriptions, techniques, uses, etc. for the drug to which they are applying for registration, and provide the state of patent ownership", where the word "etc." is ambiguous and has not been elaborated upon (Fang 2013).

C. *Single dispute resolution approach*

Article 18 of the *Provisions for Drug Registration* stipulates that "Disputes over patent rights in the course of drug registration shall be resolved in accordance with the laws and regulations of the relevant patent". CFDA will issue a notice stating that the application infringes the patent rights of others and require it to resolve the patent dispute on its own; otherwise no further examination will be conducted. However, according to Chinese *Patent Law*, this behaviour in the process of drug registration does not belong to the realm of patent infringement. The patentee has no basis for prosecution; generic drug companies cannot respond to the defence. For generic drug companies, the current defence approach is too monotonous, and it can only declare to the State IP Office that the patent in question is invalid (Fang 2013).

5.1.5 Domestic Patented Drugs Far Fewer Than Imported Patented Drugs

Nearly 90% of the patented drugs come from foreign enterprises (Jiang et al. 2017). So far, there are only two innovative drugs originated from China that have been internationally recognized, namely, artemisinin and Sodium Dimercaptosuccinate. Meanwhile, large overseas multinational pharmaceutical companies generally bring 2–3 new patents with new chemical entities to market each year (Liu 2012).

There are mainly two categories of patented drugs in China. One is the 265 exclusively patented drugs approved for import, of which 48 have got core patents in China, accounting for 18.1% of imported patented drugs. The other is the 22 first type of new drugs[7] in China, of which only 6 have core patents in China. The ratio between imported patented drugs and domestic patented drugs (those with core patents) is about 8:1 (Jiang et al. 2017).

5.2 The Characteristics of Typical Self-Developed Patented Drugs

5.2.1 Polymorphic Drug Patents

Drug polymorphism refers to the presence of drugs in two or more different crystalline states. It refers to a solid pharmaceutical polymorphic ingredient present in a particular crystalline form state, particularly solid chemicals (Zhang et al. 2016).

As shown in Fig. 11, annual patent application for polymorphic drugs has increased significantly in China in the last three decades. Between 1985 and 1994, the total number of patent applications for polymorphic drugs was only 30 (0.8% of the total). However, from 1995 to 2004, the total number of patent applications was 471, accounting for 12.6% of the total, with an average annual number of 47 applications and an average annual growth rate of 114.9%. From 2005 to 2014, the total number of patent applications was as high as 3009, 78.9% of the total, an average of 301 applications each year, with the average annual growth rate of up to 147.9% (Fig. 12).

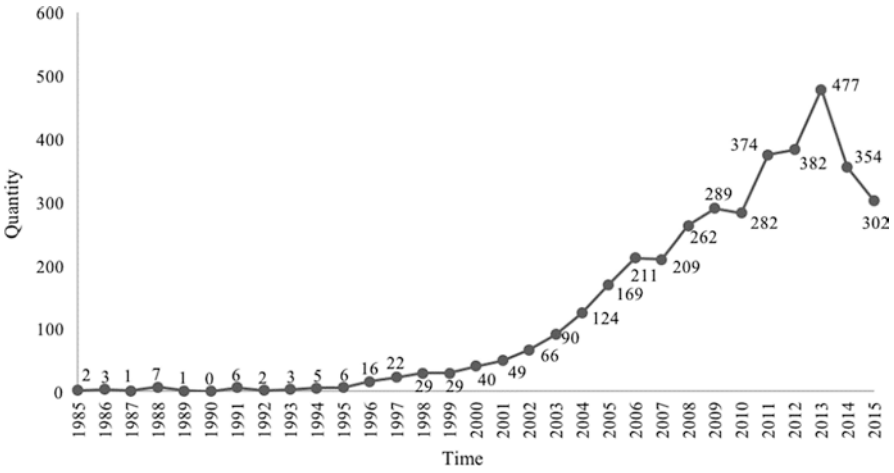


Fig. 11 Annual patent application volume related to polymorphic drugs (1985–2015) (Wang et al. 2017)

[7] The first type of new drugs refers to chemical drugs and biological products.

Fig. 12 Trends of polymorphic drug patent applications in China by applicants from China and the United States, Germany and Switzerland (1985–2015) (Wang et al. 2017)

As shown in Fig. 13, the majority of polymorphic drug patent applicants in China are enterprises, which are marked as deep black.

Figure 14 shows the polymorphic drug patent applicants in China from various countries. In terms of actual number, 2116 applications were from China, 651 were from the United States and 432 from Germany, India and Switzerland combined (accounting for 11.3% of the total).

Table 9 shows that coastal provinces and cities have stronger capabilities in the pharmaceutical industry than the western and inland regions.

5.2.2 Botanical Drug Patents

A botanical drug is one of the most important types of pharmaceutical products. Relevant patents are also key assets for such technology. In Table 10, it is clear that as of 12 December 2013, China has more than 100,000 patent applications, far greater than any other countries, and the amount of granted patents is 38,191. Among those Asian countries, the number of Japanese patent applications is the highest (more than 20,000), and South Korea's amount is in the second position, while India has over 200 applications.

As shown in Fig. 15, the total number of Patent Cooperation Treaty (PCT) applications from the United States is the largest, nearly three times that of Japan, more than four times that of Korea and nearly seven times that of China. However, the total application amount in the last 5 years of the United States is still higher than that of other countries, but the amounts have risen sharply for Korea, Japan and China.

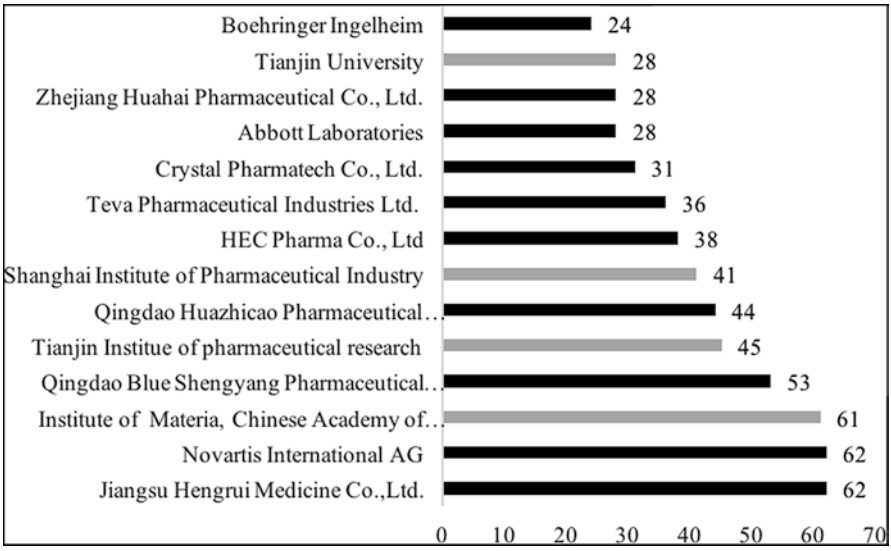


Fig. 13 Top 15 polymorphic drug patent applicants in China (1985–2015) (Wang et al. 2017)

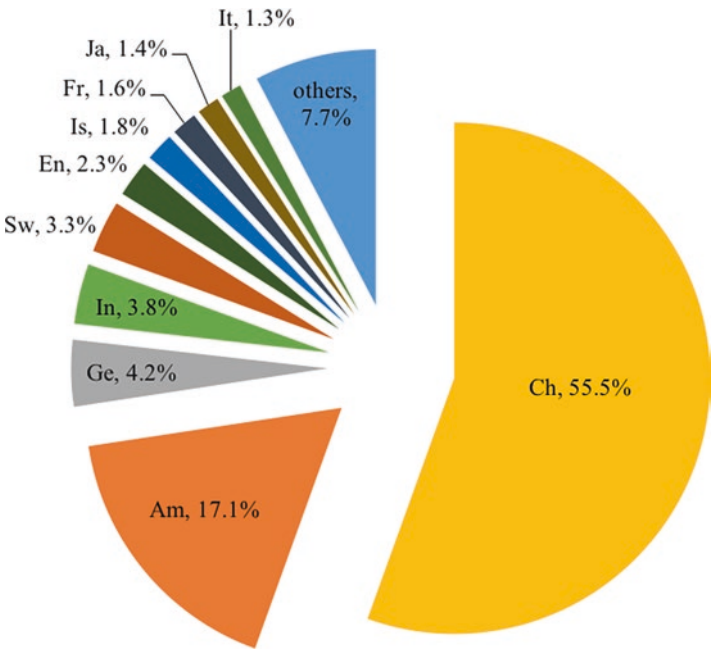


Fig. 14 Polymorphic drug patent applicants in China from various countries (1985–2015) (Wang et al. 2017)

Table 9 Polymorphic drug patent applications in China from various provinces and cities (1985–2015) (Wang et al. 2017)

Regions	Quantity	Regions	Quantity	Regions	Quantity
Jiangsu Province	365	Anhui Province	30	Hunan Province	12
Shandong Province	247	Fujian Province	30	Henan Province	12
Beijing	239	Liaoning Province	24	Shanxi Province	9
Shanghai	238	Jilin Province	22	Guangxi Zhuang Autonomous Region	6
Tianjin	205	Hubei Province	22	Qinghai Province	5
Zhejiang Province	195	Shaanxi Province	20	Inner Mongolia Autonomous Region	1
Guangdong Province	132	Yunnan Province	19	Guizhou Province	1
Sichuan Province	100	Jiangxi Province	17	Gansu province	1
Hebei Province	66	Hainan Province	17	Ningxia Hui Autonomous Region	1
Chongqing	66	Heilongjiang Province	14	–	–

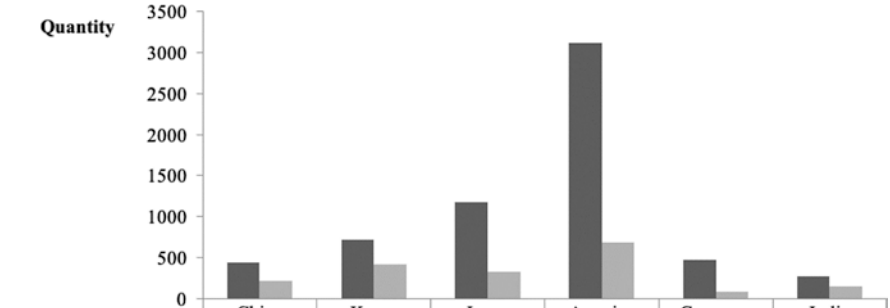
Table 10 The amount of botanical drug patent applications in various countries (Zhang and Xu 2014)

Country	The amount of patent applications
China	105,751
Japan	22,184
United States	15,573
Korea	8468
Germany	4320
India	223

Note: The data is from Espacenet Worldwide database as of 12 Dec 2013

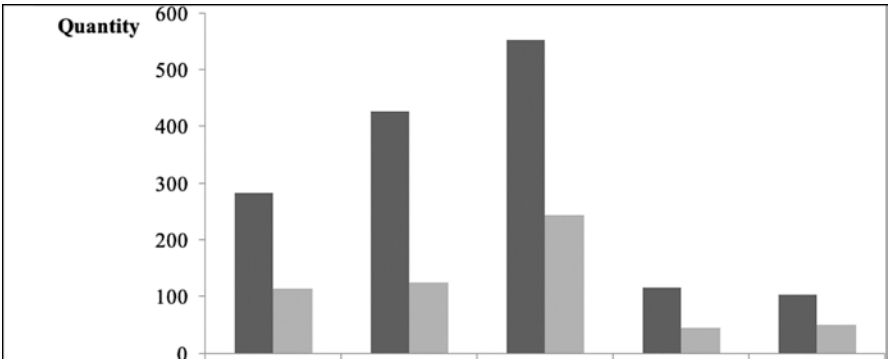
Chinese applicants filed 105,751 applications and got 38,191 grants worldwide. Japanese applicants applied for patents in China more than in other countries, but the total number of applications is only 552 and less than 250 grants, followed by the United States (see Fig. 16). Japanese applicants from cosmetics accounted for about 10%. The figure for Korean and American applicants is about 8%, while almost all of the applicants from Germany and India have little involvement with cosmetics (Zhang and Xu 2014).

According to Table 11, traditional Chinese medicine enterprises already have a large number of botanical drug patent applications and granted patents in China, while their foreign applications have just started.



	China	Korea	Japan	America	Germany	India
total	434	714	1174	3120	477	270
last five years	220	412	328	687	77	146

Fig. 15 The amount of botanical drug patent applications filed through PCT from various countries (2009–2013) (Zhang and Xu 2014)



	Korea	America	Japan	Germany	India
Applied in China	282	426	552	115	103
Granted in China	114	124	244	44	50

Fig. 16 The amount of Chinese botanical drug patent applications and granted patents by Countries (2009–2013) (Zhang and Xu 2014)

6 Comparison of the Pharmaceutical Industries Between China and India

6.1 Similarities and Differences

It will be beneficial to compare the development of pharmaceutical industries of China and India. The two countries are similar in many aspects, such as most condensed population (altogether, 40% of the population in the world), developing mode similar from an agricultural-based economy to gradually industrial economies, and most importantly, both are in the fastest growth rate in economic performance. Moreover, the two countries also face serious problems of uneven

Table 11 The botanical drug patent applications granted patents and PCT applications in top 10 traditional Chinese medicine enterprises in China (2010) (Zhang and Xu 2014)

Company name	Patent applications	Granted patents	PCT applications
Yunnan Baiyao	53	36	0
Jilin Aodong	44	26	0
Tasly	721	472	45
Kangmei Pharmaceutical	30	4	0
Kanion Pharmaceutical	110	103	0
Tong Ren Tang	102	57	3
Dong-E-E-Jiao	20	8	1
Tai Chi Group	53	38	1
Zhongheng Group Guangxi Wuzhou pharmaceutical	25	10	0
Conba	31	17	1

development level between regions and populations and mounting challenges in environmental deterioration.

On the one hand, in terms of economic scale, both went through economic reforms in their own ways during 1970s and 1980s. Based on data from World Bank, the GDP of China increased from US$59.2 billion in 1960s to US$10.87 trillion in 2015, while the GDP of India increased from US$37.7 billion in 1960s to US$ 2.07 trillion in 2015. On the other hand, in terms of ways of economic progress, there were indeed profound differences.

International scholars usually believe there are similarities in the two countries. For instance, Pye et al. (2006) did an all-round investigation from different perspective and considered strong similarities between them. As for Chinese scholars, however, differences were more emphasized. Zhao (2008) specially investigated the economic development modes of the two countries, suggested that it would be difficult to tell which way would be better than the other.

There are many contrasts between China and Indian in pharmaceutical industries. On the specific nature towards local pharmaceutical market, Huang and Khanna (2003) suggested that foreign direct investment (FDI), rather than local private firms, could be considered as major driving force for local economy in China, while local firms were strongly protected in India, and the local banking system and capital market were more appropriate for local firms in India as well. Farrell et al. (2004) clarified that the major growth power in China was from manufacturing sectors, accompanied by higher rate of bank savings[8] larger scale investment on infrastructure and inward overseas capitals, while Indian free market mechanism might be more promising, although the country was slow in economic reform (which also implies less active in IP protections in pharmaceutical sectors) and infrastructure development. Quan (2006) and Li (2006) considered that there was much less government intervention in the market development in Indian case;

[8] In China, household saving rate is generally high. If compared with GDP volume, the household saving rate in China is about 9% on average between 1998 and 2015.

therefore, the intellectual and financial resource, particularly technology resource in computer software industries could be developed "naturally", whereas there would be stronger government intervention over manufacturing capacities in both technology and production in China; in such case, dynamic and active market players might be restricted. Shi (2007) further suggested that the economic growth mode was consumption-based in India, with less intervention from local government, while such growth could be investment-based in China, where government might play an important role in it.

6.2 India as Patent Maverick vs. China as Patent Taker

Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) under World Trade Organization (WTO) policy framework is often considered highly beneficial for industrialized nations (Nayyar 1992), especially in terms of pharmaceutical sectors (Marjit 1994). However, India has managed to go its own way on patent although it became WTO member in 1995. For example, on the issue whether biotechnology could be patented, India insisted on its interests (Rao 2002, Kumar 1998) and decided in the Patents Act of 1970 not to protect medicine, only production method of medicine, until the amended Patents Act of 2005. This means there was quite a long time for Indian companies to legally imitate medicine patented in other countries.

Even after 2005, the newly added section 3(d) of the Patents Act does not protect minor modification, in order to prevent evergreening of patents: "the mere discovery of a new form of a known substance which does not result in the enhancement of the known efficacy of that substance or the mere discovery of any new property or new use for a known substance or of the mere use of a known process, machine or apparatus unless such known process results in a new product or employs at least one new reactant". Section 3(d) allows the generic companies to continue operating with a breathing space (see chapters "Historical Evolution of India's Patent Regime and Its Impact on Innovation in the Indian Pharmaceutical Industry" and "The Challenges, Opportunities and Performance of the Indian Pharmaceutical Industry Post-TRIPS" for details). In contrast, China has been a faithful taker of TRIPS Agreement, never challenged or even questioned patent protection of pharmaceutical inventions.

6.3 Summary

A comparison of the developmental similarities and differences between China and India can be summarized as follows (see Table 12).

Based on items contrasted in Table 12 and other related analysis, the strength of China's pharmaceutical industry mainly includes a strong industry base for APIs, low labour costs and well-established domestic infrastructure. The weakness, on the other hand, includes poor competitiveness in the domestic pharmaceutical market

Table 12 A comparison of pharmaceutical industry development in China and India (Wang 2013)

Criterion	Similarities	Differences
Macroeconomy	Populous developing countries, low per capita GDP	–
	Experienced rapid economic growth over the past three decades	
	Low level of medical care and individual medicine consumption	
	Less sound social security and medical insurance systems	
Market size	Except for the population and the consumption of medicines, the pharmaceutical market fundamentals in the two countries are very similar	China's pharmaceutical market is three times that of India
		China's population is 1.3 times that of India
		China's per capita consumption of medicines is 2.3 times that of India
Industry competition	Low market concentration	China's top ten pharmaceutical companies with total market share of 15–18%, while India's has been about 35% since 1999
	Excessive competition	The polarization of the pharmaceutical companies between large and small is more significant in India
	Low R&D investment in pharmaceutical companies	
	Low-level repeated competition	
Industry policy	Since India's new Patents Act came into force in 2005, the patent systems in the two countries have been gradually harmonized and in line with international standards	China's Patent Law met international standards in 1993 by extending the object of patent protection from method to products
		Between 1970 and 2005, India only granted patents for drug production process, not for the compound itself
Infrastructure	–	India is less developed than China in industrial facilities. For example, India's electricity shortfall was 10.3% and reached a peak of 12.9% in 2011

compared with multinational pharmaceutical firms, comparatively low-level R&D and professional techniques in advanced medicine production and especially low added value in international market.

Li and Huang (2007) considered that Chinese pharmaceutical companies' weak position in market competition can be attributed to inadequate innovation, restricted financial capital resource and less capable market control. Based on analysis via SWOT methodology[9] over Chinese and Indian drug companies, Li and Huang

[9] SWOT is the typical methodology applies to strategic management cases, with four factor-based framework, namely, Strengths and Weakness (SWs, considered as inner factors), Opportunities and Threats (OTs, considered as environmental factors).

found that Indian firms were more competitive in newly developed medicine in international market, quality certification and technical talents. In another comparative study, Zhang and Zhang (2009) found that Chinese firms in pharmaceutical sectors are weak in market share, earning, innovation and, most importantly, IP resource. Cai and Xiao (2013) found that Indian pharmaceutical outsourcing (CRO) sector perform overall better than Chinese, especially in terms of labour, technologies and management skills, while Chinese CRO sector appears to have better policy environment and market size. Mao and Zhang (2011) have investigated Indian pharmaceutical industries primarily from a number of key dimensions, such as local IP policy system, basic research system, national drug policies and human resource training system, and concluded that those systems and relevant dimensions, which should be understood as *Pharmaceutical Sectoral Innovation System*, could explain the successful development of the pharmaceutical industries in India.

There are other quantitative studies on Chinese and Indian pharmaceutical industries. For example, Li (2008) found that although the product innovation was comparatively weak, the industry did have comparative advantage in terms of market size and policy support in China. Liu and Yu (2010) found Chinese industry falling far behind Indian firms in internationalization. Xiao (2015) further indicated Chinese industry might have comparative advantage only in production scale and market growth and might be falling behind in R&D and internationalization. As is emphasized in chapter "The Challenges, Opportunities and Performance of the Indian Pharmaceutical Industry Post-TRIPS", though major Indian companies are all producers of generic medicines, they continue to invest sizeable share of their sales turnover in R&D. It may imply that the innovation and development of Indian pharmaceutical industry might be faster.

7 Conclusion

The Chinese pharmaceutical industry has been developing fast, in terms of increasing market size and revenue volumes, and upgraded technologies, along with the gradual opening up of the industries. Although there is a huge increase in the number of patented drugs granted to Chinese pharmaceutical companies, patents have made low contribution to the industrial values, and IP held by Chinese firms is less competitive compared with foreign companies. Most of the pharmaceutical enterprises in China still focus on generic drugs.

The scale of Chinese pharmaceutical companies is small, and the market concentration is low. Therefore, local pharmaceutical companies with higher R&D input are generally less profitable, which prevents Chinese companies from conducting effective R&D and leads them to develop in thinner profit margin market and in production of patent-expired drugs. Pharmaceutical R&D or related research is often conducted by research institutes or universities, rather than by companies in China.

Market regulation of the pharmaceutical industry in China is relatively strict, especially market entry and price control. Indeed, this may increasingly create more

monopolistic buying position for state-owned hospitals and decrease or weaken the negotiating power of pharma enterprises.

India is well known as patent maverick, whereas China as a naïve patent taker, especially in pharma invention. With Indian Patents Act utilizing the leeway left by the TRIPS Agreement to better suit its national interests and developmental needs, India's pharma industry is poised to further outperform its Chinese counterpart.

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Indian Patent Law and Its Impact on the Pharmaceutical Industry: What Can China Learn from India?

Juan He

Abstract

Both China and India are developing countries in the pharmaceutical industry, and both need to seek a balance between protecting intellectual property rights and satisfying people's healthcare needs. They also need to promote innovation and encourage the development of domestic industries. As members of the WTO, China and India have made a series of amendments to their respective intellectual property systems to live up to the TRIPS Agreement's minimum standards of protection, including recognition of pharmaceutical product patents, introduction of a compulsory licensing system, and Bolar exception. In promoting the development of its domestic pharmaceutical industry, India's experience in legislation and judicial practice deserves serious attention from China, such as using TRIPS's flexibility to facilitate access to medicines, implementing compulsory licensing to create more chances for voluntary licensing negotiation, and updating the guidelines for examining pharmaceutical applications to prevent evergreening of pharmaceutical patents. Meanwhile, learning from India, China should start to provide its legal professionals with knowledge of global rules, to better further Chinese interests in the world arena.

Keywords

Patent · Pharmaceutical industry · Generic drug · Compulsory license · Bolar exception · Evergreening

J. He (✉)
Graduate School at Shenzhen, Tsinghua University, Shenzhen, China
e-mail: he.juan@sz.tsinghua.edu.cn

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_11

1 TRIPS Agreement and India's Pharmaceutical Patent System

India was an early signatory to the General Agreement on Tariffs and Trade (GATT).[1] However, it is evident that GATT was more inclined toward developed countries than developing ones. Some developing countries, especially Brazil and India, have proposed during the Uruguay Round negotiations that GATT has no business dealing with the issues of intellectual property protection, which should be discussed at the World Intellectual Property Organization (WIPO); the United Nations Educational, Scientific, and Cultural Organization (UNESCO); and the United Nations Conference on Trade and Development (UNCTAD). During the negotiations, notwithstanding pointing out that countries at different levels of development should have their own right to decide whether to grant patent right to certain products,[2] India decided to join the nascent World Trade Organization (WTO).

On January 1, 1995, the TRIPS Agreement went into force, which meant that India as a member of the WTO was required to abandon some of its long held position in the intellectual property field to comply with the provisions of the TRIPS Agreement. As a developing country, India obtained a 5-year transition period[3] and an additional 5 years to amend patent laws on patent protection of pharmaceuticals.[4] The following analysis is based on the amendments to the Indian Patent Law of 1999, 2002, and 2005 and delineates the impact of the TRIPS Agreement on India's pharmaceutical patent system.

1.1 Amendment in 1999: Increased Exclusive Marketing Rights in Transition Period

According to Article 70.8 of the TRIPS Agreement, members that have not provided patent protection for pharmaceuticals and agricultural chemical products as of the date of entry into force of the WTO Agreement are required to provide a means by which applications for patents for such inventions can be filed as of the date of entry into force of the WTO Agreement: to apply the criteria for patentability as laid down in the TRIPS Agreement as if those criteria were being applied on the date of filing in that member country and to provide patent protection from the grant of the patent and for the remainder of the patent term, calculated from the filing date. The purpose of the TRIPS Agreement provision is to maintain the novelty and priority of

[1] India acceded to the GATT on July 8, 1948, and became a founding member of the World Trade Organization on January 1, 1995. As a result, India joined the TRIPS Agreement on January 1, 1995. On September 7, 1998, India joined the Paris Convention.

[2] Matthew O'Regan, The Protection of Intellectual Property, International Trade and the European Community: The Impact of the TRIPS Agreement of the Uruguay Round of Multilateral Trade Negotiations, 22 *Legal Issues of Economic Integration* (1995) Issue 1, 3.

[3] *TRIPS Agreement*, Article 65.2.

[4] Article 65.4 of the *TRIPS Agreement*.

such applications. This is also called the "mailbox" application system and is used by developing countries during the transition period.

At the same time, in accordance with the requirements of Article 70.9 of the TRIPS Agreement, although it is not necessary to directly provide patent protection during the transition period, exclusive marketing rights are to be granted to pharmaceuticals and agricultural chemical products provided that, subsequent to the entry into force of the WTO Agreement, a patent application has been filed and a patent granted for that product in another member and marketing approval obtained in such other member. The Patents (Amendment) Act, 1999, was issued on March 26, 1999, but effective since January 1, 1995, which is the effective date of the TRIPS Agreement. The Amendment of 1999 added Chapter IVA after Chapter IV of the Patents Act, 1970, to specifically regulate exclusive marketing rights.

According to the Amendment,[5] product patent applications can be submitted in the food and pharmaceutical fields, which however will not be subject to patent examination until December 31, 2004. At the same time, the Amendment provides another way to obtain protection, namely, exclusive marketing rights to sell or distribute the article or substance in India. For the application for exclusive right to sell or distribute an article or a substance, the Controller[6] shall first examine whether the invention is not an invention within the meaning of the Patents Act[7] or the invention is an invention for which no patent can be granted.[8] If the object of the application falls into the abovementioned matters, the application shall be rejected. In a case where an application is not rejected by the Controller, he/she may proceed to grant an exclusive marketing right in the following two situations: (1) the invention claiming the identical article or substance in a convention country has been granted a patent or sale or distribution of the article or substance has been approved. (2) The invention claiming the method or process of manufacture for that invention relating to the identical article or substance has been granted a patent in India. The exclusive marketing right shall be granted by the Controller on behalf of the Central Government. The applicant shall have the exclusive marketing right to himself/herself, his/her agents or licensees to sell or distribute in India the article, or the substance from the date of approval granted by the Controller for a period of 5 years or till the date of grant of patent or the date of rejection of the application for grant of patent, whichever is earlier.

1.2 Amendment in 2002: Wide-Ranging Changes to Meet the TRIPS Standards

The Patents (Amendment) Act, 2002, was promulgated on June 25, 2002, and came into force on such dates as the Central Government appointed, by notification in the

[5] Chapter IVA Exclusive Marketing Rights of *The Patents (Amendment) Act*, 1999.

[6] In Indian Patents Act, Controller means the Controller General of Patents, Designs and Trademarks.

[7] Section 3 of t*he Patents Act*, 1970.

[8] Section 4 of t*he Patents Act*, 1970.

Official Gazette, and different dates were designated for different provisions of this Act.[9] In order to meet the TRIPS standards, many provisions of the Patents Act, 1970, were amended, including the definition of invention, the object of patent protection, the patent term, the requirements of patent application, compulsory licenses, and the Bolar exception, which have a significant impact on India's pharmaceutical patent system.

In relation to the definition of an "invention" under patent law, the TRIPS Agreement clearly stipulates that patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step, and are capable of industrial application.[10] Therefore, the Amendment of 2002 stipulates the definition of invention, that is, a new product or process involving an inventive step and capable of industrial application, and further defines inventive step as a feature that makes the invention not obvious to a person skilled in the art.[11]

On objects that are not capable of protection under patent law, based on the Patents Act, 1970,[12] the Amendment of 2002 further clarifies that a patent shall not be granted to the following items[13]: "(1) an invention the primary or intended use or commercial exploitation of which would be contrary to public order of morality or which causes serious prejudice to human, animal or plant life or health or to the environment; (2) discovery of any living thing or non-living substance occurring in nature; (3) any process for diagnostic and therapeutic treatment of human beings or any process for a similar treatment of animals; (4) plants and animals in whole or any part thereof other than micro-organisms but including seeds, varieties and species and essentially biological processes for production or propagation of plants and animals; (5) a mathematical or business method or a computer program per se or algorithms; (7) a literary, dramatic, musical or artistic work or any other aesthetic creation whatsoever including cinematographic works and television productions; (8) a mere scheme or rule or method of performing mental act or method of playing game; (9) a presentation of information; (10) topography of integrated circuits; (11) an invention which, in effect, is traditional knowledge or which is an aggregation or duplication of known properties of traditionally known component or components."

On the term of patent protection, according to the TRIPS Agreement,[14] the term of protection available shall not end before the expiration of a period of 20 years counted from the filing date. However, Section 53 of the Patents Act, 1970, stipulates that the term of a patent in respect of an invention claiming the method or process of manufacture of a substance, where the substance is intended for use, or is capable of being used, as food or as a medicine or drug, shall be 5 years from the

[9] Section 1 of *the Patents (Amendment) Act*, 2002.

[10] Article 27.1 of the *TRIPS Agreement*.

[11] Section 3(f) of *the Patents (Amendment) Act*, 2002.

[12] Section 3. Chapter II Inventions not Patentable of *the Patents Act*, 1970.

[13] Section 4 of *the Patents (Amendment) Act*, 2002.

[14] Article 33 *of the TRIPS Agreement*.

date of sealing of the patent or 7 years from the date of the patent, whichever period is shorter, and, in respect of any other invention, shall be 14 years from the date of the patent. The Amendment of 2002 extended the term of protection of all patents to 20 years in accordance with the TRIPS requirement.[15] The Amendment stipulates that the term of every patent granted, after the commencement of the Patents (Amendment) Act, 2002, and the term of every patent which has not expired and has not ceased to have effect, on the date of such commencement, shall be 20 years from the date of filing of the application for the patent.

On the subject of compulsory license, the Amendment has made a number of changes in accordance with the TRIPS Agreement and the Doha Declaration. First of all, the Amendment further clarified the grounds for compulsory license on the basis of the Patents Act, 1970,[16] that is, at any time after the expiration of 3 years from the date of the sealing of a patent, any person interested may make an application to the Controller for grant of a compulsory license for a patent on any of the following grounds: (1) that the reasonable requirements of the public with respect to the patented invention have not been satisfied; (2) that the patented invention is not available to the public at a reasonably affordable price; and (3) that the patented invention is not worked in the territory of India. The third ground was introduced via the Amendment.[17]

In addition, the Amendment also provides a special provision for compulsory licenses on notification by the Central Government,[18] which may be issued in a circumstance of national emergency, extreme emergency, or a case of public non-commercial use, including public health crises, relating to AIDS, human immunodeficiency virus, tuberculosis, malaria, or other epidemics. At the same time, the amendment also provides for the termination of a compulsory license by the Controller,[19] namely, if and when the circumstances that gave rise to the grant thereof no longer exist and such circumstances are unlikely to recur.

On exceptions for patent infringement, the TRIPS Agreement stipulates that members may provide limited exceptions to the exclusive rights conferred by a patent, provided that such exceptions do not unreasonably conflict with the normal exploitation of the patent and do not unreasonably prejudice the legitimate interests of the patent owner, taking account of the legitimate interests of third parties.[20] Based on the Patents Act, 1970,[21] the Amendment inserted a provision for certain acts not to be considered infringement, also known as regulatory exceptions. That is, any act of making, constructing, using, or selling a patented invention solely for uses reasonably relating to the development and submission of information required under any law for the time being in force, in India, or in a country other than India, which

[15] Section 27(a) of *the Patents (Amendment) Act*, 2002.

[16] *Section 84 of the Patents Act*, 1970.

[17] *Sections 39 and 84 of the Patents (Amendment) Act*, 2002.

[18] *Sections 39 and 92 of the Patents (Amendment) Act, 2002*.

[19] *Sections 39 and 94 of the Patents (Amendment) Act, 2002*.

[20] *Article 30 of the TRIPS Agreement*.

[21] *Section 107 of the Patents Act, 1970*.

regulates the manufacture, construction, use, or sale of any product, shall not be considered an infringement of patent rights.[22] According to this provision, generic pharmaceutical manufacturers are allowed to use the patented invention to obtain market approval from a regulatory agency for medicines and healthcare products, without the patent holders' permission. This rule is also known as the Bolar exception.

1.3 Amendment in 2005: Comprehensive Improvement Before the Expiration of Transition Period

The Patents (Amendment) Act, 2005, was promulgated on April 4, 2005. While some specific provisions came into force on dates set by the Central Government, the remaining provisions came into force on January 1, 2005, when India's transition period expired. The Amendment of 2005 is crucial for India to fully implement the TRIPS obligations.

The most important change introduced by the Amendment is the omission of Section 5 of the Patents Act, 1970,[23] which provided that no patent shall be granted in respect of claims for substances intended for use, or capable of being used, as food or as medicine or drug or relating to substances prepared or produced by chemical processes.[24] The Amendment also omitted Chapter IVA "Exclusive Marketing Rights," which was inserted into the Act by the Amendment of 1999.[25] This means that, after the expiration of the transition period, in accordance with the TRIPS requirement,[26] patents shall be available for any inventions, whether products or processes, in all fields of technology.

The Amendment also made important adjustments to provisions on compulsory licenses. First, the Amendment added compulsory license for export of patented pharmaceutical products in certain exceptional circumstances.[27] The TRIPS Agreement stipulates that a compulsory license may only be issued predominantly for the supply of the domestic market of the member granting the license.[28] However, many countries without a significant pharmaceutical sector have not been able to take advantage of the compulsory licensing provisions of the TRIPS Agreement. Paragraph 6 of the Doha Declaration is aimed at finding a solution to the problem.[29] Therefore, the Amendment inserted a new section,[30] which states that a compulsory license shall be available for manufacture and export of patented pharmaceutical

[22] *Section 44 of the Patents (Amendment) Act, 2002*.

[23] *Section 5 of the Patents Act, 1970*.

[24] *Section 4 of the Patents (Amendment) Act, 2005*.

[25] *Section 21 of the Patents (Amendment) Act, 2005*.

[26] Article 27.1 of the *TRIPS Agreement*.

[27] *Section 55 of the Patents (Amendment) Act*, 2005.

[28] Article 31(f) of the *TRIPS Agreement*.

[29] WTO General Council, *The Implementation of Paragraph 6 of the Doha Declaration the TRIPS Agreement and Public Health*, WT/L/540, August 30, 2003.

[30] Section 55 of *the Patents (Amendment) Act*, 2005.

products to any country having insufficient or no manufacturing capacity in the pharmaceutical sector for the concerned product to address public health problems, provided that a compulsory license that has been granted by such country or such country has allowed importation of the patented pharmaceutical products from India. Pharmaceutical product here means any patented product or product manufactured through a patented process of the pharmaceutical sector.

Secondly, the Amendment added a special situation of compulsory license. According to the mailbox application system stipulated in the Amendment of 1999, applications in respect of a claim for the substances in the pharmaceutical sector could be filed, but these applications were not examined until January 1, 2005. The Amendment of 2005 inserted a new section, stating that, for product inventions in the pharmaceutical and chemical sector, the patent holder shall only be entitled to receive reasonable royalty from such enterprises which have made significant investment and were producing and marketing the concerned product prior to January 1, 2005, and which continue to manufacture the product covered by the patent on the date of granting of the patent, and no infringement proceedings shall be instituted against such enterprises.[31] This means that a product patent entering the mailbox application system is in essence facing the same treatment as a compulsory license, to a certain degree.

Another important change brought by the Amendment is the addition of a situation that is not considered to be an infringement of patent rights. The Amendment of 2002 added the Bolar exception for the first time,[32] while the Amendment of 2005 extended the scope of application of the Bolar exception to importation.[33] This means that any act of marking, constructing, using, selling, or importing a patented invention solely for uses reasonably related to the development and submission of information required under any law in India or in other country, which act regulates the manufacture, construction, use, sale, or import of any product, shall not be considered an infringement of patent rights. This provision mainly focuses on pharmaceutical products and medical instruments.

2 The Impact of Indian Patent Law on the Local Pharmaceutical Industry

2.1 Rejection of Product Patent

The *Report on the Revision of the Patent Law* submitted by the Patent Law Amendment Commission in 1959,[34] which was led by Shri Justice N. Rajagopala Ayyangar, pointed out that at that time foreigners held 80% to 90% of India's

[31] Section 10(c) *of the Patents (Amendment) Act*, 2005.

[32] *Section 44 of the Patents (Amendment) Act, 2002*.

[33] *Section 58(a) of the Patents (Amendment) Act*, 2005.

[34] Shri Justice N. Rajagopala Ayyangar, *Report on the Revision of the Patent Law*, Government of India, September 1959, 274, 285.

patents, of which 90% of the patented products were not manufactured in the Indian territory. Foreign companies could block the production of their patented drugs in India, causing the stagnation of the Indian domestic pharmaceutical industry. Thus, the Commission believed that the patent system had been used by multinational corporations to monopolize the market, especially in the food, pharmaceutical, and chemical industries. Market monopolies also led to high product prices. Therefore, the Commission recommended that only methods or processes in the abovementioned fields be patentable, as opposed to the Indian Patents and Designs Act of 1911, which granted patent to both product and process inventions in the pharmaceutical sector.

This suggestion was adopted by the Patents Act of 1970, which has laid the foundation for the boom in India's generic drug industry. According to the Patents Act of 1970, no patent shall be granted in respect of claims for substances intended for use or capable of being used as medicine or drug or relating to substances prepared or produced by chemical processes. The reason that the Patents Act of 1970 only grants method patents in the fields of pharmaceuticals and chemicals is because product patents have an inhibitory effect on other related research, as they can prevent others from obtaining the same products through different methods. Once product patents are granted to drugs, patentees can control the production of patented drugs and thereby unreasonably raise the prices of essential medicines.[35] Thus, the rejection of the drug product patents guaranteed that India's generic companies could produce drugs with the same or similar composition through reverse engineering and avoid being accused of infringement. India denied product patents in the pharmaceutical sector until the expiration of the transition period of the TRIPS Agreement on January 1, 2005. The rejection of product patents in the pharmaceutical sector for more than 30 years has created an opportunity for the development of the generic drug industry in India.

After comparing drug prices among India, the United Kingdom, Malaysia, and Nigeria, before and after the Indian Patents Act of 1970, R.B. Saxena, consultant at the Indian Council for Research on International Economic Relations, found[36] that the prices of pharmaceutical products in India were highest before the enactment of the Patents Act of 1970 and that in 1987 the prices in India for commonly used drugs, such as analgin tablets, doxycycline capsules, diazepam tablets, and metronidazole tablets, were low compared to those of other countries. The research also found that some of the important new drugs could be introduced into India with a time lag ranging between only 4 and 6 years. Thus, Saxena pointed out that the changes relating to process patenting incorporated in the Indian Patents Act of 1970 had benefited Indian consumers in terms of prices paid for drugs and medicines and, meanwhile, it also became possible to produce many new pharmaceutical products in India much faster than what could have been otherwise.

[35] R.B. Saxena, Trade-Related Issues of Intellectual Property Rights and the Indian Patent Act: A Negotiating Strategy, 12 *World Competition* (1988), Issue 2, 92.

[36] Ibid.

2.2 Mailbox Application Mechanism

The mailbox application mechanism during the transition period allowed India not only to meet the TRIPS requirements but also to take into account India's own development needs. India's transition period for complying with the TRIPS obligations related to pharmaceuticals was 1995 to 2005 . According to the Amendment of 1999, applications in respect of a claim for the substances in the pharmaceutical sector could be filed and entered into the mailbox system but were not processed until January 1, 2005; and the application could be granted exclusive marketing rights to sell or distribute the article or substance in India.

Before 2005, local pharmaceutical companies were allowed to reverse-engineer the best-selling drugs and produce cheap generic drugs for the domestic market and export them to Russia, China, Brazil, and Africa. In the process of producing generic drugs, Indian pharmaceutical companies accumulated extensive experience and trained their own technical personnel. During the transition period, Indian domestic pharmaceutical companies allied with each other to conduct R&D and to manufacture pharmaceuticals for multinational pharmaceutical companies. The Indian domestic pharmaceutical industry grew rapidly, and some local pharmaceutical companies embarked on medicinal R&D and applied for drug patents in the United States and the European Union.[37]

The transition decade was the fastest growing period for the Indian pharmaceutical companies, and the industry became one of the most lucrative sectors in India. Research[38] shows that the average profit margin (profit as a percentage of sales) of the pharmaceutical industry was about 8.8% in 1995 (while the profit margin of the chemical industry was 5.8%, that of the food and beverage industry was 4.8%, and that of the machinery manufacturing industry was 5.5%) and shot up to 15.4% in 2005. At the same time, generic drugs entering the Indian market grew rapidly. From 1980 to 1990, only 10 generic drugs entered the Indian market; the number reached 99 during the period 1990–1995, 156 during the period 1995–2000, and 262 during the period 2000–2005. It can be inferred that the transition period was a golden decade for the development of the Indian pharmaceutical industry.

After 2005, India started to examine product patent applications, which led Indian pharmaceutical companies to adjust their product development policy and to increase R&D investment. At the same time, multinational pharmaceutical and biotech corporations started to increase contracted R&D and manufacturing in the Indian market.

[37] Ravi Sarathy, Strategic Evolution and Partnering in the India Pharmaceutical Industry, in Subhash C. Jain (ed.), *Emerging Economies and the Transformation of International Business: Brazil, Russia, India and China (BRICs)*, Edward Elgar Publishing Ltd., 2016, 229.

[38] Mainak Mazumdar, *Performance of Pharmaceutical Companies in India*, Springer, 2013, 32.

2.3 Compulsory Licensing System

In the Patents Act of 1970, there was already a special chapter for compulsory licenses, and the system was further improved in the Patents (Amendment) Act of 2002 and 2005. The compulsory licensing system creates more chance for voluntary licensing negotiation between the domestic Indian pharmaceutical companies and multinational corporations to succeed.

According to Indian Patent Law, after the expiration of 3 years from the date of the sealing of a patent, any person interested may make an application to the Controller. The applicant is required to first attempt to procure a voluntary license from the patentee before applying for a compulsory license. If this attempt does not come to fruition within 6 months of the initial request, the applicant is entitled to file a compulsory license application.

In 2012, the Controller, upon the application of Natco Pharma Ltd. (Natco), granted a compulsory license on Nexavar (Sorafenib Tosylate), a kidney cancer medicine patented by Bayer Corporation (Bayer).[39] This is the first ever and only compulsory license in India. One of the grounds on which the Controller made the decision was that the drug Nexavar was not manufactured in India but was instead imported and marketed in the Indian market and the term of "(not) work(ed)" only means manufacturing and does not include importing or selling.

The Controller pointed out that the grounds for issuing compulsory licenses are not defined in the TRIPS Agreement itself, which leaves considerable discretion to WTO members as to how to apply the criteria within their national laws. The Controller also emphasized that the use of these flexibilities can directly or indirectly help the low- and middle-income countries to achieve a balance between intellectual property protection and specific developmental priorities, including the attainment of national public health objectives.[40] The decision of the Controller was subsequently reviewed by the Intellectual Property Appellate Board (IPAB) and courts and was finally confirmed by the Supreme Court in 2014, despite fears that the compulsory license might discourage foreign direct investment in India.[41]

Admittedly, the Nexavar case in the long run will make patentees aware of the possibility of compulsory licensing and be more ready to enter into voluntary licensing, thus creating more space for voluntary licensing negotiations, which would in turn help lower drug prices.

Thereafter, the Controller has been very cautious in issuing compulsory licenses. For example, in March 2013 BDR Pharmaceuticals Intl. Pvt. Ltd. (BDR) requested a compulsory license on Bristol-Myers Squibb's cancer drug Dasatinib,

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[39] Ibid.

[40] *Decision of the Controller in Compulsory License Application No. 1 of 2011*, March 9, 2012; Application for Compulsory Licence under Section 84(1) of the Patents Act, 1970, in respect of Patent No. 215758, 41. Available at http://patentdocs.typepad.com/files/compulsory-license-application.pdf

[41] James J. Nedumpara and Prateek Misra, Natco v. Bayer: Indian Patent Authority Grants Its First Ever Compulsory License on Pharmaceutical Products, 7 *Global Trade and Customs* (2012), 328.

which is used by patients with chronic myeloid leukemia. BDR also submitted that the price of each tablet sold by the patentee was INR 2761, working out to INR 1, 65,680 for 60 tablets per month per patient.[42] BDR promised that after obtaining the license, it would make the drug available to the public at a price of INR 135 per tablet, which would amount to INR 8100 per month, and moreover, it would provide the drug for free to a certain percentage of patients. However, the Controller rejected BDR's application in October 2013, on the ground that BRD has not made enough efforts to obtain a voluntary license for the drug. Through this rejection, the Controller has shown that any decision on compulsory license will be carefully made and patent right will be duly protected.[43] This approach effectively balances the interests of multinational corporate patentees and domestic generic companies.

2.4 Interpretation of Patentable Subject Matter

The flexibility to interpret patentable subject matter creates opportunities for the domestic generic drug companies to challenge a pharmaceutical patent in India. Given that the term "invention" is not defined in the TRIPS Agreement, there is flexibility to interpret patentable subject matter. The Indian Patents (Amendment) Act of 2005 excludes any new form of a known substance from patentable subject matter, if the new form does not result in enhancement in efficacy. This amendment would make it easier to challenge a pharmaceutical patent in India.

In the Novartis v. Union of India case, the patent application on Gleevec was rejected by the Controller, which rejection was upheld by the IPAB and eventually by the Supreme Court on the ground that the patent failed to meet the requirements of section 3(d) of the Patents (Amendment) Act of 2005. According to section 3(d), a modification of a known drug is only patentable when it enhances therapeutic efficacy. The Supreme Court decided that the substance that Novartis sought to patent was indeed a modification of a known drug imatinib, which was disclosed in the 1993 patent application. However, Novartis did not present evidence of a difference in therapeutic efficacy between the final form of Gleevec and the raw form of imatinib.[44] The rejection was considered an effective practice to prevent evergreening of pharmaceutical patents and create opportunities for local generic drug

[42] According to the national accounts data of the World Bank, India's per capita income (nominal) was USD 1670 (approximately INR 113,710) in 2016. Available at https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=IN

[43] Harsha Rohatgi, *Indian Patent Office Rejects Compulsory Licensing Application*, available at http://www.iiprd.com/2013/11/13/indian-patent-office-rejects-compulsory-licensing-application-bdr-pharmaceuticals-pvt-ltd-vs-bristol-myers-squibb/

[44] Supreme Court of India, *Judgment of Civil Appeal Nos. 2706–2716* of 2013, paragraph 128; Gopakumar G Nair, Andreya Fernandes and Karthika Nair, Landmark Pharma Patent Jurisprudence in India, 19 *Journal of Intellectual Property Rights* (2014), 80~82.

companies.[45] Novartis case was a benchmark for preventing the evergreening of pharmaceuticals. After 2013, every pharmaceutical patent has to pass the standards set by the Supreme Court in the Novartis case. Meanwhile, in 2014, the Controller framed a new set of guidelines for examining pharmaceutical applications, which incorporates the findings in the Novartis case.[46]

3 China's Patent Legislation and Patent Protection for Pharmaceuticals

Compared with other industries, the pharmaceutical industry has its own particularity, as the invention of pharmaceuticals is hugely expensive, and pharmaceuticals are closely related to human rights, such as the right to life and the right to health. The price of a patented drug is substantially higher than that of generic drugs, which affects access to medicine. In the legislative process of China's Patent Law, which was first enacted in 1984 (effective April 1, 1985) and amended three times in 1992, 2000, and 2008, the issues of whether to grant patent protection for pharmaceutical products, the extent of protection, and exceptions to patent infringement have always been important.

3.1 From Denying to Recognizing Patent Protection for Pharmaceutical Products

In 1979, Dr. Árpád Bogsch, the Director General of the WIPO, suggested that China's first patent law should not provide any exceptions to patentability and patent protection should be available for any inventions in all fields of technology. He also suggested that for some technical fields, such as in the pharmaceutical sector, if the patented invention is not worked in China, a compulsory license could be granted to local companies in order to meet public interests.[47]

During the drafting of the Patent Law of 1984, patentable subject matter was a very important issue. There was a heated debate about which inventions should be protected and which should be excluded from the scope of protection under the

[45] However, incremental innovation should be distinguished from evergreening. A pharmaceutical company engages in evergreening if it merely modifies the color of the tablet or the inert ingredients of a drug and seeks to patent the modification. However, when a modification increases a drug's bioavailability or absorptivity, it can produce significant improvements in drug delivery and effects, and hence should be treated as an incremental innovation worthy of patent protection; see Jodie Liu, Compulsory Licensing and Anti-Evergreening: Interpreting the TRIPS Flexibilities in Sections 84 and 3(d) of the Indian Patents Act, 56 *Harvard International Law Journal*, No. 1 (2015), 220.

[46] Office of the Controller General of Patents, Designs and Trademarks, *Guidelines for Examination of Patent Applications in the Field of Pharmaceuticals*, October 2014.

[47] Zhao Yuanguo, *The Formulation and Promulgation of China's Patent Law (in Chinese)*, Beijing: Patent Literature Publishing House, 2003, 28.

patent law. At the time, there were two very different views regarding the patent protection of pharmaceutical products. The argument that no patent right should be granted to pharmaceutical products was mainly based on the fact that medicines are related to people's physical health and should not be monopolized by a small number of people and that granting patent protection would hinder domestic companies which were lagging far behind their foreign competitors in pharmaceutical technology.

After many discussions, the legislators decided that pharmaceutical products should not be monopolized by patentees for two reasons: first, medicinal supply is closely related to people's health and life. Second, patent would have negative influence on the domestic pharmaceutical industry, because most of the pharmaceutical inventions were created and owned by companies of developed countries.[48] Under Item 5 of Article 25 of the Patent Law of 1984, no patent right shall be granted for pharmaceutical products and substances obtained by means of a chemical process. In fact, throughout the legislative process, in every version of the draft, including the final one, pharmaceutical products were not listed in the scope of patent protection.

However, on September 4, 1992, the Standing Committee of the National People's Congress adopted the Decision on Amending the Patent Law, which abandoned the stance of denying patent protection for pharmaceutical products of the Patent Law of 1984. This means that, from January 1, 1993, when the amendment took effect, pharmaceutical products and substances obtained by means of a chemical process could be granted patent right, provided that they possess the characteristics of novelty, inventiveness, and industrial usefulness.

One of the major reasons for the amendment of China's Patent Law in 1992 was the execution of the Memorandum of Understanding on the Protection of Intellectual Property Rights between the governments of China and the United States on January 17, 1992. In the memorandum, the Chinese government promised to expand the patentable subject matter in China's Patent Law, i.e., to extend patent protection to all chemical inventions, including pharmaceuticals and agricultural chemicals, whether products or processes.[49] Since the late 1980s, in order to obtain full and effective intellectual property protection for American enterprises overseas, the US government held intellectual property negotiations with its trading partners and threatened trade sanctions, in an attempt to force them to accept the American standards for intellectual property protection.[50] In addition, the Uruguay Round of the GATT adopted the TRIPS Agreement, which stipulates that patent protection should be available for any inventions in all fields of technology. The Amendment of China's Patent Law of 1992 was a response to US trade pressure and the requirements of the TRIPS Agreement.

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[48] Tang Zongshun, *Patent Law (in Chinese)*, Beijing: Law Press, 1996, 66.

[49] Article 1 of the *Sino-US Memorandum of Understanding on the Protection of Intellectual Property Rights*, 1992

[50] Wen Xikai, Thoughts on Second Revision of the Chinese Patent Law (in Chinese), 1 *China Patents and Trademarks* (1999), 16.

3.2 Compulsory License for Exploitation of Pharmaceutical Patents in Theory but Not in Practice

The compulsory licensing system was established in China's Patent Law of 1984. According to Articles 51 and 52 of the Patent Law of 1984, the patentee has an obligation to manufacture the patented product or use the patented process in China. If, 3 years after the date of the grant of a patent right, the patentee of an invention or utility model has failed, without any justifiable reason, to manufacture the patented product or use the patented process in China, the Patent Office may, upon the request of a unit possessing the means to exploit the invention or utility model, grant a compulsory license to exploit the patent.

These provisions are very similar to the condition of granting a compulsory license in Indian Patents Act, according to which if the patented invention is not worked in the territory of India within 3 years from the date of sealing a patent, any person may make an application for grant of a compulsory license. Admittedly, the obligation to exploit a patent within a country's territory can increase the value of the patent in the country concerned, as it would promote technical transfer to the country and help the training of relevant technical personnel. For domestic generic companies, this can also mean more opportunities to exploit patents owned by foreign companies.

However, this obligation to exploit a patent in China was cancelled in the Patent Law of 1992, and two other conditions for granting a compulsory license were added in the law. Firstly, where any entity which is qualified to exploit the invention or utility model has made a request for authorization from the patentee to exploit the patent or utility model on reasonable terms and has been unable to obtain such authorization within a reasonable period of time, the Patent Office may, upon the application of such entity, grant a compulsory license to exploit the patent for the invention or utility model.[51] Secondly, where a national emergency or an extraordinary state of affairs occurs, or where the public interest so requires, the Patent Office may grant a compulsory license to exploit the patent for an invention or utility model.[52]

In order to better solve public health problems, the State Intellectual Property Office (SIPO) of China issued the *Rules for Compulsory License of Patents concerning Public Health Problems in 2006*, which were abolished and replaced by the Rules on the Implementation of Compulsory Patent License issued by the SIPO in 2012. The rules were promulgated for implementing the Doha Declaration on the TRIPS Agreement and Public Health by the WTO Ministerial Conference and Paragraph 6 of the Doha Declaration on the TRIPS Agreement and Public Health by the General Council of WTO.

In the third Amendment, another new circumstance for granting a compulsory license was added in the Patent Law of 2008 (effective October 1, 2009), i.e., for the purpose of public health, the patent administrative department of the State Council

[51] Article 51 of the *Patent Law*, 1992.

[52] Article 52 of the *Patent Law*, 1992.

may grant a compulsory license for a patented medicine so as to produce and export it to the country or region which conforms to the provisions of the relevant international treaty to which China has acceded.[53] In accordance with this provision, in case any member of the WTO notifies the TRIPS Council of its desire to import medicines for treating certain epidemic disease(s), or least-developed countries which are nonmembers of the WTO notify the Chinese government through a diplomatic channel of their desire to import from China medicines for treating certain epidemic disease(s), then the relevant department of the State Council may ask the SIPO to grant a compulsory license and allow the licensee to manufacture the relevant kind of medicines and export them to the countries concerned.

As one of the drafters of the patent law has explained, the greatest value of the compulsory licensing system is its deterrent and persuasive effect.[54] So far, no compulsory license has ever been granted in China. However, every time when the patent law was amended, this issue has always been a contentious topic and received much attention. The reason is that a compulsory license is an important tool to satisfy public interests.

3.3 From Experimental Use Exception to Bolar Exception

The Patent Law of 1984 already listed certain acts that were not considered patent infringement, including the use of a patent solely for the purposes of scientific research and experiment.[55] However, different interpretations on how to define the boundary of the experimental use exception in practice existed. The first dispute arising from a clinical experimental use was handled by the court in 1995. In the GlaxoSmithKline v. Southwest Pharmaceuticals Plant case, the court granted the total damages caused during the clinical experimental use, which implied that the trial per se constituted infringement.[56] This case also showed that it is difficult for the act of clinical experimental use of patented drugs to be exempted from liability for infringing others' patent rights. Therefore, it is necessary to formulate special provisions to regulate matters relating to the clinical experimental use of patented drugs.[57]

The first so-called Bolar exception case in China, the Sanyo case, was heard in 2006 by the Beijing Second Intermediate People's Court.[58] In the ruling, the court held that the defendant, Wansheng Pharmaceutical Company, had used Sanyo's patented process to make a drug for the purpose of undertaking a clinical trial and applying for approval of production. This act was aimed at testing the safety and

[53] Article 50 of the *Patent Law*, 2008.

[54] Wen Xikai, The Value of Compulsory Licensing Lies in Deterrence and Dissuasion (in Chinese), 1 *China WTO Tribune* (2003), 19.

[55] Article 62 of the *Patent Law*, 1984.

[56] Chongqing First Intermediate People's Court (1995) Zhong Jing Chu No. 406, Civil Judgment.

[57] Wu Yuhe/Liu Zhi, Experimental Use Exemption in Clinical Trial of New Drugs (in Chinese), 2 *China Patents and Trademarks* (2003), 27.

[58] Beijing Second Intermediate People's Court (2006) Min Chu No. 04134, Civil Judgment.

effectiveness of the drug in order to satisfy the requirement of the relevant state agency for approval of the drug. Given that the defendant did not make the drug directly for the purpose of production and business, the act of clinical trial was not deemed an infringement. The judgment in the Sanyo case was supported by most of the Chinese IP legal practitioners, as the judiciary in China urgently needed to search from the existing provisions of the infringement exemptions contained in the patent law for a basis for not construing a clinical trial as patent infringement.[59]

The regulatory Bolar exception was introduced into the Patent Law of 2008. According to Article 69(5), any person who produces, uses, or imports patented drugs or patented medical apparatus and instruments, for the purpose of providing information required for administrative examination and approval, or any other person who produces or imports patented drugs or patented medical apparatus and instruments exclusively for that person shall not be deemed to have infringed the patent right involved.

4 What Could China Learn from India?

4.1 To Fully Utilize the TRIPS Exceptions to Prepare Domestic Pharmaceutical Industry

The transition period gives some exceptions to the implementation of TRIPS to the developing countries. Noteworthy is that India has fully utilized the transition period to prepare its domestic pharmaceutical industry. When the TRIPS Agreement came into force on January 1, 1995, India was a founding member of the WTO and should have implemented the TRIPS obligations after the 5-year transition period available to a developing country member. However, India made best use of the additional period of 5 years to extend product patent protection to pharmaceutical products. In other words, India only began to fully implement the TRIPS obligation to provide both product and process patent protection for pharmaceuticals starting from January 1, 2005. In contrast, China officially became a WTO member on December 11, 2001, but China had amended its patent law as early as in 1992 and had begun to grant product patent for pharmaceutical products and substances from January 1, 1993, onward, 12 years earlier than India. This period constituted an opportune time slot for preparing the generic drug companies in India to face new competition. Indian domestic companies used the decade not only to strengthen R&D capabilities but also to dominate the international generic drug market.

4.2 Legal Professionals Who Understand Global Rules

After India signed the TRIPS Agreement, Mr. Zheng Xiaoguang, an official of the Chinese Embassy in India, wrote an article to remind Chinese readers that, in the

[59] Jiang Hongyi, Compelled Choice Made in Dilemma: Comments on the Issue of Application of Law in the First Case of "Bolar Exception" in China (in Chinese), 4 *China Patents and Trademarks* (2007), 36.

past, India had always acted independently and declined to make concessions, but after the entry into force of the TRIPS Agreement, India had to extensively amend its patent system to comply with the TRIPS requirements and that while so doing India had paid a price far lower than that of China, especially in the pharmaceutical industry.[60]

This is not only because India was already a member of the GATT and a founding member of the WTO and hence had an inherent advantage. What is more important is that India has several generations of elite lawyers, who use English as their mother tongue and have received a Western education and gained familiarity with the Western legal system. These lawyers hold a global perspective and ability to handle complex global issues and therefore understand how to make full use of the flexibilities of the TRIPS Agreement. China should start to cultivate its lawyers to be internationalized so that they become able to further Chinese interests in the world arena.

4.3 Measures to Promote Drug Innovation and Develop Generic Drugs

The Indian government strategically aligns its pharmaceutical policies with its economic ambitions, to suit the domestic interests.[61] India makes progress step by step, winning valuable opportunities for the local pharmaceutical industry to achieve technical sophistication and garner more market share. However, a realistic strategy and specific measures based on the developmental situation of the domestic pharmaceutical industry were simply lacking in China until 2017.

It is therefore encouraging to see the General Office of the Central Committee of the Communist Party of China and General Office of the State Council issued the *Opinions on Deepening the Reform of the Evaluation and Approval Systems and Encouraging Innovation on Drugs and Medical Devices* in October 2017, to promote technological innovation in the drug and medical device industries and to enhance their competitiveness so as to meet the health needs of the general public.

In the opinions, the following measures are, inter alia, put forward: (1) to establish a catalog of marketed drugs of China, which shall categorize innovative drugs, modified new drugs, and generic drugs with the same quality and therapeutic effect as the brand-name drugs and contain information such as active ingredients, forms, specifications, holders of marketing licenses, patents obtained, and protection period of trial data; (2) to explore and establish a patent linkage system, which shall link drug evaluation and approval with drug patents, protect the lawful rights and

[60] Zheng Xiaoguang, General Agreement on Tariffs and Trade and Indian Patent Law: Analysis of the Current Patent System in India (in Chinese), *Patent Law Research (1994)*, Beijing Patent Literature Publishing House, 1995, 197.

[61] Arpan Banerjee, The Law and Politics of Pharmaceutical Patents in India, in Kung-Chung Liu/Racherla U. (eds) *Innovation and IPRs in China and India*. China-EU Law Series, Vol. 4. Springer, 2016, 155.

interests of patent holders, and concomitantly reduce the risks of patent infringements by generic drugs and encourage the development of generic drugs; and (3) to conduct the pilot program of a patent term compensation system, which foresees an appropriate patent term extension for certain new drugs to compensate for the time lost due to delay caused by clinical trial, evaluation, and approval.

5 Conclusion

Both China and India are developing countries and need to seek a balance between protecting intellectual property rights and satisfying people's healthcare needs. They also need to promote innovation and encourage the development of domestic industries. As members of the WTO, both China and India have made a series of amendments to their respective legal systems in response to the TRIPS Agreement's standards of intellectual property protection, including the recognition of pharmaceutical product patents, introduction of a compulsory licensing system, and the Bolar exception. In promoting the development of the domestic pharmaceutical industry, India's experience in legislation and judicial practice deserves serious attention from China, such as using TRIPS's flexibility to facilitate access to medicines, implementing compulsory licensing to create more chance for voluntary licensing negotiation, and updating the guidelines for examining pharmaceutical applications to prevent evergreening of pharmaceutical patents. Meanwhile, learning from India, China should start to cultivate its legal professionals to understand global rules, so that they become able to further Chinese interests in the world arena.

Acknowledgments Research funding for this chapter is from the Shenzhen Soft Science Research (Project No. RKX20180413181939223) and Key Research Center of Humanities and Social Sciences of the Ministry of Education of the People's Republic of China (Project No. 14JJD820018).

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Historical Evolution of India's Patent Regime and Its Impact on Innovation in the Indian Pharmaceutical Industry

Uday S. Racherla

Abstract

Article 21 of the Indian Constitution guarantees every person and citizen of India *the right to life and the right to personal liberty*. Further, Article 47 of the Indian Constitution declares that *it is the duty and obligation of the Indian state to improve public health*. In addition, Article 12 of the International Covenant on Economic, Social and Cultural Rights (ICESCR) adopted by India asserts that *nations have an obligation to facilitate the right to health*. Thus, the Indian government operates under the premise that *medicines critical to the important healthcare needs of India's population must be both available and affordable. Indeed, this paradigm is the foundational basis for India's vision for the right to health under the Article 21 of the Indian Constitution*. Thus, the Indian policy makers strive to meet India's constitutional obligations for the right to health while promoting its *innovation ecosystem* and safeguarding the legitimate business interests of MNCs. Indeed, this powerful undercurrent has been shaping the evolution of the Indian patent regime since India's independence in 1947, through the 1970s, the economic liberalization era initiated in the 1990s, through the membership of WTO and TRIPs Agreement in 1995, post-TRIPS in 2005 and all the way up to today. In this context, this chapter analyzes how the Indian patent regime has been leveraging the flexibilities afforded under the TRIPS Agreement for the prevention of *evergreening*, award of *compulsory licenses*, retention of *pre-grant opposition*, and introduction of *post-grant opposition* and discusses how these dynamic changes are having a global impact.

U. S. Racherla (✉)
Indian Institute of Technology Kanpur, Kanpur, India
e-mail: udays@iitk.ac.in

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_12

Keywords
Innovation · Innovation ecosystem · Competitive advantage · Sustainable economic growth · Indian intellectual property rights regime · Indian generic pharmaceutical industry · Available and affordable medicines · TRIPS flexibilities · Evergreening · Compulsory license · Pre-grant opposition · Post-grant opposition

1 Introduction

It has been recognized by industry, academia, and policy makers alike that innovation is pivotal to *value creation*, *competitive advantage*, and *sustainable economic growth*. As knowledge economy became the basis for globalization, innovation opportunities have been incessantly emerging around the world for value-added products, processes, and services to meet the ever-growing needs, wants, challenges, and opportunities of the world. As a result, today we find many individuals, companies, communities, and nations working relentlessly on innovation. Thus, policy makers, both nationally and internationally, have recognized that innovation either flourishes or suffers depending upon the *innovation ecosystem*. However, the *innovation ecosystem* of a nation depends upon three primary factors, namely, technology environment, business environment, and policy environment (Fig. 1).[1]

Consequently, academia, industries, and governments around the world have been focused on strengthening and promoting the *innovation ecosystem* in order to meet the national priorities, as well as achieve *competitive advantage*, *sustainable economic growth*, and *creation of employment* in the global economy.

In this regard, it is important to note that the vision and strategies of a country's *patent regime* play a crucial role in (a) advancing the goals of its *innovation ecosystem* (indigenously or as part of international agreements), (b) protecting its social and economic interests, and (c) safeguarding the legitimate business interests of competition.

Indeed, it is in this light that the historical evolution of the *Indian patent regime* and its impact on innovation in the Indian pharmaceutical industry must be analyzed and understood.

[1] There are other secondary factors as well. *Technology environment* depends upon the quality of education, innovation support, and the training the citizens receive; *business environment* depends upon the investment and policy support for innovative growth of an existing business or new venture creation; *policy environment* depends upon the socioeconomic goals, science and technology vision, and commitment to innovation.

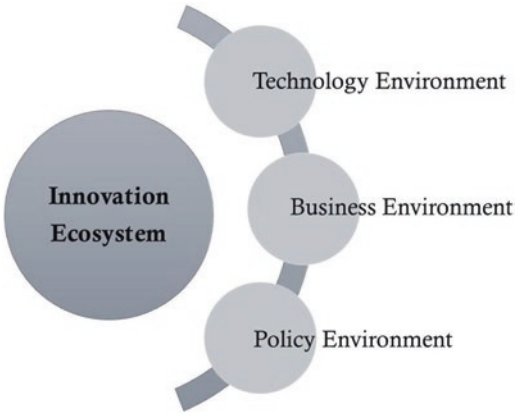

Fig. 1 Innovation ecosystem and the factors governing it

2 Overview of the Indian Pharmaceutical Industry

2.1 Business Achievements

India is a unique global player in the pharmaceuticals business world. To start with, India has a large pool of well-trained scientists and engineers who have the potential to innovate and steer the industry to meet India's vision, national needs, and future goals.

The Indian pharmaceutical industry, valued at US $33 billion in 2017, is currently the *largest global supplier of cost-effective generic drugs*. Thus, the drugs made in India are exported to more than 200 countries around the world, with the United States of America (USA) being India's biggest market. According to *India Brand Equity Foundation* (IBEF), in 2016–2017, around 40.6% of India's pharmaceutical exports (US$ 16.8 billion) were to the American continent, followed by a 19.7% to Europe, 19.1% to Africa, and 18.8% to the Asian continent.[2]

The Indian pharmaceutical companies meet over 50% of the global demand for various vaccines, 40% of the generic demand in the USA, and 25% of demand of all the medicines in the UK. In addition, India supplies over 80% of the antiretroviral drugs needed globally for AIDS (*acquired immunodeficiency syndrome*). In 2017, the Indian pharmaceutical companies received 304 Abbreviated New Drug Application (ANDA) approvals from the US Food and Drug Administration (USFDA).

India is also emerging as a key player in the biotechnology industry. India's biotechnology industry includes biopharmaceuticals, bio-services, bio-agriculture, bio-industry, and bioinformatics. This sub-sector of the Indian pharma industry is expected to grow at an average annual growth rate of around 30% and reach US$ 100 billion by 2025. In fact, the biopharma industry – comprising of vaccines, therapeutics, and diagnostics – contributes US$ 1.89 billion, which is a significant portion of the total industry revenues.

[2] https://www.ibef.org/industry/pharmaceutical-india.aspx

The Indian pharmaceutical market grew at a CAGR[3] of 5.6%, during FY[4] 2011–2016, from US$ 20.95 billion in FY2011 to US$ 27.57 billion in FY2016. In FY2017 alone, the industry's revenues grew by 7.4% and stood at US$ 33 billion. In March 2018, the market grew at 9.5% year-on-year with sales of US$ 1.56 billion. According to the industry analysts, India's pharmaceutical sector is predicted to grow at a CAGR of 22.4% during FYs 2015–2020, to reach US$ 55 billion, as branded drugs worth US$ 55 billion will become off-patent during this period. By FY2020, India is expected to be among the top three pharmaceutical markets in the world by organic growth and sixth largest market in absolute size.

2.2 Investments, Mergers, and Acquisitions

The growing middle-class population in India, increasing demand for better access to healthcare, improving medical facilities, and better penetration of health insurance in the country point to lucrative investment opportunities in the Indian pharmaceutical sector. Not surprisingly, the Government of India amended its *Foreign Direct Investment* (FDI) *policy* in the pharmaceutical sector to automatically allow up to 100% FDI for the manufacture of medical devices subject to, of course, some guidelines.

Thus, according to the data released by the Department of Industrial Policy and Promotion (DIPP), the Indian pharmaceutical sector attracted US$ 15.59 billion worth of FDI in 17 years, between 2000 and 2017. In Q2 2018, the Indian pharmaceutical sector posted private equity and venture capital investments of US$ 396 million. Also, in 2017, India witnessed 46 mergers and acquisitions (M&As) – worth US$ 1.47 billion – in the pharmaceutical sector.[5]

3 Goals and Priorities of the Indian Patent Regime

The Indian pharmaceutical industry is well aware that innovation is critical for *wealth creation, competitive advantage,* and *sustainable growth*. Innovation in the pharmaceutical industry is often a high-risk, high payoff gamble. While companies may deliver *high returns on investment* (ROI) when innovations are successful, innovation failures can threaten company's survival itself.[2] Consequently, Indian pharmaceutical companies rely on successful innovations[6] to make *high profits*, deliver *consistent ROI to shareholders*, and achieve *sustainable growth*. On the

[3] CAGR, compound annual growth rate.

[4] FY, fiscal year.

[5] https://www.rdmag.com/article/2016/02/intellectual-property-and-indian-pharmaceutical-industry

[6] Here the word "innovations" encompass not only *new drug discoveries* but also *reverse engineering and remaking of old drugs* for which patent rights have expired (known as *generic drugs*) or *frugal innovation of important drugs for which compulsory licenses have been given – in a highly competitive and cost-effective manner*.

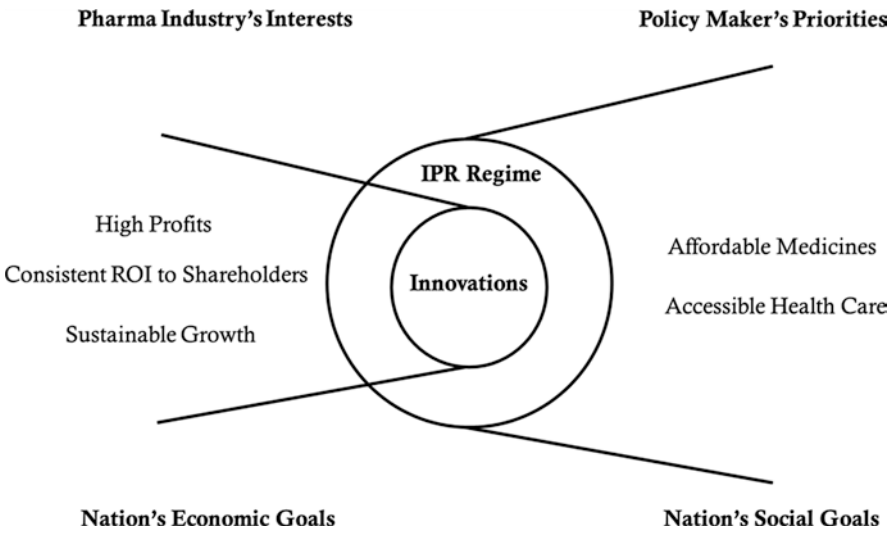

Fig. 2 Dilemma of the Indian policy makers' goals and priorities

other hand, the policy makers of the Indian government *depend on the patent regime to ensure that pharmaceutical innovations deliver affordable medicines and accessible health care to all citizens*. Therefore, successful pharma companies are those that can innovate to solve the healthcare needs, wants, and challenges of millions of people in India while also posting robust revenues, profits, market share, and growth. In other words, nations such as India *aim to balance social goals* (which aim to ensure affordable medicines and accessible healthcare to all citizens) *against the economic goals* (which are aligned with the interests of pharmaceutical companies). Figure 2 summarizes this dilemma of Indian policy makers.

Indeed, it is this powerful undercurrent that has been shaping the policies of the *Indian patent regime* since India's independence in 1947, through the 1970s, the economic liberalization era that started in the 1990s, through the membership of WTO and TRIPS Agreement in 1995, post-TRIPS in 2005, and all the way up to today. Therefore, the historical evolution of the *Indian patent regime*, imperfect as it may seem, makes sense only when one understands how India *tries to continually balance its social goals and priorities against the economic goals*.

4 Brief Overview of the Indian Patent Regime's History

It is important to note that a seminal paper in this area has been published by Janice Mueller.[7] Thus, the Indian patent regime reflects India's journey in three different periods: *colonization*, *post-independence,* and *globalization*. During the

[7] Mueller, J. M. "The Tiger Awakens: The Tumultuous Transformation of India's Patent System and the Rise of the Indian Pharmaceutical Innovation," University of Pittsburgh Law Review, 2006, 68, 491–641.

"colonization" phase, the Indian Patents and Designs Act of 1911 – drafted by the British – enacted India's first patent statutes. India gained its independence in 1947. However, during the "post-independence" phase, the British-imposed, foreigner-favoring patent laws stunted the development of the Indian pharmaceutical industry and forced independent India to import even basic medicines at unaffordable prices. Consequently, in 1949, the Indian government constituted a high-powered committee headed by an eminent jurist of the Lahore High Court, Bakshi Tek Chand, and sought an intensive review of the existing patent laws. The most significant finding of the Chand Committee was that the prevailing Indian patent laws offered asymmetrically strong protections to foreign multinational corporations (MNCs) while severely inhibiting the development of the domestic manufacturing sector. Further, according to the Controller General of Patents, Designs, and Trademarks[8]:

> The committee also observed that the Patents Act should contain clear indication *to ensure that food and medicine and surgical and curative devices are made available to the public at the cheapest price commensurate with giving reasonable compensation to the patentee*.

In 1957, the Government of India appointed another committee led by the distinguished retired Justice of the Supreme Court of India, N. Justice Rajagopala Ayyangar, to examine the question of revising the Patents Act and advising government. This committee's recommendations acted as a catalyst for changing the Indian patent law, which eventually led to India Patents Act of 1970. The India Patents Act of 1970 incorporated major provisions to reduce the social costs of the foreigner-owned patents. Thus, the Patents Act of 1970 (a) *prohibited patents on products* useful as medicines and food, (b) *shortened the term* of *chemical process patents*, and (c) significantly *expanded the availability of compulsory licensing*. This led to the birth and growth of the powerful Indian pharmaceutical generic drugs industry. The third "globalization" phase approximately spans the years 1986 up to the present. According to Mueller, during the "globalization" phase:

> India's participation in the debates over the inclusion of intellectual property within the GATT framework and its eventual entry into the World Trade Organization (WTO), along with its accession to the Paris Convention for the Protection of Industrial Property and the Patent Cooperation Treaty, *have compelled significant strengthening of the nation's patent laws*. The implementation of those changes is ongoing, and their anticipated impact remains to be fully seen. Today *India stands as a rising global power with a patent system still very much in flux*.

5 The Historical Evolution of India's Patent Regime and Its Impact

Now we can look at some of the important details in the evolution of India's patent regime and its impact on innovation in the pharmaceutical industry.[9]

[8] http://www.ipindia.nic.in/history-of-indian-patent-system.htm

[9] (a) https://www.rdmag.com/article/2016/02/intellectual-property-and-indian-pharmaceutical-industry; (b) http://icrier.org/pdf/India's_IPR_Regime.pdf; (c) See Reference 7 as well.

5.1 1947–1970

India won its independence in 1947. In its Constitution, India declared itself as *sovereign socialist secular democratic* republic. Thus, from the beginning, Indian policy makers believed in the principle of *distributive justice* and *government's active role in curbing socioeconomic inequalities*.

At the outset, the Indian government had to meet the needs of nearly 400 million people and confront simultaneous challenges such as food and water shortages, inadequate housing, illiteracy, unemployment, infant mortality, epidemics, inaccessible healthcare, and unaffordable medicines. Faced with the staggering healthcare needs and under the burden of British imposed, foreigner-favoring patent laws, India had no choice but to rely on importing even the most basic medicines such as insulin and penicillin manufactured by other nations, at some of the highest prices in the world.

The *Bakshi Tek Chand Committee Report* noted that the existing Indian patent law afforded "inequitably strong IP protection" to MNCs a situation that was blocking the Indian manufacturing industry in its infancy itself.

As reported in the Shodhganga – the digital repository of Indian Electronic Theses and Dissertations – setup by the INFLIBNET Centre[10]:

> The Indian patent system has failed in its main purpose, namely to stimulate invention among Indians and to encourage the development and exploitation of new inventions for industrial purposes in the country so as to secure benefits thereof to the largest sections of the people.[11]

Strong evidence for this had come just a few years afterward, when Hoechst pharmaceutical company won an injunction in Bombay High Court against Unichem Laboratories of India over infringement of its patent for the manufacture of a highly needed antidiabetic drug.[12]

Thus, the *Bakshi Tek Chand Committee Report* recommended[13]:

> The main provisions suggested by the committee among others include *compulsory licensing*, *commercial working of patented inventions in India* barring importations, *setting up of appellate body* in the form of an ad-hoc Special Tribunal nominated by the Central Government consisting of a sitting or retired judge of a High Court (as the President), and *ensuring that food and medicines are available at cheapest rates to the public* commensurate with giving reasonable compensation to the patentee etc.

This is the first instance where the Indian policy makers unequivocally articulated the need to balance India's social goals against its economic goals.

[10] http://shodhganga.inflibnet.ac.in/bitstream/10603/128146/14/07_chapter%202.pdf

[11] Venkataramiah, E.S. *Supra Note*, **2**, pp. 23.

[12] https://indiankanoon.org/doc/865758/

[13] Draft Manual 2008. *Supra Note*, **1**, pp. 8 and 9.

In 1957, yet another committee was constituted under Rajagopala Ayyangar, for the purpose of building on the recommendations of *Bakshi Tek Chand Committee Report* and sculpting policies that will ensure India's national goals and interests and kick-start the Indian industry. Thus, the new committee once again carefully examined the patent laws of India, in light of the successful public welfare models of several other nations.

Accordingly, the *1959 Ayyangar Committee Report*[14a] noted the following:

> It would be convenient to consider the two matters dealt with by this provision separately –
>
> (1) The precise degree and extent of *patentability to be permitted in regard to inventions of chemical products in general*; and
> (2) the law determining the *patentability of inventions relating to food and medicine*.

In continuation, the *Ayyangar Committee Report*[14a] recommended:

> As regards inventions relating to chemical products, or products produced by chemical processes, I am clearly of the view that the interests of the country would be best served *by confining patentability to the processes* by which the products are obtained and *to deny patents to the products either per se or in the qualified manner suggested in the Bill*. The reasons for this recommendation are based on (1) the history of the law relating to patents regarding chemical inventions in Europe during the past nearly 100 years and the lessons to be derived therefrom; (2) the experience of other countries somewhat similarly situated like India; and (3) *the disadvantages to an underdeveloped country of permitting product claims for such inventions*.

Also notable are the arguments advanced in the *Ayyangar Committee Report*[14b] on patent grant vis-à-vis *economic benefits* and *social costs*:

> Where *the patentee has no intention of working the invention in this country* either because he considers that this is *not profitable* or because he *prefers to expand the production in his home country* so as to achieve there greater efficiency and more production or is otherwise not interested in working the invention in India, *the grant of the Indian patent might tend to improve the economy of the patentee's home country but offers little advantage to us*. Unless therefore the law provides for *measures to be taken to compel the patentees to work the invention within the country*, and these measures are effective to achieve their purpose, *the social cost involved in the grant of the patent is not offset by any benefit to the community* [*by way of an increase of technical skill or of national wealth*].

Next, a joint select committee of the parliament and the parliament itself debated the findings and recommendations of the *Bakshi Tek Chand Committee Report* and the *Ayyangar Committee Report*. This resulted in the Patent Bill of 1965 which incorporated changes relating to patents for food, drug, and medicines. This bill was introduced first in the lower house of the Parliament on September 21, 1965. The bill was reintroduced with some changes in the Parliament in 1966 but could not be passed. The bill eventually lapsed with the dissolution of the Lok Sabha (the lower

[14] a) https://spicyip.com/wp-content/uploads/2013/10/ayyangar_committee_report.pdf, page 23. (b) https://spicyip.com/wp-content/uploads/2013/10/ayyangar_committee_report.pdf, page 18.

house of Parliament) in March 1967. However, the bill was finally passed by the Parliament, and the *Patents Act 1970*[15a] came into force on April 20, 1972 along with Patent Rules 1972. Thus, the *Patents Act 1970* repealed and replaced the 1911 Act while incorporating the recommendations of both the committees. The 1911 Act however continued to apply to designs.

5.2 1970–1995

In the Patents Act 1970, the following *four articles* and *their intended purpose* are noteworthy[15b]:

Chapter II (***Inventions not Patentable***), **Article 5** clarifies that *only processes are patentable*:

> In the case of inventions –
>
> (a) claim.ing *substances intended for use, or capable of being used, as food or as medicine or drug*, or
>
> (b) relating to substances prepared or produced by chemical processes (including alloys, optical glass, semi- conductors and inter-metallic compounds), ***no patent shall be granted in respect of claims for the substances themselves***, ***but claims for the methods or processes of manufacture shall be patentable***.

Chapter VIII (*Grant and Sealing of Patents and Rights Conferred Thereby*), **Article 53** states:

> (1) Subject to the provisions of this Act, the term of every patent granted under this Act shall –
>
> (a) in respect of an *invention claiming the method or process of manufacture of a substance*, where the substance is intended for use, or is capable of being used, as food or as a medicine or drug, be ***five years from the date of sealing of the patent***, or ***seven years from the date of the patent whichever period is shorter***; and
>
> (b) *in respect of any other invention*, be ***fourteen years from the date of the patent***.

Finally, XVI (*Working of Patents, Compulsory Licences, Licences of Right and Revocation*), **Article 83** clarifies the *economic goals* of the Indian policy makers:

> Without prejudice to the other provisions contained in this Act, in exercising the powers conferred by this Chapter, regard shall be had to the following general considerations, namely;
>
> (a) that ***patents are granted to encourage inventions and to secure that the inventions are worked in India on a commercial scale*** and to the fullest extent that is reasonably practicable without undue delay;
>
> (b) that they are ***not granted merely to enable patentees to enjoy a monopoly for the importation*** of the patented article;
>
> (c) that the protection and enforcement of patent rights ***contribute to the promotion of technological innovation and to the transfer and dissemination of technology***, to the mutual advantage of producers and users of technological knowledge and ***in a manner***

[15] (a) http://www.ipindia.nic.in/writereaddata/Portal/IPOAct/1_113_1_The_Patents_Act_1970_-_Updated_till_23_June_2017.pdf. (b) http://www.wipo.int/wipolex/en/text.jsp?file_id=128091

conducive to social and economic welfare, and to a balance of rights and obligations;

(d) that patents granted ***do not impede protection of public health and nutrition*** and should ***act as instrument to promote public interest*** specially in sectors ***of vital importance for socio-economic and technological development of India***;

(e) that patents granted ***do not in any way prohibit Central Government in taking measures to protect public health***;

(f) that the patent right ***is not abused by the patentee*** or person deriving title or interest on patent from the patentee, and the patentee or a person deriving title or interest on patent from ***the patentee does not resort to practices which unreasonably restrain trade or adversely affect the international transfer of technology***; and

(g) that patents ***are granted to make the benefit of the patented invention available at reasonably affordable prices to the public***.

Chapter XVI (***Working of Patents, Compulsory Licences, Licences of Right and Revocation***), **Article 97** clarifies when *compulsory licenses* will be given:

(1) If the Central Government is satisfied in respect of any patent or class of patents in force ***that it is necessary or expedient in the public interest that compulsory licences should be granted*** at any time after the sealing thereof to work the invention or inventions, ***it may make a declaration to that effect in the Official Gazette***, and thereupon the following provisions shall have effect, that is to say –

(i) the Controller shall on application made at any time after the notification ***by any person interested grant to the applicant a licence*** under the patent on such terms as he thinks fit;

(ii) (in settling the terms of a licence granted under this section, the Controller shall endeavour to secure that ***the articles manufactured under the patent shall be available to the public at the lowest prices consistent with the patentees deriving a reasonable advantage from their patent rights***. …

Thus, the Patents Act 1970 (a) *prohibited patenting of products* and *allowed patenting only on the methods/processes of manufacture useful as medicines and food* (see Article 5), (b) *shortened the term of chemical process patents* (see Article 53), and (c) *significantly expanded the grant of compulsory licenses* (see Articles 83 and 97).

Indeed, the India Patents Act, 1970, was *momentous* in the history of the Indian pharmaceutical industry as it enabled domestic firms to replicate the drugs patented by MNCs, creating a booming generic pharmaceutical industry. As MNCs began to exit the Indian market due to significantly diminished IP protection, the Indian pharmaceutical companies began to fill the void and dominate the global business *of reverse-engineered highly cost-efficient generics* that sold at *exceptionally cheaper prices compared to the counterparts marketed by* MNCs. This is how the generic pharmaceutical industry of India was able to become *one of the most prolific drug manufacturing industries in the world*, ranking third globally in annual volume.

Thus, the Indian government was able to meet its *social goals* as well as *economic goals* (Fig. 2). Interestingly, however, there were advantages as well as disadvantages to the unexpected nearly complete exit of the western pharmaceutical companies from India. Thus, while the generics industry saw a rapid growth, creativity and new drug discovery took a hit.

In 1990s, the Indian government led by Prime Minister P. V. Narasimha Rao *initiated the economic reforms and opened up the Indian economy to foreign*

investment.[16] While this created many opportunities for rapid growth of the economy, it also necessitated India to become a member of the international trade agreements. Indeed, this exposed the limitations of the Indian patent regime on investment, imports, as well as exports of medicines.

As the USA succeeded *in the inclusion of patent rights* in particular and *intellectual property rights* (IPRs) in general, in the *General Agreement on Tariffs and Trade* (GATT) negotiations, India faced new challenges.

Thus, India needed to figure out how to leverage the trade benefits of globalization against its obligation to afford stronger patent protections to MNCs under the TRIPS *Agreement*, which could threaten its high priority social goals and the interests of the domestic pharmaceutical industry. India feared that the stronger IP protection mechanisms under TRIPS could once again unduly favor the MNCs and may unravel the benefits achieved under the Patents Act of 1970.

Initially, India opposed the strong IP protections which are part of the TRIPS Agreement, leading a group of developing countries with similar reservations. However, India signed the Uruguay Round Agreements (along with 116 other nations) on April 15, 1994, and became a member of the WTO effective January 1, 1995, while continuing advocacy of more equitable provisions. Thus, India became obligated to modify its domestic intellectual property laws in order to comply with the TRIPS Agreement.

The TRIPS Agreement afforded *a 10-year grace period* to developing countries for configuring their judicial systems and economies, to fully comply with the TRIPS provisions.

5.3 1995–2005

To start with, the Indian government enacted the Patents (Amendments) Ordinance of 1994 to buy time, while statutory changes to the law were pursued in Parliament.[17] However, this ordinance expired on March 26, 1995, before a permanent legislative solution from the Indian Parliament was put in place for compliance of the TRIPS requirements. Unfortunately, the tenth Lok Sabha was itself dissolved later in 1995, throwing the Indian IPR regime into uncertainty. During this period of political chaos, India was taken to the dispute settlement panel of the WTO by the USA and EU separately that resulted in pronouncements against India. Under the impending threat of trade sanctions, the Indian Parliament then acted rapidly to pass the necessary laws.

Thus, changing the IP Laws for TRIPS Compliance was a big challenge for India once TRIPS Agreement came into force on January 1, 1995. To meet its obligations, India embarked on a substantive overhaul of its patent laws but chose to do so

[16] https://qz.com/india/799883/how-narasimha-rao-fixed-the-indian-economy-and-the-congress-party-only-to-be-forgotten/

[17] See Reference 10.

gradually and stagewise. This resulted in three separate patent amendment Acts in 1999, 2002, and 2005 that incrementally modify the Patents Act of 1970 to make it fully TRIPS compliant.

In this context, it is important to note that the *Doha Declaration of November 2001 took into consideration the concerns expressed by several emerging and less-developed nations and strengthened the cause of flexibilities* under TRIPS. Thus, these flexibilities enabled some WTO member states to alleviate hardships resulting from the need to modify patent laws to TRIPS standards.

The DOHA Declaration (2001): Key Articles

The DOHA Declaration recognized the serious concerns of the least developed countries.[18a,b] Some of the articles shown below exemplify this:

Ministerial Declaration

(3) We ***recognize the particular vulnerability of the least-developed countries and the special structural difficulties they face in the global economy***. We are committed to addressing the marginalization of least-developed countries in international trade and to improving their effective participation in the multilateral trading system. We recall the commitments made by ministers at our meetings in Marrakesh, Singapore and Geneva, and by the international community at the Third UN Conference on Least-Developed Countries in Brussels, to help least-developed countries secure beneficial and meaningful integration into the multilateral trading system and the global economy. We are determined that the WTO will play its part in building effectively on these commitments under the Work Programme we are establishing.

(5) We ***are aware that the challenges Members face in a rapidly changing international environment cannot be addressed through measures taken in the trade field alone***. We shall continue to work with the Bretton Woods institutions for greater coherence in global economic policy-making.

Trade-Related Aspects of IPRs

(17) We stress the importance we attach to implementation and interpretation of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) ***in a manner supportive of public health, by promoting both access to existing medicines and research and development into new medicines*** *and, in this connection*, ***are adopting a separate declaration***.

[18] (a) https://www.wto.org/english/tratop_e/dda_e/dohaexplained_e.htm; (b) https://www.wto.org/english/thewto_e/minist_e/min01_e/mindecl_e.pdf

(continued)

Special and Differential Treatment

(44) We *reaffirm that provisions for special and differential treatment* are an integral part of the WTO Agreements. We *note the concerns expressed regarding their operation in addressing specific constraints faced by developing countries, particularly least-developed countries*. In that connection, we also note that some Members have proposed a Framework Agreement on Special and Differential Treatment (WT/GC/W/442). We ***therefore agree that all special and differential treatment provisions shall be reviewed with a view to strengthening them and making them more precise, effective and operational***. In this connection, we endorse the work programme on special and differential treatment set out in the Decision on Implementation-Related Issues and Concerns.

Finally, the India Patents Act 1970 was amended in 2005, so as to[19]:

(a) Include *products* in the *patentable subject matter* category.
(b) Make *reverse-engineering or copying of patented drugs without requisite licensing* from the patent holder *illegal* after January 1, 1995. One exception was that the Act did allow the manufacture of generic versions of drugs patented prior to 1995.
(c) Provide a *20-year guaranteed term of protection to patents* under Article 32 of TRIPS.

5.4 The Key Provisions That Gained Prominence After 2005

However, the India Patents Act, 1970 (2005), also needed to ensure that (Fig. 2):

(a) The *new policies did not adversely impact India's social goals to provide affordable medicines and accessible healthcare to all its citizens*; that means preventing abuse by MNCs.
(b) The *interests of India's generic pharmaceutical industry are considered, while India meets its social goals*; that means FDI and ensuring access to new markets outside India.
(c) The *innovation ecosystem is supported by the Indian government* to facilitate the Indian pharma industry achieve long-term competitive advantage.

Accordingly, the Indian policy makers decided to (i) invoke 3(d) to *prevent* Evergreening by MNCs[20] and (ii) *retain* certain articles to *allow* Compulsory

[19] For "Post-TRIPS experience of the generic pharmaceutical industry in India," see next chapter by B. Dhar.

[20] http://www.ipindia.nic.in/writereaddata/Portal/IPOAct/1_113_1_The_Patents_Act_1970_-_Updated_till_23_June_2017.pdf, page 8

Licensing,[21] so as to ensure its social goals. In addition, India decided to (iii) *retain* pre-grant opposition and (iv) *introduce* post-grant opposition. The details are described below.

Prevent Evergreening

Simply stated, "Ever-greening" refers to *the different means a pharmaceutical patent holder employs to exploit the legal loopholes of patenting to extend/fortify monopoly typically over blockbuster drugs*[22] by either filing disguised or artful patents on previously patented invention just before the end of the term of the parent patent or employing other related regulatory policies.

According to Kumar and Nanda[22]:

> *Ever-greening* is a *strategy employed by the innovator companies to recover high costs* incurred by them in Research and Development and as a means to legally protect any minor modifications that are intentionally made to the parent patent just to obtain multiple patents on the same drug and hence extend the overall term of the patent *to enjoy monopoly for extended periods of time.*
>
> In simple words, a company launches a drug product and obtains patent protection for it and just before the end of the term of that patent; the company files a new patent for a minor modification in the original molecule that extends the overall term of patent protection which ultimately contributes to their monopoly. Hence, extending the patent protection period *delays or prevents the entry of the generic versions of the drug* which can affect the budget for public health and finally the patient.

Companies *often seek protection of the following for the purpose of evergreening*:

- Combinations of two or more drugs
- Dosing regimen, dosing rate, and dosing route
- Biological targets for a known compound
- Delivery profiles, mechanisms of action
- Isomeric forms and derivatives
- Screening methods
- Packaging
- Different treatment methods

Thus, the *rationale and tactics for evergreening of blockbuster drugs* by MNCs are the following[22]:

> Pharmaceutical research and development is an expensive, time consuming and uncertain process that may take 8–10 years to complete. Patent clock starts much before a new drug is approved for marketing and significant amount of time may be lost in the review and

[21] http://www.ipindia.nic.in/writereaddata/Portal/IPOAct/1_113_1_The_Patents_Act_1970_-_Updated_till_23_June_2017.pdf, pages 64–73.

[22] Kumar, A.; Nanda, A. "Ever-greening in Pharmaceuticals: Strategies, Consequences and Provisions for Prevention in USA, EU, India and Other Countries", *Pharmaceutical Regulatory Affairs: Open Access.* 6(1), DOI: https://doi.org/10.4172/2167-7689.1000185 (2017).

> approval process by regulatory bodies. So, *in order to recoup the considerable time and resources invested in the drug development* and *approval process*, *the pharmaceutical companies depend on exclusivity provisions granted by the regulatory bodies*. *There are several official and unofficial methods to extend term of a patent beyond 20 years*. Official methods include provisions by some regulatory bodies such as *data exclusivity*, *orphan drug exclusivity*, *pediatric exclusivity*, *the 180-day exclusivity* (Hatch Waxman Act, U.S. Food and Drug Administration),[23] and *supplementary protection certificate* (European Medical Agency), whereas unofficial methods include *altering or reformulating the existing compound to obtain a new patent by utilising polymorphism, creating combinations, stereo-selective/chiral switches, conversion to NDDS, OTC switching, authorised generics*, etc.

Evergreening, if unchecked, *blocks* the generic drugs market, *undermines* innovation, and *prevents access* to *affordable medicines and accessible healthcare* to citizens. Not surprisingly, this would be detrimental to India's social goals as well as economic goals. Consequently, *the following was substituted for clause (d) in Section 3 in the Patents (Amendment) Act, 2005,* to discourage or prevent *evergreening*. Thus, the new Section 3(d) states[24]:

> The mere discovery of a new form of a known substance ***which does not result in the enhancement of the known efficacy of that substance*** or the mere discovery of any new property or new use for a known substance or of the mere use of a known process, machine or apparatus ***unless such known process results in a new product or employs at least one new reactant***.
>
> ***Explanation***. For the purposes of this clause, salts, esters, ethers, polymorphs, metabolites, pure form, particle size, isomers, mixtures of isomers, complexes, combinations and other derivatives of known substance ***shall be considered to be the same substance***, ***unless they differ significantly in properties with regard to efficacy***.

Aleksandar Ristanić nicely articulated how India leveraged the flexibility afforded by Article 27(1) TRIPS to design 3(d)[25a]:

> First and foremost, Article 27(1) TRIPS requires member states to make patents "*available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application*". TRIPS thus ***simply enunciates these essential patent law concepts*** such as *invention*, *novelty*, *inventiveness* and *industrial applicability* ***without defining them***, ***which leaves a***

[23] The "Drug Price Competition and Patent Term Restoration Act of 1984," also known as *the Hatch-Waxman Amendments*, established the approval pathway for generic drug products, under which applicants can submit an ANDA under section 505(j) of the *Federal Food, Drug, and Cosmetic Act (FD&C Act)* (see https://www.fda.gov/Drugs/DevelopmentApprovalProcess/HowDrugsareDevelopedandApproved/ApprovalApplications/AbbreviatedNewDrugApplicationANDAGenerics/ucm613498.htm).

[24] http://www.ipindia.nic.in/writereaddata/Portal/IPOAct/1_113_1_The_Patents_Act_1970_-_Updated_till_23_June_2017.pdf

[25] (a) http://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=8894039&fileOId=8894040, page 18. (b) Ho, Cynthia M., Access to Medicine in the Global Economy: International Agreements on Patents and Related Rights, (Oxford University Press, 2011), page 92.

> ***considerable discretion to states with how to apply those requirements in their national laws***. The way these key terms are defined, however, can be of the utmost importance for both innovation and access to medicine. If a drug is unpatented it is in the public domain and anyone can produce it.[25b] ***An example of taking advantage of freedom and flexibilities under TRIPS is to be found in India's 2005 amendment to its Patents Act 1970***. While finally allowing the patent protection for pharmaceutical products, India's patent law, Section 3(d), in particular, limits the number of patents that can protect a drug, providing two important exclusions from the scope of that protection. It excludes from the scope of inventions mere discoveries of (1) new forms of known substances – unless there is an enhancement of the known efficacy of that substance, and (2) new uses for known substances. In addition, ***the amendment provides a list of substances that would be considered a new form of the same substance unless they differ significantly in properties with regard to efficacy***.

Indeed, the US and the EU strongly oppose Section 3(d) of the Patents (Amendment) Act, 2005. However, many other countries – like Argentina, Brazil, China, Indonesia, Malaysia, the Philippines, South Africa, and Thailand – either emulate India's patent reforms or strongly support them.

Thus, in 2008, the Philippines amended Section 22 of the Republic Act 8293, exactly along the lines of Section 3(d). Argentina revised and restricted the patentability of derivatives of pharmaceutical products, following the example set by 3(d), and going even tougher in certain respects. Mexico revised its patent law precisely adopting the language of 3(d). The same is true of many other countries mentioned. The *Novartis* vs. *Union of India Case Study* is instructive of how 3(d) set a precedent in India.[26a]

5.5 The Novartis vs. Union of India Case Study

Soon after Section 3(d) in the *Patents (Amendment) Act, 2005,* came into force, the statute was tested. Thus, in 2006, Novartis applied for an Indian patent on the *beta crystalline form of imatinib mesylate*.[27] The Madras Patent Office rejected the patent application, citing that *imatinib mesylate* was a *known compound* (a pre1990s molecule) and the *beta crystalline form was merely a derivative of imatinib mesylate*.

Novartis then appealed the Madras Patent Office's decision to the Intellectual Property Appellate Board (IPAB). IPAB modified the decision of the Patent Office stating that ingredients for grant of patent novelty and nonobviousness may be present in the application but rejected the application on the ground that the drug is not a new substance but an amended version of a known compound. Novartis mounted a separate and concurrent litigation before the Madras High Court arguing that Section 3(d) has violated Article 14 of the Indian Constitution because the

[26] (a) https://www.omicsonline.org/open-access/evergreening-in-pharmaceuticals-strategies-consequences-and-provisions-for-prevention-in-usa-eu-india-and-other-countries-2167-7689-1000185.pdf. (b) High Court of Judicature at Madras for W.P., Novartis AG and another v. Union of India and others, nos. 24759 and 24760 of 2006, 6 August 2007.

[27] *Imatinib mesylate* is used to treat chronic myeloid leukemia and is marketed by Novartis as "Glivec" or "Gleevec."

definition of "enhanced efficacy" was too vague and was in violation of India's obligations under the TRIPs Agreement. The High Court ruled that the law was not vague and that the law complied with TRIPS. In upholding the constitutionality of Section 3(d), the Madras High Court noted that[26b]: "India, being a welfare and a developing country, which is predominantly occupied by people below poverty line, has a constitutional duty to provide good health care to its citizens by giving them easy access to life saving drugs. In so doing, the Union of India would be right, it is argued, to take into account the various factual aspects prevailing in this big country and prevent 'evergreening' by allowing generic medicine to be available in the market." Thus, it was evident that Novartis could not back up its claim of "enhanced efficacy" for *imatinib mesylate over the parent molecule*, according to the patentability standards laid down by Section 3(d).

Next, Novartis appealed IPAB's decision to the Supreme Court of India.[28] However, the Indian Supreme Court agreed with the IPAB ruling that Novartis *had not established the "enhanced therapeutic efficacy" over the parent compound*, *and thus failed to meet the requirements laid down by* Section 3(d). In addition, the Indian Supreme Court opined that *the constitutional validity of* Section 3(d) *was as per the flexibilities offered by* TRIPS framework.[29]

Analyzing the *Novartis* vs. *Union of India case*, Lukose[30] noted that the patented drug "Gleevec" by Novartis costed the patients Rs. 4115/per tablet, while its generic version was available at Rs. 30/per tablet, at 99% cost savings to the patient. The differential is even greater in annual costs. Thus, while the annual cost of the Gleevec to patients in India is Rs. 1,500,000, its generic versions costed just Rs. 10,000 annually, a whopping savings of Rs. 1,490,000. Typically, when a patent for a blockbuster drug expires, the price falls up to 95%.[31]

Thus, the *Novartis* vs. *Union of India case* makes clear that India will not permit the *evergreening* of patents, risking its social and economic goals. Indian patent regime also sends a strong message to the world that an extended monopoly to salts, esters, ethers, polymorphs, metabolites, pure form, particle size, isomers, mixtures

[28] After IPAB rejected the patent application in 2009, Novartis appealed directly to the Supreme Court through a Special Leave Petition under Article 136 of the Indian Constitution. Under normal circumstances, an appeal from IPAB should have been before one of the High Courts before it could proceed to the Supreme Court. However, the patent if granted on appeal would expire by 2018 and thus any further appeal at that stage would be pointless. Considering this urgency and the need for an authoritative decision on Section 3(d), the Supreme Court granted special leave to bypass the High Court appeals process.

[29] Banerjee R. "The Success of, and Response to, India's Law against Patent Layering." *Harvard Int Law J.* 2013, *54*: 205–232.

[30] (a) Lukose, L. "Patent Evergreening and Ethics," *7th International Conference on Information Law and Ethics*, University of Pretoria, South Africa (2016). (b) Proceedings of the 7th International Conference on Information Law and Ethics ICIL, Bottis M. and Alexandropoulos E. (Eds) (2016), ISBN: 978-618-5196-25-7.

[31] https://theconversation.com/explainer-evergreening-and-how-big-pharma-keeps-drug-prices-high-33623

of isomers, complexes, combinations, and other derivatives of a known substance *will not be possible unless they exhibit demonstrably high therapeutic efficacy over the known substance*.

Allow Compulsory Licensing
The flexibilities afforded by the TRIPS Agreement (see Articles 30 and 31 below)[32] allow "compulsory licensing" – *in the case of a national emergency, other circumstances of extreme urgency or public health use* etc. Thus, *compulsory licensing enables other companies to produce a patented product without the permission of the patent holder, under certain conditions*.

Article 30
Exceptions to Rights Conferred

Members ***may provide limited exceptions to the exclusive rights conferred by a patent***, provided that such exceptions do not unreasonably conflict with a normal exploitation of the patent and do not unreasonably prejudice the legitimate interests of the patent owner, taking account of the legitimate interests of third parties.

Article 31
Other Use Without Authorization of the Right Holder

Where the law of a Member ***allows for other use of the subject matter of a patent without the authorization of the right holder, including use by the government or third parties authorized by the government***, the following provisions shall be respected:

(a) authorization of such use *shall be considered on its individual merits*;
(b) such use may only be permitted if, prior to such use, the proposed user has made efforts to obtain authorization from the right holder on reasonable commercial terms and conditions and that such efforts have not been successful within a reasonable period of time. ***This requirement may be waived by a Member in the case of a national emergency or other circumstances of extreme urgency or in cases of public noncommercial use. In situations of national emergency or other circumstances of extreme urgency, the right holder shall, nevertheless, be notified as soon as reasonably practicable.*** In the case of public noncommercial use, where the government or contractor, without making a

(continued)

[32] https://www.wto.org/english/docs_e/legal_e/27-trips.pdf

patent search, knows or has demonstrable grounds to know that a valid patent is or will be used by or for the government, the right holder shall be informed promptly;

(c) the *scope and duration of such use shall be limited to the purpose for which it was authorized*, and in the case of semi-conductor technology shall only be for public noncommercial use or to remedy a practice determined after judicial or administrative process to be anti-competitive;

(d) such use shall be *non-exclusive*;

(e) such use shall be *non-assignable*, except with that part of the enterprise or goodwill which enjoys such use;

(f) any such use shall be *authorized predominantly for the supply of the domestic market of the Member authorizing such use*; …. (continued)

TRIPS Agreement empowers individual nations to rightfully exercise the option of *compultsory licensing* under *justifiable socioeconomic circumstances and legitimate needs*. Therefore, a *compulsory license* would ensure much needed access to affordable medicines to all citizens, shielding them from the negative effects of the monopoly of patents. *The Natco Pharma* vs. *Bayer Corporation case* exemplifies how India awarded its first *compulsory license* in 2012.[33]

5.6 The Natco Pharma vs. Bayer Corporation (*Nexavar* Compulsory License) Case

Bayer first obtained a US patent (US8609854B2) on the drug *sorafenib tosylate* in 1999. Following further development, it launched *sorafenib tosylate* internationally in 2005, under the brand name "Nexavar," an oncology drug useful for the treatment of advanced stage liver and kidney cancers (Fig. 3).

In 2008, Bayer obtained the Indian patent (Patent No. 215758) on *sorafenib tosylate* and launched the drug into the Indian market under the same trade name, "Nexavar," selling it at Rs. 275,000 (US$ 5500) per patient per month in India. In 2010, Cipla, a well-known Indian generic drug manufacturer, which held one of the largest market shares in India, started selling the generic version of Nexavar at about Rs. 29,000 (US$ 580) per month, a price that is 90% cheaper. In 2011, Bayer sued *Cipla* for patent infringement. On a different front, the Indian generic drug manufacturer Natco Pharma Limited ("Natco") applied for *compulsory license* in India on the *sorafenib tosylate patent*.

In 2012, *the Controller General of Patents Designs and Trademarks of India* granted the Indian generic drug manufacturer, Natco Pharma Limited, a *compulsory*

[33] http://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=8894039&fileOId=8894040, page 33

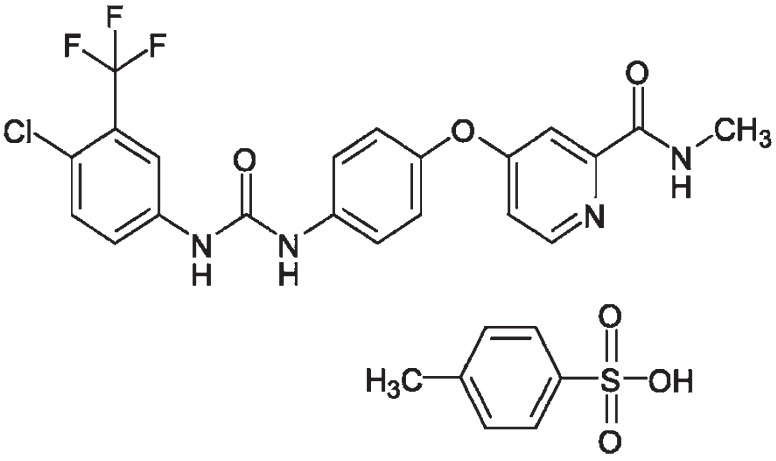

Fig. 3 Sorafenib tosylate ("Nexavar")

license for Bayer AG's drug, *sorafenib tosylate* ("Nexavar"), an oncology drug useful for the treatment of advanced stage liver and kidney cancers.

The *compulsory license application* of Natco was based on the grounds stated in Section 84(1) of the Indian Patents Act 1970, as amended by Act 15 (2005),[34] which reads as follows:

> 84. Compulsory licenses. – (1) At ***any time after the expiration of three years from the date of the grant of a patent***, any person interested may make an application to the Controller for grant of *compulsory license* on patent on any of the following grounds, namely:
>
> (a) ***that the "reasonable requirements of the public" with respect to the patented invention have not been satisfied***, or
> (b) ***that the patented invention is "not available to the public at a reasonably affordable price"***, or
> (c) ***that the patented invention is "not worked in the territory of India***.

In a landmark decision on 9 March 2012, the Controller *granted the compulsory license* to Natco and stripped Bayer of its exclusive right to the medicine in India, citing that *the grounds (a)–(c) in Section 84(1) of the Indian Patents Act 1970 (2005) were individually met, though any one of them would have been sufficient for the grant of a compulsory license*.

[34] http://www.wipo.int/edocs/lexdocs/laws/en/in/in065en.pdf

Further, the Controller reasoned that[35]:

- Bayer's drug was *available only to a small percentage of eligible patients* (slightly above 2%), *which failed to meet the "reasonable requirements of the public."*
- The 2012 price of Rs. 280,000 per month (approximately US$5600) to the patient *does not meet the condition that the drug must be available to the public at a "reasonably affordable price."* This is based on the purchasing power of patients in India.
- Bayer's *patented invention was "not being worked in India"* as Nexavar *was not manufactured within India and imported from the manufacturing facilities outside India.* This did not satisfy the third mandatory requirement.
- Natco may sell the drug to patients within India at a price of no more than Rs. 8800 (approximately US$176) per month, which is 97% cheaper than the Bayer's price.
- Natco was required to pay a 6% royalty to Bayer.

Next, Bayer then appealed the decision of the Controller to the IPAB. Pending appeal, Bayer also petitioned for stay of the Controller's order, which was denied. About a year later, the IPAB upheld the Controller's decision of granting the *compulsory license* to Natco with certain changes. Though both the Controller and the IPAB arrived at the same conclusion in the *Natco Pharma* vs. *Bayer Corporation Case*, their approaches differed from each other. Thus, while the Controller relied on the *statistical data submitted by the parties* for analyzing the substantive issues of the case, the IPAB analyzed the issues from the *public health perspective in the context of the right to life* under Article 21 of the Indian Constitution.[36]

Then, Bayer tried to appeal the IPAB's decision to the Bombay High Court, which simply refused to take up the case. On 12 December 2014, the Indian Supreme Court finally dismissed Bayer's petition against the Bombay High Court and ruled in favor of the *compulsory license* of Nexavar to Natco. The Supreme Court's judgment *fits the established opinion that all the three grounds for compulsory license had been fully met*. Once again, being the first of its kind in the history of the Indian patent regime, the *Bayer vs. Natco ruling* has set a clear precedence for seeking *compulsory licenses* by other generic pharmaceutical companies in India, as well as by the policy makers and patent regimes of other countries.

Naturally, MNCs strongly opposed *the judgment in the Natco Pharma* vs. *Bayer Corporation* and expressed many concerns.[37] On the other hand, the judgment was

[35] https://www.whitecase.com/sites/whitecase/files/files/download/publications/alerts-indian-patent-office-grants-compulsory-license.pdf; See 84(1) above.

[36] Sood, M. "Natco Pharma Ltd. v. Bayer Corporation and the Compulsory Licensing Regime in India," *NUJS Law Review*, 99 (2013), p. 104.

[37] http://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=8894039&fileOId=8894040

hailed by the *champions for affordable access to drugs*. The case is also notable because it is only the second time in the world that a nation issued a *compulsory license* for a drug used for treatment of a *chronic* rather than an *infectious* disease. Prior to this case, only Thailand awarded *compulsory licenses* to four drugs between 2006 and 2008.[38]

Retain Pre-grant Opposition

Pre-grant opposition[39a] was already there in the India Patents Act 1911,[39b] and it was retained in the India Patents Act, 1970 (2005).[39c] India's *pre-grant opposition procedures* in 1911 were modeled similar to the British patent laws in force.[40] However, during that time, the British patent system was not the only patent system that relied *on pre-grant opposition*; many other countries also used a *novelty-only examination system* coupled with *pre-grant opposition*[41] to supplement the resources of the patent examiner.

Thus, Section 25(1) of the India Patents Act, 1970 (2005), provides for *pre-grant opposition* of pending patent applications. The *pre-grant opposition* may be based on any number of grounds,[42] including *anticipation, lack of inventive step, non-invention under Section 3 of the Patents Act (including the anti-evergreening provisions of Section 3(d)), insufficient or unclear description of the invention in the specification, failure to disclose the source of biological material used for the invention, and inventions which are considered traditional knowledge*.

Notably, Section 25(1) of the India Patents Act, 1970 (2005), *does not impose any estoppel limitations on a party* who first files a *pre-grant opposition* and later tries to challenge the patent's validity in a court proceeding. The Act even mandates that the party filing the *pre-grant opposition* receive a hearing before the Controller if requested, which will delay the process even if patentability was affirmed over all objections.

The Indian patent regime views that *pre-grant opposition* is actually helpful to get all the prior art before the patent examiner. Hence, the same patent examiner who examines the initial patent application will also examine the *pre-grant opponent's submission*. The Indian Patent Office does not agree that *pre-grant opposition* would delay the process of patent grants. It is important to note that the

[38] https://www.reuters.com/article/us-india-drugs/analysis-india-cancer-ruling-opens-door-for-cheaper-drugs-idUSBRE82C0IN20120313

[39] (a) See Reference 3. This author describes the *pre- and post-grant opposition to patents* in great detail. (b) Indian Patents and Designs Act, 1911. http://theindianlawyer.in/statutesnbareacts/acts/d42.html, Section 9. (c) See Reference 20, Chapter V, Section 25, page 25.

[40] Janis, M. D. "Patent Abolitionism", *Berkeley Tech. L. J*. 899, 903 (2002).

[41] Vojacek, J. *A Survey of the Principal National Patent Systems*, 28 (1936).

[42] See Section 25(1)(k) for details.

Indian generic pharmaceutical companies and the MNCs are on opposite sides of the *pre-grant opposition* debate. Thus, while the former *favor pre-grant opposition*, the latter *strongly oppose* it.[43]

Mueller observes[44] that according to press reports in March 2006, approximately 100 *pre-grant oppositions* were pending in the four Indian Patent Office branches, including challenges filed by Indian generic firms against pending patent applications on Astra Zeneca's cholesterol drug *Rosuvastatin*, Pfizer's antifungal drug *Voriconazole*, Wockhardt's antibacterial drug *Nadifloxacin*, Gilead-Roche's bird-flu drug *Oseltamivir*, and Astra Aktiebolag's formulation of ulcer drug *Omeprazole*. In addition, nongovernmental organizations and healthcare advocacy groups in India have also been using the *pre-grant opposition* as a powerful tool to challenge the grant of patents on essential medicines.

Introduce Post-grant Opposition

Unlike *pre-grant opposition* "which already existed" in the Indian patent law in one form or another, *post-grant opposition* is a "new addition" to the Patents (Amendment) Act, No. 15 of 2005. The grounds for *post-grant opposition* are very similar to those of *pre-grant opposition*, including virtually all patentability criteria. Therefore, to understand the "new" grounds for *post-grant opposition*, see Section 25 (2) (a)–(k) below of the India Patents Act 1970 (2005)[45]:

25. **Opposition to the patent**.
(2) At ***any time after the grant of patent but before the expiry of a period of one year from the date of publication of grant of a patent***, ***any person interested may give notice of opposition*** to the Controller in the prescribed manner on any of the following grounds, namely –
  (a) that the patentee or the person under or through whom he claims, *wrongfully obtained the invention or any part thereof* from him or from a person under or through whom he claims;
  (b) that the invention so far as claimed in any claim of the complete specification *has been published before the priority date of the claim* – (i) in any specification filed in pursuance of an application for a patent made in India on or after the 1st day of January, 1912; or (ii) in India or elsewhere, in any other document: Provided that the ground specified in sub-clause (ii) shall not be available where such publication *does not constitute an anticipation of the invention* by virtue of sub-section (2) or sub-section (3) of section 29;

(continued)

[43] https://economictimes.indiatimes.com/news/economy/policy/what-is-patents-amendment-bill/articleshow/971708.cms (December 27, 2004).

[44] https://core.ac.uk/download/pdf/129759353.pdf

[45] http://www.ipindia.nic.in/writereaddata/Portal/IPOAct/1_113_1_The_Patents_Act_1970_-_Updated_till_23_June_2017.pdf, page 26.

(c) that the invention so far as claimed in any claim of the complete specification is *claimed in a claim of a complete specification published on or after the priority date of the claim of the patentee* and filed in pursuance of an application for a patent in India, being a claim of which the priority date is earlier than that of the claim of the patentee;
(d) that the invention so far as claimed in any claim of the complete specification *was publicly known or publicly used in India* before the priority date of that claim.

Explanation. For the purposes of this clause, an invention relating to a process for which ***a patent is granted shall be deemed to have been publicly known or publicly used in India before the priority date of the claim*** if a product made by that process *had already been imported into India* before that date except where such importation has been for the purpose of reasonable trial or experiment only;

(e) that the invention so far as claimed in any claim of the complete specification *is obvious and clearly does not involve any inventive step*, having regard to the matter published as mentioned in clause (b) or having regard to what was used in India before the priority date of the claim;
(f) that the subject of any claim of the complete specification *is not an invention within the meaning of this Act*, or *is not patentable under this Act*;
(g) that the complete specification *does not sufficiently and clearly describe the invention* or *the method* by which it is to be performed;
(h) that the patentee has *failed to disclose* to the Controller the information required by section 8 or has furnished the information which in any material particular was false to his knowledge;
(i) that in the case of a patent granted on a convention application, *the application for patent was not made within twelve months from the date of the first application* for protection for the invention made in a convention country or in India by the patentee or a person from whom he derives title;
(j) that the complete specification *does not disclose or wrongly mentions the source and geographical origin of biological material* used for the invention;
(k) that the invention so far as claimed in any claim of the complete specification *was anticipated having regard to the knowledge, oral or otherwise*, available within any local or indigenous community in India or elsewhere, but on no other ground.

Unlike *pre-grant oppositions,* the *post-grant oppositions* will be heard by a *three-person Opposition Board* that *does not include* the original patent examiner. *Post-grant opposition* is a very important aspect of European Patent Convention (not yet part of the US patent law). In 2017, of all the patents granted under the European Patent Convention, approximately 3.7% were subjected to *post-grant oppositions*.[46]

It is important to mention that neither the Patents Act nor any other rules require the Controller to (a) *notify* (in the Official Journal) that a *post-grant opposition* has been initiated or (b) *announce* the decision taken and *provide* the underlying reasons. At this time, it is yet unclear how much the *post-grant opposition procedure* will be used in India.

[46] https://www.epo.org/about-us/annual-reports-statistics/annual-report/2017/statistics/searches.html#tab4

6 Conclusion

India is a dominant player in the global generics market, with the largest number of USFDA-approved labs outside the USA, and holding a 30% share (by volume) of the US generics market. However, India has been witnessing increasing competition from other nations such as South Korea and China, who are also trying to establish themselves in the global generics market. Indeed, competition is always better for the patients seeking cheaper medicines and better access to healthcare.[47] In response to these dynamic market changes, the Indian generic pharmaceutical industry has been *strategically repositioning* itself. Some highlights are:

(a) **Gaining Proficiency in Complex Generics**. According to Vijayaraghavan,[48] complex generics include, "*Complex injectable formulations* (liposomal, microsphere-based depot formulations et al), *inhalation drugs*, *topical products and transdermals*." Case and point: Sun Pharma could commence selling *Lipodox*, a pegylated liposomal doxorubicin formulation (generic of Janssen's *Doxil*), even prior to the patent expiry in the USA due to drug shortage and be the only generic on the market even after the *Doxil* patent expired.

(b) **Focusing on Specialty Portfolios**. *Indian pharma companies are increasingly focusing on specialty portfolios in specific therapeutic categories. In other words, Indian pharmaceutical companies are actively pursuing the Section 505(b)(2) of USFDA specialty drugs*.[49] *This is evident from industry examples such as*:
- *Glenmark's targeted focus on dermatology, oncology, and respiratory*
- *Dr. Reddy's focus on Dermatology – through its US subsidiary Promius Pharma*
- *Lupin Pharma's focus on pediatrics – proprietary portfolio of branded drugs such as Alinia® and Locoid® Lotion*

(c) **Capitalizing on the Abuse Deterrent Opioids[50] Market**. The USFDA's *Opioids Action Plan* laid down the new draft guidance in March 2016, for regulation of *the generic versions of approved opioids with abuse-deterrent formulations*.[51] Indeed, this attracted the Indian pharmaceutical companies to

[47] https://www.sathguru.com/news/2017/05/03/innovation-in-indian-pharma-empowering-stronger-global-presence-but-fraught-with-challenges-for-serving-indian-market/

[48] https://www.sathguru.com/Publication/download/Medcon-2017-Whitepaper.pdf, page 80. See full details in this reference.

[49] For drugs approved under section 505(b)(2) of USFDA, an NDA must be filed but for which approval can be based in part on the safety and effectiveness of an already-approved drug.

[50] *Abuse deterrence* is an emerging market segment in the global pharmaceutical industry for *extended release* and *rapid release prescription control substances (opioids)*.

[51] See Reference 47, page 17.

do business in this space. Further, as the USA is a key market for Indian-made drugs, Indian pharma companies have been innovating to gain a strong foothold in this new market segment. This is evident in Zydus Cadila's recent acquisition of Sentynl Therapeutics (USA) for $171 million. Currently, Sentynl holds the US market rights for "Abstral," *a unique sublingual abuse deterrent formulation of Fentanyl* for cancer pain – a product that has no direct market competition.

(d) **Fortifying Domestic R&D and Fostering Innovation**. The Indian pharmaceutical companies as well as the policy makers of India have long recognized the absolute need to strengthen domestic R&D and *nurture innovation opportunities for creating sustainable competitive advantage*. Significant *innovation opportunities* for India include[52] 3D printing in medical applications across product development and commercial manufacturing, increasing pursuit of drug device combinations for life cycle management and competitive advantage, innovations in biomaterials expanding possibilities, pervasive use of robotics, artificial intelligence and machine learning for developing smart devices, and leveraging Internet of Things (IoT) to progress toward a more connected continuum of care.

Not surprisingly, therefore, India's policy makers know that they have a critical role to play in fortifying the *innovation ecosystem* of India. Accordingly, the Government of India declared 2010–2020 as the "Decade of Innovation." In 2013, *the Ministry of Science and Technology* unveiled a coherent vision for bringing the different pieces of the Indian *innovation ecosystem* together, which states[53]:

> The guiding vision of aspiring Indian STI [Science, Technology, and Innovation] enterprise is to accelerate the pace of discovery and delivery of science-led solutions for faster, sustainable and inclusive growth. A strong and viable Science, Research and Innovation System for High Technology-led path for India (SRISHTI) is the goal of the new STI policy.

Therefore, India is embracing many important initiatives such as *Make in India*[54] and *Startup India*[55] and many others[56] shown below to meet its socioeconomic goals:

- ***The National Health Protection Scheme (Ayushman Bharat, 2018)***. This is the largest government funded healthcare program in the world, expected *to benefit*

[52] See Reference 47, page 7.

[53] https://timreview.ca/article/818

[54] http://www.makeinindia.com/home

[55] https://up.startupindia.gov.in/content/sih/en/home-page.html

[56] http://www.nbr.org/downloads/pdfs/ETA/IIP_kapoor_sharma_workingpaper_070815.pdf

100 million poor families in the country for secondary and tertiary care hospitalization – by providing a cover of up to US$ 7720 per family per year.

- ***Single-window facility to provide consents, approvals, and other information***. In March 2018, the Drug Controller General of India announced this *to boost the Make in India initiative*.
- ***Electronic platform to regulate online pharmacies***. The Government of India announced this initiative *to stop any misuse of online pharmacies*.
- ***Drug Price Control Order and the National Pharmaceutical Pricing Authority***. The Government of India introduced these initiatives *to ensure the affordability and availability of medicines*.
- ***The Government of India's "Pharma Vision 2020."*** This is aimed *at making India a global leader in end-to-end drug manufacture* with reduced approval time for new facilities.

In support of this vision, the Government of India is striving *to create a robust IPR regime* that can serve as the bedrock of innovative and competitive India. Indeed, many countries are closely observing *the evolution of Indian IPR regime* to see how it further leverages the flexibilities offered by TRIPS *to advance its own socioeconomic goals* while simultaneously *promoting its innovation ecosystem* and *protecting the legitimate business interests of* MNCs. Thus, India's patent reforms are having a global impact.[57]

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[57] For understanding (a) how China's patent legislation has impacted the patent protection for pharmaceuticals in China and (b) what China is interested in learning from the Indian example, see the previous chapter on "Indian Patent Law and Its Impact on Pharmaceutical Industry: What China can learn from India?" by Juan HE.

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The Challenges, Opportunities and Performance of the Indian Pharmaceutical Industry Post-TRIPS

Biswajit Dhar and Reji K. Joseph

Abstract

India's generic pharmaceutical producers face numerous challenges after the country's patent law was amended to make it compatible with the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). Two amendments were significant: introduction of product patent regime covering the area of pharmaceuticals, replacing the process patent regime existing earlier, and increase in patent term for pharmaceutical patents to 20 years, from the earlier 5–7 years (5 years from sealing of patent or 7 years from the date of application, whichever was lower). India's pre-TRIPS patent regime that did not allow product patents in the pharmaceutical sector provided the impetus for the emergence of a generic pharmaceutical industry from the 1980s.

How did the Indian pharmaceutical industry respond to the challenges posed by the TRIPS-consistent patent regime, in particular the product patent regime? This paper analysed a number of functional parameters to answer this question.

Analysis of the parameters explaining the size and the operational strengths of the major companies in the industry did not suggest structural weaknesses in the generic companies. They continued to remain the leaders in the industry, both in terms of invested capital and size of operations. They remained viable: their profit rates were higher than those in most major manufacturing sectors in India.

Although the major generic companies are all producers of generic medicines, they continued to invest sizeable shares of their sales turnover in research and development (R&D). They have been active in taking patents, but their filings in foreign jurisdictions were significantly higher.

B. Dhar (✉)
Centre for Economic Studies and Planning,
School of Social Sciences, Jawaharlal Nehru University, New Delhi, India

R. K. Joseph
Institute for Studies in Industrial Development, New Delhi, India
e-mail: rejikjoseph@isid.org.in

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_13

Keywords
TRIPS Agreement · Indian Patents Act of 1970 · Generic pharmaceutical manufacturers · Patents · R&D

1 Introduction

Since the 1980s, India has had a strong generic pharmaceutical industry that has been providing medicines at prices that are among the lowest in the world. The credit for the emergence of the generic industry should be given almost entirely to the Patents Act enacted in 1970[1] that replaced the colonial Patents and Designs Act of 1911.[2] Two key provisions of Patents Act, 1970, were largely instrumental in supporting the growth of local entrepreneurship in the pharmaceutical industry. The first was discontinuation of the product patent regime covering all chemicals of the 1911 Act and introduction of a process patent regime. The second was the shortening of the period of patent protection for pharmaceutical processes to 5 years from grant or 7 years from the date of application, whichever was shorter, as against 14 years for all other fields of technology. The process patent regime allowed the Indian companies to develop alternative processes to produce generic versions of proprietary drugs.[3]

India's commitments to implement the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)[4] changed the favourable conditions enjoyed by the generic industry until then. The critical issue was the introduction of the product patent regime that restricted the ability of the generic companies to work around proprietary processes. The future prospects of these companies, therefore, hinged critically on the ability of the Indian policy makers to design a patent law that incorporated the flexibilities existing in the TRIPS Agreement.

Two substantial amendments[5] were needed to make India's patent regime fully consistent with the TRIPS Agreement. The first was the amendment of the patentable subject matter by allowing patenting of microorganisms and "essentially non-biological processes" and increasing the term of patents to 20 years from the date of application. The second amendment introduced the product patent regime in

[1] The Patents Act 1970 (No. 39 of 1970), *Gazette of India*, 1970-09-21, Part II, Sec. 1.

[2] The Indian Patents and Design Act, 1911, Act 2 of 1911.

[3] Dhar and Rao (2002) discuss the case of the then leading firm in the pharmaceutical industry, Ranbaxy Laboratories.

[4] Agreement on Trade-Related Aspects of Intellectual Property Rights (Annex 1C to the Agreement establishing the World Trade Organization of April 15, 1994).

[5] Another amendment was introduced in 1999 to meet the requirements of Article 70.9 of the TRIPS Agreement. India was obligated to provide a so-called mailbox for receiving product patent applications from 1 January 1995, well ahead of the introduction of the product patent regime. In case patents were granted on any of these applications in a WTO member country, India had to provide "exclusive marketing rights" for 5 years or until the rights were granted or rejected in the country.

the area of pharmaceuticals. The first two amendments had to be introduced on 1 January 2000, and the second was introduced on 1 January 2005.

This chapter analyses the performance of the pharmaceutical industry in India after the introduction of the TRIPS-compliant patent law. To set the context, the key elements of the TRIPS-compliant patent law are discussed in the first section. The second section discusses the performance of the Indian pharmaceutical industry since India began amending Patents Act, 1970, to make it TRIPS-compliant. This exercise uses various indicators to assess the viability of the leading pharmaceutical companies when TRIPS-compliant patent standards are being implemented.

2 India's TRIPS-Compliant Patent Law

One of the distinguishing features of the post-TRIPS patent law in India is that it seeks to balance the interests of the patent holder with the imperatives of public interest[6] through two sets of provisions. The first relates to the scope of patentability and the second the compulsory licencing system.[7]

2.1 Section 3(d): Preventing Grant of Patents on Minor Modifications

Indian patent law has an important provision to prevent the grant of patents on minor modifications of known substances. Section 3(d) does not allow grant of patents on "mere discovery of a new form of a known substance which does not result in the enhancement of the known efficacy of that substance or the mere discovery of any new property or new use for a known substance or of the mere use of a known process, machine or apparatus unless such known process results in a new product or following: employs at least one new reactant". An explanation provided to this section says the following: "salts, esters, ethers, polymorphs, metabolites, pure form, particle size, isomers, mixtures of isomers, complexes, combinations and other derivatives of known substance shall be considered to be the same substance, unless they differ significantly in properties with regard to efficacy". This exclusion is aimed at ensuring that a product can be considered for the grant of patent only when the applicant can prove that the claimed invention has "enhanced efficacy"[8] over an existing product.

[6] This feature of the Indian patent law brings it close to the realisation of the objectives of the TRIPS Agreement stated in Article 7: "The protection and enforcement of intellectual property rights should [be] to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations".

[7] Pre- and post-grant oppositions are the other important provisions that have been exploited in public interest.

[8] This was a point made by the Supreme Court when it heard Novartis' appeal against the rejection of its patent claim on an anticancer drug on the ground that it did not meet the standards of Section 3(d). Details are in the following discussion.

Discussions in the Uruguay Round negotiations that led to the adoption of the TRIPS Agreement, provides the basis for Section 3(d), in our view. Participants dwelled on the problems arising from too short a period of patent protection to recoup the returns on investments in research and development (R&D).[9] They, therefore, argued that new norms and standards of intellectual property (IP) protection were needed, including longer period of patent protection. This, they opined, would sufficiently incentivise R&D activities so that new molecules can be produced.[10] These arguments were consistent with the persuasive position taken by Douglass North, who had argued that "development of a patent system and other laws protecting intellectual property … encouraged the growth of innovation".[11] This implies that longer term of patent protection can be justified only when innovators provide innovative products and processes, instead of minor modifications of known substances. In other words, it can be argued that providing 20-year patent protection for minor modifications of existing substances would tantamount to egregious rent seeking and would therefore be anti-competition and anti-innovation.

Yet another strong case in favour of Section 3(d) is that it is an effective bulwark against "evergreening" of patents. Some of the originator companies have made it a common practice to create minor variations to proprietary medicines and seek another "full" term of patent protection on the trivial modifications and to repeat this process for along as possible (hence, the name, "evergreening").[12] This strategy works well for these companies as they successfully block new entrants into the market even after the patent on the original medicine expires. This issue was highlighted by the Technical Committee (better known as the "Mashelkar Committee") that was appointed by the Indian Government to advice whether the Patents Act should limit the grant of a patent for pharmaceutical substance only to new chemical entities. The Mashelkar Committee recommended that the Patents Act must prevent "evergreening of patents", achieved by "executing trivial and insignificant changes to an already existing patented product".[13]

The legal validity of Section 3(d) was tested in the case that arose when Novartis petitioned against the rejection of the patent claim. The company had applied for a patent for the beta crystalline form of its anticancer drug, imatinib mesylate, in 1998.[14] The application was rejected by the Indian Patent Office on three grounds, namely, that the claimed invention (i) was anticipated by prior publication, (ii) was obvious to a person skilled in the art judging from the disclosure provided in the

[9] GATT 1987, Submissions from Participants on Trade Problems Encountered in Connection with Intellectual Property Rights, p. 8.

[10] GATT 1988, Compilation of Written Submissions and Oral Statements – Prepared by the Secretariat: Revision, p. 15.

[11] North and Thomas (1970, 16).

[12] Ali and Rajagopal (2008).

[13] Report of the Technical Expert Group on Patent Law Issues 2006, paragraph 5.10.

[14] The product patent application followed the "mailbox" procedures that India had put in place on 1 January 1995.

patent specifications and (iii) failed to meet the Section 3(d) standards. Novartis petitioned before High Court of Madras against the Patent Office ruling on its patent application. After the Intellectual Property Appellate Board (IPAB)[15] became functional in 2007, Novartis filed an appeal against the rejection of its application. When the IPAB rejected the patent claim, Novartis filed an appeal before the Supreme Court of India.

Novartis petitioned against the decision of the Patent Office in the High Court of Madras on two counts: (i) Section 3(d) of the Patents Act, 1970, was inconsistent with Articles 1(1) and 27 of the TRIPS Agreement and (ii) Section 3(d) was unconstitutional being vague, arbitrary and violative of Article 14 of the Constitution of India, which guarantees equality before law.[16] The Court ruled that it did not have the jurisdiction to pass judgement on a provision of an international treaty and it therefore refused to comment on Novartis' contention that Section 3(d) violated, in particular, Article 27 of the TRIPS Agreement, which laid down the norms for patentable subject matter. However, the High Court made an important observation in the context of India's amendments to its Patents Act to make it compatible with the TRIPS Agreement. The Court argued that Article 7 of TRIPS Agreement "provides enough elbow room to a member country" to comply with its obligations under the Agreement "by bringing a law in a manner conducive to social and economic welfare and to a balance of rights and obligations" and added that Article 1 of the TIPS Agreement "enables a member country free to determine the appropriate method of implementing the provisions of this agreement within their own legal system and practice".

As regards the contention of the petitioner that Section 3(d) was unconstitutional as it was vague and arbitrary, and that it violated Article 14 of India's Constitution, the High Court observed that the legislature had clearly laid down the parameters the any patent applicant had to meet for obtaining a patent: "if a discovery is made from a known substance, a duty is cast upon the patent applicant to show that the discovery had resulted in the enhancement of a known efficacy of that substance and in deciding whether to grant a Patent or not on such new discovery". The Court ruled that Section 3(d) was not in violation of Article 14 of the Constitution of India. It was the Court's understanding that the Government of India had amended the Patents Act with the objective "to prevent evergreening; to provide easy access to the citizens of this country to life saving drugs and to discharge their Constitutional obligation of providing good health care to its citizens".[17] Further, the debates in the Parliament on the third amendment of Patents Act showed that "welfare of the people of the country was in the mind of the Parliamentarians"[18] and the Madras High Court, therefore, rejected Novartis' petition arguing that Section 3(d) violated Article 14 of the Constitution of India.

[15] IPAB was established by the Patents (Amendment) Act, 2002, which was the Second Amendment of the Patents Act in fulfilment of India's TRIPS commitments.

[16] Novartis AG v. Union of India, High Court of Madras, paragraph 2.

[17] Novartis AG v. Union of India, High Court of Madras, paragraph 19.

[18] Novartis AG v. Union of India, High Court of Madras, paragraph 15.

Yet another interesting observation of the High Court was regarding the obligations that the TRIPS Agreement brought on the WTO member states: "Article 7 of [the TRIPS Agreement] provides enough elbow room to a member country in complying with [the] obligations by bringing a law in a manner conducive to social and economic welfare and to a balance of rights and obligations. Article 1 of [Agreement] enables a member country free to determine the appropriate method of implementing the provisions of this agreement within their own legal system and practice".[19] Thus, the Court endorsed the interpretation that the TRIPS Agreement provided a number of flexibilities that the governments could creatively use to safeguard public interest.

Novartis filed an appeal against the ruling of the Patent Office after the IPAB was established in 2007. IPAB reversed the findings of the Patent Office that the beta crystalline form of imatinib mesylate did not stand the tests of novelty and nonobviousness. However, the Board rejected the appeal of Novartis against the Patent Office decision on the ground that the claimed invention had failed to meet the requirements of Section 3(d). The Board explanation of its decision was as follows: India has established "a requirement of higher standard of inventive step by introducing the amended section 3(d) of the Act, what is patentable in other countries will not be patentable in India. [T]he object of amended section 3(d) of the Act is nothing but a requirement of higher standard of inventive step in the law particularly for the drug/pharmaceutical substances".[20]

The Supreme Court of India heard the appeal of Novartis against the decision of the IPAB. The Court examined Novartis' petition in light of the criteria for inventive step laid down by India's Patents Act, in Article 2(1)(j) and 2(1)(ja). In particular, the Court asked if the product for which Novartis claimed patent protection qualified as a "new product" which was an invention that involved technical advance over existing knowledge and made the invention "not obvious" to "a person skilled in the art".

Upon its examination of Novartis' claims, especially on the use of Section 3(d) by the IPAB to reject its application for a patent for imatinib mesylate, the apex court made a critical observation regarding Section 3(d). This section, according to the Supreme Court of India, "clearly sets up a second tier of qualifying standards for chemical substances/pharmaceutical products in order to leave the door open for true and genuine inventions but, at the same time, to check any attempt at repetitive patenting or extension of the patent term on spurious grounds".[21] The Supreme Court thus denied patent rights to Novartis for its anticancer drug, imatinib mesylate, since the claimed invention, in its view, did not meet the test of novelty and inventive steps besides failing to meet the requirements of Section 3(d).

[19] Novartis AG v. Union of India, High Court of Madras, 2007, paragraph 15.

[20] Novartis AG v. Union of India, The Supreme Court of India, 2013, paragraph 17.

[21] Novartis AG v. Union of India, The Supreme Court of India, 2013, paragraph 103.

2.2 Compulsory Licencing System

Public interest considerations resulted in the adoption of the system of compulsory licensing (CL) in India. These provisions can be invoked where the patent monopolies are in conflict with public interest. India's Patents Act included the CL provisions, according to which, an application for the grant of CL can be made only after 3 years from the date of grant of the patent unless exceptional circumstances like national emergency or extreme urgency can be used to justify the grant of a licence on an earlier date. Three broad grounds for the grant of the CL have been spelt out in Section 84 of the Patents Act: (a) reasonable requirements of the public with respect to the patented invention have not been satisfied, (b) the patented invention is not available to the public at a reasonably affordable price and (c) the patented invention is not worked in the territory of India. However, a CL can be granted only when the patentee is paid adequate remuneration taking into account the economic value of the authorisation.

The provisions for the grant of CL are wholly consistent with the TRIPS Agreement as clarified in the Doha Declaration on TRIPS Agreement and Public Health.[22] In the Doha Declaration, adopted in 2001, Ministers of WTO Member States agreed that "TRIPS Agreement does not and should not prevent members from taking measures to protect public health". More importantly, Ministers agreed that the "Agreement can and should be interpreted and implemented in a manner supportive of WTO members' right to protect public health and, in particular, to promote access to medicines for all". And last, but not the least, the Declaration affirmed that "[E]ach Member has the right to grant compulsory licences and the freedom to determine the grounds upon which such licences are granted".

India has exercised a high degree of prudence in the use of CL provisions. In the post-TRIPS regime, there has been a solitary instance of the use of these provisions. This was done when Bayer Corporation, the American subsidiary of the German firm, Bayer AG, which held the patent on the anticancer drug sorafenib tosylate (sold under the brand name, Nexavar), charged unreasonably high price for the product and also did not make the drug available in sufficient quantities even through imports. The generic manufacturer Natco Pharma Ltd. applied for the grant of CL for domestically producing sorafenib tosylate, assuring that it could sell the medicine at Rs. 8000 (nearly $ 130) for a month's supply, which was a fraction of Bayer Corporation's price of Rs. 2,80,000 ($ 4600). Ruling on Natco Pharma's application, the Controller of Patents observed that Bayer was not making the patented invention available to the public at a reasonably affordable price and therefore granted a non-exclusive CL to the applicant.[23] Natco Pharma Ltd. was required to pay Bayer Corporation royalty at the rate of 6% of the net sales of the medicine.[24]

[22] WTO (2001).

[23] Natco Pharma Ltd. vs Bayer Corporation: Application for Compulsory Licence Under Section 84(1) of the Patents Act, 1970 In Respect of Patent No.215758., Order issued on March 2012.

[24] Bayer Corporation challenged this ruling by the Controller of Patents in the Intellectual Property Appellate Board (IPAB). The IPAB upheld the ruling. Bayer Corporation challenged IPAB's deci-

The above discussion shows the ways in which India used some of the available flexibilities in the TRIPS Agreement and has been able to provide a regime of patent protection in which the rights of the patent holder have been balanced with public interest imperatives. Importantly, the two crucial provisions that were discussed here have withstood scrutiny in its course of implementation and also upheld by the judiciary.

3 Indian Pharmaceutical Industry Since the Implementation of TRIPS Agreement

The previous section discussed the major amendments to Patents Act, 1970, to bring India's patent regime in conformity with the provisions of the Agreement on TRIPS, which included the introduction of the product patent regime. The generic companies that had thrived in the absence of a product patent regime, this amendment, therefore brought significant challenges. However, the Indian government fully utilised the flexibilities in the TRIPS Agreement and introduced several provisions so as to ensure that the generic industry could remain viable.

3.1 Economic Performance of Leading Companies

Did using flexibilities have the desired impact on the generic industry? This section will use a number of indicators to answer this question.

3.1.1 Net Worth of 20 Largest Pharmaceutical Companies

The first indicator that we shall use, one which provides evidence of the market value of the companies, is "net worth". Table 1 provides the details.

One of the distinctive features of the top 20 companies in the Indian pharmaceutical industry is that, measured in terms of the book value, domestic companies were ahead of the affiliates of foreign companies, like Pfizer and GlaxoSmithKline. In fact, this feature has been seen during the past three decades, i.e. ever since the generic companies were able to establish themselves in the industry.[25]

After the introduction of the post-TRIPS patent regime, the pharmaceutical industry in India displayed two-paced growth. During the previous decade, net worth of all the large domestic generic companies registered very high rates of growth. However, in the current decade, there has been a perceptible growth slowdown, not only of the industry but also of some of the companies like Dr. Reddy's and Cipla that have driven the consolidation and growth of the Indian industry since the 1990s. In recent years, Sun Pharmaceutical and Lupin have emerged as two of

sion before the Bombay High Court (Bayer Corporation vs Union of India, Writ Petition No. 1323 of 2013). The High Court once again rejected Bayer Corporation's contention against the grant of CL to Natco Pharma Ltd.

[25] Dhar and Rao 2002, Transfer of Technology for Successful Integration into the Global Economy: A case study of the Pharmaceutical Industry in India, p. 18.

Table 1 Net worth of 20 largest pharmaceutical companies

Company name	Net worth in 2016–17 (US $ mn)	Average annual growth rate (AAGR, %)		
		1999–2000 to 2004–2005	2005–2006 to 2010–2011	2011–2012 to 2016–2017
Sun Pharmaceutical Industries Ltd.	3165.7	28.8	33.6	32.6
Lupin Ltd.	2242.0	79.5	37.1	24.8
Cipla Ltd.	1941.7	22.8	25.2	5.4
Dr. Reddy's Laboratories Ltd.	1759.6	45.6	21.8	5.8
Glenmark Pharmaceuticals Ltd.	1431.4	20.6	44.9	29.0
Aurobindo Pharma Ltd.	1281.7	28.5	19.6	21.2
Cadila Healthcare Ltd.	999.3	10.9	21.9	14.8
Biocon Ltd.	992.1	79.9	17.4	25.4
Divi's Laboratories Ltd.	820.5	32.2	35.7	13.9
Torrent Pharmaceuticals Ltd.	675.6	11.6	21.1	21.2
Alkem Laboratories Ltd.	666.3	40.8	20.3	12.2
Strides Shasun Ltd.	490.3	17.2	40.3	19.1
Ipca Laboratories Ltd.	375.5	17.3	21.6	8.6
Pfizer Ltd.[a]	366.9	21.4	25.8	32.7
GlaxoSmithKline Pharmaceuticals Ltd.[a]	307.7	17.9	11.2	−3.0
Natco Pharma Ltd.	257.2	26.0	19.9	23.2
Sanofi India Ltd.[a]	255.6	26.3	12.0	4.1
Ajanta Pharma Ltd.	228.1	−3.1	14.8	33.6
J B Chemicals and Pharmaceuticals Ltd.	210.5	16.6	17.5	2.5
Abbott India Ltd.[a]	210.4	11.9	16.3	11.8
Average		28.5	24.3	17.2

Source: Prowess Database provided by the Centre for Monitoring Indian Economy (CMIE), downloaded on 1 March 2018
Note: [a] denotes affiliates of foreign companies in India

the largest leading companies in terms of their net worth. Although these companies grew much faster than the industry average, they were unable to balk the trend of slowing growth rates. Sun Pharmaceutical was able to increase its net worth nearly threefold since 2013–2014, largely due to its acquisition of Ranbaxy Laboratories, which was the undisputed leader of the Indian generic industry until the middle of the previous decade. Among the affiliates of foreign companies in the top 20 list, only Pfizer experienced steady growth in its net worth in the new millennium.

3.1.2 Sales Turnover of Top 20 Pharmaceutical Companies

The trends in the market presence of the largest generic pharmaceutical companies in India measured in terms of their sales turnover are similar to that of their net worth. After growing impressively in the previous decade, sales turnovers of most

Table 2 Sales turnover of top 20 pharmaceutical companies

Companies	Sales in 2016–2017 (US $ mn)	Average annual growth in sales (%)		
		1999–2000 to 2004–2005	2005–2006 to 2010–2011	2011–2012 to 2016–2017
Lupin Ltd.	1933.7	23.5	20.1	12.6
Cipla Ltd.	1665.0	25.9	13.0	3.6
Aurobindo Pharma Ltd.	1483.7	12.5	18.9	11.4
Dr. Reddy's Laboratories Ltd.	1474.4	31.0	22.6	2.1
Glenmark Pharmaceuticals Ltd.	1228.0	27.3	23.5	35.2
Sun Pharmaceutical Industries Ltd.	1175.7	18.7	11.3	31.7
Alkem Laboratories Ltd.	706.0	−5.0	15.4	12.2
Torrent Pharmaceuticals Ltd.	691.9	10.7	17.2	12.6
Divi's Laboratories Ltd.	616.9	16.1	31.8	10.9
Cadila Healthcare Ltd.	494.6	22.1	11.7	3.5
Ipca Laboratories Ltd.	481.2	14.3	17.8	0.9
GlaxoSmithKline Pharmaceuticals Ltd.[a]	452.8	9.5	5.8	1.0
Abbott India Ltd.[a]	443.9	5.5	19.5	9.6
Biocon Ltd.	398.8	40.2	14.1	4.9
Sanofi India Ltd.[a]	356.4	9.4	5.2	7.3
Wockhardt Ltd.	348.5	2.9	15.3	−3.7
Strides Shasun Ltd.	321.0	13.1	14.8	25.9
Pfizer Ltd.[a]	310.7	15.2	5.9	11.7
Natco Pharma Ltd.	306.2	14.9	15.8	32.0
Ajanta Pharma Ltd.	276.5	11.9	18.0	18.0
Average	1933.7	16.0	15.9	12.2

Source: Same as Table 1
Note: [a] denotes affiliates of foreign companies in India

companies in this decade were perceptively slower (Table 2). The two exceptions were Sun Pharmaceutical and Glenmark Pharmaceuticals; the sales turnovers of the two companies not only registering the fastest expansions in the industry, their growth rates in the current decade were the highest since the turn of the millennium.

The growth in sales registered by the leading generic producers in the early 1990s led to a complete transformation of the composition of market leaders in the Indian pharmaceutical industry. In 1994–1995, five of the ten top companies in terms of sales were the associates of foreign companies, with GlaxoSmithKline Pharmaceuticals Ltd. (then Glaxo India Ltd.) as the market leader. But two decades later, nine of the top ten sellers were generic companies.

Over the past two decades, therefore, there has been an interesting transformation in the composition of top five companies in terms of sales turnover. In 1994–1995, the top five companies in terms of sales turnover included three affiliates of foreign companies (GlaxoSmithKline, Novartis and Aventis) and two generic companies (Ranbaxy and Cipla). By 2005–2006 this group included four generic companies (Ranbaxy, Dr. Reddy's, Cipla and Lupin) and one foreign affiliate (GlaxoSmithKline) with Ranbaxy at the top. In the current decade, only generic companies have figured in this group, with Cipla establishing itself as the market leader in most years. Cipla was the first company in the Indian industry to cross the threshold of 1-billion-dollar sales turnover in 2007–2008; by 2016–2017, five more companies figured in the billion-dollar league.

One aspect of the operations of the companies listed in Table 2 that has not been not captured is the growing importance of their global operations. For example, in 2016–2017, Sun Pharmaceutical Industries reported that foreign sales accounted for 68% of its revenue.[26] Dr. Reddy's Laboratories, too, showed a similar tendency; foreign sales were 58% of the company's total revenue.[27]

Thus, the top 20 companies in the Indian pharmaceutical industry continued to expand their presence, both in the domestic and international markets, notwithstanding the uncertainties they faced following the introduction of the TRIPS-compliant patent regime.

3.1.3 Profitability Ratios of Top 20 Pharmaceutical Companies

Pharmaceutical companies having the highest profitability ratios (or, profit to sales ratios) in the current decade are shown in Table 3. Except two exceptions, all companies included in the above table showed double-digit profit to sales ratios since 2011. But these figures were significantly lower than the ratios in the second half of the previous decade.

The largest companies were not among those having high profitability ratios. One possible explanation for this is that global operations of these companies have not been included in the data presented in Table 3. Thus, Sun Pharmaceutical Industries Ltd., which does not even figure in the list of top 20 companies having high profitability ratios, reported net profits of 23% in 2016–2017 when the company's foreign sales are also considered.[28] This figure was above the average profitability ratio for the industry since 2011–2012.

A noteworthy feature of the pharmaceutical industry is that it is the industry with the highest profitability ratio among all the leading sectors of the Indian industry (Fig. 1). Interestingly, the profitability of the pharmaceutical industry increased almost consistently through the period. It needs to be mentioned here that the pharmaceutical industry had outperformed other sectors of the industry despite facing significant uncertainties arising from the changes in the patent regime.

[26] Sun Pharmaceutical Industries Ltd. 2017–2018, Annual Report, p. 12.

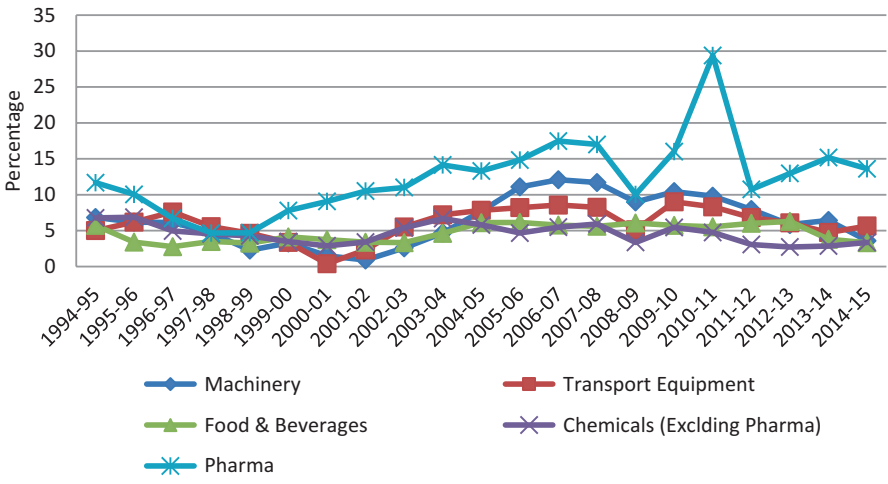
[27] Dr. Reddy's Laboratories Ltd. 2017, Annual Report, p. 43.

[28] Sun Pharmaceutical 2017, Sun Pharma reports Q4 and FY17 results.

Table 3 Pharmaceutical companies having highest profitability ratios (%)

Companies	1999–2000 to 2004–2005	2005–2006 to 2010–2011	2011–2012 to 2016–2017
Strides Shasun Ltd.	8.3	4.2	58.3
Divi's Laboratories Ltd.	17.9	32.1	28.4
Cadila Healthcare Ltd.	11.0	18.4	24.4
Lupin Ltd.	7.4	15.9	22.8
Glenmark Pharmaceuticals Ltd.	10.9	19.3	22.0
Torrent Pharmaceuticals Ltd.	11.3	14.5	22.0
Ajanta Pharma Ltd.	5.6	7.2	21.5
Natco Pharma Ltd.	0.4	15.4	19.5
Pfizer Ltd.	8.6	23.3	18.2
F D C Ltd.	17.4	17.5	17.6
Alkem Laboratories Ltd.	13.0	16.4	17.5
Biocon Ltd.	21.3	25.3	16.0
GlaxoSmithKline Pharmaceuticals Ltd.[a]	11.9	29.3	16.0
Dr. Reddy's Laboratories Ltd.	17.0	16.6	15.5
Aurobindo Pharma Ltd.	7.3	11.4	14.0
Cipla Ltd.	15.9	16.9	13.4
Sanofi India Ltd.	11.5	16.7	13.2
Wockhardt Ltd.	16.4	−6.6	11.9
Ipca Laboratories Ltd.	9.0	11.4	9.4
Abbott India Ltd.	17.3	9.2	9.1

Source: Same as Table 1
Note: [a] denotes affiliate of foreign company in India



Source: Same as Table 1

Fig. 1 Profitability ratios in different industries in India. (Source: Same as Table 1)

3.2 Indian Industry in Global Markets

We had mentioned in our earlier discussion that the generic pharmaceutical industry performed significantly better in the international markets. This was essentially because the leading companies of this industry were considerably more export-oriented as compared to those belonging to other industries. The trend towards enhancing the export-orientation of the industry had begun in the early 1990s, which went through a rapid consolidation in the subsequent years. This was particularly noticeable in case of the large generic firms in the industry. Table 4 shows that in recent years, foreign markets were substantially more important than the domestic market for several companies, including the large companies like Dr. Reddy's Laboratories and Cipla Ltd. Between 2011 and 2017, 74% of the sales of Dr. Reddy's Laboratories were, on an average, in foreign markets, while for Cipla Ltd., the corresponding figure was nearly 51%. It is also important to note that these companies have steadily increased their export orientation over time. Sun Pharmaceutical Industries did not report export figures in 2016–2017, which

Table 4 Top 20 companies with highest exports to total sales ratios (in %)

Company	1999–2000 to 2004–2005	2005–2006 to 2010–2011	2011–2012 to 2016–2017
Marksans Pharma Ltd.	21.2	26.1	97.5
Hikal Ltd.	79.6	78.5	77.5
Granules India Ltd.	57.4	73.5	76.5
Dr. Reddy's Laboratories Ltd.	53.0	63.1	73.9
Aurobindo Pharma Ltd.	48.7	59.9	73.8
Neuland Laboratories Ltd.	57.2	68.3	71.4
Kopran Ltd.	26.3	53.7	70.2
Shilpa Medicare Ltd.	53.3	73.3	64.8
Ind-Swift Laboratories Ltd.	36.0	38.6	55.2
Cipla Ltd.	35.9	50.6	50.7
Orchid Pharma Ltd.	79.2	68.9	48.4
Biocon Ltd.	48.3	44.1	46.4
Nectar Lifesciences Ltd.	17.2	37.5	45.6
Wanbury Ltd.	37.2	42.0	43.0
Indoco Remedies Ltd.	6.1	24.2	35.0
Aarti Drugs Ltd.	30.6	32.0	33.0
Cadila Pharmaceuticals Ltd.	13.9	27.8	32.9
Panacea Biotech Ltd.	8.5	26.5	32.9
Unichem Laboratories Ltd.	8.9	19.2	31.7
Sanofi India Ltd.[a]	18.4	20.5	21.2
Average for the top 20 companies	36.9	46.4	54.1

Source: Same as Table 1
Note: [a] denotes affiliate of foreign company in India

explains its absence from Table 4, but in 2015–2016, 63% of its sales were in foreign markets. The company met its international obligations through its subsidiaries located in other countries.

In contrast, affiliates of foreign companies operating in India do not engage significantly in exports; their production capacities in the country were increasingly being used for satisfying India's internal demand. This tendency stood out in case of the affiliates of some of the largest companies in the global industry like GlaxoSmithKline and Pfizer, which have reduced their exports from India since the middle of previous decade.

The strong performance of the generic industry in the global markets resulted from a number of its inherent advantages. It has been argued that Indian companies have lower costs – estimated to be one-eighth in R&D activities and one-fifth in manufacturing – as compared to the Western companies.[29] The cost advantages are most pronounced in respect of lower fixed asset costs and labour costs, where the costs in India can be one-eighth of the cost in the United States. Table 5 shows the trends in India's trade in pharmaceutical products.

Over the past two decades, India's total trade in pharmaceutical products increased from less than US$ 2 billion to more than US $27 billion. This expansion came on the back of a strong export performance, which, as the table above shows, increased from just over US$ 1 billion dollars in 1996 to over US$ 20 billion in 2016. Importantly, the pharmaceutical sector has been one of the few manufacturing sectors to have consistently increased its net foreign exchange earnings. Also, over the past 2 years, when India's exports have generally experienced uncertainties, the pharmaceutical industry was the only one among the manufacturing sector to have registered a healthy export growth (Table 6).

India's place in the global market as the supplier of cheap generics is confirmed by the pharmaceutical industry's growing presence in the market for formulations. Until the beginning of the current decade, exports of the active pharmaceutical ingredients (APIs) and the formulations were almost at par, but in the period since, exports of formulations have steadily increased, while exports of APIs have stagnated (Table 7).

Table 5 India's pharmaceutical trade – exports vs imports (in US $ billions)

Years	Exports	Imports	Trade balance
1996	1.2	0.7	0.6
2000	1.9	0.8	1.1
2005	5.2	2.1	3.1
2010	11.4	5.5	5.9
2012	16.6	7.3	9.3
2014	18.4	7.8	10.6
2016	20.1	7.4	12.7

Source: Authors' estimates using UN Comtrade database

[29] Grace, Cheri (2004), The Effect of Changing Intellectual Property on Pharmaceutical Industry Prospects in India and China: Considerations for Access to Medicines, p. 8.

Table 6 India's trade in pharmaceutical products by main categories (Figs. in US $billions)

	Active pharmaceutical ingredients			Formulations		
Years	Exports	Imports	Trade balance	Exports	Imports	Trade balance
1996	0.6	0.6	0.0	0.7	0.1	0.6
2000	1.0	0.6	0.4	0.9	0.2	0.7
2005	2.8	1.6	1.2	2.4	0.5	1.9
2010	5.2	3.9	1.3	6.2	1.5	4.7
2012	6.9	5.2	1.8	9.7	2.1	7.5
2014	6.7	5.8	0.8	11.7	2.0	9.7
2016	6.9	5.2	1.7	13.2	2.2	11.0

Source: Authors' estimates using UN Comtrade database

Table 7 Exports of generic formulations to major regions (% of total in parenthesis)

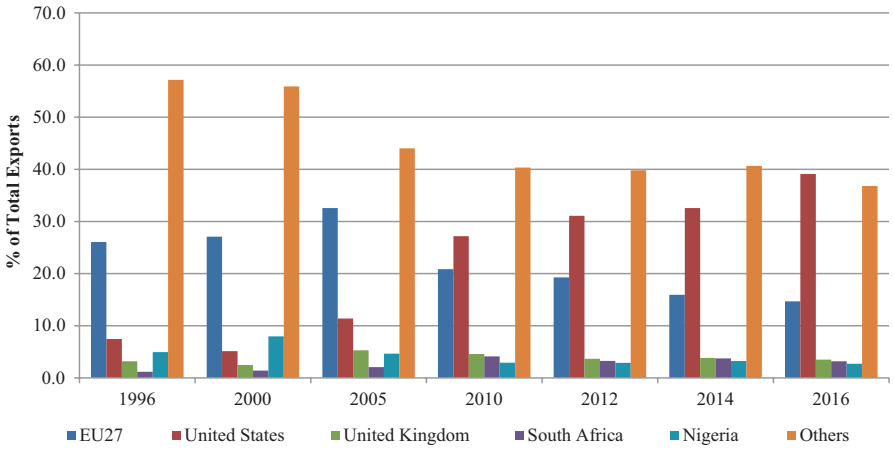
Years	Africa	Asia	EU27[a]	North America	South America
1996	0.1 (15.1)	0.2 (26.1)	0.2 (23.3)	0.1 (8.9)	0.02 (2.3)
2000	0.2 (21.6)	0.3 (30.0)	0.1 (15.4)	0.1 (7.6)	0.04 (4.6)
2005	0.5 (20.3)	0.6 (24.4)	0.4 (17.9)	0.3 (12.8)	0.1 (5.2)
2010	1.5 (24.5)	1.1 (17.1)	1.0 (15.6)	1.7 (28.2)	0.2 (3.7)
2012	2.2 (22.7)	1.6 (16.6)	1.4 (14.3)	3.2 (32.8)	0.4 (3.7)
2014	2.9 (24.5)	1.9 (16.3)	1.5 (13.1)	4.0 (33.9)	0.5 (4.4)
2016	2.9 (22.0)	2.1 (15.8)	1.6 (12.0)	5.4 (40.6)	0.4 (3.2)

Source: Authors' estimates using UN Comtrade database
Note: [a]EU-27 in the UN Comtrade database is an economic grouping created for statistical purposes. The Statistical Office of the European Union (Eurostat) provides EU-27 data

In 1995–1996, more than one-half of the exports of formulations by Indian generic companies were destined to Europe and Asia. Two decades later, the share of these two regions declined to a quarter. This decline, however, was not because of the decline in the value of exports but rather the expansion of exports to other regions. Decline in the share of Europe and Asia was matched by the expansion of exports to North America and Africa. In 2016, North America was the single largest market for India's formulations, with a 41% share. Exports to this region grew from a mere $60 million in 1996 to more than $5 billion in 2016. Penetration of Indian generic companies in Africa was also particularly noticeable. Between 2003 and 2016, exports of Indian formulations to Africa increased nearly tenfold, from $270 million to almost $3 billion.

The United States was the single largest market for Indian formulations with a 39% share. This market had expanded from less than $300 million in 2005 to over $5.2 billion in 2016. The relative importance of the European Union as a market for Indian generics had, however, fallen during the same period. The chart below provides a summary of the main destinations of Indian formulations (Chart 1).

India's place in the global market as a supplier of generic medicines is somewhat diminished by the fact that it is now a major importer of APIs. Between 2005 and 2016, API imports have increased more than threefold. Exports of APIs have also expanded, almost doubling between 2005 and 2016. China has emerged as India's



Source: Same as table 5

Chart 1 Major export destinations of Indian formulations. (Source: Same as Table 5)

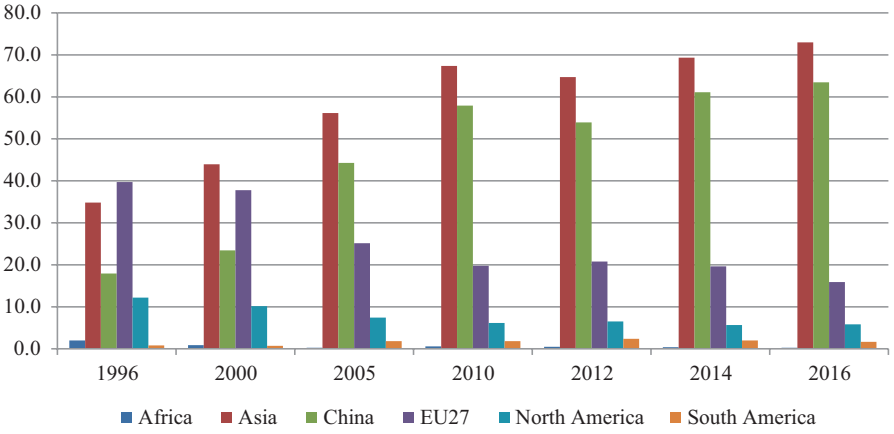


Chart 2 India: sources of imports of APIs

largest supplier of APIs, accounting for nearly two-thirds of its total imports from its northern neighbour (Chart 2).

3.3 Penetration of Indian Generics into Industrially Advanced Countries: The Case of the United States

Since the mid-1980s, Indian generic manufacturers benefited from a series of changes in the regulatory framework adopted by the US Food and Drug Administration (FDA), which explicitly favoured the generic drugs. The most

significant of these was the Drug Price Competition and Patent Restoration Act of 1984 (better known as "the Hatch-Waxman Act") that created opportunities for marketing of generics or the so-called abbreviated new drug applications (ANDAs). The Hatch-Waxman Act established the ANDA approval process, which allows lower-priced generic versions of previously approved innovator drugs to be brought into the market. The Hatch-Waxman Act established bioequivalence as the basis for approving generic copies of drug products. This allows the FDA to grant approvals to market generic versions of proprietary drugs without going through the costly and duplicative clinical trials for establishing the safety and efficacy of the generics.

An ANDA contains data which is submitted to FDA for the review and potential approval of a generic drug product. Once approved, an applicant may manufacture and market the generic drug to provide a safe, effective, lower-cost alternative to the brand-name drug. All approved products, both innovator and generic, are listed in FDA's *Approved Drug Products with Therapeutic Equivalence Evaluations* (Orange Book).

Generic drug applications are termed "abbreviated" because they are generally not required to include preclinical (animal) and clinical (human) data to establish safety and effectiveness. Instead, generic applicants must scientifically demonstrate that their product performs in the same manner as the innovator drug. One-way applicants demonstrate that a generic product performs in the same way as the innovator drug is the time it takes the generic drug to reach the bloodstream in healthy volunteers. This demonstration of "bioequivalence" gives the rate of absorption, or bioavailability, of the generic drug, which can then be compared to that of the innovator drug. To be approved by FDA, the generic version must deliver the same amount of active ingredients into a patient's bloodstream in the same amount of time as the innovator drug.

Market penetration of generic drugs increased rapidly after the enactment of Hatch-Waxman Act. By the early years of the new millennium, generic drugs comprised of more than 47% of the prescriptions filled for pharmaceutical products, up from 19%, when the Act came on the statute book.[30] Generic drugs continued to gain in popularity in the United States; the Office of Generic Drugs of the FDA reports that currently, 9 out of 10 prescriptions filled are for generic drugs.[31] Increasing the availability of generic drugs helps to create competition in the marketplace, which then helps to make treatment more affordable and increases access to healthcare for more patients. One estimate shows that due to the availability of low-cost generics, the healthcare system in the United States was able to save $263 billion in 2016 and nearly $1.7 trillion over the past decade.[32]

[30] US Federal Trade Commission, Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy 2002, p. i.

[31] US Food and Drug Administration, Orange Book: Preface (online publication).

[32] Association for Accessible Medicines, Generic Drug Access and Savings in the United States, report prepared by the IMS Health Institute 2017, 20.

The market penetration made by the Indian generic companies can be seen from the approvals they have been receiving from the FDA for the marketing products on the basis of their safety and efficacy. The approvals published in the "Orange Book" have been based on clearly defined criteria.[33]

Table 8 and Chart 3 show that until the late 1990s, Indian generic manufacturers received very few approvals from FDA to market their products in the United States. Although this trend had changed from early 2000s, it was only after the middle of the previous decade that there was quantum leap in the number of approvals received by Indian companies. Sun Pharmaceutical and Aurobindo Pharma Ltd., along with their group companies, were the main beneficiaries. A notable feature of the marketing approvals obtained was that the Indian generics have a major share of prescription drugs.

3.4 The Technology Dimension

The pharmaceutical industry can be divided into three product groupings, viz. bulk drugs, intermediates and formulations. While bulk drug production can be sustained over a long period only through sustained involvement in R&D activities, formulation production can be carried out with relatively low levels of technological sophistication.

During the past decade, however, the R&D profile of the Indian pharmaceutical industry has undergone major changes. The most obvious of these is the manifold increase in the spending on R&D, particularly since the beginning of the current decade. The increase in R&D intensity (R&D to sales) of the Indian pharmaceutical industry since 1999–2000 is the other significant aspect. This is an indication that the pharmaceutical industry in India is allocating increasing amounts of its sales turnover towards R&D spending (Chart 4).

Until the end of 1990s, the pharmaceutical industry, like other major industries, was spending only less than 1.5% of sales on R&D. But from the beginning of current decade, there is a steep increase in the R&D spending, from 2% in 2000–2001 to nearly 7% in 2015–2016. This trend is strongly reinforced by the R&D-intensive companies in industry (Table 9).

The top 20 companies in terms of R&D intensities were all manufacturers of generic medicines. Major companies, including Sun Pharmaceutical Industries, Dr.

[33] FDA classifies as therapeutically equivalent those products that meet the following general criteria: (1) they are approved as safe and effective; (2) they are pharmaceutical equivalents in that they (a) contain identical amounts of the same active drug ingredient in the same dosage form and route of administration and (b) meet compendia or other applicable standards of strength, quality, purity and identity; (3) they are bioequivalent in that (a) they do not present a known or potential bioequivalence problem, and they meet an acceptable in vitro standard, or (b) if they do present such a known or potential problem, they are shown to meet an appropriate bioequivalence standard; (4) they are adequately labelled; and (5) they are manufactured in compliance with current Good Manufacturing Practice regulations (for details, see US FDA. Orange Book: Preface, 2018).

Table 8 FDA approvals received by Indian companies (top ten)

Companies	Prior to 2000			2000–2010			2011–2018			Total approvals
	OTC	R/x	Total	OTC	R/x	Total	OTC	R/x	Total	
Aurobindo Pharma Ltd.	0	0	0	0	183	183	21	469	490	673
Sun Pharmaceutical Industries Ltd.	0	73	73	15	251	266	15	286	301	640
Dr. Reddy's Laboratories Ltd.	4	14	18	14	139	153	14	194	208	379
Lupin Ltd.	0	0	0	0	78	78	1	245	246	324
Glenmark Pharmaceuticals Ltd.	0	0	0	0	61	61	1	166	167	228
Wockhardt Ltd.	2	40	42	6	94	100	8	57	65	207
Torrent Pharmaceuticals Ltd	0	0	0	0	44	44	4	146	150	194
Macleods Pharmaceutical Ltd.	0	0	0	0	0	0	0	160	160	160
Cipla Ltd.	0	0	0	0	45	45	2	72	74	119
Hetero Labs Ltd.	0	0	0	0	21	21	3	86	89	110
Total	6	127	133	35	850	885	64	1881	1950	2968

Source: Orange Book: *Approved Drug Products with Therapeutic Equivalence Evaluations*, accessed from: https://www.accessdata.fda.gov/scripts/cder/ob/index.cfm

Note: OTC: Over the Counter; R/x: Prescription Drugs

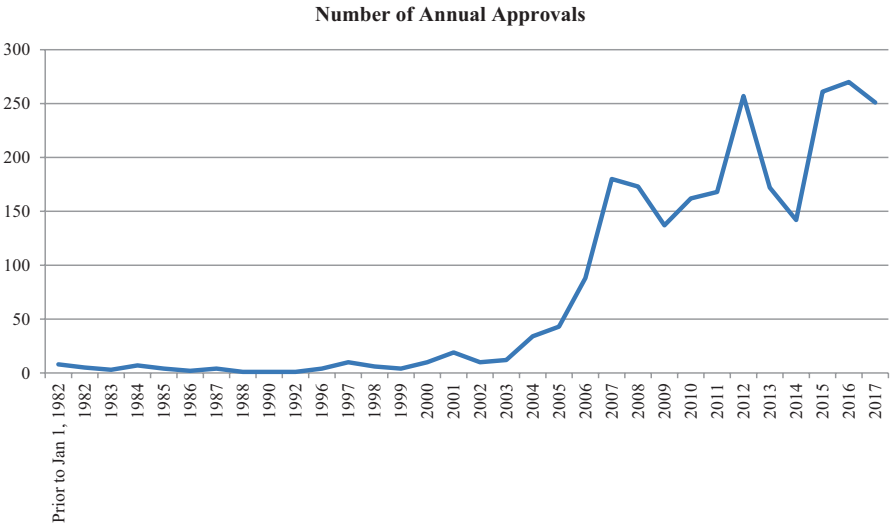
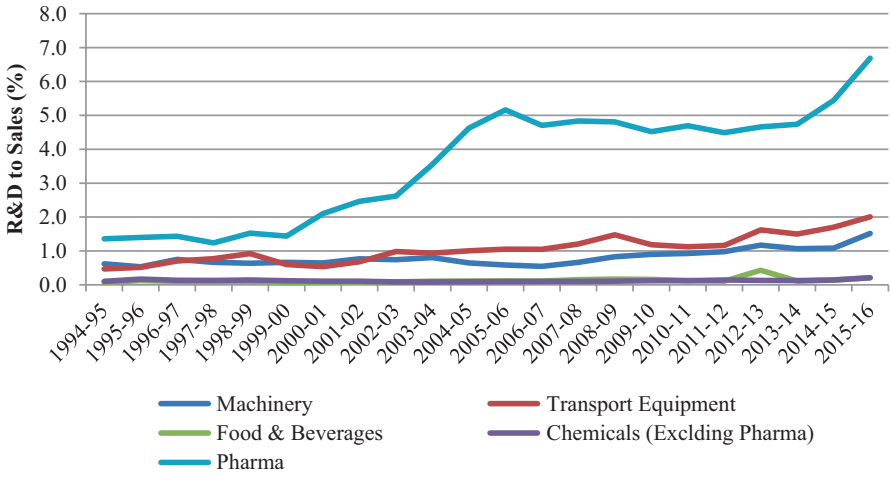


Chart 3 Trends in FDA approvals received by Indian companies (top ten recipients). (Source: Orange Book, accessed from: https://www.accessdata.fda.gov/scripts/cder/ob/index.cfm)



Source: Same as table 1

Chart 4 Ratio of R&D to sales of major sectors in India. (Source: Same as Table 1)

Reddy's Laboratories, Cipla and Lupin Laboratories, registered upward trends in their R&D intensities from the beginning of the 2000s.

Globally, pharmaceutical industry is an R&D-intensive industry, with several large companies spending upwards 15% of their sales on research (Table 10).

Table 9 R&D intensities of top 20 pharmaceutical companies (Figs. in %)

Companies	1999–2000 to 2004–2005	2005–2006 to 2010–2011	2011–2012 to 2016–2017
Panacea Biotec Ltd.	3.0	6.1	13.7
Lupin Ltd.	3.6	8.0	12.7
Cadila Healthcare Ltd.	4.0	8.7	12.5
Suven Life Sciences Ltd.	6.8	19.9	11.9
Dr. Reddy's Laboratories Ltd.	9.1	9.1	10.9
Sun Pharmaceutical Industries Ltd.	2.8	6.8	10.3
Wockhardt Ltd.	5.2	3.0	8.8
Ind-Swift Laboratories Ltd.	1.8	8.3	6.9
Ajanta Pharma Ltd.	0.6	3.5	6.1
Cipla Ltd.	3.1	4.3	6.1
Glenmark Pharmaceuticals Ltd.	4.5	4.6	5.6
Torrent Pharmaceuticals Ltd.	6.4	8.9	5.4
Natco Pharma Ltd.	0.8	2.8	5.3
Biocon Ltd.	2.4	5.3	4.9
Unichem Laboratories Ltd.	1.8	3.9	4.5
Aurobindo Pharma Ltd.	1.2	3.6	4.1
Orchid Pharma Ltd.	1.7	3.4	3.8
Ipca Laboratories Ltd.	1.9	3.0	3.7
Indoco Remedies Ltd.	0.8	2.0	3.1
Divi's Laboratories Ltd.	1.8	1.2	1.0
Average	3.2	5.8	7.1

Source: CMIE, Prowess database

Tables 9 and 10 show that in 2017, Indian generics were lagging behind the research-intensive global companies. But, as mentioned above, the encouraging fact for the Indian pharmaceutical companies is that a number of companies have graduated into the league of companies that have double-digit R&D intensities.

A quick check on the R&D output of some of the leading companies can be made through their patenting activity. Table 11 shows that there is a correspondence between the worldwide patent filings of the companies and their R&D spending. However, while Dr. Reddy's and Lupin Laboratories had either remained range bound or had increased their patent filings between 2010 and 2017, Cipla had decreased their patenting activity during this period.

Table 12 provides the data on the patents granted to a few major Indian companies in India, after the introduction of the product patent regime. Immediately after the introduction of the product patent regime in pharmaceuticals, the leading Indian companies obtained a significant number of patents in India. However, in the current decade, these companies were unable to maintain the momentum.

Table 10 R&D intensity of top ten companies in pharmaceuticals and biotechnology sectors (2017)

Company	R&D intensity (%)
Johnson & Johnson	12.7
Novartis	18.2
Bayer	10.0
Pfizer	14.7
Roche	19.6
Merck US	17.2
Sanofi	14.1
GlaxoSmithKline Pharmaceuticals Ltd	12.1
AstraZeneca	24.6
Gilead Sciences	15.4
Average	15.9

Source: The 2017 EU Industrial R&D Investment Scoreboard (accessed from: http://iri.jrc.ec.europa.eu/scoreboard17.html)

Table 11 Worldwide patent filings by major Indian companies by year of publication

Years	Dr. Reddy's	Lupin	Cipla	Natco Pharma	Sun Pharmaceutical
2000	10	7	5	0	0
2005	54	35	61	15	5
2010	75	40	68	13	5
2015	53	76	71	14	4
2017	65	74	44	17	1

Source: Espacenet Patent search, https://worldwide.espacenet.com

Table 12 Patents granted to Indian generic companies in India

Companies	Patents granted	
	2005–2009	2010–2013
Cipla Ltd.	19	4
Dr. Reddy's Laboratories	22	0
Lupin Ltd.	6	0
Natco Pharma	16	0
Panacea Biotech Ltd.	8	7
Sun Pharmaceutical Industries Ltd.	8	1

Source: Controller General of Patents, Designs and Trade Marks, India

Another interesting fact is the patenting activities of the leading generic companies in India and in other jurisdictions were significantly different. While companies like Lupin Laboratories and Natco had increased their worldwide patent filings, they had stopped filing for patents in the Indian Patent Office. This behaviour needs to be analysed looking at their firm-level characteristics, which is beyond the scope of this chapter.

4 Concluding Remarks

The strong presence of companies producing generic medicines has given a special character to the Indian pharmaceutical industry. The growth of these companies and their subsequent consolidation can largely be attributed to the Patents Act enacted in 1970. This legislation had two key features that provided space for the growth of the generic companies. First, the Patent Law, 1970, allowed grant of only process patents for chemicals, including pharmaceuticals, and second, the term of patent protection was shorter for pharmaceutical patents. The process patent regime, in particular, enabled the generic manufacturers to develop alternative processes for proprietary products that were already in the market.

India's accession to the TRIPS Agreement led to fundamental changes in the country's patent regime. The two key provisions of Patents Act, 1970, which the generic companies had benefited from, were amended. Product patents were introduced to cover pharmaceutical innovations, and a uniform period of patent protection of 20 years was introduced.

However, the Government of India exploited the flexibilities of the TRIPS Agreement and introduced two provisions in the amended Patents Act that could lessen the impact on the generic companies. The first was Section 3(d) that does not allow patents on minor modifications of existing product. This objective of this provision was to eliminate the possibilities of "evergreening of patents". Section 3(d) ensures that public domain allows the generic companies to continue operating in the industry.

The second provision provided by the Indian Patents Act is the possibility for the grant of compulsory licencing if the patent is not worked in India or the product resulting from the exploitation of the patent has exorbitant prices. Importantly, both these flexibilities have successfully stood scrutiny, including by the highest court of the land.

This study analysed the performance of the Indian pharmaceutical industry in the post-TRIPS patent regime. Our analysis showed that the leading generic companies of the industry have mixed performance. While most indicators exhibited an upward trend through the previous decade, in the present decade, there has been some slowing of the growth rates. These figures do not provide conclusive evidence about the health of the industry.

The industry as a whole and some of the leading companies in particular have shown considerable improvement in R&D intensity since the previous decade. An indicator of the better performance of the industry has been the increase in its patenting activity, as reflected in the figures of the major companies.

For the past two decades, the Indian pharmaceutical industry has emerged a global player, by being a supplier of affordable medicines to a large number of countries. Some of the leading companies, including the largest company, namely, Sun Pharmaceutical Industries Ltd., have larger shares of their businesses in the global markets. The major markets of the industry are in the developed world, especially in the United States. In this market, the Indian pharmaceutical companies have been able to exploit the opportunities provided to the generic companies by the Hatch-Waxman Act of 1984, which provides an easier set of regulatory requirements for these companies to obtain marketing approval.

In an ever-shifting world of intellectual property protection, the Indian pharmaceutical industry faces considerable challenges. The flexibilities provided by the Indian Patents Act, which has provided some space to the manufacturers of generic medicines in the country, have been critically commented on by two of India's largest economic partners, namely, the United States and the EU. The United States Trade Representative (USTR) has been conducting annual investigations under Special 301[34] since 1989, and in each annual investigation, India has been named either as a "Priority Foreign Country" or has been included it in the "Priority Watch List". The former designation is for countries "that have the most onerous or egregious acts, policies, or practices and whose acts, policies, or practices have the greatest adverse impact (actual or potential) on the relevant US products" and the latter for countries in which "problems exist … with respect to IP protection, enforcement, or market access for persons relying on [intellectual property]".[35]

In 2014, the European Commission adopted the "Strategy for the protection and enforcement of intellectual property rights in third countries" for "fighting IPR infringements in third countries…".[36] As a part of this strategy, the Commission identified India as a country, which has "[r]estrictive patentability criteria combined with difficulties to enforce patents granted, as well as very broad criteria being applied for granting compulsory licenses or for revoking patents" that "make effective patent protection in India very difficult, notably for pharmaceuticals and chemicals …".[37]

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[34] These investigations are conducted under Section 182 of the Trade Act of 1974, as amended by the Omnibus Trade and Competitiveness Act of 1988, the Uruguay Round Agreements Act and the Trade Facilitation and Trade Enforcement Act of 2015 (19 U.S.C. § 2242).

[35] Office of the United States Trade Representative (2018), p. 8.

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Part V

Plant Varieties and Food Security

Protecting New Plant Varieties in China and Its Major Problems

Yangkun Hou

Abstract

China has achieved remarkable results for the protection of new plant varieties since it promulgated and implemented "Regulations for the Protection of New Plant Varieties" in 1997. However, as a whole, the level of legislation is still at an early stage, primarily referencing to the UPOV Convention and the legal content of other countries. The legislation has not yet set up the ultimate goal and reasonable protection measures that would meet China's current actual needs. The chapter discusses the status of protection of new plant varieties in China and characteristics. It then analyzes the major deficiencies and shortcomings of existing laws and explores the main reasons behind. This chapter proposes a number of specific measures for perfecting the legal system for the protection of new plant varieties in China before it ends with a conclusion.

Keywords

New plant variety · UPOV · Variety name rights · Breeder's right

1 Status of Protection of New Plant Varieties in China

1.1 The General Background

China is one of the oldest civilizations in the world and has a vast territory. From north to south, it spans the cold temperate zone, temperate zone, warm temperate zone, subtropical zone, and tropical zone. There is a large variety of plants growing on this vast land. According to scientific investigation, there are more than 30,000

Y. Hou (✉)
School of Law Beijing Institute of Technology, Beijing, China

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_14

kinds of higher plants in China, ranking third after Brazil and Colombia. This rich plant resource has laid a solid foundation for the cultivation of new plant varieties in China and for the enhancement of the protection of new plant varieties.

In the long historical development of China, the hardworking and wise Chinese farmers have domesticated and cultivated a large number of plant species and applied them to agricultural production. In modern breeding, workers continue to cultivate a large number of new varieties. Since the founding of the People's Republic of China (PRC) in 1949, China's crop varieties have been updated for several generations, which have made important contributions to China's improving varieties and increasing yields. In particular, Academician Yuan Longping, the father of the well-known rice breeding in China, has made outstanding contributions to the world's breeding business and helped solving the basic human need for food.

Under the background of this breeding history and breeding scale, China promulgated the Regulations for the Protection of New Plant Varieties in 1997 and began to introduce and implement a legal system for the protection of new plant varieties in China, which has its origin in the 1941 Breeders Ordinance of the Netherlands. Its central content is the protection of breeder rights, which enables breeders to derive economic benefits from the commercial exploitation of new plant varieties. Obviously, the value objective established by this legal system is mainly to obtain personal economic benefits through legitimate breeding labor[1]. However, the problem that is difficult to avoid is that compared with the "collectivism" and "devotion spirit" advocated and implemented in China since 1949, emphasis on the "pursuit of purely personal economic interests" is unlikely to take root in China due to its ancient and profound social tradition.[2]

Since the promulgation and implementation of the "Regulations for the Protection of New Plant Varieties" in 1997, China has made huge progress and achievements in the legislation for the protection of new plant varieties. The National People's Congress Standing Committee, the Supreme People's Court, the Ministry of Agriculture and Rural Affairs, and the National Forestry and Grassland Administration have all played a role. In the revision of the Seeds Law in 2015, a section on the protection of new plant varieties was added; and the Supreme People's Court has promulgated the judicial interpretation to specifically deal with this issue. The agriculture and forestry departments have promulgated respective regulations,

[1] Internationally, this legal system for the protection of new plant variety rights was established by the International Convention for the Protection of New Plant Varieties (UPOV Convention), which was established in 1961. After three revisions in 1972, 1978, and 1991, there are now three valid texts: the 1961/1972, 1978, and 1991 texts. As of June 2018, the UPOV Convention has 75 member states. Only Belgium is applying the 1961/1972 text, 17 countries are applying the 1978 text, and the remaining 57 countries are applying the 1991 text. China joined the 1978 text in 1999.

[2] In the traditional culture of China, people have advocated the spirit of "equality," "dedication," "mutual help," and "supremacy of national interests" and have not promoted, or have even opposed, the simple pursuit of economic wealth.

including the "Implementation Rules for the Protection of New Plant Varieties," "Guidelines for the Examination of New Plant Varieties," "The Protection List of Plant Varieties," etc., which foresee the application, testing, authorization, review, and protection of new plant varieties and achieve basic complete coverage.

It is particularly worth noting that the Ministry of Agriculture and Rural Affairs has also issued the following important regulations, including "Nomenclature of Agricultural Plant Varieties," "Registration Guidelines for Non-major Crop Varieties," "Registration Measures for Non-major Crop Varieties," "The Measures for the Protection of Agricultural Wild Plants," and "Administrative Measures on Crop Germplasm Resources," which reflect the fact that the Ministry is continuously refining and improving this legal system.

1.2 The Research Status of Protection of New Plant Varieties

With regard to the research status of new plant varieties in China, the number of experts and scholars in China who study the protection of new plant varieties is very small. The main reasons for this are the following: (a) It is difficult for experts and scholars engaged in legal research to study this area in depth, as general legal knowledge is not enough and basic intellectual property legal knowledge is required. (b) Even experts and scholars who have mastered the knowledge of intellectual property law are unable to systematically study this area and can only understand the legal system from the literal meaning of the law and general social common sense, if they do not have expertise in biology, genetics, and breeding. (c) The number of legal cases in this area is still small compared with the cases of copyright, patents, and trademarks and has not attracted much attention.

Although Chinese scholars began to explore and discuss the issue of the protection of valuable non-plant new varieties, essentially derived varieties, criminal liability for infringement breeders' rights, reasonable damages, range of special rights of farmers, and the establishment of special variety name rights in legislation. At present, research in China on the protection of new plant varieties is still mainly to learn and understand the basic content of the UPOV Convention and other national laws. China has yet to establish its own DUS (the Examination of Distinctness, Uniformity and Stability) test guide and genetic fingerprint data for plant varieties and to integrate the scientific spirit of this legal system into the inner spirit of the Chinese nation. The research on this legal system still faces the following problems that need to be solved: What is the goal that should be pursued in this legal system? What specific contents should be included in it? How could this legal system be improved according to China's characteristics in plant resources and cultural and social development and from the long-term and overall perspectives? How can this legal system serve Chinese people and people of the world better? At present, there is basically little or no research on these deeper and broader issues in China.

1.3 Granting of Breeders' Rights in China

1.3.1 The Total Number of Breeders' Rights Granted in China by June 2018

China has accepted and approved breeders' rights since 1999. This work is handled by the Ministry of Agriculture and Rural Affairs (formerly the Ministry of Agriculture) and the National Forestry and Grassland Administration (formerly the State Forestry Administration). According to the statistics of the relevant departments of the Ministry of Agriculture and Rural Affairs, by 2016, the number of applications for new plant variety rights in China already ranked first in the world.[3] From 1999 to June 2018, China approved a total of 12,221 breeders' rights, of which 10,863 are for agriculture and 1358 are for forestry (the author carried out calculations based on the statistics and information published on the official website of the Ministry of Agriculture and Rural Affairs and the National Forestry and Grassland Administration).

1.3.2 Period Needed for Applying for Breeders' Rights in China

The average length of time from the application of a variety right to its acquisition in China varies, which can range from about 10 months to 9 years. For crops such as rice, corn, wheat, soybeans, and cotton, generally, it takes 3 to 4 years. Cases with delay of over 5 years may have encountered opposition, related litigation, or disputes during the application process. Since 2017, this period has been shortening. More and more breeders' rights on new plant varieties have been obtained within a period of less than 1 or 2 years.

1.3.3 Foreign Applicants Obtaining Breeders' Rights in China

The majority of breeders' rights holders are Chinese units and individuals. A small number of foreign units and individuals have also been applying for breeders' rights in China. Until 2018, foreign applications mainly come from the United States, Germany, France, the United Kingdom, the Netherlands, Belgium, Italy, Denmark, Japan, Switzerland, and New Zealand. Among these, the United States, the Netherlands, France, Germany, the United Kingdom, and Switzerland have obtained the most breeders' rights.

From 1999 to June 2018, 188 forestry breeders' rights in China were obtained by foreign applicants from nine countries, accounting for 13.84% of the total forestry breeders' rights. In the category of agricultural breeders' rights, the proportion of breeders' rights acquired by foreign units and individuals is smaller. In addition, due to the different types of varieties, it is difficult to compare the commercial advantages of breeders' rights for different owners. According to the statistics of the

[3] According to Zhang Yanqiu, the number of applications for breeder's rights in China in 2016 has doubled from 5 years ago (in Chinese), available at http://finance.china.com.cn/news/20171013/4413049.shtml (accessed 2018-04-16).

National Forestry and Grassland Administration, as of the end of 2016, the top ten units that have obtained forestry breeders' rights in China are Beijing Forestry University; Chinese Academy of Forestry; Shandong Academy of Forestry; Kunming Yang Yueji Horticulture Co., Ltd.; Chinese Academy of Sciences; Shandong Agricultural University; W. Korder' Sohne (Germany); Shanghai Botanical Garden; Palm Garden Co., Ltd.; and Meilland International SA (France).[4]

1.3.4 Commercial Use of Breeders' Rights in China

At present, the economic significance and commercial value of the new plant varieties in China are mainly reflected in the fact that the breeders' rights holders prohibit others from commercializing the authorized varieties and less in the use of these exclusive rights to gain commercial interests. In addition, breeders can also obtain benefits through cooperative breeding with others, or commissioned breeding for others, and licensing others to use their authorized varieties, or selling the application right of breeders' rights or the breeders' rights. Finally, under China's current legal provisions, breeder rights holders can also use the variety rights as capital contributions, or mortgages, and can also use breeder rights for financing. However, so far, such activities are still in their infancy in China.

1.4 Chinese Applying for Breeders' Rights with Foreign Countries: Extremely Rare

The number of Chinese individuals and units applying for new plant variety rights with foreign countries is very small. From 2000 to 2013, Chinese applicants filed for a total of 133 applications with different foreign countries, obtaining 47 authorizations in aggregate. In 2013, Chinese applicants submitted a total of 33 applications overseas and obtained 5 authorizations. In 2014, a total of two applications were filed with different foreign countries and one authorization was obtained. In other words, Chinese breeders mainly apply for breeders' rights in China and rarely pay attention to applying abroad. The main reason for this situation may be that Chinese seed companies mainly engage in commercial activities related to the seed industry in China and have not expanded their activities overseas.

2 Types of Disputes Occurred in China

Chinese courts now mainly hear the following types of cases.

[4] Intellectual Property Research Center of State Forestry Administration. Forestry plant new varieties, http://www.cfip.cn/yjzx/SecondBrw.cbs?ResName=lyzs&RC=95&order=94&ResultFile=c%3A%5Ctemp%5Ctbs%5CF249824%2Etmp&SortFld=&sortorder=

2.1 Dispute Over Ownership and the Right to Apply for Breeders' Rights

Cases include Tian Qingyi v. Zhongzhong Group Chengde Great Wall Seed Co., Ltd. (Civil Judgment of the Intermediate People's Court of Shijiazhuang City, Hebei Province (2005), Shi Min Wu Chu Zi No. 00176); Shenyang Agricultural University v. Du Mingqi, etc. (Civil Judgment of the Higher People's Court of Liaoning Province (2005), Liao Min Si Zhong Zi No. 73); and Wang Tengjin and Liu Zhenzhuo v. Sichuan Zhongzheng Science and Technology Seeds Co., Ltd., and Guangxi Bobai County Agricultural Science Institute (Civil Judgment of the Nanning Intermediate People's Court of Guangxi Zhuang Autonomous Region (2006), Nanning Min San Chu Zi No. 9).

2.2 Infringement of Breeder's Rights

There are currently six types of cases that infringe on a breeder's rights in China.

2.2.1 Fabricating a Variety Name

In this type of infringement, the infringer produces and sells another person's authorized variety, but deliberately uses another name to replace the name of the authorized variety. The name used by the infringer may be the real name of another breed or may be a false name that was arbitrarily fabricates and does not exist at all. Currently, this is a major type of infringement in China. In the production and management of the seed industry, people generally refer to this type of infringement as "brand counterfeit." For example, in the case of Dunhuang Seed Industry Pioneer Seed Co., Ltd. v. Xinjiang Xinteli Seed Co., Ltd. and the Fourth Group of the First Agricultural Division of the Xinjiang Production and Construction Corps (Civil Judgment of the Supreme People's Court (2014) Min Ti No. 26.), the name of the plaintiff's authorized variety was "Xianyu 335," but the defendants replaced it with "Xianyu 696" and produced and sold it. "Xianyu 696" was a false name arbitrarily fabricated by the defendants. The court ruled that the defendants constituted an infringement according to Article 6 of The Regulations on the Protection of New Varieties of Plants (2014 Revision) and should assume tort liability[5].

2.2.2 Forging or Imitating Another Person's Authorized Variety

In this type of infringement, another variety is used as impostor of another person's authorized variety. The basic feature of this type of infringement is using variety B,

[5] Article 6 of the Regulations on the Protection of New Varieties of Plants provides: The unit or individual that completes the breeding shall enjoy exclusive rights to its authorized varieties. No unit or individual may produce or sell the propagation material of the authorized variety for commercial purposes without the permission of the owner of the variety right and may not reuse the propagation material of the authorized variety for the production of propagation material of another variety for commercial purposes. However, unless otherwise provided by this Ordinance.

either legally owned by the infringer or a third party, and passing it off as authorized variety A. The variety produced and sold is nominally the authorized variety A, but is actually variety B. There are two specific ways of implementing specific torts: directly forging the denomination and packaging of an authorized variety to carry out production and sales activities and imitating the name of an authorized variety or its external packaging. For this type of infringement, some breeder's rights holders are unwilling to sue publicly because they fear that once people know that there are fake varieties of their breeds, their normal sales will be affected. Therefore, fewer cases of this type have been brought to court.

2.2.3 Unauthorized Use of Authorized Varieties of Others

Currently in China this is also an important type of infringement, which involves producing and selling authorized varieties belonging to others for commercial purposes without obtaining the permission of the right holders. Unauthorized here includes the following: no authorization was ever obtained (Guo 2006); authorization obtained, but expired or terminated[6], or the authorized geographical scope or time range was exceeded (Yangkun, 2015); and unauthorized permission by third party (Hou 2017).

2.2.4 Plundering Others' Right to Apply for Breeder's Rights

This type of infringement is a direct plunder of other people's breeding achievements. The infringement usually takes place in employment breeding – often occurs after employees have retired, resigned, or switched to other companies – commissioned breeding, and cooperative breeding. Infringers often deliberately violate the working regulations or the agreement of the parties, thus illegally utilizing the breeding results. An example in point is the abovementioned Wang Tengjin and Liu Zhenzhuo v. Sichuan Zhongzheng Technology Co., Ltd., and others, where the defendant used the opportunity to help the plaintiff submit the application materials to the relevant government agency and took the new plant variety cultivated by the plaintiff as his own, applying for the breeder's right as the applicant. After finding out the facts, the court ruled that the defendant's ill-gotten breeder's rights should be transferred back to the plaintiff.

2.2.5 Stealing Others' Authorized Varieties

The typical method of infringement is direct theft of the breeding materials for authorized varieties of others. These are generally stolen from the fields where reproduction occurs or from the households of farmers or purchasers who are entrusted with reproduction. The number of varieties obtained by this type of theft

[6] Sichuan Zhong Zheng Technology Co., Ltd. v. Guangxi Zhuang Autonomous Region Bobai County Institute of Agricultural Sciences and others by the Guangxi Zhuang Autonomous Region Higher People's Court (2017), Gui Min Zong 95 civil judgment, in which the defendant's act of producing and selling authorized varieties after the termination of the license contract was ruled to be constituting infringement, see the Supreme People's Court, Top 10 Intellectual Property Cases in 2017, available at http://www.court.gov.cn/zixun-xiangqing-91312.html.

is relatively small. For example, Hainan Province is an important breeding base for new plant varieties in China. Many breeding workers in the northern provinces generally need to go to Hainan to speed up their breeding progress; there, they can increase the planting period from one season to two seasons annually. During this process, pirates steal the seedlings or seeds of new plant species cultivated by others from the fields and then use them as their own breeding materials to breed their own new varieties.

It is very regrettable that China does not have any special provisions for such theft. It can only be dealt with in accordance with the Criminal Law promulgated and implemented in 1997. However, according to the provisions of the Criminal Law, the police can only file a case when the value of the stolen goods reaches a certain amount, and yet the value of small amount of breeding materials stolen is difficult to specify. Therefore, we have not yet seen charges against such a theft, which has led to the widespread occurrence of theft of breeding materials in Hainan. However, in the past 2 years, the Chinese government begun to pay attention to this situation and strengthen the management of the breeding base in Hainan.

2.2.6 Using Essentially Derived Varieties

This type of infringement involves using other people's authorized varieties for modified breeding, that is, only adding or modifying a small portion of genetic traits, without changing the main genetic traits of the original varieties, so as to obtain an essentially derived variety. Although the essentially derived varieties may have some differences in form from the original varieties, the basic traits of the varieties are basically the same, and the infringers used the essentially derived varieties to commit infringement. This use of the breeding technology to hide the infringement still amounts to a kind of tort.

After obtaining essentially derived varieties, the infringers would often apply for breeder's rights on them; once obtaining the breeder's rights, the infringers will be entitled to "frankly and squarely" and "legally" produce and sell the essentially derived varieties, achieving infringement of the varieties of others through legal means. Another way to commit infringement is through use of essentially derived varieties for commercial activities, without applying for breeder's rights. During litigation, the appraisal technology may determine that the derived variety is distinct from the actually infringed authorized variety, thereby avoiding the possibility of being identified as a tort.

It is a great pity that the "essentially derived varieties" clause, which is in the UPOV Convention's 1991 text, was not included in the 1978 text in that China is now participating. Therefore, in China, there is no concept of "essentially derived varieties" in the law, so there have so far been no cases or court decisions in China concerning "essentially derived varieties."

However, since China already has advanced breeding technology, it is not a difficult task for many breeding units to cultivate "dependently derived varieties" purposefully. In fact, many "essentially derived varieties" have been cultivated, widely produced, and sold. The current outstanding problem is that there is a lack of legislation to deal with the reality.

2.3 Contract Disputes for New Plant Varieties

There are mainly three types of contract disputes in China.

2.3.1 Over Commissioning Production Seeds

A variety owner, or licensed manufacturer and seller, needs to produce an authorized variety in order to sell it. In reality, they generally need to entrust the farmer or the farm to produce the authorized variety, and the two parties need to sign a contract entrusting the farmer with production. There are also frequent disputes in the performance of such contracts.

There are two types of such disputes: one is simply an ordinary dispute between the two parties and the other is due to the fact that the entrusting party illegally produces an authorized variety of others, causing infringement of the breeder's rights of others, resulting in inability to continue fulfilling the signed contract.

One such case is Henan Golden Dr. Seed Industry Co., Ltd. v. Jiaozuo Bonon Seed Co., Ltd.; see Civil Judgment of Henan Higher People's Court (2006), Yu Fa Min San Zhong Zi No. 38.[7] The plaintiff signed an entrustment contract with the defendant and entrusted the defendant to produce wheat seeds. However, the defendant did not produce the quantity agreed in the contract, and a dispute between the two parties occurred. Finally, the court ruled that the defendant bore legal responsibility.

2.3.2 Arising from Transfer Contract or License Contract

In a dispute over a transfer contract, there are two types, namely, dispute over a contract transferring the right to apply for breeder's rights and dispute over a contract transferring the breeder's rights. In China, disputes based on transfer contracts and licensing contracts are common. An example is the case of Jiangsu Suke Seed Industry Co., Ltd. v. Jiangsu Siyuan Seed Industry Technology Co., Ltd. (Civil Judgment of Jiangsu Higher People's Court (2008), Su Min San Zhong Zi No. 0051). The defendant failed to fulfill the contract for the transfer of the right to operate the breeder's right signed by the two parties, and the court ruled that the defendant was legally liable.

2.3.3 Over Contracts on Breeding New Plant Varieties

Such contract disputes sometimes involve the issue of the ownership of breeder's rights, and some involve only the issue of simply performing the contract. An example is the case of Sichuan Agricultural University Hi-Tech Agriculture Co., Ltd. v. Mianyang Xiannong Seed Industry Co., Ltd. and the third person Sichuan Agricultural University; see Sichuan Chengdu Intermediate People's Court Civil Judgment (2003) Cheng Min Chu Zi No. 926. Although the defendant actually participated in the breeding work of the plaintiff, it only provided financial support and assistance, and the ownership of the new variety was not clearly stipulated in the cooperative breeding contract. The court ruled that the new variety belonged only to the plaintiff.

[7] Available at the website of the Supreme People's Court of the PRC: http://ipr.chinacourt.org/public/detail_sfws.php?id=11919.[2007-11-29/2010-05-03]

3 Major Deficiencies and Shortcomings of Existing Laws

Although China's legislative work has achieved remarkable results, China's legislation on the protection of new plant varieties clearly has the following defects and deficiencies due to the influence and constraints from various factors.

3.1 Overall Lower Level of Protection

Since China has acceded to the 1978 Act of UPOV Convention, the text of the Convention restricts the current legislation in China. This situation has made China's level of protection of new plant varieties as a whole relatively low. This kind of legislative backwardness is mainly reflected in the following two aspects: (a) The content of breeder's rights is too thin and simple. On the one hand, it only provides protection of propagation materials and does not involve harvested materials and their direct products; on the other hand, it lacks provisions on the essentially derived varieties, leaving room for this important type of infringement. (b) Tort liability is too simple and backward for two reasons. One is the absence of specific legal provisions for criminal responsibility in legislation, and the other is that there are only three categories of civil tort liability: "stop infringement," "damage compensation," and "elimination of impact." And there is no scientific refinement of "damage compensation." Since the entire legislative content is both simple and backward, it has severely hampered the legitimate expectations and demands of breeder's rights holders and farmers. Obviously, this situation has not met the requirements of the times.

3.2 Serious Disconnect Between New Plant Varieties and Agricultural and Forestry Production

Due to the lack of "practicability" requirements in the current conditions for the identification of new plant varieties in the law, some new plant varieties for which breeder's rights have been granted, but they have no practical value in agricultural and forestry production, or they cannot meet the need for large-scale agricultural cultivation. This makes these new varieties not useable in actual production. Obviously, as these new plant varieties can serve as breeding material for breeding work, they may still have some value during the breeding process. However, from the perspective of the agricultural production, these new plant varieties should not be eligible for, and therefore, should not be granted breeder's rights.

Of course, in China's legislation, the conditions for the establishment of "new plant varieties" are based on the provisions of the UPOV Convention. In terms of form, Chinese legislators should not bear any responsibility for this. However, because these conditions do not meet the actual needs of Chinese society, Chinese legislators have the responsibility to modify and improve such conditions to make them more scientific and reasonable.

This involves a more in-depth issue. What is the purpose of establishing a legal system for the protection of new plant varieties? What do we want to achieve? Or is it that we are mainly to meet the requirements of developed countries that require us to establish such laws? Obviously, for this issue, the answer can be easily reached from a simple logical relationship and the literal meaning of the current law: "Protection of breeder's rights and promotion of breeding development." However, this answer faces two problems: (A) In reality, to what extent can the existing legislative content guarantee the realization of the above objectives, or rather, how far has the current legislative content deviated from the way in which the above objectives can be truly achieved? (B) In addition to the current legislative model and legislative content, is there a more scientific and reasonable legislative model and legislative content? Of course, people may find it hard to answer these questions. Many people may not have thought about these issues yet.

3.3 The Social Effects of the Existing Legislative Content Are Not Ideal

Over the years, through the implementation of laws for the protection of new varieties of plants, it has always been better for society to promulgate and enforce certain laws than to lack them. However, the objective reality that cannot be overlooked is that the new plant variety infringement activity in China has been relatively common, and it has been fairly serious in some provinces. In addition to infringing on breeders' rights, there are also a large number of counterfeit seeds that have caused considerable harm to farmers. This fact fully demonstrates that there is still a significant gap between the existing legislation on the protection of new plant varieties and the social reality of China.

In addition, using existing legal provisions to implement rights protection, especially the use of judicial means to protect rights, is not only complicated and costly, but the end result is often disappointing to the plaintiff. The main reason is that the tort liability that the infringer ultimately assumes is likely to be much lower than the actual illegal gains. The plaintiff has to bear additional costs in order to safeguard his rights. However, in the end, there is still no reasonable compensation or reasonable compensation that can actually be obtained. This situation has objectively encouraged infringers to continue recklessly.

4 Main Reasons Affecting the Protection of New Plant Varieties

4.1 The Influence and Role of Social Status on Legal Status

There are two main factors affecting China's legal system for the protection of new plant varieties: (a) the state of the society in which the legal system is located and (b) the state of the law, including the status of legal research, the level of legislation, and the level of justice.

Among these two reasons, the state of society is the basis of the state of law and plays a decisive role in the state of law. The state of law is subject to the state of society. Just like the relationship between land and crops, the social state of a country in a certain historical period is like a piece of land, and the specific legal status is like crops growing on this land. Some crops are suitable for planting here, others are not; whether a crop can be harvested, eventually, to a large extent depends on the characteristics of the land and the adaptability of the crop itself.

4.2 Social Status and Legal Status Reflected in the Legislation and Enforcement of New Plant Varieties

4.2.1 Treating New Plant Varieties Simply as an Ordinary Commodity

In the existing theoretical research, legislation and enforcement of protection of new plant varieties, people generally regard new plant varieties as a kind of seed that can be produced and sold just like any commodity, and the breeder's right is only an intellectual property right that belongs to the category of civil rights. Almost completely ignored is its close relation to the national genetic resources, ecological environment, biodiversity, and food safety on which we all depend.

What should be seen is that no matter how advanced science and technology is, and no matter how amazing the technological products created by human are, there is one thing that human beings cannot detach themselves from, that is, we are part of the biological world. We need to guarantee the existence and continuation of an ecological environment in which we live. As a result, it is unscientific to disregard the genetic resources involved in new plant varieties, which cannot be treated as a pure economic issue.

4.2.2 Some Law Has Fallen into the Shadow of Foreign Law

Under the framework of the TRIPS Agreement, every sovereign state should ask itself what the ultimate purpose of its legal protection of plant breeder's rights should be. Obviously, the ultimate goal in China should be to solve the problems that have occurred or will occur in China's reality. However, for many years, the jurisprudence in China has been gradually dissociating from or ignoring China's actual situation and instead blindly following foreign legal provisions and their literal meanings, without being able to learn their core spirit.

The spirit of law is connected to the basic conditions of the country and society, which are the root cause of their survival and function. Unfortunately, some people apply the judgment made by a foreign court as a legal standard to interpret a domestic legal norm. In fact, this is a very unwise approach, because it is separated from the basic principle that the specific legal content needs to be combined with specific social soils.

Obviously, if the legal system for the protection of new plant varieties in China is to achieve true development and progress, it must emerge from the shadow of

foreign laws, be based on in-depth investigation on China's basic national conditions, and absorb good legal concepts and provisions of foreign laws.

4.2.3 The Spirit and Rationale of Law Are Affected by Times

The mission of law is to pursue fairness and justice in human society, which in turn aims to firmly safeguard the interests of the vast majority of people, protect the interests of honest laborers, and foster the development and progress of society. Since the 1990s, great changes have taken place in China, and have been accompanied by widespread problems, including serious environmental pollution, food safety problems, counterfeiting of products, high housing prices, high school fees, expensive medical care, and lack of access to medical services. To this end, the Chinese government continues to take various measures, however with little improvement.

It is worth noting that these social issues have also had a significant impact and influence on China's legal sciences. First of all, the prominent and ubiquitous nature of these social issues is increasingly affecting people's normal lives. With the rising expenditures of people, pressure from life will make people feel that the relationship between them and society is almost one of money and economic interests. This will, to a certain extent, obscure people's understanding of the unifying ideals and goals that society should have. This will also force people to pay more and more attention to immediate and realistic economic interests. Obviously, this has deeply plunged people into the scope of a single economic interest and cannot take into account the personal spiritual interests and public interests of the entire society.

This situation is reflected in the field of law. Legal researchers, legislators, judges, lawyers, and administrative law enforcement officers are also ordinary members of society.

They must face the social problems that most ordinary people face, the actual feelings of the vast majority of ordinary people are also their actual feelings, and their actual feelings are that in the current Chinese society, economic interests are very important and even the only thing that is truly worth pursuing and getting for them. Therefore, economic interests should also become the main issue in the law, even the core issue. In this situation, the interests of the public, the interests of others, and the long-term development of society may be ignored, and in some cases, basic fairness and justice may even be bought off or subverted by the pursuit of economic benefits in the real world.

In short, due to the influence of the social environment, in the field of law, it is easy to deal with many things and many problems in society from an economic standpoint. It seems that everyone is mainly living for the money in front of them, and all of human society exists for the current economic benefits. Obviously, if this situation occurs in the field of law, it will be very regrettable. However, an unacceptable reality is that in the current social reality, this situation has been not only universally existed but also serious in some respects. At present, there are also such effects in the legal system for the protection of new plant varieties, that is, all the problems of protecting the breeders' right are simply attributed to an economic problem.

5 Measures Proposed for Perfecting the Protection of New Plant Varieties in China

5.1 Institutions Authorizing Breeder's Rights Should Be Unified

At present, China's new plant variety authority is the Ministry of Agriculture and Rural Affairs and the State Forestry and Grassland Administration. Under this form, which set up Office for the Protection of New Varieties of Agricultural Plants and the Office for the Protection of New Varieties of Forestry Plants, respectively. These two offices have enacted their separate departmental regulations and management methods. Obviously, this model is very unscientific and unreasonable. The two agencies should be merged into one unified China Plant Variety Protection Office.

In addition, breeders' rights are granted by the Chinese government and embody a kind of national behavior under state sovereignty. Granting of such rights should not be done by different governance agencies. Just as it is not possible for a country to have two independent foreign ministries at the same time, there should not be two offices that grant breeders' rights.

5.2 To Apply the 1991 UPOV Convention Text as Soon as Possible

The prominent differences between the 1991 and 1978 UPOV Convention are the following two: (a) In terms of protected plant species, the 1978 text only requires the protection of some plant species, while the 1991 text requires the protection of all plant species. (b) The second is the content of breeders' rights. The 1991 text not only extends the scope of protection from simple reproductive materials to harvested materials and their direct products but also protects essentially derived variety. In addition, the social role of the breeders' rights is greatly improved and their protection enhanced. Based on China's abundant plant resources, current breeding level, and agricultural development level, China should apply the 1991 text of the UPOV Convention to better protect plant resources and promote the further development of breeding work.

5.3 To Revise and Improve the Legal Regimes on New Plant Varieties

The following modifications and improvements are proposed, which can be realized through revising the "Regulations on the Protection of New Plant Varieties" and (or) elevating the regulations into the level of a statutory law by People's Congress to better satisfy the requirement of rule of law.

5.3.1 To Set Up Special "Variety Name Rights"

As mentioned above, there is no provision in the existing UPOV Convention, including the 1961/1972, 1978, and 1991 texts, or in the "Regulations for the Protection of New Plant Varieties" in China that recognizes the "variety name rights."[8] The author proposes the introduction of such rights, either as a new power of the breeder's rights or independent of the breeder's rights. In addition, this author suggests that the variety name rights should not have a time limit for the protection period and that the "variety name rights" should include (i) the right to use the variety name in commercial activities, (ii) the right to use the variety name similar to the protected variety name, and (iii) the right to use this variety name on other goods and services.

5.3.2 To Add the Requirement of Practicality as One Condition for Obtaining the Breeder's Rights

As mentioned above, within the framework of the current UPOV Convention, varieties that have acquired breeder's rights may not have practical value in actual agricultural production. This is because there is no "practicality" requirement in the conditions of obtaining the breeder's rights. In particular, for some varieties, although the breeder's rights have been obtained, they are not allowed to enter agricultural production because of their obvious defects and bad characteristics. This has affected the role of the breeder's rights legal system, which in turn affects people's attitude toward the protection of breeder's rights.

Therefore, the "practicability" requirement should be added to the conditions of granting the breeder's rights. "Practicability" here includes two items: (i) If the variety belongs to the scope of China's variety certification, it should meet the basic conditions for the certification. (ii) If it does not belong to the scope of variety certification, it shall be able to satisfy the basic conditions for the variety to be planted in the field.

5.3.3 To Establish a Professional Qualification Restriction System for Infringers

At present, there are a large number of violations of breeder's rights through various channels and methods in China. In particular, due to the relatively light tort liability, some infringers have continued infringement after being punished by the law. Obviously, it is no effective deterrent effects. Therefore, the author proposes to increase legal responsibilities, including "professional responsibility," which would prohibit infringers from engaging in varieties breeding and seed production for a certain number of years. This kind of legal responsibility is commonly stipulated in

[8] The author has published a paper on this topic and related issues, see Yangkun Hou, On the Characteristics and Legal Functions of the Names of New Plant Varieties (in Chinese), Intellectual Property Rights, 2015(9):37–43.

China's traffic business administration and other related laws[9] and can effectively contain illegal activities. Therefore, it is recommended to introduce and adopt penalties for such professional qualifications in the punishment of infringement.

Based on the characteristics of new plant varieties in breeding and production operations, in order to effectively stop violations of breeder's rights, the following should be added to the tort liability: (i) The infringer cannot apply for or own breeders' rights within 3 years, with an increase to periods of 5, 8, or 10 years for repeated infringement. (ii) The infringer shall not engage in or participate in varieties breeding, seeds production, or related business activities and shall not have the qualifications for production of seeds within the following period of 3, 5, 8, 10, 15, and 20 years.[10]

5.3.4 To Set Up a System of "Statutory Starting Point for Damages" in Legal Liability

According to the "Provisions of the Supreme People's Court on the Specific Application of Legal Issues in the Trial of Cases of Disputes over the Violations of New Plant Varieties," the calculation of damages is mainly based on the following four criteria: (i) the actual loss of the infringed person; (ii) the illegal profits obtained by the infringer; (iii) the multiple of the license fee; and (iv) within RMB 3,000,000 the court selects the appropriate amount as compensation according to the circumstances of the case. This is a common calculation standard and method in China's current intellectual property laws, which ranges from"10,000 to 500,000 yuan" to "10,000 to 1 million yuan" and to "10,000 to 3 million yuan."[11]

It can be seen that although the specific amount ranges are different, their basic ideas and models have not changed. In reality, for the general case, "the actual losses of the infringed person" and "the illegal profits obtained by the infringer" are all difficult to accurately calculate. So overall, this provision is more of a simple legislative declaration; for those cases not involving license for use, the "multiplier of license fees" has no practical significance. In addition to the above three items, although the law stipulates three ranges of 10,000 to 500,000 yuan, 10,000 to 1 million yuan, and 10,000 to 3 million yuan, each range is quite large. However, in the legislation, there is no detailed refinement or division of specific standards in this scope, which makes this provision less operable.

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[9] According to Road Traffic Safety Law of the PRC (2011 Amendment), drivers who violate this law should bear the legal responsibility of "being issued warning, paying fine, motor vehicle driving license being temporarily seized or suspended, or being detent." This law is valid throughout China.

[10] At present, no foreign legislation has provisions on legal responsibilities suggested here, which are the author's own proposals based on his estimate of China's social reality.

[11] In China's copyright law, the amount of compensation that the judge can award at his discretion should be within 500,000 yuan; that in patent law is within 1 million yuan; in trademark law it is within 3 million yuan. In China, in general cases of infringement of intellectual property rights, compensation of at least 10,000 yuan will be awarded; less than 10,000 yuan has rarely occurred. Therefore, when judges consider appropriate compensation, they usually begin by considering more than 10,000 yuan.

This kind of situation, whether for the judge or the parties involved, is undoubtedly a difficult problem for anyone who cannot find a standard answer. In this case, regardless of the discretion of the judge, it is difficult for both parties to be satisfied with his discretionary decisions, because the parties' claims and demands are exactly the opposite. After going through lawsuits, many feel that the implementation of rights protection activities is generally worthless. It not only fails to achieve their desired goals, but it even makes them feel that they are far from their desired goal. Because, for these lawsuits, they have to spend time, energy, and money, after the lawsuits, in addition still having difficulty in effectively curbing the other party's infringement, they may be worse off economically. Thus, in addition to the fact that the content of the legislation to stop infringement is too simple, in terms of compensation for losses, the actual amount of compensation is often too low.

To make up for the abovementioned deficiencies, the author proposes to establish a statutory starting point for compensation in legislation. As long as the defendant is found to have committed a tort, he must bear this statutory amount of compensation. On this basis, the actual losses of the plaintiff or the illegal proceeds of the defendant are calculated again.

Establishing the statutory starting point for damages can largely guarantee that the plaintiff can obtain a basic amount of compensation and maintain faith in the implementation of rights protection. The author proposes to establish the following ten levels of statutory starting point in the protection of new plant varieties: (i) 50,000 yuan, (ii) 100,000 yuan, (iii) 150,000 yuan, (iv) 200,000 yuan, (v) 300,000 yuan, (vi) 500,000 yuan, (vii) 800,000 yuan, (vii) 1 million yuan, (ix) 1.5 million yuan, and (x) 2 million yuan.[12] The reason why different levels should be set up is because different infringers have different infringement hazards. The compensation amount set up is relatively large, because the infringers who violate the breeder's rights usually have higher sales revenue when they produce seeds.[13] Judges can choose one of the statutory starting points according to the extent and scale of the infringement. In addition, the statutory starting point amount is not affected by the amount of actual loss suffered by the plaintiff. It is independent statutory damages.

5.3.5 To Set Up Clear Criminal Responsibility

In China's Criminal Law (1997), the crime of infringement of intellectual property rights was specifically established, but only crimes concerning copyright, trademark rights, patent rights, and trade secrets were stipulated, and crimes for infringing breeders' rights have not been stipulated. However, in reality, some serious violations of breeders' rights constitute crimes in terms of their degree of infringement

[12]Yangkun Hou, Legislation Proposal for the Protection of New Animal Variety Rights Law of the People's Republic of China (in Chinese), Beijing: Intellectual Property Publishing House, 2017: 81.

[13] Supreme People's Court Civil Judgment (2014) Min Ti No. 31 (Dunhuang Seed Industry Pioneer Variety Co., Ltd. v. Zhangye Olin Agricultural Science and Technology Development Co., Ltd. and Shihezi Jinshi Seed Industry Co.). The illegal profits obtained by the defendants were RMB 2,650,920 yuan. The court ruled that all illegal profits must be returned to the plaintiff.

and social harm, but due to lack of corresponding legal provisions in the current legislation, it is difficult to criminally punish such behaviors. Based on the strict nature of the Criminal Law, according to China's current legal provisions, it is difficult to directly add relevant criminal liability clauses in the "Regulations for the Protection of New Plant Varieties" or the "Seed Law." This will require joint efforts with the National People's Congress Standing Committee and other units to facilitate the completion of this work. In terms of specific articles, it is possible to make clear provisions on the conditions for filing a case, what constitutes a crime, and the extent of sentencing, with reference to the existing provisions concerning intellectual property crimes in the Criminal Law.

5.3.6 To Establish "Unified Jurisdiction of the Same Infringement Series of Cases"

In reality, there are often interrelated infringers and infringements, which can be divided into three types in China. One is in the same place; for the same breeders' right, there are multiple different infringers and infringements; the second is in different places, for example, in different provinces, there are multiple different infringements and infringers for the same breeders' right; and third, the same infringer has infringed on different breeders' rights.

In this case, if an infringed right holder needs to file independent infringement cases at the defendant's or defendants' location(s) (residence(s)), infringement site(s), and place(s) where the result of a tort took place), then he may need to go to different provinces or different courts in the same province to file lawsuits, respectively. Obviously, this will greatly increase the plaintiff's litigation costs and the difficulty of litigation, objectively benefitting the infringers.

Therefore, the author proposes to establish a new infringement litigation system in legislation, that is, the system of "uniform jurisdiction over the same infringement series of cases." The purpose of establishing this litigation system is that in cases of infringement of a certain authorized variety or set of varieties, regardless of where the infringement occurred and who or how many parties committed the infringement, all cases are subject to the jurisdiction and trial of a single court. The plaintiff needs only to file one case in a suitable court. For different cases, it is only necessary to file an additional case in this same court.

This system has the following advantages: (i) For the plaintiff, it saves a large amount of litigation costs, and the relevant evidence that has been submitted to the court in previous cases is not required to be submitted in any subsequent cases if the relevant evidence has been determined by the court. (ii) For the court, because the plaintiff's situation is already familiar, there is no need to repeatedly review and confirm facts, which will save a lot of energy and resources, improve trial efficiency, and also avoid different understandings of the plaintiff's basic facts in different cases. (iii) In the same or similar cases, verdicts will be basically the same, avoiding different decisions by different courts in separate cases. (iv) It can swiftly and effectively crack down on infringement by different parties across the whole country and fully protect the interests of farmers and breeders.

5.3.7 To Add "Special Rights of Farmers"

In the protection of new plant varieties, the protected owners are the breeders' rights holders. After the varieties have been applied to production and business activities, the main stakeholders are the farmers who have purchased and planted the varieties. Moreover, because each farmer's ability to withstand economic losses is relatively low, so the injury caused to each farmer is even more serious. In reality, infringers often produce and sell imitated seeds in large quantities, so the scope of the affected farmers is relatively wide. However, under the existing legal framework, although farmers are the direct victims of the torts as well as the breeders' rights holders, farmers do not have any right to stop such infringements in their own name and to obtain compensation. Farmers can only lodge a compensation request on the ground that "the seed quality is unqualified" and the applicable law is the Contract Law. However, violation of the contractual agreement can lead to compensation of actual loss, and the amount of such compensation is generally low.[14] In addition, since this is a contract dispute, farmers have no right to stop the defendant from continuing to commit the infringement, and they cannot claim punitive damages from the defendant.

Based on the legal spirit of fairness and justice, farmers should also have the right to file an infringement action against the infringer in their own name and request that the court order the infringer to stop the infringement and compensate their losses, including direct losses and reasonable returns that are normally available. Only in this way can farmers' legal interests be fully protected. The injured farmers should be the joint plaintiff with the owner of the breeder's rights or be added as joint plaintiff. If the number of farmers is large, they can elect representatives to participate in the proceedings. In order to enable affected farmers to be aware of the infringement cases that have already been initiated, the court should notify the local government, which should issue a circular in the locality to inform farmers about the names and characteristics of the varieties involved, and encourage the affected farmers to join the lawsuit.

6 Conclusion

China is the most populous country in the world, with the largest demand for food, vegetables, and fruits, which means that excellent plant varieties and sufficient food production are important factors that China cannot ignore. Therefore, in-depth

[14] Intermediate People's Court of Tieling City, Liaoning Province Civil Judgment (2017) Liao 12 Min 840 (Zhao Guoqing v. Changtu Town, Changtu County, Iron Research Seed Shop) involving seed quality dispute. The plaintiff spent RMB 4500 yuan to buy seeds and planted 16 acres of land. Due to the quality of the seeds, the production was reduced. The estimated loss was 52,250 yuan. However, the court's effective judgment only required the defendant to compensate for one-third of the losses, plus the cost of purchasing seeds, totaling 18,917 yuan. The plaintiff's other losses were not compensated. http://www.pkulaw.cn/Case/pfnl_a25051f3312b07f396d6a91f52f22f-cc56d620afd628d2f [2017-06-20/2018-07-19].

research on the issue of new plant varieties and the establishment of reasonable legislative protection are also important.

At present, the main problems facing China in this regard are concentrated in three aspects.

First, the theoretical research on the protection of new plant varieties is relatively superficial. At present, it mainly translates and introduces the contents of the UPOV Convention, as well as some foreign research articles. It has not yet established its own theoretical content in line with China's national conditions.

The second problem is that China's current legislation is relatively backward and cannot meet China's current social needs. It should be revised and improved as soon as possible by participating in the 1991 UPOV Convention and adding some reasonable new content.

The third is the unscientific production and management philosophy that prevails in China's current society – "money may be obtained by unscrupulous means" – which induces many businesses to infringements and other illegal acts in pursuit of their own economic interests.

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Genetically Modified Foods in China: Regulation, Deregulation, or Governance?

Juanjuan Sun

Abstract

Whether to regulate or deregulate genetically modified food is an international debate, and each country or region has put forward specific policies and legislation based on its own special needs. When it comes to China, technological innovation, economic development, and food security and safety are significant considerations during the decision-making process. This chapter will outline these considerations and examine their influences on the formulation of policies and legislation on genetically modified foods and then point out the trend of government regulations and regulatory debates in China before ending with a conclusion.

Keywords

Regulation · Governance · Genetically modified food · China

This article is also contributing to the National Research Programme: Study on the Construction of Legal Structure Regulating GM Food in China (No. 18ZDA147).

J. Sun (✉)
Center for Coordination and Innovation of Food Safety Governance,
Renmin University of China, Beijing, China
e-mail: juanjuansun@ruc.edu.cn

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_15

1 Introduction

Generally speaking, state intervention in the form of regulation[1] is to provide legal rules to modify the economic behavior of individuals and firms in the private sector, such as the research or marketing of genetically modified foods (GM foods). Thus, the reasons for regulation can be as diverse as the correction of market failure, maximization of economic efficiency and consumer choice, promotion of human rights, etc.[2] To these ends, licensing, standard setting, and requirements of information disclosure are important regulatory tools. Given the continually changing economic and societal contexts, nations take various actions to reorganize or reform regulations.

For one thing, the expansion in the use of rule-making by the state has led to the regulatory state, in particular as a response to socially harmful acts. In this aspect, there is evolution from economic regulation to social regulation, in order to address the safety concerns of the society, such as public health, in addition to economic efficiency. Moreover, risk regulation puts the emphasis on government's intervention in market or social processes to control potential adverse consequences. Given the challenges in the characterization of risks and hazards, it calls for professional engagement of experts to carry out scientific work. Deregulation is also introduced to reduce or eliminate excessive state regulation, for the purposes of lifting the burdens on business to increase their competitiveness and promoting self-regulation or private regulation on the basis of market mechanisms to achieve market relevancy.

Whether regulation or deregulation should be preferred depends on the economic sector and varies from state to state. The shift from deregulation in the 1990s to better regulation in the 2000s in the UK has provided insight into the importance of public participation and deliberation to promote an evidence-based and transparent process of public administration. That is to say, in addition to the role of the state, cooperation and commitment of different stakeholders are also needed. Noteworthy is the trend toward governance, which is broader in scope than state intervention that emphasizes the importance of private and public sector cooperation as well as public participation. From the above, a rough structure for the state intervention models can be generalized as below.

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[1] According to one definition, regulation is one of the governmental actions with legal power to impose rules backed by the use of penalties that are intended specifically to modify the economic behavior of individuals and firms in the private sector. See Organization for Economic Co-operation and Development, Glossary of industrial organization economics and competition law, available at http://www.oecd.org/regreform/sectors/2376087.pdf, p. 73.

[2] Tony Prosser, The Regulatory Enterprise, Government, Regulation and Legitimacy, Oxford University Press Inc., 2010, pp. 11–18.

The state intervention models

Models	Characteristics	Tools
Regulation	Economic regulation	Licensing
	Social regulation	Standards
		Information disclosure
	Risk regulation	Expert participation
Deregulation	Lifting of regulatory burdens	Information disclosure
	Self-regulation	Participation
	Private regulation	
	Better regulation	
Governance	Regulation as large subset of governance	Information disclosure and communication
	Private-public cooperation	Participation
	Public participation	Cooperation

As far as GM foods are concerned, the most important regulatory purpose considered is food safety and thus human health. In this aspect, the essential role of state regulation is to deal with public risk, which is largely outside the individual risk bearer's direct understanding and control.[3] That is to say, as the purpose of regulating food safety is to control potential adverse consequences to health, food safety regulation in general, and GM food regulation in particular, can be regarded as a typical example of risk regulation. The newly emerging technological risks involved in GM food have increased the uncertainty in terms of safety. The involvement of experts and their advice can provide scientific evidence for regulatory measures in order to decrease such uncertainty. However, whether scientific rationale is adequate to support public decision-making in the case of GM food is disputable.

On the one hand, a harmonized international rule provided by the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) requires that members shall ensure that any sanitary or phytosanitary measure is based on scientific principles and is not maintained without sufficient scientific evidence.[4] Moreover, in the scientific assessment of foods derived from biotechnology, it is also preferable to apply the principle of substantial equivalence. Accordingly, if a new or modified food or food component is determined to be substantially equivalent to an existing food, it can be treated in the same manner as its analogous conventional counterparts.[5] In other words, once its substantial equivalences have been established, a food that is produced from biotechnology can be put on the market without the requirement of procuring extra licenses.

On the other hand, there is also exception to the scientific principle, since the SPS Agreement on its own provides that in cases where relevant scientific evidence

[3] Huber, P., Safety and the second best: the hazards of public risk management in the courts, The Columbia Law Review, 1985, No. 85 (Arcuri 2011), p. 277.

[4] Agreement on the Application of Sanitary and Phytosanitary Measures, Article 2.2.

[5] OECD, Safety evaluation of foods derived by modern biotechnology, concepts and principle, 1993, p. 14.

is insufficient, a member may provisionally adopt sanitary or phytosanitary measures on the basis of available pertinent information, including that from the relevant international organizations as well as from sanitary or phytosanitary measures applied by other members.[6] In such circumstances, members shall seek to obtain the additional information necessary for a more objective assessment of risk and review the sanitary or phytosanitary measure accordingly within a reasonable period of time. As far as how scientific uncertainty can justify the government's action rather than inaction in waiting for sound scientific evidence, a precautionary principle has been further introduced in the risk regulation regime of environment and food in order to allow the government's action and prioritize the public interest, like health, in the case of scientific uncertainty. Taking environmental protection as example, the United Nations Conference on Environment and Development has contributed to internationalizing this precautionary approach as a principle by proclaiming it in the Rio Declaration on Environment and Development in 1992 as: "in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."[7]

In practice, the United States (USA) and the European Union (EU) represent different models regarding the state intervention in the case of GM foods. Generally speaking, the US model is relatively more "favorable" to the GM foods and has no license and labeling requirements for such tech-foods on the grounds of scientific assessment and substantial equivalence. The reason for such deregulation is to advance the biotechnology and international competitiveness of the USA. In contrast, the regulation of GM food in the EU may be characterized more as being precautionary, which has at its disposal regulatory tools that include license, labeling, and traceability. Notably, to support the regulation of scientific uncertainty in the case of GM foods, one important legal rule, the precautionary principle, is stipulated by the so-called General Food Regulation[8] in the EU. Accordingly, in specific circumstances where, following an assessment of available information, the possibility of harmful effects on health is identified but scientific uncertainty persists, provisional risk management measures necessary to ensure the high level of health protection chosen in the Community may be adopted, pending further scientific information for a more comprehensive risk assessment.[9]

Despite the current regulatory arrangements in the USA and the EU, how to regulate GM foods is still an ongoing dispute within these regions. For the USA, there are calls for re-regulating GM foods in certain states, in particular the labeling requirement to protect consumers' right to know. Taking Vermont as example, it was

[6] Agreement on the Application of Sanitary and Phytosanitary Measures, Article 5.7.

[7] The Rio Declaration on Environment and Development of 1992, Rio de Janeiro, June 3–4, 1992, The United Nations Conference on Environment and Development, Principle 15.

[8] Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety, Official Journal L 31, 01.02.2002.

[9] General Food Regulation, Article 7.

the first state in the USA to adopt a law requiring labels for GM foods, which went into effect in July 2016. For the EU, there are also controversies between the EU and member states and between member states as well. For example, when the EU authorized MON 810 maize based on the risk assessment, member states like UK and France approved its access to their markets, while Italy forbade its introduction. For such derogation, the application of the precautionary principle has been the rationale for the Italian regulation, and thus derogation has been supported by the European Court of Justice.[10]

It should be emphasized that the regulation of GM foods is also closely linked to more general regulation of biotechnology and its products. Notably, a transparent and efficient regulatory system in this field not only protects public health and the environment based on the best available science but also prevents unnecessary barriers to innovation and competitiveness, as the development and application of a technology need to go through various barriers, including technical challenges, economic costs, government regulations, and social responses.[11] It is therefore these multiple interests or even their conflicts that add complexity to government's regulation of GM food. That is to say, balancing multiple interests involved in the formulation of policies and legislation relating to the subject matters of food, biotechnology, and GM food poses a tremendous challenge. In China, for example, decision-makers have to consider the promotion of scientific and technological advancement, regulation of risks resulting from novel science and technology, the engagement of scientific experts and the public, and a myriad of other stakeholders. Therefore, whether GM technology can be transformed from laboratory results into commercial profits is decisively dependent on government's regulatory model, which in turn depends on the understanding of the safety of GM technology. In this respect, the regulatory approach to scientific uncertainty and the degree of response to public perceptions of risk, as well as other economic and cultural considerations, have further shaped the regulatory differences between the USA and the EU in GM foods.

In the meantime, government intervention in GM foods in China not only takes reference from the American and European experiences but also takes into consideration national condition from the political, scientific, economic, and societal perspectives. Comparatively speaking, national specialty in food regulation also contributes to the complexity of GM food regulation in China. Nowadays, food safety has become an urgent concern due to a series of food safety scandals, such as faked powdered milk and the so-called gutter oil (illicit reuse of cooking oil). Melamine-contaminated milk in 2008 received the most attention. Nevertheless, food regulation in China is not just about food safety. High on the agenda is also food security, given its large population. As a result, there is a host of disputes on whether to deregulate GM foods to ensure sufficient food supply or to regulate GM foods in a precautionary way that would highlight food safety and public health. Additionally, it is also important to mention the importance of governance promoted in the food safety domain of China. As provided by the *Food Safety Law* after

[10] Case C-236/01, Monsanto Agricoltura Italia (2003) ECR II-8105.

[11] Suk et al., Dolly for dinner? Assessing commercial and regulatory trends in cloned livestock, Nature Biotechnology, 2007, No. 25.

revision in 2015,[12] social co-governance is one of the legal principles, and numerous institutional requirements are outlined for the subjects, content, and tools of governance.[13] For example, risk communication from the perspectives of information disclosure and public participation was introduced for the first time to encourage participation by experts and the public.

In view of the above, this chapter first aims at outlining China's policies and legislation in relation to biotechnology regulation, with the purpose of highlighting the role of government in promotion of science and risk prevention. Secondly, by discussing GM food regulation, this chapter also addresses the challenges on how to consider scientific advice and public perception of risks during state intervention. In conclusion, the chapter will revert to the question raised by the title of the chapter and attempt to provide an answer on regulation of GM foods in China.

2 Biotechnology: Promotion of Science and Risk Prevention

2.1 Scientific and Technological Advancement

It is trite to acknowledge that advances in science and technology are crucial for economic and social development, and it is self-evident that scientific and technological progress has contributed considerably to improvement in the quality of life. As popularly accepted in China, science and technology are the first production force. Similarly, the USA also puts emphasis on the fact that a nation's economic performance and security depend on its ability to achieve world leadership in science and its innovative capacity of engineering, among others. The government, with its overarching responsibilities for planning, budgeting, and review, is uniquely suited to promote—though not manage—this process.

However, the government has an additional role to play in the research and application of biotechnology, which not only calls for public support for its further development but also government intervention to address safety, health, and environment-related concerns. As a matter of fact, in the risk society that we are now living in, together with benefits come risks, which are likely to be manifest in physical, chemical, or biological harms. Moreover, these risks have attracted public attention amidst environmental disasters and food safety concerns emanating from events such as the BSE (bovine spongiform encephalopathy, or mad cow disease) crisis.[14] Therefore,

[12] Food Safety Law of the People's Republic of China, as revised and adopted at the 14th session of the Standing Committee of the Twelfth National People's Congress on April 24, 2015.

[13] Chinese Food Safety Law, Article 3. For a more detailed introduction to food safety governance in China, see Lepeintre Jerome and Sun Juanjuan (eds), Building food safety governance in China, Luxembourg Publications Office of the European Union, 2018, downloadable freely at https://eeas.europa.eu/sites/eeas/files/building_food_safety_governance_in_china_0.pdf

[14] The first diagnosed BSE in cattle was in the UK in 1986. However, the UK government did not take immediate action to protect consumers from contaminated meat products, as there was no sound scientific evidence to prove the risks to human health. The BSE crisis totally changed consumers' perception of food and food safety regulation. The failure to deal with food safety issues

while it is a national prerogative to support the research and development of science and technology, it is also vital to regulate its application in actual practice, in order to hold people and institutions engaged in these activities accountable and to protect public interests such as public health and environmental safety.

The emergence of biotechnology from laboratory to industrial application was welcome in the USA and the EU alike at the beginning. However, as it later turned out, the USA is in favor of GM food, while the EU is against it, as mentioned above. Additionally, it is also important to note that the research and development of this kind of science and technology as well as its application do include the food field but are not limited to it. For example, biotechnology can also be employed in the pharmaceutical industry. In view of this, biotechnology is a strategic research tool, and government's priorities in intervention can differ from sector to sector.

In the case of China, biotechnology has been applied in many specific fields, such as agriculture and food production and transgenic animal(s) in medicine and pharmacology. Although the legislative framework is still under development, many of the concerned departments have provided rules to mitigate the conflicts between the technological and economic benefits and safety concerns. Legal hierarchy in China accords precedence to laws enacted by the National People's Congress and thereafter to administrative regulations issued by competent authorities, which are followed by departmental rules. Therefore, the introduction of legislation with respect to biotechnology would establish general principles of law and provide binding guidance to competent authorities.

2.2 Promotion of Biotechnology from a Scientific Perspective

Biological processes have traditionally been utilized to improve the quality of human life, as in the case of food production and preservation with biological fermentation. Biotechnology has been regarded as one of the important scientific breakthroughs in China from the late 1970s. Since 1986, increased resources have been poured into research and application at the national level via in particular the "Seventh Five-Year Plan" of the National Key Scientific and Technological Project and the National High Technology Research and Development Program 863.

Therefore, early rules on biotechnology were promulgated by the State Scientific and Technological Commission[15] to promote the research and development of biotechnology, taking the assurance of safety, including human health and environmental safety as well as the ecological balance, into account. It is indubitable that high-risk investment is of necessity during the research and development of biotechnology, which is faced with the challenges of raising large-scale monetary support, a lengthy research period, as well as unpredictable barriers or burdens caused by new regulation. Furthermore, experience has shown that broad application of

led not only to economic suffering but also to political mistrust and even loss of legitimacy of public authorities. To regain consumers' confidence in food business and official control, the EU food safety regulation went through radical reform.

[15] This national agency has been transformed to the Ministry of Science and Technology in 1998.

biotechnology will lead to considerable commercial value, such as genetic engineering, plant biotechnology, and pharmaceuticals, to name a few.

The national support for biotechnological research and development has enabled Chinese scientists to achieve a number of breakthroughs on novel gene identification in crops, leading to development of GM crops. Plant biotechnology and its application have contributed to reducing the threats posed by pests and diseases and limited resources like land and water and thus to improvement in productivity, most notably in the field of GM cotton and rice. For the former, it was a miraculous result,[16] since Bt cotton is resistant to the bollworm and thus reduces use of insecticide and increases yields. For the latter, two strains of Chinese GM pest-resistant Bt rice, Huahui No. 1 and Bt Shanyou 63, obtained biosafety certificates in 2009.[17]

2.3 Legal Protection Mechanisms for Biotechnology

Intellectual property protection is implemented with the objective of incentivizing the research and development of biotechnology as well as its application. In this aspect, one of the typical examples is the development of plant biotechnology and protection of new varieties of plants. To this purpose, either a patent system or plant variety protection system based on the International Convention for the Protection of New Varieties of Plants (UPOV) can be applied. For the former, patent law has continued to develop and evolve in keeping with scientific and technological advancement, which with the emergence of biotechnology challenges the idea of non-patentability of living matter, as it proved to be incompatible with the biotechnological inventions surrounding plant varieties or human genes. As a result, patent regime in the USA was amended to extend patent protection to newly created microorganisms, genes, living animals, and plants. In relation to plant variety protection, the UPOV provides general rules for its member states to grant and protect breeders' right(s), which allows breeders to authorize acts such as production and sale of the propagating material of the protected variety.[18] Notably, the exceptions to

[16] There are more than 300 species of cotton pests in China, and there are frequent outbreaks in large areas, causing serious losses in cotton production. Besides, the use of chemical pesticides has led to the emergence of some cotton pest resistance, which seriously threatens cotton production and also worsens environmental pollution. In this aspect, insect-resistant and herbicide-tolerant genetically modified cotton provides a new means for controlling pests, and China has started to commercialize GM cotton since 1997. See Liu Chenxi and Wu Kongming, Current progress in research and development of transgenic cotton and a strategic prospect for China, Plat Protection, 2011, 37 (Alimentarius, 2001), pp. 11–17.

[17] However, these two strains of approved GM rice did not get authorization for commercialization before the biosafety certificates expired on August 17, 2014.

[18] International Convention for the Protection of New Varieties of Plants (UPOV), 1991, Article 2: each.

Contracting Party shall grant and protect breeders' rights.

the breeder's right(s) are acts done privately and for noncommercial purposes or for experimental purposes.[19]

From a comparative perspective, a plant breeder's right is a specialized form of protection limited to new varieties of plant(s), while patent includes but is not limited inventions in the field of plant biotechnology. In view of the coexistence of these two systems as well as the interaction between them, a common understanding has been reached, that is, the promotion of plant biotechnology can be realized by combining these two systems.[20] Therefore, after several revisions, the 1991 Act of the UPOV recognizes that both of these systems can be applied to the same plant variety.[21,22] However, application in practice differs by country, as each country gets to choose the protection afforded by either of the systems or two protections under both systems after the ban on "double protection" was lifted.[23]

As far as China is concerned, the Patent Law was enacted in 1984. However, it clearly provides that no patent right shall be granted to plant varieties. There was no specific law for protecting new varieties of plants at that time either, which led to a legal vacuum in the protection of new plant varieties until the Regulation on Protection of New Varieties of Plants was introduced by the State Council in 1997. That is to say, China has chosen a special model rather than patent protection to grant and protect breeders' rights. It is interesting to note that the introduction of such regulation was a result of both internal and external pressures. For the former, it was the call for protection of breeders' rights from scientists engaged in the research of plant breeding. For the latter, it was the pressure from the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) after China's accession to the World Trade Organization (WTO) and UPOV. Accordingly, members of the WTO are required to provide for protection of plant varieties either by patents or by an effective sui generis system or by any combination thereof.[24] However, the sui generis system in China, namely the 1997 Regulation, was based on the 1978 Act of the UPOV Convention, which has limited scope and extent of protection compared

[19] According to Article 15 of UPOV, the breeder's right shall not extend to acts done privately and noncommercial purposes.

[20] For more information, see WIPO-UPOV Symposium, http://www.upov.int/en/documents/Symposium2003/intro_index.html. 2003

[21] Compilation of the 2002 & 2003 Joint Symposia Document of the World Intellectual Property Organization and the International Union for the Protection of New Varieties of Plants, UPOV publication No. 792(E), 2005, p. 16.

[22] Comparatively, Article 2.1 of 1978 Act provides that each member State of the Union may recognize the right of the breeder provided for in this Convention by the grant either of a special title of protection or of a patent. Nevertheless, a member State of the Union whose national law admits of protection under both these forms may provide only one of them for one and the same botanical genus or species. However, Article 2 of the 1991 Act deleted such double protection.

[23] For more information, see UPOV 78 to UPOV 91, http://www.apbrebes.org/content/upov-78-upov-91

[24] TRIPS, Article 27(3(b).

Category of rules	Title	Year of taking effect and revision
Regulation	Regulation on Protection of New Varieties of Plants issued by the State Council	1997 (revised in 2013)
Departmental internal rules	Rules for the Implementation of the Regulation on the Protection of New Varieties of Plants (Agriculture Part) issued by the Ministry of Agriculture	1999 (revised in 2014)
	Rules for the Implementation of the Protection of New Varieties of Plants (Forestry Part) issued by the Bureau of Forestry	1999
	Rules for Review of New Varieties of Plants by Reexamination Committee under the Ministry of Agriculture	2001
Judicial interpretation	Interpretation of the Supreme People's Court on Several Issues Concerning the Trial of Dispute Cases on New Varieties of Plants	2001
	Regulations of the Supreme People's Court on Some Issues Concerning the Application of Law in the Trial of Cases Involving the Disputes over Infringement upon the Rights of New Plant Varieties	2007

Chart 1 Summary of current legal provisions on new plant varieties in China

to the 1991 Act of the UPOV as well as legislative updates in other regions, such as the EU.[25]

Despite the weakness in the legal protection of breeders' rights in the 1997 Regulation,[26] some detailed rules have emerged (Chart 1): two rules for the implementation of the 1997 Regulation have been put forward in 1999 to satisfy the practical needs for implementation of the Regulation and for dispute settlement due to the quick development of the domestic plant breeding industry. One is for agriculture and the other for forestry. Additionally, a detailed rule for carrying out reexamination when rejecting applications was issued in 2001. There are also judicial

[25] Chen Chao, Zhan Jinpeng, The challenges on the protection of new varieties of plants in China with the application of genetically modified technology, Intellectual Property, 2006, 6, p. 44.

[26] For example, the legal requirements are confusing, while coordination between related regulations is missing. See On choice of legal system for protection of new varieties in China, available at http://www.iolaw.org.cn/showArticle.aspx?id=4255 (last access on 2 July 2018).

interpretations and regulations from the Supreme People's Court to solve disputes over infringement of the rights over new plant varieties.

More importantly, increased attention has been paid to the protection of new varieties of plants due to China's ambition to develop a modern crop seed industry. As stated in the National Plan for Developing Modern Crop Seed Industry in China from 2012 to 2020 issued by the Office of the State Council,[27] the crop seed industry is a national strategic and core industry and also the foundation for promoting long-term stable development of agriculture and for ensuring national food security. For this purpose, the Regulation on Protection of New Varieties of Plants was revised in 2013. The most important change relates to the increase of fines in case of infringement of others' new plant variety rights (1–5 times the value of the infringing goods or RMB 250,000 when no value of goods is available or the value of goods is below RMB 50,000).[28]

However, as analyzed in Chap. 14, the exiting legislative contents are from ideal arrangement due to the overall lower level of protection, serious disconnect between new plant varieties, and agricultural and forestry production.

2.4 Biotechnology in the Field of Agriculture and the Regulation of Its Biosafety

Agricultural biotechnology involves modification of living organisms such as plants by using scientific tools and techniques, including genetic engineering. However, not only benefits but also risks come with such development, such as risks relating to biosafety.

The Ministry of Agriculture (MoA)[29] in China has formulated rules for applying agricultural biotechnology. In 1996, the MoA issued Implementation Rules on Safety Administration of Agricultural Biological Genetic Engineering according to the Rules on Safety Administration of Biological Genetic Engineering promulgated by the State Scientific and Technological Commission in 1993, which are applied specifically to genetically modified organisms in the field of agriculture, such as plants and animals. Government intervention in biotechnological development not only promotes research and development but also addresses safety-related concerns over the environment and human health. Accordingly, experimental research, pilot tests, environmental release, and commercial production should be regulated while taking into account the risk levels.[30] On the other hand, China became a contracting

[27] Office of the State Council, National Plan for Developing Modern Crop Seed Industry in China from 2012 to 2020 [2012] No. 59, available at http://www.gov.cn/zwgk/2012-12/31/content_2302986.htm

[28] Regulation on Protection of New Varieties of Plants, Article 39.

[29] Notably, after the reform of organizational arrangement in China in 2018, the Ministry of Agriculture has been expanded to the Ministry of Agriculture and Rural Affairs.

[30] According to the Implementing Rules on Safety Administration of Agricultural Biological Genetic Engineering, genetically modified agricultural organisms are classified into Classes I, II,

party of the Convention on Biological Diversity in 1993. As a part of the Convention, the Cartagena Protocol on Biosafety regulates the safety of handling, transport, and use of genetically modified organisms (GMO), which has an impact on the regulation of GMO for both internal biosafety and transborder biosafety. For example, a National Coordinating Group was established by the department responsible for environment to implement the Convention in 1993 with specific measures, such as the China National Biosafety Framework. Accordingly, it has clarified the framework of policy and legislation on biosafety management, technical norms for risk assessment and risk management of GMOs and their products, and requirements for national capacity building on biosafety management.

In addition to the abovementioned regulatory experiences, the increasing quantity of imported GM food (corns, beans, etc.) without appropriate regulation and unauthorized plantation of GM crops also called for stricter regulation.[31] As a result, the Regulation on Safety Administration of Genetically Modified Agricultural Organisms was promulgated in 2001 by the State Council. Compared with the Implementation Rules issued by the MoA, the Regulation has more legal importance, as it provides the legal basis for all the rules made by the relevant competent authorities. More importantly, the definition and scope provided by this Regulation regarding GMO includes not only animals and plants produced by this new technology but also products produced from these raw materials or products, such as seed, pesticide, and additives. To strengthen the official control and operators' obligation for biosafety, this Regulation lays down requirements for the licensing for production, distribution, recording, and labeling. Among these requirements, a safety certificate is required as an essential condition to obtain variety approval, and a license for production, distribution, and commercial applications is also mandatory. To make the Regulation more practicable, the MoA has further established detailed rules, namely, Administrative Measures on the Safety Assessment of Transgenic Agricultural Products, Administrative Measures on the Safety of Imported Transgenic Agricultural Products, Administrative Measures on the Labeling of Transgenic Agricultural Products in 2002, and Administrative Measures on Authorization of Processing Transgenic Agricultural Products in 2006.

Regrettably, the application of rules and measures of the MoA on agricultural biotechnology has been criticized for lack of transparency. According to the Top 10 Food Safety Events published by the Research Center for Food Safety Law under the China Law Society in 2015,[32] one lawsuit was brought by a lawyer against the MoA on the ground of the MoA's failure to publish administrative information with

III, and IV pursuant to their risks to human beings, animals, plants, microorganisms, and the ecological environment. More detailed information can be found in the Administrative Measures on the Safety Assessment of Transgenic Agricultural Products (infra Chart 2).

[31] For more information, see the explanation for the adoption of stricter regulation by the State Council, http://law.npc.gov.cn/FLFG/flfgByID.action?flfgID=42320&showDetailType=QW&zlsxid=23

[32] For more information, see the report Top 10 Food Safety Events in China 9, December 16, 2015, p. 10, available at http://epaper.legaldaily.com.cn/fzrb/content/20151216/Articel10003GN.htm

respect to assessment and legal enforcement regarding GM food. Worse still, scandals involving illegal production and distribution of GM rice and its products have been consecutively exposed. For example, the EU imposed in 2011 and 2013 emergency measures governing the importation of specific rice products originating or consigned from China due to unauthorized GM rice.[33] In addition, CCTV reported the illegal production of GM rice in Hubei province in 2014. As a result, heightened nationwide enforcement of regulation on GM crops has been introduced. According to the Notification on the Strengthening of Official Control for GMO issued by the MoA, in 2016,[34] the frequency of inspection and testing as well as the strictness of accountability in case of non-compliance with agricultural biotechnology shall be increased. Further, when the Seed Law was revised in 2015, specific traceability requirements regarding the use of seeds produced from biotechnology and harsh punishment for illegal production and sale of GM seeds were introduced.

3 The Regulation of GM Food in China

3.1 Evolution for GM Food Regulation

Although general regulation is applicable to agriculture when biotechnology is involved, there is no specific rule applicable to GM food. The rules provided by the MoA are mainly concerned with the safety of primary production, and there is a lack of regulation on safety assessment and testing methods if GM organisms are to feed human beings. In view of this, the Ministry of Health (MoH),[35] as the competent authority for implementing Food Hygiene Law, decided to fill this legal lacuna in 2001. As a result, Rules on Hygiene Administration of Genetically Modified Food were issued by MoH in 2002. The rules were aimed at protecting consumers' right to health and information and hence require all food produced from genetically modified plants and animals as well as microorganisms to be assessed for safety and nutrition and also labeled with information identifying them as GM foods. However, the rules were repealed by the Rules on Administration of Novel Food Materials in 2007, resulting in a legal lacuna for regulating GM foods. As a remedy, the revised Food Safety Law in 2015 put emphasis on labeling requirements in the production and sale of GM foods.[36] In case of violation of the labeling

[33] Commission Implementing Decision (EU) No. 2011/884/EU in 2011. However, due to the continual notifications from member states for food and feed concerning unauthorized genetically modified rice in rice products originating from China, the Implementing Decision 2011/884/EU has been updated by the Commission Implementing Decision of June 13, 2013. Accordingly, other products which may contain rice were added to the scope of Implementing Decision 2011/884/EU. Besides, additional sampling protocols were also added to address processed products which were not covered by the previous decision.

[34] Notice on further strengthening regulation of GMO, 2016, available at http://www.moa.gov.cn/zwllm/tzgg/tz/201604/t20160417_5096932.htm

[35] Notably, after reform in 2018, MoH has become the National Health Commission.

[36] Food Safety Law of 2015, Article 69.

Legal provision	Department	Purpose	Year of taking effect and revision
Regulation on Safety Administration of Genetically Modified Agricultural Organisms	State Council		2001, revised in 2011
Administrative Measures on the Safety Assessment of Transgenic Agricultural Products	Ministry of Agriculture	Process for authorization of safety certificate	2002, revised in 2016
Administrative Measures on the Labeling of Transgenic Agricultural Products	Ministry of Agriculture		2002
Administrative Measures on the Safety of Imported Transgenic Agricultural Products	Ministry of Agriculture		2002
Administrative Measures on Authorization of Processing Transgenic Agricultural Products	Ministry of Agriculture		2006
Rules on Hygiene Administration of Genetically Modified Food	Ministry of Health	Strengthening regulation of GM food and protecting consumers' health and right to know	2002, repealed in 2007 by the Rules on Administration of Novel Food Material
The Food Safety Law	NPC Standing Committee	Production and distribution of GM food shall be clearly labeled.	2009, revised in 2015

Chart 2 Legislative evolution on genetically modified agricultural organism and genetically modified food

requirements, consumers can claim punitive damages in an amount equivalent to ten times the price paid for GM foods.[37]

In view of the above, from agriculture to food, a legislative evolution is summarized in Chart 2. Notably, the listed departments for rule-making also provide a regulatory system for GM food regulation in China.

3.2 Key Mechanisms to Ensure GM Food Safety

According to the abovementioned laws and regulations, the regulation of GM food safety is supposed to be precautionary. Because there is a license requirement for GMO, and if an approved GMO is used for food production, labeling is further required for the final product. Notably, even for imported GMO used as food or GM food, labeling is necessary to indicate its GMO status. During this process, as a risk regulation, the regulation of GM foods relies also on the following important institutional arrangements to ensure GM food safety: risk assessment, GM food labeling, and risk communication.

3.2.1 Scientific Assessment

As mentioned above, GM foods are regarded as a kind of tech-food and rely on scientific assessment to prove their safety. In this sense, scientific assessment is also a basic principle that enables the application of biotechnology in practice and the implementation of food safety regulation. It is generally acknowledged that the introduction of Food Safety Law in 2009 provided the legal basis for food safety regulation in China, and one of the progresses achieved is to establish a scientific rationale for food safety by introducing risk assessment as well as risk monitoring. In the case of agricultural food, as early as in 2001, the safety assessment for transgenic agricultural products was established. More importantly, greater progress at this stage of primary production was the establishment of the Expert Committee on Agricultural Food Safety Risk Assessment in 2007 by the MoA according to the Law on Quality and Safety of Agricultural Products.[38] Notably, to be approved for commercialization, after obtaining safety certificates, there are still a variety of review, production, and sale licensing processes to be complied with.

3.2.2 Labeling

Generally, food labeling is the primary means of communication between the producer and seller of food on the one hand and the purchaser and consumer on the other. From a regulatory perspective, labeling is an essential tool to deal with

[37] Food Safety Law of 2015, Article 148.

[38] Law on Quality and Safety of Agricultural Products, Article 6. Although the Food Safety Law is aimed to unify food safety regulation in China, the regulation of safety and quality of agro-food at the stage of primary production is still separate. See Sun Juanjuan, Review of the "Law of the People's Republic of China on Quality and Safety of Agricultural Products", Journal of Resources and Ecology, 2018, 9 (Alemanno, 2012), pp. 106–113.

information asymmetry, in order to ensure an informed choice by consumers. In view of this, the requirement of food labeling in the case of GM foods provided under Article 69 of the Food Safety Law is closely linked to the need to protect the consumers' right to know. More importantly, the labeling provision has been further implemented by a national mandatory food safety standard, namely, GB 7718 on General Standard for the Labeling of Pre-packaged Foods.[39] In practice, consumers' claims for compensation due to the lack of GM food labeling have been supported by courts.[40] As mentioned earlier, the provision of punitive damages in the Food Safety Law also encourages consumers to participate in the fight against GM food that violates labeling requirements.

3.2.3 Risk Communication

Food scandals in China have not only pushed the reform for food safety regulation but also raised the public's awareness of food safety. As far as GM foods are concerned, a tussle between the popular celebrities Fang Zhouzi and Cui Yongyuan also attracted considerable attention thanks to the power of new media such as Weibo. Briefly, Cui Yongyuan is a well-known television personality who has engaged in the fight against GM foods for a long time. Among others, he criticized an article in favor of genetically modified foods written by Fang Zhouzi, who is a prominent biochemistry blogger. Fang then accused Cui of spreading unfounded rumors that hindered the development of China's national agriculture program. As a result, these disputes further raised public concern and mistrust on food safety of GM food.

Given the decline of public trust in food safety regulation, a communicative, participatory, and deliberative risk decision-making process can garner not only legitimacy but also public acceptability of protection levels. Therefore, in 2015 the Food Safety Law introduced risk communication among risk assessors, risk managers, consumers, industry, the academic community, and other interested parties, to encourage the interactive exchange of information and opinions throughout the risk assessment and management process concerning risk, risk-related factors, and risk perceptions, including the explanation of risk assessment findings and the basis of risk management decisions. Since then, increasingly, scientific experts have engaged in risk communication about GM foods. For instance, the 2016 Specific Project of Cultivation of New Varieties of GMO is one of the Major National Science and Technology Programs for the "Thirteenth Five-Year Plan". In addition to "hard science" research, two "soft science" research studies have begun in 2017, one dealing with science popularization and risk communication on GM technology and its development, the other exploring and implementing new approaches to risk

[39] GB 7718–2011 is available at http://bz.cfsa.net.cn/staticPages/9058ADC5-AFC3-4586-9798-D0170F6F879C.html

[40] For example, in a civil case decided by Beijing Haidian People's Court, (2017) Jing 0108 MinChu No. 29455, an imported food product was not labeled as GM food in line with its original labeling in English, and the court supported the consumer's claim of ten times compensation since it is legally required to be labeled. More information can be found at http://wenshu.court.gov.cn/content/content?DocID=5716fdee-a38b-44ab-ab46-a85600f04aa8&KeyWord.

communication on innovative technologies of strategic importance and public controversy.[41]

3.3 Ongoing Debates on GM Food Regulation

Although there are international obligations for the WTO members to base their food safety regulations on sound scientific evidence, the disagreements between the USA and the EU have shown that the regulatory differences in relation to GM foods are shaped by their differing economic and cultural specialties, public perceptions of risk, and scientific uncertainty. Therefore, to create the right regulatory environment for GM foods in China, government regulation should take into account the following factors.

3.3.1 National Condition

Comparatively speaking, the light regulatory touch for GM food in the USA is aimed at promoting new technology and economic value, since it is conducive to technological innovation and commercialization, thereby increasing national competitiveness. Benefiting from such light touch regulation, American biotech companies have taken leading positions in the field of biotechnology research and application and in turn become promoters of such light touch regulation of GM food. In contrast, the EU has paid more attention to public interest, since it had an urgent need to recover public confidence after the BSE crisis. Furthermore, listening and responding to public concerns also consolidated its democratic foundation as a Union and smoothed legislation at the EU level. In view of this, national specialty is an essential context for understanding the regulatory environment for GM food regulation.

As far as China is concerned, food security and food safety are both of great concern to the state and the public. Indubitably, the challenges of food security and the possible ways of overcoming such challenges are major concerns in China. However, issues like the surge in the import of staple foods, the drop in self-sufficiency rates of food supply, the reduction of cultivated land, and pollution of the environment all raise the expectations for the potential contribution of GM technology in improving yield.

Also as a special condition in China, public concern over GM foods exerts huge pressure on the commercial production of GM rice even after the granting of a safety certificate. Ongoing food safety problems have not only seriously affected consumer confidence in the government's credibility but also have an adverse economic impact on China's food industry and food trade. In this regard, the current situation in China is similar to that of the EU after the BSE crisis. That is to say,

[41] News, project of scientific education and risk assessment of biotechnology was officially launched in Tsinghua, 2017-01-05 (in Chinese), available at http://www.biotech.org.cn/information/144802 (last accessed on July 2, 2018).

there is a strong need in China to restore consumer confidence in food administration and food industry through the strengthening of food safety regulations.

3.3.2 Scientific Assessment and Public Perception

Undoubtedly, scientific assessment provides sound evidence for food safety regulation. However, it is still questionable whether scientifically favorable opinion is adequate to support the government's decision to release GMO into the environment and use it for food production. As a tool to communicate with the public, risk communication is used not only to inform the public but also to involve them in the decision-making. Certainly, the lack of knowledge may lead to misunderstanding among the public, and rumors may find a way to exacerbate the situation. Therefore, education and communication are needed to change and improve public perception. Moreover, transparency with respect to decision-making also matters and can be achieved through the involvement of stakeholders and the public. In so doing, the decision-makers can have adequate information to undertake risk-taking or risk-avoidance decision(s), and public's tolerance of the risk can also increase.

Admittedly, participation of scientists and their opinions is necessary for decision-making during risk management in food safety regulation(s). However, lay people usually hold a different opinion from that of experts on technological risks. As shown by research,[42] the ranking of risk among the ordinary public is based not on the statistics utilized by experts but on qualitative dimensions, such as whether risk is voluntarily or involuntarily taken, happens chronically or catastrophically, is known or unknown to science, and is controllable or uncontrollable. Furthermore, people tend to overestimate the probability of unfamiliar, catastrophic, and overly publicized events. Despite the subjectivity of the public's attitude toward risk, the public's perception of risk usually transforms into public concerns and, in turn, affects decision-making and eventually crystallizes into regulations. Therefore, the involvement of the public is also a mechanism to increase the social acceptance of a given risk.

3.3.3 Scientific Certainty Versus Scientific Uncertainty

Although science brings about certainty in public decision-making, it also entails uncertainty, which may result from indeterminacy, ignorance, or scientific controversy. As shown in the lessons from the BSE crisis, the failure to consider a scientific controversy may lead to an underestimation of a newly emerging risk as well as irreversible damage to human health. This is why the so-called precautionary principle was introduced in the EU as a legal principle for food law. Generally speaking, the precautionary principle was put forth to enable appropriate action against scientific uncertainty, with the purpose of dealing with irreversible damage in a proactive manner. Notably, the precondition for a precautionary action is still scientific assessment. In this respect, as a structured decision-making process, risk assessment is the

[42] For more information about this research and finding, see Zhang Jie and Zhang Taotu, Risk communication researches in the USA: academic evolution, core proposition and key element, Public Relationship Research, 2009, 9, p. 98.

first step to provide scientific certainty, while precautionary action should be taken to handle scientific uncertainty.

Yet, as a weak principle, the application of the precautionary principle is subject to review by continued scientific assessment as well as principles such as proportionality, consistency, etc. Besides, in spite of an ongoing debate on whether being precautionary is a principle or an approach or an exception to scientific assessment, protective action with precaution has already been applied in the regulation of food safety. When it comes to China, the Food Safety Law provides risk prevention as a legal principle. However, without detailed rules to concretize this principle, it is difficult to discern whether it plays a role akin to the precautionary principle in European food law or not.

4 Conclusion: Governance Over Regulation

GM foods are specific foods produced through biotechnology. The regulation of such foods is undertaken with an aim of preventing technological risk and protecting public health and safety. Although international obligations and American practices have emphasized the role of scientific assessment in regulatory decisions in this area, precaution is also needed to deal with scientific uncertainty, either through the exception of the safeguard clause provided by the SPS Agreement as mentioned above or the precautionary principle promoted by the EU. All of these constitute a controversial background against which China may build its own regulatory system. As far as GM foods are concerned, there are only regulations on transgenic agricultural products in general and labeling requirements provided by the Food Safety Law in particular. The lack of detailed legislation reflects China's evasive attitude toward this issue.

In the end, a balanced approach to risk management regarding GM foods depends on the various stakeholders. While regulation was introduced as a form of government intervention in the case of market failure, self-regulation or co-regulation has also been introduced to promote cooperation between the government and market players. As in the case of traceability of GM food, the role of the government is to impose necessary obligations and undertake inspections through documentation. However, it is still the food business operators that have an advantage in recording and sharing the traced information, since they are best suited to do so at the production line. In addition to these important stakeholders, the participation of experts and the public are also important to guarantee science-based regulatory decisions and their social acceptance.

Therefore, this author is of the opinion that "governance" is a more preferable way to delineate a balanced regulatory environment for GM food. According to the definition proposed by the Commission on Global Governance[43] in *Our Global*

[43] The Commission was established in 1992 with the full support of United Nations Secretary-General Boutros Boutros-Ghali. One of its contributions was to make a standard definition on global governance.

Neighborhood in 1995, "governance" is the summation of many ways in which individuals and institutions, public and private, manage their common affairs, as well as a continuing process through which conflicting or diverse interests may be accommodated and cooperative action taken. By replacing regulation with governance, the emphasis is shifted to the engagement and coordination among different stakeholders. In this respect, food safety regulation, including regulation on GM foods, in China has yet to keep pace with the tendency of favoring governance over regulation.

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Genetically Modified Plants: The IP and Regulatory Concerns in India

Malathi Lakshmikumaran

Abstract

The status of patent protection for genetically modified plants is presently uncertain in India and is a debate rife with economic and ethical considerations. The need for consistent public policy and robust frameworks for regulatory control poses significant challenges for the introduction of genetically engineered/modified crop plants in India. This is especially vital considering India's desire to foster an innovation-based economy. The research questions of this chapter include the following: How is the insertion of different traits, such as insect resistance in plants by methods such as transformation different from introgression/hybridization? Can genetic modification of plants by methods such as transformation be termed as "an essentially biological process"? If not, how can the said process be classified for the purpose of Section 3(j) of the Indian Patents Act, 1970?

Keywords

rDNA technology · Genetically modified plants · Transformation · Plant variety · Patents

The views and the opinions expressed herein are solely those of the author and do not reflect the views or position of any organization/firm. All website information was accessed on April 20, 2018.

M. Lakshmikumaran (✉)
Lakshmikumaran & Sridharan, New Delhi, India
e-mail: malathi.l@lakshmisri.com

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_16

1 Introduction

Although the diaspora of plant variation and biodiversity has been enriched by natural processes since time unknown, it was back in the mid-1960s that the first new high-yielding varieties of wheat were developed by Dr. Norman Borlaug of Mexico, followed by adaptation of this technology world over. It was in 1966, spearheaded by Dr. M. S. Swaminathan, often addressed as the "Father of Indian Green Revolution," that India introduced and further developed the high-yielding varieties of wheat under the High-Yielding Varieties Program (HYVP). India started as a country largely based on agriculture following its independence in 1947, and even today, about 55% of its population makes its living on farming, either directly or indirectly.[1] Adoption of the HYVP in India overcame the life-threatening food crisis faced by Indians in the 1960s. With the rise in agricultural productivity, the "Green Revolution" made the Indian economy, self-sustainable. As India enters the new millennium, with increasing costs of living accompanied by increasing population and widening gaps in terms of access to resources, there has arisen a need and demand to revitalize Indian agriculture by "Gene Revolution." Two technologies are at the forefront of shaping the next revolution in agriculture and plant-related technologies in India. One of them pertains to the recombinant DNA technology (rDNA) that was pioneered by Herbert Boyer and Stanley Cohen, who kick-started the field of biotechnology with the fundamental phenomenon of transferring genetic material from one organism and artificially introducing it into the genome of another organism, where the genetic material so transferred gets replicated and expressed by that other organism. The rDNA technology-based genetically modified organisms (GMOs) differ from traditional methods in nature and prior conventional plant breeding programs in that they do not involve overall mixing of genome between the plant species. Rather, GMOs involve very selective and precise movement of DNA fragment from one organism carrying a desired stretch/stretches of genetic material that can confer desired traits to the receiving organism by employing tissue culture techniques. The rDNA technology has been extensively recognized as providing valuable tools, in agriculture and plant-related biotechnology, and products using these same tools have been extensively employed to produce GMOs and genetically modified (GM) plants (Commission 2010). Another path-breaking technique that has the potential to change the agriculture and biotechnology fields, both economically and technologically is clustered regularly interspaced short palindromic repeats (CRISPR) technology, which is a characteristic of the bacterial defense system and has been adapted and modified to become the foundation for CRISPR-Cas9 genome editing technology[2] along with other alternate systems. Using such technologies can bring about a change in the technological and economic landscape of Indian agriculture (Lakshmikumaran and Malhotra 2018).

[1] https://www.weforum.org/agenda/2017/10/more-than-55-of-indians-make-a-living-from-farming-heres-how-we-can-double-their-income/

[2] The new frontier of genome engineering with CRISPR-Cas9, Jennifer A. Doudna, Emmanuelle Charpentier,
SCIENCE, Vol. 346, Issue 6213, 1258096, November 28, 2014

Much like the green revolution of the 1960s, which was a landmark adoption of innovative yet incentivized technology that enabled India to achieve a food surplus and feed its masses, the adoption of technologies such as rDNA technology and GM plants – Gene Revolution – may have a big impact on India's agricultural needs (Herring 2008).

The first genetically modified crop to be commercialized in India was *Bt* cotton, which is a nonfood plant product. The *Bt* cotton plant has been created by incorporating endotoxin-producing *Cry genes* (*Cry1Ac* and *Cry2Ab*) from the bacteria *Bacillus thuringiensis* into the genome of the cotton plant. India first approved the Bollgard® technology directed to *Cry1Ac* and then approved Bollgard II® (Bg II) technology directed to two genes, *Cry1Ac* and *Cry2Ab*. Both these genes have been identified in *Bacillus thuringiensis* and inserted into plants, such as cotton using recombinant DNA technology. The incorporation of these genes into the cotton genome by using synthetic recombinant DNA constructs enables the plant to produce δ-endotoxins, hence making it resistant to infestation from pests like bollworm. This reduced the need for foliar insecticides that targeted these pests and reduced outbreaks of secondary pests, thereby improving crop quality and yield and increasing the economic value of the crop. By 2011 over 95% of cotton in India was produced by using Bg II technology (Herring 2014). With the incorporation of this technology, India has evolved from an importer to an exporter of cotton, and at present, India's average yield is around 500 kg of lint per hectare. The monthly report released on March 9, 2018, by the Cotton Association of India (CAI) gauges the cotton production in India for the season 2017–2018 (October–September) to be around 362 lakh bales (one bale = 170 kg cotton) and exports to be between 65 and 70 lakh bales (Vyavhare and Kerns 2017).[3] The United States Department of Agriculture (USDA) corroborates India as the largest producer of cotton in the world with 365 lakh bales in the year 2017–2018.[4] However, due to demand and consumption by local mills, India stands as the fourth largest exporter of cotton, behind the USA, Australia, and Brazil (James n.d.). It took India several years to grant regulatory approval of *Bt* cotton for commercialization. While *Bt* cotton has been successfully grown since, recent developments mar this success, posing challenges to the future of such crops/plants in India (Jamiepighin 2003). However, as it stands, there are no food crops approved for use in India using GM technology. The Indian regulatory authority, the Genetic Engineering Approval Committee (GEAC), had approved *Bt* brinjal (eggplant) as being biosafe; however, its commercialization was not approved by the Ministry of Environment, Forest and Climate Change more on the basis of the precautionary principle.

In contrast, Bangladesh has approved four varieties of *Bt* brinjal for cultivation, based on India's biosafety analysis and data. Bangladesh's approved varieties have been advanced on the backbone technology developed in India for *Bt* brinjal, where

[3] http://www.smetimes.in/smetimes/news/indian-economy-news/2018/Mar/30/export-cotton37951.html

[4] http://www.yarnsandfibers.com/news/textile-news/foreign-buyers-are-interested-sourcing-cotton-india#.W3K3iGwnY2w

the brinjal plant has been transformed with a synthetic gene encoding the toxin protein *Cry1Ac*, which makes it resistant to pests and reduces the dependence on pesticides. Brinjal is second only to potato in terms of consumption in India; hence any decision on this issue of not accepting GM brinjal has far-reaching implications in the food crop industry.

In 2017, the GEAC had given approval to GM mustard, a genetically modified high-yielding variety developed in India by Delhi University's Centre for Genetic Manipulation of Crop Plants (CGMCP), called DMH 11 (Dhara Mustard Hybrid) for commercial release. DMH 11 carries three genes that have been isolated and transformed into mustard plants, including *bar*, *barnase*, and *barstar* genes. While in May 2018, the GEAC called for more tests, including field demonstrations of GM mustard, its commercial release has been put on hold by the Environment Ministry.

The need for consistent public policy and robust frameworks for regulatory control poses significant challenges for the introduction of genetically engineered crops in India. The intellectual property (IP) framework is prescriptive in its scope, and the recent judgments[5] preclude protection for technologies for the development of genetically engineered plants under the existing provisions of the Patents Act, 1970 (the "Patents Act"). This would perhaps serve to disincentivize players who have developed proprietary technologies from bringing their latest inventions for use by farmers in India.

This chapter intends to, firstly, simplify and help the readers understand the science and technology involved in developing genetically modified plants and, having provided the readers with this background, move forward to discuss the eligibility of such genetically modified plants as patentable subject matter in light of relevant national, i.e., Indian, as well as international legal provisions. Thereafter, the chapter discusses the recent case of *Nuziveedu Seeds Ltd. & Ors. v. Monsanto Technology LLC & Ors*[6] which is especially relevant in understanding the current legal position in India regarding patentability of genetically modified plants. The chapter also discusses the statutory regime available for protection of plant varieties in India and ends by drawing a distinction between intellectual property rights guaranteed under the Patents Act versus the plant variety protection regime in the context of genetically modified plants.

2 Transgenic Plants/GM Plants: Understanding the Technology

Understanding the science is critical for understanding the frameworks for genetically modified/transgenic plants. A transgenic plant is a GMO and indicates that genes from either an unrelated plant or a microbe have been transferred artificially, using rDNA technology into a plant of interest.

[5] *Nuziveedu Seeds Ltd. & Ors. v. Monsanto Technology LLC & Ors.,* FAO (OS) (COMM) 86/2017, C.M. APPL. 14331, 14335, 15669, 17064/2017

Monsanto Technology LLC & Ors. v. Nuziveedu Seeds Ltd. & Ors., FAO (OS) (COMM) 76/2017, CAV. 328/2017, C.M. APPL. 133348-13352/2017

[6] Ibid.

Selecting for plants during cultivation is not a new phenomenon. For many years plant breeding entailed the selection of the elite plants for higher yields and tolerance to biotic and abiotic stresses. Earlier, variation occurred through induced mutation or hybridization where two or more plants were crossed. Selection occurred through breeding process, and only the seeds with the best traits were selected. Even before the creation of a transgenic, the alteration of crops to improve their production had been performed through selection for thousands of years, becoming a science onto itself in recent centuries. However, to manipulate plants through selection takes many generations and does not always work due to randomness in the natural selection process. By using transgenic technology, which involves the use of genetic engineering techniques, one can control the process better and produce crops that are resistant to biotic and abiotic stresses. With recent developments in genetic engineering techniques, scientists can now identify, manipulate, and exploit genes responsible for specific traits.

Creating a transgenic plant involves modifying the plant genome for expressing the desired trait(s). The steps involved in developing a transgenic plant as illustrated in Fig. 1 include:

1. Step one. Synthesizing a DNA construct for a gene of interest under the control of a promoter (regulatory element) to express the gene and thus leading to the production of a desired protein in a host organism (recombinant host cell). In addition, the DNA construct could have DNA for selection markers for antibiotic or herbicide resistance, transit peptides that can localize its expression into organelles, and other transcription factors that function like an on/off switch.
2. Step two. Transformation of plant cells by insertion of the recombinant DNA construct using genetic engineering methods. However, this technique may lead

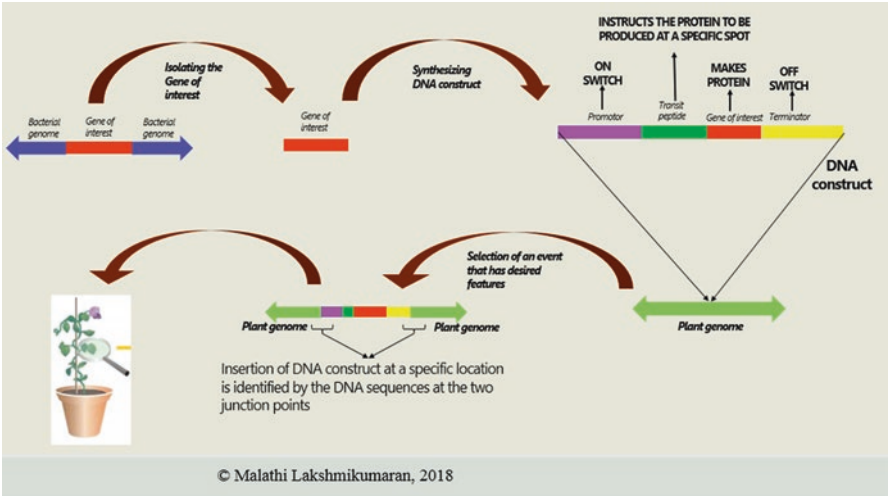

Fig. 1 Creating a transgenic plant involves modifying the plant genome for expressing the desired trait(s)

to the insertion of the gene of interest at any random location in the chromosome of the plant, leading to the production of several transgenic plants. It is possible that the transformation method can result in insertion of one copy to several copies of the recombinant DNA construct carrying the gene of interest.

3. Step three. It is possible that not all the insertions from the aforementioned transformation lead to the expression of the gene of interest. Therefore, the next step is to screen and select for the desired transformants expressing the gene of interest. Screening of these transformants involves identification of the most advantageous insertions, namely, the elite transformants, which are named as "events." In other words, when the gene of interest is located at different locations in the plant genome, each constitutes a different "event." Thus, this step entails selecting one or more elite event(s) with the desired expression of the gene of interest in the transgenic plant.

There are applications for patents that comprise of the first two steps as described above (e.g., Indian patent no. 214436, where claims 1–24 relate to the transformation process or step 2 and claims 25–27 relate to recombinant DNA construct carrying the modified bacterial gene of interest or step 1). There are also patent applications that pertain to specific events and their screening such as Indian patent no. 232681, for *Bt* gene associated with Bg II (more specifically the cotton event is named as MON 15985).

Finally, the elite transgenic event obtained from the transformation process is used to transfer the desired trait(s) (e.g., insect resistance) to different varieties of a plant. This can be done by using conventional crossing techniques like backcrossing, hybridization, etc. to produce new plant varieties expressing the desired gene of interest.

Usually, companies or research entities develop proprietary technologies for making the gene construct, transforming plant cells, and screening for the elite "events." These events are licensed out as donor seeds in the exchange for licensing fees and royalties for the use of the GM technology in plants. The licensees (commercial seed growers/breeders) use the donor seeds for introgression of the desirable genetic trait developed by the licensor into their own specific varieties by backcrossing breeding.

3 Genetically Modified Plants: Patent Protection

The status of patent protection for GM plants is presently uncertain in India and is a debate rife with economic and ethical considerations. It is relevant to note the legislative intent of the Patents Act and follow the history of its revisions to become TRIPS (the Agreement on Trade-Related Aspects of Intellectual Property Rights) compliant to understand the issues surrounding the patentability of plant-related inventions in a broader context (Declaration on Patent Protection – Regulatory Sovereignty under TRIPS 2014).

3.1 Plants or Animals and Conventional Methods of Production and Propagation of Plants and Animals Are An Unpatentable Subject Matter

Article 27.1 of TRIPS requires that "…patents shall be available for any inventions…in all fields of technology…."

Article 27.3 of TRIPS states that "[m]embers may also exclude from patentability… (b) plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes."

Article 28.1(b) of TRIPS states that for process patents, the rights granted include the right "to prevent third parties not having the owner's consent …from the acts of: using, offering for sale, selling, or importing for these purposes at least the product obtained directly by that process."

Section 48(b) of the Patents Act states that "where the subject matter of the patent is a process, the exclusive right to prevent third parties, who do not have his consent, from the act of using that process, and from the act of using, offering for sale, selling or importing for those purposes the product obtained directly by that process in India."

A combined reading of Article 27.3 with Article 27.1 of TRIPS would render biotechnological inventions in agriculture patentable and not excluded subject matter, provided they would otherwise qualify to be patentable. However, it is contended that plants, including GM plants are excluded under Section 3 of the Patents Act and hence constitute non-patentable subject matter.

The Ayyangar Committee Report of 1959, based on which the Patents Act was enacted, expressly clarified that the prohibition under Section 3(h)[7] of the Patents Act, excluding "methods of agriculture or horticulture" from patentability, was intended to apply to "inventions in the field of plant propagation by asexual methods."[8] Presently, the Indian Patent Office tends to consider every conventional practice that is carried out in an open field as a method of agriculture. Consequently, any claim in a patent application that refers to terms like germinate, seeds, hybrid, variety, etc. is objected to under Section 3(h) by the Indian Patent Office and deemed to be excluded from patentability.

Prior to being amended in 2002, Section 3(i) of the Patents Act read as:

> *"(i) any process for the medicinal, surgical, curative, prophylactic or other treatment of human beings or any process for similar treatment of animals or plants to render them free of disease or to increase their economic value or that of their products;"*

[7] Section 3(h) of the Patents Act reads as: "3. What are not inventions.—The following are not inventions within the meaning of this Act,—(h) a method of agriculture or horticulture;…."

[8] Paragraph 331 of the Ayyangar Committee Report of 1959

Section 3(i) of the Patents Act was amended in 2002, and the words "or plants" were omitted by the Patents (Amendment) Act, 2002. Thus, the treatment of plants to render it free of disease or to increase its economic value no longer falls under the scope of the existing Section 3(i)[9] nor under any of the other exclusions specified by Section 3 of the Patents Act.

Further, Section 3(c)[10] of the Patents Act excludes the "discovery" of naturally occurring living things or nonliving substances from patentable subject matter. This means inventions such as isolated DNA or protein molecules are non-patentable subject matter. On the other hand, recombinant DNA constructs, modified DNA, and modified protein molecules developed in the laboratory and involving substantial human intervention qualify as patentable subject matter as these cannot be considered as discovery.

Furthermore, Section 3(j)[11] of the Patents Act excludes "plants and animals in whole or any part thereof other than micro-organisms, but including seeds, varieties and species and essentially biological processes for production or propagation of plants and animals" from patentable subject matter. The Indian position on plants or animals and on conventional methods of production and propagation of plants and animals is that they do not fall under patentable subject matter.

3.2 Differing Interpretations of What Is Covered Under "Any Part of a Plant" of Section 3(j) of the Patents Act: To Consider an Artificial DNA Construct as a Part of a Plant Is Scientifically Incorrect

The gray area lies in the interpretation and implication of what is covered under "any part of a plant" – is it limited to organs such as leaves, roots, stems, and flowers, or can this term "any part thereof" extend to plant cells as well? The Indian Patent Office's position at present does not allow claims directed to eukaryotic cells that include plant cells and animal cells as these are objected to under Section 3(j) of the Patents Act. The Indian Patent Office considers cell as a part of a plant even though it uses transgenic technology to produce transformed, recombinant plant cells. In contrast, all microbial cells (prokaryotic) are patentable under Section 3(j)

[9] Section 3(i) of the Patents Act reads as: "3. What are not inventions.—The following are not inventions within the meaning of this Act,—(i) any process for the medicinal, surgical, curative, prophylactic diagnostic, therapeutic or other treatment of human beings or any process for a similar treatment of animals to render them free of disease or to increase their economic value or that of their products.….."

[10] Section 3(c) of the Patents Act reads as: "3. What are not inventions.—The following are not inventions within the meaning of this Act,—….(c) the mere discovery of a scientific principle or the formulation of an abstract theory or discovery of any living thing or non-living substance occurring in nature;….."

[11] Section 3(j) of the Patents Act reads as: "3. What are not inventions.—The following are not inventions within the meaning of this Act,—….(j) plants and animals in whole or any part thereof other than micro organisms but including seeds, varieties and species and essentially biological processes for production or propagation of plants and animals;….."

of the Patents Act, as long as these do not fall under discovery and meet the criteria of novelty and inventive step.

While many patent applications for method of transforming plants have been allowed by the Indian Patent Office, interestingly, the Indian Patent Office has also found Section 3(j) of the Patents Act to be applicable in case of transgenic plants in the case of *Monsanto Technology LLC.* v. *Controller General of Patents.*[12] In this case, the Controller of Patents refused Monsanto's patent application claiming an invention titled "A method for producing a transgenic plant with increased heat tolerance" as non-patentable subject matter falling under the scope of Section 3(j) of the Patents Act, among others. Monsanto challenged the Controller's order before the Intellectual Property Appellate Board (IPAB). The IPAB accepted Monsanto's argument that since the production of the transgenic variety being claimed involved substantial human intervention, it could not be considered as an "essentially biological process" and, thus, was not hit by Section 3(j) of the Patents Act. The IPAB held as follows:

> *"29. ……The plant is modified by the introduction of known recombinant DNA into its genome, thereby causing the said predisposition. The specification also teaches how the known regeneration and screening technique can be used to screen the transformed plant with heat, salt or drought tolerance. The appellant has given up all claims relating to recombinant DNA, plant cell, progeny, plant, crop plant, propagule, seed etc. [claims 1–15] and also claims 17 [transgenic plant,19 [Isolated protein] and 20 [a field crop].*
>
> *30. Let us see amended Claim 1 [claim16 amended]. It relates to a method that requires several steps that together provide claimed solution. The method here is best considered as a series of individual steps. It is a method that includes an act of human intervention on a plant cell and producing in that plant cell some change. Therefore, the respondent erred in finding this method as essentially biological process and excluded under section 3(j). We set aside his findings to that extent."*

Following the above interpretation of the IPAB, there have been many decisions by the Indian Patent Office, wherein the objection under Section 3(j) of the Patents Act has been set aside on account of the inventions having a substantial human intervention and tissue culture steps such that they no longer constituted essentially biological processes for the production or propagation of plants and animals, thereby allowing the patent grant. This has been especially true and applicable to method of transformation in plants involving recombinant DNA constructs. While the IPAB ultimately rejected Monsanto's application on grounds of lack of inventive step and non-patentability under Section 3(d),[13] it set aside the Controller's order on the issue of non-patentability under Section 3(j) of the Patents Act.

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[12] IPAB Order No. 146 of 2013 dated 5 July 2013

[13] Section 3(d) of the Patents Act reads: "(d) the mere discovery of a new form of a known substance which does not result in the enhancement of the known efficacy of that substance or the mere discovery of any new property or new use for a known substance or of the mere use of a known process, machine or apparatus unless such known process results in a new product or employs at least one new reactant. **Explanation.—**For the purposes of this clause, salts, esters, ethers, polymorphs, metabolites, pure form, particle size, isomers, mixtures of isomers, complexes, combinations and other derivatives of known substance shall be considered to be the same substance, unless they differ significantly in properties with regard to efficacy."

In a differing interpretation of Section 3(j) of the Patents Act, the Division Bench of the Delhi High Court in the case of *Nuziveedu* v. *Monsanto*[14] *vide* judgment dated April 11, 2018 invalidated Monsanto's patent no. 214436, holding that the subject matter of the patent was non-patentable under Section 3(j) of the Patents Act.[15] First, the judgment does not address the question of whether DNA should be considered as a part of a plant or not and is further unclear with regard to the interpretation and applicability of Section 3(j) of the Patents Act. This is especially relevant to an otherwise patentable subject matter concerning isolated, modified genes, i.e., modified DNA molecules, to create DNA constructs for transformation of plants.

Claims 25–27 of the Monsanto's impugned patent no. 214436 pertain to a DNA construct where the gene of interest encodes for *Bacillus thuringiensis* (*Bt.*) toxin. Claim 25 of the said patent is reproduced below:

> *"25. A nucleic acid sequence comprising a promoter operably linked to a first polynucleotide sequence encoding a plastid transit peptide, which is linked in frame to a second polynucleotide sequence encoding a Cry2Ab Bacillus thuringiensis δ-endotoxin protein, wherein expression of said nucleic acid sequence by a plant cell produces a fusion protein comprising an amino-terminal plastid transit peptide covalently linked to said δ-endotoxin protein, and wherein said fusion protein functions to localize said δ-endotoxin protein to a subcellular organelle or compartment.*

Such a DNA construct comprising a promoter sequence, transit peptide, and a gene of interest expressing the *Cry2Ab* protein is a synthetic molecule called as recombinant DNA construct and considered a patentable product under the Patents Act in India. Such a DNA construct was never a part of a plant and further did not occur in nature. Therefore, the product claims for the recombinant DNA construct cannot be considered a plant or part thereof and thus should be excluded from falling under the purview of Section 3(j) of the Patents Act. This is the view taken by the Indian research institutes and the scientists' community.

The question to be asked is can and should DNA, proteins, RNA, cDNA, etc., which are chemical molecules, and although may be present in the plant cells, fall under the scope of the term "any part thereof" or the expression "parts of a plant"?

Recombinant DNA constructs cannot fall under Section 3(j) of the Patents Act, even if these constructs function, or express genes in plant species. Since, recombinant DNA technology used in the construction and synthesis of such recombinant DNA constructs has been singularly practiced in the laboratories requiring human intervention and manipulation, these cannot fall under Section 3(j) of the Patents Act. It is to be emphasized that "plant" under the meaning of Section 3(j) of the

[14] *Nuziveedu Seeds Ltd. & Ors. v. Monsanto Technology LLC & Ors.,* FAO (OS) (COMM) 86/2017, C.M. APPL. 14331, 14335, 15669, 17064/2017, *Monsanto Technology LLC & Ors. v. Nuziveedu Seeds Ltd. & Ors.,* FAO (OS) (COMM) 76/2017, CAV. 328/2017, C.M. APPL. 133348-13352/2017

[15] This judgment has been set aside by the Supreme Court *vide* judgment dated 08 January 2019 in C.A. Nos.4616 – 4617/2018, *Monsanto Technology LLC & Ors.* v. *Nuziveedu Seeds Ltd. & Ors.*

Patents Act is a "living organism," while "DNA" or a gene or a DNA construct are inanimate molecules, not a living entity, which merely code for production of a protein in a living organism. Hence, it is erroneous to focus on the "application" or "use" of such an inanimate product, when used in a plant to conclude it as a part of a plant. Thus, to consider an artificial DNA construct as a part of a plant is scientifically incorrect. In fact, Section 3(j) of the Patents Act nowhere mentions "use" of a product as a basis for non-patentability of inventions; it only covers product (plant or parts thereof) or process (essentially biological process). DNA constructs inserted into a plant using recombinant DNA technology cannot be interpreted as falling under the definition of plants or parts thereof.

3.3 Transformation Is Neither a Conventional Breeding Method nor an "Essentially Biological Process" for Production of Plants

However, in contrast to the aforementioned IPAB order for the process of generating transgenic plants by transformation, in *Nuziveedu v. Monsanto*,[16] the Delhi High Court inferred that claims 1–24 of the patent no. 214436 that are directed to a method of transformation of plants fall under Section 3(j) of the Patents Act. Claim 1 of the said patent is reproduced below:

> *"1. A method for producing a transgenic plant comprising incorporating into its genome a nucleic acid sequence comprising a plant functional promoter sequence operably linked to a first polynucleotide sequence encoding a plastid transit peptide, which is linked in frame to a second polynucleotide sequence encoding a Cry2Ab Bacillus thuringiensis δ-endotoxin protein, wherein said plastid transit peptide functions to localize said δ-endotoxin protein to a subcellular organelle or compartment."*

Transformation is the method by which a recombinant DNA construct is inserted into a plant system, which has been equated to a microbiological process and, thus, is patentable. Transformation creates hundreds or thousands of possibilities, i.e., gene insertion can take place at any location in the plant genome, and there can be multiple insertions as well. Thousands of plants having the DNA construct at various locations in the plant genome can be produced by transformation methods. The recombinant DNA constructs, such as the construct of claims 25–27 of the patent no. 214436, has a gene of interest encoding for *Cry2Ab* protein. Similarly, any gene of interest can be introduced into a plant species. Importantly, the gene of interest expressed by such a recombinant DNA construct (as claimed in patent no. 214436) is a protein of bacterial origin, which cannot be considered as a part of a plant. This process is carried out in a laboratory under strictly controlled tissue culture

[16] This judgment has been set aside by the Supreme Court *vide* judgment dated 08 January 2019 in C.A. Nos.4616 – 4617/2018, *Monsanto Technology LLC & Ors.* v. *Nuziveedu Seeds Ltd. & Ors.*

conditions and thus, under no stretch of imagination, can be said to be either a "conventional method of breeding" or an "essentially biological process" for the production of plants.

In fact, it is to be considered as a microbiological process, where the transformation occurs, which is an insertion of a recombinant, synthetic DNA construct into a plant species mediated by *Agrobacterium tumefaciens*, microprojectile bombardment, etc., and cannot be equated to an essentially biological process. The Delhi High Court has overlooked the claims directed to the process of transformation of plants (using the recombinant DNA construct) to express the *Bt* toxin and rather focused on post-invention, conventional breeding methods for introgression of desired traits into plants and not on the claimed transformation method, which does not involve any conventional method of breeding. Transformation can neither be considered a conventional breeding method nor an "essentially biological process" for the production of plants as it is carried out in the laboratory, involving tissue culture techniques in the laboratory which are results of human ingenuity, and, therefore, cannot fall under Section 3(j) of the Patents Act.

It must be understood that transformation is in no way even similar, to any conventional means of breeding such as hybridization or introgression. While transformation is not considered as an "essentially biological process" (since it is performed using DNA constructs in the laboratory), hybridization/introgression, on the other hand, falls under essentially biological process involving crossing, backcrossing, selfing, etc. of plant varieties to transfer the genes or genetic material conferring the traits from one plant to another; and these are carried out in the fields or greenhouses and constitute conventional methods of breeding.

The European Enlarged Board of Appeals, in its decision of *Plant Bioscience Limited v. Syngenta Participations AG Groupe Limagrain Holding*[17] while expanding the definition of an "essentially biological process," has held that:

> *1. A non-microbiological process for the production of plants which contains or consists of the steps of sexually crossing the whole genomes of plants and of subsequently selecting plants is in principle excluded from patentability as being "essentially biological" within the meaning of Article 53(b) EPC.*[18]
>
> *2. Such a process does not escape the exclusion of Article 53(b) EPC merely because it contains, as a further step or as part of any of the steps of crossing and selection, a step of a technical nature which serves to enable or assist the performance of the steps of sexually crossing the whole genomes of plants or of subsequently selecting plants.*
>
> *3. If, however, such a process contains within the steps of sexually crossing and selecting an additional step of a technical nature, which step by itself introduces a trait into the genome or modifies a trait in the genome of the plant produced, so that the introduction or*

[17] *Plant Bioscience Limited v. Syngenta Participations AG Groupe Limagrain Holding,* G2/07 dated 9 December 2010, page 71

[18] Article 53(b) EPC reads as: "53. Exceptions to patentability – European patents shall not be granted in respect of: ….(b) plant or animal varieties or essentially biological processes for the production of plants or animals; this provision shall not apply to microbiological processes or the products thereof."

modification of that trait is not the result of the mixing of the genes of the plants chosen for sexual crossing, then the process is not excluded from patentability under Article 53(b) EPC.

4. In the context of examining whether such a process is excluded from patentability as being "essentially biological" within the meaning of Article 53(b) EPC, it is not relevant whether a step of a technical nature is a new or known measure, whether it is trivial or a fundamental alteration of a known process, whether it does or could occur in nature or whether the essence of the invention lies in it.

Since, transformation has introduced a recombinant DNA construct conferring a trait in the genome of the plant species; and this introduction of the trait is not the result of the mixing of the genes of the plants, but rather a process carried out in the laboratory under strict supervision and with ample human interference; it is not an "*essentially biological process*" for production of plants and thus ought not to fall under the ambit of Section 3(j) of the Patents Act. The confusion arises due to the use of the terms, transformation and hybridization, but it is pertinent to distinguish them and to emphasize that the initial transformation process forms part of the patentable subject matter in India, which cannot be equated to an "essentially biological process" for the production of plants.

Further, in the case of *Plant Genetic Systems* v *Greenpeace*,[19] the European Enlarged Board of Appeals has held that insertion of the relevant DNA sequence into the genome of a plant could not occur without human intervention, and consequently, this step is an important technical step which has a decisive impact on the desired final result. Such a process is not "essentially biological" by any definition and thus not excluded from patentability. Moreover, the first plant directly obtained by such a transformation process is to be considered as a product of a microbiological process. In contrast, the subsequent generations obtained using the first transformed plants by conventional breeding them to other plants to obtain subsequent transgenic plants would constitute an essentially biological process.

Claims 25–27 of the patent no. 214436 pertain to a recombinant synthetic DNA construct where the gene of interest encodes a bacterial protein, *Bt* toxin, while claims 1–24 pertain to a transformation method for insertion of the recombinant DNA construct into the plant species. Clearly, the said patent is directed at a method of transformation. Therefore, neither the product claimed in claims 25–27 can be considered as a plant or part thereof, nor can the transformation method of claims 1–24 be considered an "essentially biological process" under Section 3(j) of the Patents Act. Therefore, in our view, neither the product, nor the process claimed in the patent no. 214436 falls under the scope of Section 3(j) of the Patents Act.

[19] *Plant Genetic Systems* v *Greenpeace,* T0356/93, dated 21 February 1995, paragraph 40.1

4 Genetically Modified Plants: Plant Variety Protection

4.1 Difference Between Patent Law and PPV&FR Act

4.1.1 Transformation Method Cannot Get Protection Under PPV&FR Act

The Protection of Plant Varieties and Farmers' Rights Act (PPV&FR Act), 2001, is a *sui generis* legislation formulated by India to fulfill its obligation under TRIPS[20] for providing effective intellectual property right protection for plant varieties. However, one is to note here that the PPV&FR Act awards protection to the commercial growers/breeders/seed companies for specific varieties in terms of Distinctness, Uniformity and Stability (DUS) testing to distinguish and identify a new, extant,[21] essentially derived variety[22] and farmer's variety.[23]

Moreover, Section 2(za) of the PPV&FR Act defines a "variety" as "a plant grouping except microorganism within a single botanical taxon of the lowest known rank, which can be -

(i) *defined by the expression of the characteristics resulting from a given genotype of that plant grouping;*
(ii) *distinguished from any other plant grouping by expression of at least one of the said characteristics; and*

[20] Article 27.2 of the TRIPS Agreement reads as follows: "3. Members may also exclude from patentability: (a)diagnostic, therapeutic and surgical methods for the treatment of humans or animals;(b)plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties either by patents or by an effective sui generis system or by any combination thereof. The provisions of this subparagraph shall be reviewed 4 years after the date of entry into force of the WTO Agreement."

[21] Section 2(j) of the PPV&FR Act defines "Extant Variety" as "a variety available in India which is— (i) notified under section 5 of the Seeds Act, 1966 (54 of 1966); or (ii) farmers' variety; or (iii) a variety about which there is common knowledge; or (iv) any other variety which is in public domain."

[22] Section 2(i) of the PPV&FR Act states that an "Essentially Derived Variety" in respect of a variety (the initial variety) "shall be said to be essentially derived from such initial variety when it— (i) is predominantly derived from such initial variety, or from a variety that itself is predominantly derived from such initial variety, while retaining the expression of the essential characteristics that results from the genotype or combination of genotype of such initial variety; (ii) is clearly distinguishable from such initial variety; and (iii) conforms (except for the differences which result from the act of derivation) to such initial variety in the expression of the essential characteristics that result from the genotype or combination of genotype of such initial variety."

[23] Section 2(l) of the PPV&FR Act defines a "Farmers' Variety" as "a variety which— (i) has been traditionally cultivated and evolved by the farmers in their fields; or (ii) is a wild relative or land race of a variety about which the farmers possess the common knowledge."

(iii) *considered as a unit with regard to its suitability for being propagated, which remains unchanged after such propagation, and includes propagating material of such variety, extant variety, transgenic variety, farmers' variety and essentially derived variety."*

Considering the aforesaid, a gene can never be equated to be a variety, wherein a trait is determined by the expression of one or more genes. Thus, a gene made of nucleic acids is a chemical compound within a plant which may confer a specific trait or characteristic to a plant but cannot be considered a variety under PPV&FR Act. Moreover, when a gene or DNA molecule is inserted into a plant species through the transformation method, such method cannot get protection under PPV&FR Act. Such methods can only be protected under the patent regime, since there is no provision of protecting a method of transforming a plant or regeneration of plant using tissue culture methods under PPV&FR Act.

It is further important to note that a trait for resistance to biotic and abiotic stress may be a distinct characteristic under the PPV&FR Act regime. However, the protection under this regime is for all the characteristics of a plant variety and not for a specific distinct trait which differentiates this variety from other closely related varieties. Therefore, genes, proteins, promoters, enhancers, and traits in plants cannot get specific protection under PPV&FR Act and need to be protected under the patent regime. Thus, a recombinant DNA construct, which is neither a plant or part thereof, nor a variety, can be protected under the patent regime and not under the PPV&FR Act regime.

4.1.2 PPV&FR Act Allows Breeders to Use Protected Varieties to Develop Newer Ones

Article 27.3(b) of the TRIPS Agreement gives the flexibility to member nations to exclude plants and animals from being patentable subject matter, provided that the members have an alternative provision for protecting plant varieties through a separate system such as the PPV&FR Act, or a combination thereof. In terms of the leeway provided under the Patents Act and PPV&FR Act in India, it is to be understood that the Patents Act only allows the use of a patented invention for merely "experimental use," while the PPV&FR Act allows breeders to use even protected varieties to develop newer varieties. The aforesaid exemption is described under Section 30[24] of the PPV&FR Act.

[24] Section 30 of the PPV&FR Act reads as: "30. Researcher's rights—Nothing contained in this Act shall prevent— (a) the use of any variety registered under this Act by any person using such variety for conducting experiment or research; or (b) the use of a variety by any person as an initial source of variety for the purpose of creating other varieties: Provided that the authorisation of the breeder of a registered variety is required where the repeated use of such variety as a parental line is necessary for commercial production of such other newly developed variety."

4.1.3 Benefit Sharing Under PPV&FR Act Offers No Benefits to IP Holders

Another difference between the PPV&FR Act and the Patents Act is the benefit sharing provisions under Section 26 of the PPV&FR Act.[25] But the system of benefit sharing, much like the limitation to "variety" under PPV&FR Act, is applicable only for varieties registered under the PPV&FR Act regime. Post registration of a variety, the authority invites claims of the public, and where it is established that the third party had played a role in contributing to the development of the registered variety, such third party is awarded the right to seek part of the benefits that a registered owner of a variety may derive. The overall scheme and object of PPV&FR Act suggests that the benefit sharing system has been created to benefit the farmers and communities who have helped conserve plant germplasm that may have contributed to the development of registered varieties.

To interpret the benefit sharing system as catering to IP holders will actually lead to an absurdity. This is because the benefit sharing system under Section 26 of PPV&FR Act only applies to registered varieties that are generated out of the research varieties that are in the true sense the varieties produced by the primary transformation event, also referred herein above as a microbiological process. Therefore, if a recombinant technology is used to develop subsequent transgenic varieties that are not ultimately registered under the PPV&FR Act, the benefit sharing system will not apply, and the IP holder would have no recourse for being rewarded for their valuable technology. This injustice would only become manifold

[25] Section 26 of the PPV&FR Act describes benefit sharing as: "Determination of benefit sharing by Authority — (1) On receipt of a copy of the certificate of registration under sub-section (8) of section 23 or subsection (2) of section 24, the Authority shall publish such contents of the certificate and invite claims of benefit sharing to the variety registered under such certificate in the manner as may be prescribed. (2) On invitation of the claims under sub-section (1), any person or group of persons or firm or governmental or non-governmental organisation shall submit its claim of benefit sharing to such variety in the prescribed form within such period, and accompanied with such fees, as may be prescribed: Provided that such claim shall only be submitted by any person or group of persons, if such person or every person constituting such group is a citizen of India; or firm or governmental or non-governmental organisation, if such firm or organisation is formed or established in India. (3) On receiving a claim under sub-section (2), the Authority shall send a copy of such claim to the breeder of the variety registered under such certificate and the breeder may, on receipt of such copy, submit his opposition to such claim within such period and in such manner as maybe prescribed. (4) The Authority shall, after giving an opportunity of being heard to the parties, dispose of the claim received under subsection (2). While disposing of the claim under sub-section (4), the Authority shall explicitly indicate in its order the amount of the benefit sharing, if any, for which the claimant shall be entitled and shall take into consideration the following matters, namely the extent and nature of the use of genetic material of the claimant in the development of the variety relating to which the benefit sharing has been claimed; the commercial utility and demand in the market of the variety relating to which the benefit sharing has been claimed. (5) The amount of benefit sharing to a variety determined under this section shall be deposited by the breeder of such variety in the manner referred to in clause (a) of sub-section (1) of section 45 in the National Gene Fund. (6) The amount of benefit sharing determined under this section shall, on a reference made by the Authority in the prescribed manner, be recoverable as an arrear of land revenue by the District Magistrate within whose local limits of jurisdiction the breeder liable for such benefit sharing resides."

if there is no patent protection for the technology in the first place. Thus, the interpretation that IP holders under the PPV&FR Act regime can take the advantage of the benefit sharing system is not a possible option.

4.2 Infringement Under PPV&FR Act

Section 64[26] of the PPV&FR Act states that the sale, import, and production of a variety registered under the PPV&FR Act by a person who is not the breeder of the said variety or the registered licensee of a registered breeder, without the permission of the registered breeder of the said variety, shall constitute as infringement of the registered variety. Further, the said section also states that the sale, import, and production of any other variety by giving it a denomination identical with or deceptively similar to the denomination of a variety registered under the PPV&FR Act, in a manner that causes confusion in the mind of general people, will also amount to infringement of the registered variety.

Section 65[27] of the PPV&FR Act states that a suit for infringement of a registered variety or any right relating to a registered variety shall not be instituted in a court inferior to a District Court.

Thus, it can be seen that the PPV&FR Act only provides for a legal recourse when either the variety registered under the PPV&FR Act or any right relating to such a registered variety is infringed by any person who is not authorized to use such a registered variety. The factum of infringement would have to be established by examining whether the allegedly infringing variety carries all characteristics of the registered variety or not, as infringement under Section 64 of the PPVFR Act is with respect to a registered variety only and not for a trait.

Therefore, recourse in the manner of a suit for infringement under Section 65 of PPV&FR Act is no recourse to the developers having IP in the recombinant DNA technology by which the GM plants are created.

[26] Section 64 of the PPV&FR Act reads: "Infringement.— Subject to the provisions of this Act, a right established under this Act is infringed by a person— (a) who, not being the breeder of a variety registered under this Act or a registered agent or registered licensee of that variety, sells, exports, imports or produces such variety without the permission of its breeder or within the scope of a registered licence or registered agency without permission of the registered licensee or registered agent, as the case may be; (b) who uses, sells, exports, imports or produces any other variety giving such variety, the denomination identical with or deceptively similar to the denomination of a variety registered under this Act in such manner as to cause confusion in the mind or general people in identifying such variety so registered."

[27] Section 65 of the PPV&FR Act reads: "Suit for infringement, etc.—(1) No suit— (a) for the infringement of a variety registered under this Act; or (b) relating to any right in a variety registered under this Act, shall be instituted in any court inferior to a District Court having jurisdiction to try the suit. (2) For the purposes of clauses (a) and (b) of sub-section (1), 'District court having jurisdiction' shall mean the District Court within the local limit of whose jurisdiction the cause of action arises."

4.3 Researcher's Rights?

Nevertheless, even if one were to consider the PPV&FR Act as an alternative regime for protecting the transgenic plant variety containing the recombinant DNA construct conferring the specific trait to the plant, the third party infringes under the garb of researchers' rights provided under Section 30 of the PPV&FR Act can use such a variety as an initial source to create other varieties containing the recombinant DNA construct.

Section 30 of the PPV&FR Act reads:

> *Nothing contained in this Act shall prevent –*
>
> (a) *the use of any variety registered under this Act by any person using such variety for conducting experiment or research; or*
> (b) *the use of a variety by any person as an initial source of variety for the purpose of creating other varieties:*
> *Provided that the authorisation of the breeder of a registered variety is required where the repeated use of such variety as a parental line is necessary for commercial production of such other newly developed variety.*

It is clear from Section 30 of the PPV&FR Act that one can use the initial research variety to create other varieties, which in turn if not registered would lead to unauthorized and inappropriate use of research varieties. Such unauthorized and inappropriate use of research varieties cannot be brought into justice under any provision of Indian IP law. In other words, the PPV&FR Act regime does not offer any protection against the unauthorized use, sale, export, import, and production of the specific distinct trait, e.g., insect resistance, which may have been inserted into another plant variety by conventional breeding methods using the initial transgenic plant.

Accordingly, neither the benefit sharing under Section 26 nor infringement under Section 64 of the PPV&FR Act can come to the aid of an innovator when it comes to protecting a specific distinct trait in a plant variety. Thus, it is imperative to have protection under the patent regime for such inventors as a compensation for disclosing and sharing their technology for the public's benefit.

5 Conclusion

In case of transgenic plants developed using recombinant DNA technology, such as those having a trait for insect resistance, the flow of innovation, inter alia, requires the synthesis of a recombinant DNA construct, followed by the transformation of a plant cell by insertion of the recombinant DNA construct. Due to fundamental differences in biology, if the gene is obtained from a completely unrelated species (e.g., a bacterium), it cannot be successfully inserted into a plant with any success. Significant human intervention in the form modifying the gene for it to be suitable for a plant genome and adding several other components is required. Further, the

insertion of the DNA constructs into the plant can occur at different locations in the plant genome, but not all of them will result in a desired trait. Only through significant human intervention can one select one of these "events" that will result in the transgenic plant expressing the desired trait at the optimal level. The recombinant DNA constructs developed in vitro, the method for developing the genetically modified plants using that gene, and the integration of the DNA construct into the plant genome at a specific location in the plant genome cannot be termed as "essentially biological processes" and should be considered as patentable subject matter.

Such recombinant DNA constructs, recombinant DNA sequences, and methods of developing a transgenic plant are *per se* not a subject matter of protection under the PPV&FR Act because none of them can be considered as a "variety." A variety as defined under the PPV&FR Act only refers to a plant grouping within a given species of plants and does not cover such recombinant DNA constructs. A plant variety being registered under the PPV&FR Act could also be a variety which was developed by backcrossing/breeding/hybridization of the transgenic plant – the "event." The PPV&FR Act also does not deal with granting any form of intellectual property rights to plant breeding methods.

Effectively then, rights under the PPV&FR Act and the rights granted under the Patents Act operate in completely different spheres. What is protected under the Patents Act cannot be protected under the PPV&FR Act, and the vice versa holds true as well.[28]

Recently, on January 8, 2019, the Hon'ble Supreme Court set aside the Delhi High Court, Division Bench judgment in *Nuziveedu Seeds Ltd. & Ors. (Supra)*, holding that the findings of the Division Bench were not based upon examining any technological or expert evidence, which was of critical value in the present case, the issue involved therein being complicated and relating to chemical, biochemical, biotechnological, and microbiological processes. The matter has been remanded back to the *Ld.* Single Judge of the Delhi High Court for proper adjudication and disposal in accordance with law. Even though the Supreme Court has not provided any observations or interpretation of Section 3(j), setting aside of the Division Bench's order entails that the interpretation of Section 3(j) adopted by the Division Bench shall no longer be applicable. A trial will commence soon, and the outcome of this case will be of great significance and will have a deep impact on how plant-related biotechnological inventions are treated under the Indian patent regime.

Thus, the future of IP protection for agricultural biotechnologies in India needs (Statutory?/Regulatory?) clarification on the scope of protection for technologies involved in developing transgenic plants – the "events" – the scope of protection for "plant varieties" being made clear under the PPV&FR Act. This is especially vital considering India's desire to foster an innovation-based economy.

[28] *Monsanto Technology LLC & Ors.* v. Nuziveedu Seeds Ltd. & Ors., C.A. Nos.4616 – 4617 of 2018

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Rooting for Sustainable Agriculture and Food Security Through Improved Regulatory Governance in India

Sunita Tripathy

Abstract

'Zero hunger' as a sustainable development goal requires macro-level multisectoral innovation in any regulatory setting. This is more so in the case of India, which grapples with poverty, famine, shortage in food supply and massive hike in prices of basic foodstuffs. In this chapter, I critically analyse the recent Indian efforts to overcome challenges posed by the pervasive problem of food insecurity and discuss the issues that India must overcome to position itself in a low-hunger bracket globally. In that I elaborately reflect on whether the prevailing food distribution system is being reformed to achieve aims of creating sustainable food systems through action-oriented policies. Further I contend that agroecological practices in comparison to the intellectual property-centred industrial model are the more sustainable approach in the longer run. However, the high concentration of firms in the sector seems to often create an imbalance, since capitalist tendencies outweigh the presence of any competition in the market. I argue that this imbalance has specifically led to regulatory failure in the Indian context by exemplifying the litigations concerning ag-biotech gene patents held by Monsanto. Thus, improved oversight through better understanding of the long-term goal of regulation in light of the food-health-climate nexus is the need of the hour. Preserving gene diversity, traditional farm practices and adapting to sustainable ways that aid regulatory governance in India is the plausible way to create a hunger-free future, as envisaged in UN Food and Agriculture Organisation's definition of food security.

S. Tripathy (✉)
Jindal Global Law School, O.P Jindal Global University, Sonipat, Haryana, India
e-mail: stripathy@jgu.edu.in

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_17

Keywords
Biosafety · Bt cotton · Competition · Compulsory license · Food security · Gene diversity · Intellectual property · Make in India · Monsanto · Nuziveedu · NFSA · Right to food · Sustainable food systems · Sustainable agriculture · Sustainable development goals · Traditional knowledge · UNFAO · Zero hunger

1 Introduction

> Food security exists when all people, at all times, have physical and economic **access to sufficient, safe and nutritious** food to meet their dietary needs and food preferences for an active and healthy life. – 1996 World Food Summit Plan of Action, UN FAO.[1]

To reduce, no later than 2015, the number of undernourished people to half the present (1996) level was a promise made at the World Food Summit after much deliberation.[2] Around 12 years later, on June 19, 2009, over one-sixth of humanity

[1] The World Food Summit pledge of 1996 committed the World's governments to reducing, no later than 2015, the number of undernourished people to half the present (1996) level. See http://www.fao.org/docrep/w9990e/w9990e07.htm

[2] This number was later announced as being close to 790 million at the end of 1999, though not accounting for the number of undernourished since 1996 which was the base year as per the Summit pledge. See "Food Security: When People must live with hunger and fear starvation" (UNFAO, 1999) – The first 'State of Food security in the world' (SOFI) report, 1999 available online http://www.fao.org/3/a-x3114e.pdf. The SOFI report is jointly prepared by FAO, IFAD, UNICEF, WFP and WHO and is released annually. The UN General Assembly Resolution for adoption of Millennium Development Goals (http://www.who.int/topics/millennium_development_goals/about/en/) in September 2000 reiterated the goal with modifications in the base year as 2000 and the action of now halving "the *proportion* of the world's people [i.e. the entire world population]…who suffer from hunger [i.e. the number of undernourished people]." This proportion-based metric assumes an accurate calculation of the number of undernourished as a fixed number to be supported without accounting for the ever-increasing world population. Thus shifting focus to increased government action to control world population which is expected to automatically lessen the number of undernourished thereby sizing down the amount of action required to halve the number of (now reduced) hungry people. This way, any food programme that caters to the miniscule number of undernourished while the world population is uncontrollably expanding will merely register an institutional effort of window dressing for a solution to the problem of food security but not resolve the food crisis. For a descriptive critique on the approaches of international agencies such as FAO and the World Bank in remedying undernourishment, see especially, Pogge, T., "The Hunger Games" in *Food Ethics*, Springer, 2016, Vol 1, pp. 9–27, available online: https://link.springer.com/article/10.1007/s41055-016-0006-9?view=classic ['Pogge, Hunger Games'] – (governments kept the headline formulation of the goal – "We will halve poverty and undernourishment by 2015" – but they [surreptiously] lowered the bar so as to make this goal more easily achievable.) The goals were further narrowed down to focus only on 'undernourishment in the developing world' and also backdated such that government action for achieving the Millennium Development Goals (MDGs) seemed to have commenced in the year 1990. Consequently, the first UN report on the progress made in regard to the MDGs depicted that world's most populous countries such as East Asia (China included) and the Pacific had succeeded in halving extreme poverty-related concerns (such as hunger) in 1999 itself. However, subsequently the success rate diminishes

was, more than ever before, reported as 'undernourished' by the United Nations' Food and Agriculture Organisation (UNFAO).[3] This was also the first time in world history that the official figures had climbed above 1 billion.[4] Severe shortage in food supply and massive hike in prices of basic foodstuffs were identified as the primary reason for undernourishment.[5] A phase of institutional reform followed, and new metrics for calculating hunger were employed.[6] The last report released by UNFAO upon the lapse of the timeline for achieving the millennium development goals in 2015, indicated that the proportion of undernourished people in the developing regions, fell by almost half since 1990, from 23.3% in 1990–1992 to 12.9% in 2014–2016.[7] Such assertions notwithstanding, the World Food Price Index was found spiking from 201.4 in 2008 to 229.9 in 2011 and more recently to 163.5 in

considerably reflecting uneven progress. For the first UN Report, see United Nations, 'Implementation of United Nations Millennium Declaration: Report of the Secretary-General' (July 31, 2002) available online: http://www.un.org/millenniumgoals/sgreport2002.pdf?OpenElement; for the last UN Report, "Millennium Development Goals Report 2015", see http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf.

[3] See UNFAO, "1.02 Billion People Hungry" (June 19, 2009) available online: http://www.fao.org/news/story/en/item/20568/icode/. See also Conway, G., *One Billion Hungry: Can We Feed The World* (Cornell University Press, New York, 2012) – the routes to World Food Security are technological innovation, fair and efficient markets, people and political leadership.

[4] These official figures may be an understatement of the real-world scenario as the earlier FAO metric for measuring 'undernourishment' overlooks nutritional deficiency in food intake (such as necessary vitamins and their absorption for healthy and balanced living), energy expenditure due to work (as opposed to sedentary lifestyle), famine or disease and merely focuses on state of dietary energy deprivation lasting over a year. Clearly discounting extended periods of short-term starvation that last under a year's duration. See for example, ['Pogge, Hunger Games'] supra at 1 for a critique on the FAO definition of undernourishment.

[5] See Timmer, P., 'Reflections on Food Prices Past' in *Food Policy*, Elsevier, February 2010, Issue 1, Vol 35, pp. 1–11 – from the beginning of 2007 to early 2008, the prices of some of the most basic international food commodities increased dramatically on international markets.

[6] After the Global Food Crisis (See fn.2), the old FPPI was redesigned by the Committee on World Food Security (CWFS). The now reformed CWFS convened a High Level Panel of Experts (HLPE) for Food Security and Nutrition in October 2009 and developed an expert report for new FPPI along with recommendations for monitoring undernourishment before the expiration of the timeline for realization of the Millennium Development Goals (http://www.who.int/topics/millennium_development_goals/about/en/).The new FPPI depicted 13% reduction in undernourishment which co-related with World Bank's cumulative extreme poverty decline since 1996 reported after the WTO Ministerial Conference in Seattle in November 1999. See especially, [*'Pogge, Hunger Games'*] *supra* at 2—"[The new method] ensured, at least, that the officially reported undernourishment and extreme poverty trends were now firmly headed in the same direction."; see also ["*Special Feature article on the New FPPI, 2013*"] at fn 8; see also HLPE Secretariat, UNFAO, "The High Level Panel of Experts on Food Security and Nutrition: Key elements" available online: http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Key_elements_EN.pdf

[7] UN Report, "Millennium Development Goals Report 2015" see http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf

October 2018.[8] Food prices have only continued to remain volatile over the years,[9] and India, the highest exporter of rice in the world,[10] grapples with food insecurity still.

The promise made in 1996 has been rechristened as one of the sustainable development goals (SDGs) to be achieved by the year 2030.[11] Newer policies and regulatory measures ought to have been designed to achieve the 'zero hunger' goal by then. It is worthwhile to consider whether this goal-shifting will help resolve the problem of hunger or at least make it manageable for countries such as India. These concerns constitute the main premise of this chapter.

Pragmatically speaking, a hunger-free future, as envisaged in the definition above, requires innovation in food regulation overall. From regulating innovation in food production techniques (farming and seed cultivation) to innovation that safeguards the produce from contamination (due to reasons of ecological imbalance or human-activity), while ensuring adequate supply and successful distribution through innovative government strategy, food security as a development goal requires macro-level multisectoral innovation in any regulatory setting. For instance, at the national level, strategies employing subsidies or what is referred to as expenditure tax credits to innovative firms, specifically tailored national intellectual property (IP) policy that benefits important sectors and activities that foster collaborative partnerships between public and private firms for effective distribution, characterize policies that are vital catalysts for achieving the goal.

In a similar vein, aiming for skill enhancement and job creation in over 25 sectors (including agriculture), the Indian government launched the 'Make in India'

[8] See UNFAO, "Food Price Index" in World Food Situation (November 01, 2018) available online: http://www.fao.org/worldfoodsituation/foodpricesindex/en/; for a discussion on the methodology for determining the FFPI and measurements that assess trends in food prices, see Ali Arslan Gurkan, "FAO's Food Price Index Revisited" Food Outlook (November 2013) available online: http://www.fao.org/fileadmin/templates/worldfood/Reports_and_docs/Special_feature_FFPI_en.pdf ["*Special Feature article on the New FPPI, 2013*"]

[9] See ['*Pogge, Hunger Games'*] *supra* at 2. The World Food Crisis due to the exorbitant food prices had led to food riots in several developing economies including Bangladesh, Bolivia, Brazil, Burkina Faso, Cameroon, Egypt, Ethiopia, Haiti, India, Indonesia, Ivory Coast, Mauritania, Mexico, Morocco, Mozambique, Myanmar, Pakistan, Senegal, Somalia, South Africa, Sri Lanka, Tajikistan, Uzbekistan and Yemen.

[10] See US Department of Agriculture, "Principal Rice Exporting Countries worldwide in 2017/18 (in 1000 metric tons)" in Statista (As of February 2018, rice export of India was projected to amount to some 12.5 million metric tons) available online: https://www.statista.com/statistics/255947/top-rice-exporting-countries-worldwide-2011/; see also Cahill, C and Gulati, A., OECD/ICRIER (2018), "Agricultural Policies in India" OECD Food and Agricultural Reviews, OECD Publishing, Paris (Despite… notable achievements, challenges remain; among them, the prevalence of very large numbers of smallholders, low productivity, climate change, pressure on natural resources such as water, persistent food insecurity, and an under-developed food processing and retail sector), available online: https://read.oecd-ilibrary.org/agriculture-and-food/agricultural-policies-in-india_9789264302334-en#page4 ['*OECD/ICRIER 2018 Report'*]

[11] The '2030 Agenda for Sustainable Development' still encompasses food security as a major goal. See "Zero Hunger" enlisted as sustainable development goal# 2, available online: https://www.un.org/sustainabledevelopment/hunger/

initiative in the year 2014.[12] As a result, national strategies integrating employment for farmers and approaches to tackle their vulnerability via climate adaptation, social protection and disaster risk reduction were called for. Since food systems account for 30% of human-caused greenhouse gas emissions,[13] emphasis on shifting to the low-carbon economy as the low-cost path to long-term international competitiveness and environmental sustainability as per the Cartagena Dialogue[14] now constitutes positive action points at the policy level. These efforts may well mark the beginning of a trend to address the food-health-climate nexus and remedy the problem of uninformed and ineffective policy.[15] It thus, becomes imperative to take a closer look at the regulatory challenges faced by India and the solutions that it has been subscribing to as part of its mandate to realize this sustainable development goal. Prominent in such analysis emerges the tale of violations in the ag-biotechnology sector, and its deleterious effects on food security in India. In this chapter, I will critically analyse the recent Indian efforts to overcome challenges posed by the pervasive problem of food insecurity and discuss the regulatory challenges that India must overcome to position itself in a low-hunger bracket globally.

The discussion in the chapter is structured into three main parts, wherein, the first part elaborates on the aims of creating 'sustainable food systems'; second part compares agroecological practices with the IP-centred industrial model from a sustainability lens; the third part ponders on the problems emerging from the trend of relying on genetic engineering for production of food and agriculture in India; and the concluding section summarizes the views advanced by emphasizing the importance of effective regulation to address the aspirational goals of food security.

[12] For description of 'Make in India', see India Brand Equity Foundation, https://www.ibef.org/economy/make-in-india. Also see Key highlight of Union Budget 2017–2018 includes plans to double the income of farmers in 5 years as part of the Agenda 2017–2018 – "Transform, Energise and Clean India". https://www.indiabudget.gov.in/budget2017-2018/ub2017-18/bh/bh1.pdf

[13] See generally, World Resources Institute in collaboration with the World Bank, UNEP, UNDP,CIRAD and INRA, "Creating a sustainable food future: Interim findings," WRI Report 2013–2014 (Washington DC: WRI) at p.73, 83–89, available online: https://wedocs.unep.org/bitstream/handle/20.500.11822/10731/CreatingSustainableFoodFuture.pdf?amp%3BisAllowed=&sequence=1

[14] India is one of the 40 countries that are committed to becoming (now remaining) low-carbon countries and is working towards a legally binding Agreement under the United Nations' Framework Convention on Climate Change (UNFCCC). Five regional groups (including Asian States) came together to form this group which was founded in Cartagena, Columbia in 2010 after COP12 in Copenhagen in 2009. For more details on the negotiations, see online: http://www.cicep.no/copguide/2015/10/25/cartagena-dialogue

[15] See generally, Tripathy, S and Rosencrantz, A., "Climate impacts food security and health" (March 25, 2018). The Statesman https://www.thestatesman.com/opinion/climate-impacts-food-security-health-1502607709.html – The recent unusual smog occurrence in New Delhi and Haryana between November 2017 and February 2018 … came to be incorrectly explained as environmental contamination caused due to vehicular pollution. Actually, the practice of burning residual crop stubble is the main reason for elevated rates of airborne particulate matter in the area…The pollutants further deteriorate the soil composition which makes farming susceptible to pests; and the pests are treated with more chemicals and pesticides which go on to contaminate the upstream food chain again – leading to the vicious cycle that engenders consumer health.

Admittedly, 'right to food' may just be the starting point to regulatory implementation, thus newer approaches that compliment it are also suggested to achieve an improved food future for India.

2 Sustainable Food Systems: An Ideal Approach

Availability, accessibility and adequacy remain recurring concerns while developing policies to achieve 'zero hunger'. Climate change and land limitations are also emerging as critical factors that compound the problem of food insecurity at a global scale. Notably, '[i]ncreasing food insecurity is likely to intensify debates about patenting of seeds and plant variety protection, fueling calls for compulsory licensing provisions akin to those used to provide access to life-saving medicines in developing countries'.[16] With a population of over 1.35 billion, India can achieve food security only through measured proactive steps.

Interestingly, India was the ninth largest exporter of agricultural products in 2017, and the sector constitutes a share of 13% of total exports of the country.[17] However, incidence of poverty contributes to the persistence of food insecurity at the domestic level. Additionally low nutritional quality of food has led to increase in stunting and wasting of large sections of the population.[18] A historical understanding of the regulatory framework to counter these challenges can help shed light on the reasons behind the government action, which allows for an opportunity to scrutinize them objectively.

2.1 Food Distribution as a Policy: The Why's and How To's for India

Food security has always featured as an important component of the agricultural policy. Regulatory reforms in the sector came about as a measure to counter the disastrous impact of the Bengal Famine of 1943.[19] The Indian public distribution system

[16] Leidwein, A., "Food Security, climate change and IP rights" – WIPO Magazine, 2011. Also note that similar debates have started to ensue in relation to climate resilient plant and seed varieties.

[17] India Brand Equity Foundation Report 2018, "Agriculture in India: Information about Indian agriculture and its importance," (September 2018) available online: https://www.ibef.org/industry/agriculture-india.aspx

[18] *Supra* [*'OECD/ICRIER 2018 Report'*] at fn 10

[19] See Swaminathan, M.S., "From Bengal Famine to Right to Food" The HINDU (February 13, 2013) available online: https://www.thehindu.com/opinion/lead/From-Bengal-Famine-to-Right-to-Food/article12342992.ece; notably post-second world war, food had become crucial for long-term peace and post-war reconstruction globally as well. In 1943, a conference on food and agriculture was convened that led to the institutional development of the UNFAO and eventually the international harmonization of food standards started in earnest through the Codex Alimentarius Commission, a subsidiary body of the FAO and the WHO. See specifically, Drahos, P and Braithwaite, J, (2000) "Ch. 16: Food" in *Global Business Regulation* (Cambridge University Press, England: 2000) at 400.

(PDS) was designed to address the consequent inequality.[20] However, the scheme was found to aid distribution of food grains to urban areas mostly and was later revamped in 1992 to specifically include remote areas of India. The revamped PDS was further replaced by the targeted PDS (TPDS) in 1997. TPDS focused on distribution of food grains to the impoverished in every area – urban and remote – of the country. The categorization was done in terms of the household income, i.e., households below the poverty line (BPL) would constitute the beneficiaries of the scheme. Foodstuffs were made available at subsidized rates for the BPL category.

In order to support the poorest of the poor, in the year 2000, a new scheme Antyodaya Anna Yojana (AAY) introduced further subsidies for the extremely marginalized BPL households. These schemes along with the other welfare schemes (OWS) especially the wheat-based nutrition programme and midday meal provisions were consolidated as a common policy goal. Finally, the 'right to food' as a legal entitlement was incorporated within the newly enacted National Food Security Act (NFSA) in September 2013.[21] The coverage under the NFSA has been delinked from poverty estimates and is based on officially reported consumption expenditure of households.[22] A further change in categorization of beneficiaries distinguished between the priority households (including all BPL and some above the poverty line (APL) beneficiaries) and the AAY households under the TPDS. Each AAY household is entitled to 35 kilogramme of food grains per month, while priority category beneficiaries are entitled to 5 kilograms of grains per person per month. The issue price is fixed as rice, 3 INR; wheat, 2 INR; and coarse grains, 1 INR per kilogramme by the central government, and no price-fluctuations would be experienced for at least 3 years.[23] It has been noted that the issue price has remained unchanged since 2013,[24] but objective reports evaluating the claims of marked improvement in food security at the household level are unavailable.

The aforementioned schemes have been operationalized through the centralized procurement undertaken by the Food Corporation of India (FCI) and the decentralized procurement facilitated by authorized agencies which hold and distribute grains in certain remote regions of the country.[25] The FCI procures food grains from farmers at

[20] Government of India (2017), Department of Food and Public Distribution, Ministry of Consumer Affairs, Food and Public Distribution, "Targeted Public Distribution System," available online: https://dfpd.nic.in/public-distribution.htm

[21] Government of India (2013), Department of Food and Public Distribution, Ministry of Consumer Affairs, Food and Public Distribution, *National Food Security Act*, see https://dfpd.nic.in/LwB3AHIAaQB0AGUAcgBlAGEAZABkAGEAdABhAC8AUABvAHIAdABhAGwALwBNAGEAZwBhAHoAaQBuAGUALwBEAG8AYwB1AG0AZQBuAHQALwA=1_43_1_NFS-Act-English.pdf ['*NFSA 2013*']

[22] The Planning Commission relied on the National Sample Survey Office (NSSO) data on consumption expenditures for the TPDS scheme under the NFSA.

[23] See *supra* ['*OECD/ICRIER 2018 Report'*] at fn 10.

[24] Ibid, ['*OECD/ICRIER 2018 Report'*] at fn 10.

[25] Government of India (2015), Press Information Bureau, Department of Food and Public Distribution, Ministry of Consumer Affairs, Food and Public Distribution, "Decentralized procurement to be encouraged to enhance the efficiency" (December 15, 2015) available online: http://pib.nic.in/newsite/PrintRelease.aspx?relid=133255; for a comparable understanding of the efficiency

the minimum support price (MSP) predetermined by the Cabinet Committee on Economic Affairs based on the recommendations of the Commission for Agricultural Costs and Prices (CACP).[26] These grains are stored and accounted according to operational stocks that are distributed under the TPDS and OWS and the food security stocks that are utilized to meet shortfalls and supply inadequacies.[27] According to the NFSA, changes to the issue price can be made by the central government on the condition that in no event does the issue price exceed the MSP. Also, in order to counter problems of availability due to a lean season or to stabilize market prices, the central government can direct the FCI to release food stock at predetermined minimum issue price in the domestic market under the Open Market Sales Scheme (OMSS) or have State trading enterprises and private agencies export the grains.

Despite these, food security self-sufficiency at the national level remains illusionary due to implementation failure.[28] It is my view that the regulatory framework would be efficient once the relation between the regulation and the risk it seeks to avoid is clearly gauged. Risk posed due to food security can be better tackled when the informational gaps that contribute to the continuity of the social problem are ascertained. An independent body of specific domain experts – a plurality of knowledgeable minds – that can be brought together and funded to study existing data sets as a multi-sectoral problem, identify areas for research, depute teams for data collection, analyse data so collected based on prevalent indices in that discipline, conduct stakeholder consultations and present findings supported by policy prescription for effective implementation and compliance. Such 'openness' in regulatory decision making, can effectuate relevant research to plug the gaps, provide objective evaluation, generate public awareness and build trust in the system through a practicable roadmap for a nourished and healthy India. In essence, failure to effectively distribute can be checked by means of an enforcement structure akin to 'responsive regulation' making agencies accountable for improving the food

of the decentralized procurement system, see also Government of India (2013), Press Information Bureau, Department of Food and Public Distribution, Ministry of Consumer Affairs, Food and Public Distribution, "Center to Encourage Decentralized Procurement" (March 05, 2013) available online: http://pib.nic.in/newsite/PrintRelease.aspx?relid=93033

[26] Government of India (2017), Commission for Agricultural Costs and Prices, Ministry of Agriculture and Farmers Welfare, "Determinants of MSP" available online: https://cacp.dacnet.nic.in/content.aspx?pid=62. The MSP is fixed by considering several factors such as the cost of production, the domestic and international price trends.

[27] Food Corporation of India (2017), see online: http://fci.gov.in/aboutUs.php. The Food Corporation of India was setup under the Food Corporation's Act 1964, in order to fulfill following objectives of the Food Policy: (i) effective price support operations for safeguarding the interests of the farmers, (ii) distribution of food grains throughout the country for public distribution system and (iii) maintaining satisfactory level of operational and buffer stocks of food grains to ensure National Food Security. Since its inception, FCI has played a significant role in India's success in transforming the crisis management-oriented food security into a stable security system.

[28] See The Economic Times, "National Food Security Act not implemented as it should be: Supreme Court" (July 21, 2017) available online: https://economictimes.indiatimes.com/news/politics-and-nation/national-food-security-act-not-implemented-as-it-should-be-supreme-court/articleshow/59702676.cms.

distribution effects.[29] A new policy wing, the National Institution for Transforming India (NITI) or 'Niti Aayog' which came into existence in 2014, is the main body currently undertaking all policy evaluations.[30] Being a government-funded think tank that was institutionalized after replacing the erstwhile Planning Commission instituted in 1950, Niti Aayog may not be considered independent. Effective policy formulation and implementation deserves intermittent and objective evaluation for the purposes of growth and consistency.

2.2 Sustainable Agriculture for Practicable Food Security: The Law and Policy of It

The price of key staples for world food supply will increase 70–90% by 2030, relative to 2010 prices, *before* the effects of climate change.[31] In order to meet the domestic demands of the consumers in 2050, agriculture in India is required to grow annually at nearly 3% to keep pace with the rising populations.[32] One way to ensure such growth is to incentivize adoption of 'sustainable agriculture' as a matter of practice.

[29] See Braithwhite, J., "Responsive regulation and developing economies" World Development, 2005, 34: 884–98; see also Braithwhite, J., "The essence of responsive regulation" University of British Columbia L. Rev., 2011, 44: 475–520; also take note that group of actors united by common regulatory discourse and technical expertise constitute an important 'epistemic community' who can help achieve the goals of regulatory globalization cautiously. See especially, Drahos, P., "Regulatory Globalisation" in Drahos, P ed., *Regulatory Theory, Foundations and Applications* (Australian National University Press, 2017) at 253; for role of experts in ensuring compliance, see also Parker, C and Nielsen, V., "Compliance: 14 Questions" in Drahos, P ed., *Regulatory Theory, Foundations and Applications* (Australian National University Press, 2017) at 229. For a descriptive understanding of empirical work undertaken for developing regulatory frameworks, see especially, Henne, K., "Multi-sited fieldwork in regulatory studies" in Drahos, P ed., *Regulatory Theory, Foundations and Applications* (Australian National University Press, 2017) at 97.

[30] See National Institution for Transforming India (NITI Aayog) http://niti.gov.in/ – The government of India, in keeping with its reform agenda, constituted the NITI Aayog to replace the Planning Commission. This was done in order to better serve the needs and aspirations of the people of India. An important evolutionary change from the past, NITI Aayog acts as the quintessential platform of the government of India to bring States to act together in national interest and thereby fosters cooperative federalism.

[31] Bailey, R., Oxfam International Report on "Growing a Better Future: Food justice in a resource-constrained world" (May 31, 2011) at 6, 12

[32] National Academy of Agricultural Research Management, NAARM Vision 2050, Indian Council of Agricultural Research, available online: https://naarm.org.in/publications/naarm-vision-2050/. Definitional description of sustainable agriculture at the international level includes, 'the *management and conservation of the natural resource base*, and the orientation of technological change in such a manner as to ensure the attainment of *continued satisfaction of human needs for present and future generations'*. See UN FAO, "Building a common vision for sustainable food and agriculture: Principles and approaches"(2014) available online: http://www.fao.org/3/a-i3940e.pdf. Ideally, sustainable food systems would entail the following important components: (i) viable food economy for farmers and producers; (ii) accessibility and affordability for consumers; (iii) nutritious, healthy and wholesome food; (iv) sound environmental stewardship; (v) cultural heritage and customs evolving within communities; (vi) effective use of technology; and (vii) clear distinction between sustainability from organic.

The 'successful management of resources for agriculture, to satisfy the changing human need while maintaining ecological balance by avoiding depletion of natural resources' is referred to as 'sustainable agriculture' in India.[33] Building sustainable food systems has been undertaken as part of the National Mission for Sustainable Agriculture (NMSA), which is one of the eight missions introduced under the National Action Plan on Climate Change (NAPCC) by the government on June 30, 2008.[34] It focuses on four main areas, namely, (i) dryland agriculture, (ii) risk management, (iii) access to information and (iv) use of biotechnology.[35] The aim is to make appropriate adaptation and mitigation strategies for combating climate change-related effects on Indian agriculture and thereby warranting food security and enhancing ecological sustainability. Integrated farming practices and agroforestry techniques are detailed in operational guidelines and are to be monitored through progress reports periodically. While the aims of the mission are noble and can contribute towards knowledge sharing of sustainable practices, there is no express compliance requirement for it. Thus the mission may be understood as a *nudge* towards adopting sustainable agriculture.[36] With increased stakeholder engagement at the grass-root level, it could very well transform into an effective responsive regulation qualified with appropriate mandates and deliverables in the longer run.

A conjoint reading of Articles 39, 43 and 47 which feature as Part IV of the Indian Constitution denoting the *Directive Principles of State Policy* recognizes the 'right to adequate food' as a legislative mandate.[37] Accordingly, all citizens have the right to adequate means of livelihood, for which the State shall endeavour to provide a decent standard of life for everyone and raise levels of nutrition and improve public health as among its primary duty. Furthermore, India became State party to the International Covenant on Economic, Social and Cultural Rights (ICESCR) in 1979 by way of accession – recognizing everyone has a right to […] be free of hunger.[38] It is also

[33] See National Mission for Sustainable Agriculture (NMSA), available online: https://nmsa.dac.gov.in/

[34] See Department of Science and Technology, "Climate Change Programme" available online http://www.dst.gov.in/climate-change-programme; see also Yasmin, S and Sheikh, M.A., "Sustainable Agriculture: A Legal Perspective," International Journal of Socio-Legal Analysis and Rural Development L. Vol. 2 No. 1, 125, 126 (2016).

[35] *Id* at 128

[36] See Thaler, R and Sunstein, C, *Nudge, Improving Decisions About Health, Wealth and Happiness* (Yale University Press, 2008); for a general understanding of what constitutes a nudge success, see Kosters, M and van der Heijden, J, "From mechanism to virtue: Evaluating Nudge Theory" in Evaluation 21:276–91; note that awareness of the benefits of nudges can allow freedom to alter behaviour as opposed to addressing digression through command and control. For a critique on consumer choices shaped through nudges from supermarkets, see Drahos, P and Krygier, M., "Regulations, Institutions and Networks" in Drahos, P ed., *Regulatory Theory, Foundations and Applications* (Australian National University Press, 2017) at 1.

[37] For text of Articles 39, 43 and 47 of the Indian Constitution, see online https://www.india.gov.in/sites/upload_files/npi/files/coi_part_full.pdf at p. 21, 22 and 23, respectively.

[38] Article 11 of ICESCR, 1966

obligated as a signatory to the Universal Declaration of Human Rights (UDHR) to take measures so that 'everyone has a right to standard of living adequate for the health and well-being […] including food, clothing, medical care and necessary social services'.[39] With 48% of children under the age of 5 being stunted, 43% being underweight and 7 out of every 10 children between 6 and 59 months are reported anaemic,[40] India is challenged with a crisis of malnourishment and requires strategic action. Sustainable agriculture may well be the path for India to confer food security in a practicable way by minimizing social inequality and poverty[41] through sustained State action.

2.3 Regulatory Aims, Efforts and Challenges

Institutional credit to the agriculture sector is targeted at Rs. 11 lakh crores (~ US$ 172.93 billion) for 2018–2019 in the Union Budget.[42] The total allocation for the rural, agriculture and allied sectors in 2017–2018 – Rs. 1,87,223 crores, which is

[39] Article 25 of UDHR, 1948

[40] See especially, Grebmer, K et al., "2017 Global Hunger Index – The Inequalities of hunger" International Food Policy Research Institute (IFPRI) publication at 12, available online: http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/131422/filename/131628.pdf (See Table 2.1 at 13 – "At 31.4 India's 2017 GHI score is at the high end of the serious category" at 12); also see The MINT, "The fuzzy numbers on child malnutrition" (October 14, 2014) available online https://www.livemint.com/Opinion/bgIJC0LykMr6iwAYSUfMNJ/The-fuzzy-numbers-on-child-malnutrition.html that discusses the India case study and the pervasive problem of malnutrition since 2004 to 2014; also, for press reports on alarming food insecurity and the slow improvement, with India ranking 55th out of 76 nations in the Global Hunger Index in 2014, see BusinessLine, "India moves up 8 places on Global Hunger Index" (October 29, 2014) available online: https://www.thehindubusinessline.com/economy/India-moves-up-8-places-on-Global-Hunger-Index/article20898587.ece; the depth of food deficit (kilocalories per person per day) estimates has been staggering over the years with almost 20 crore (~200 million) people being undernourished in India. See FAO/STAT (March 16, 2017) available online: https://data.worldbank.org/indicator/SN.ITK.DFCT; see also 2018 SOFI Report: http://www.fao.org/state-of-food-security-nutrition/en/; for an understanding of the impact of natural disaster induced hunger and their economic consequences, see Gordon, K.P., The Chilean Protein Problem: A Case Study (Cornell University, 1975); see also ['Hunger Games'] supra n. 1. The children of women born just before the Great Leap Forward famine in China or the 1960 earthquake in Chile – that periods of severe undernourishment during childhood often damage the health of one's offspring born decades later.

[41] See Sen, A., *Poverty and Famines: An Essay on Entitlement and Deprivation* (Oxford University Press, 1983) at 257. As key contributor to the associated risks of non-communicable diseases, poverty creates greater social inequality due to inability to access adequate food and essential healthcare; see also Reutlinger, S and Selowsky, M., "Malnutrition and Poverty: Magnitude and Policy Options", World Bank Staff Occasional Paper No. 23 (1976) for underlying determinants of hunger.

[42] India Brand Equity Foundation, Highlights of the Union Budget 2018–2019, available online: https://www.ibef.org/economy/union-budget-2018-19. It is noteworthy that the budget 2017 targeted Rs 10 lakh crores (~ US$157.2 billion) for agricultural credit in 2017–2018.

24% higher than the previous year.[43] The interlinked challenges of production, equity and resilience need thorough systemic reform so that the future will not be one of zero-sum competition between States, resource grabs by powerful elites and ecological collapse. In that light, building a sustainable bio-economy expects that disciplines of science, law and policy intertwine and help identify a nexus between food, health and climate justice especially to close prevailing inequalities between developing agrarian economies such as India, and other developed economies.

The following sections discuss regulatory aims, efforts and challenges posed to the Indian government followed by suggestions for a possible way forward.

2.3.1 UNFAO CPF for India: New Aspirations for Zero Hunger

The UNFAO Country Programming Framework (CPF) for India envisions a strong involvement from national stakeholders, both the private and the government sector.[44] The main policy-making wing of the government, NITI Aayog's 7 year National Development Agenda, the medium-term 3 Year Action Agenda as well as the Union Budget contain overarching framework for the agriculture sector and enhancing farmers' income and wellbeing in the main.[45] The aim is to double the farmers' income in a period of 5 years by effectuating efficient solutions and ensuring equity in a sustainable manner.[46] Since the IFPRI Global Hunger Index in 2014, India has focused on community development as a means for capacity building. As per the 2015–2017 CPF, '[t]he areas that [will be]… prioritised are sustainable agricultural development, food and nutritional security, transboundary cooperation that includes India's contribution to global public goods… and climate change as cross-cutting issues wherever they are applicable'.

In order to combat climate change, the goal for UNFAO and India is to *increase the community capacities to adapt farming patterns* by applying strategies that will help minimize the effects of climate change in India.[47] Furthermore, newer schemes for knowledge sharing through digital networks (e-Krishi Samvad) have been introduced in May 2017,[48] similar projects for improved access to irrigation

[43] The Indian agriculture sector includes – agriculture (Agriculture proper & Livestock), forestry and logging, fishing and related activities. The Indian agriculture and allied sector contributes 17.32% of the gross value added (GVA), which was around Rs 23.82 lakh crore INR in 2016–2017. See The Central Statistics Office, India (updated as on November 2017). See also source: Ministry of Statistics and Programme Implementation, Planning Commission of the government of India, http://statisticstimes.com/economy/sectorwise-gdp-contribution-of-india.php

[44] See UNFAO India CPF, 2018 available online: http://www.fao.org/india/programmes-and-projects/en/

[45] Ibid.

[46] See Agenda 2017–2018 – "Transform, Energise and Clean India" https://www.indiabudget.gov.in/budget2017-2018/ub2017-18/bh/bh1.pdf

[47] UN FAO India CFP, 2015–17

[48] It is noteworthy to mention the 'Digital India' initiative (http://www.digitalindia.gov.in/) which aims to make India a digitally empowered society and knowledge economy; for understanding of Smart regulation, Gunningham, N and Sinclair, D., "Smart Regulation" in Drahos, P ed., *Regulatory*

(Pradhanmantri Gram Sinchai Yojna (PGSY)) implemented, and farmers motivated to adopt sustainable and organic farming (*Paramparagat Krishi Vikas Yojna* (PKVY)). Moreover, to improve sales of the agricultural produce and allow for network benefits among farmers, all Agriculture Produce Marketing Committees were unified to create an Electronic National Agricultural Market (eNAM) in April 2016.

3 Agroecological Practices Versus IP-Centred Industrial Model

Increased drought, soil salinity, pests and disease, adaptation to climate change in many agricultural regions may require stress-tolerant plant varieties. Thus genetic engineering and plant breeding as an approach for increasing the availability and adequacy of global food supplies has become prevalent. IP privileges can help attract investment in R&D of new plant varieties (PV) that would enable adaptation. Recognizing a market opportunity, companies have begun marketing GM plants that are tolerant to a variety of stress factors such as abscisic acid, which is a hormone that regulates plant growth, discovered in 2009 under the Bayer Climate Program.[49]

While IP is often considered necessary for innovation, it is my view that it is never sufficient by itself to catalyse it. A competitive environment is quite necessary as well. Otherwise, over time any monopolist would have fewer incentives to innovate further[50] and may abuse the IP privilege. On that note, I look at the possible impact of adopting IP-centred agriculture instead of the sustainable alternative.

Theory, Foundations and Applications (Australian National University Press, 2017) at 133; see also Gunningham, N and Grabosky, P., *Smart Regulation. Designing Environmental Policy* (Oxford: Oxford University Press,) pp. 5–19.

[49] Bayer Climate Program, "Climate Protection and adaptation to climate change" available online, www.Climate.bayer.com/en/stress-tolerant-plants.aspx

[50] See Arrow, K (1962) "Economic welfare and the allocation of resources for invention" in Nelson, R. ed., *The Rate and Direction of Inventive Activity*, Princeton University Press, 1962, pp. 609–25. Also note that new theoretical models that have offered to test the Schumpeterian hypothesis (concentrated markets provide an innovative environment) in certain product markets while complimenting the Arrowian view have noted that the positive effects of market competition on innovative activity when competition is not intense is significant, whereas intense competition may reduce the reward for innovation thereby reducing the incentive to innovate. Therefore, a mere IP like exclusivity is insufficient. The relationship between product market competition, especially in labor-intensive sectors such as agriculture, and the price-cost margin measurement (e.g. by means of Lerner's index) will not be stable. This is characteristic of agriculture markets in countries such as India and China. For reference, see especially, Aghion, P., Burgess, R., Redding, S and Zilibotti, F (2003), "The Unequal Effects of Liberalization: Theory and

Evidence from India" available online: http://econ.lse.ac.uk/staff/rburgess/wp/abrz031002.pdf.

3.1 Impact of Adopting Proprietary Plants and Seeds: An Overview

Instant or current impact	Long-term impact
Supra-competitive returns for many years along with yield improvements	*At the expense of biological diversity as herbicides and pesticides are sprayed over genetically altered crops*
Short-term bump in yield, pressures other farmers to adopt it as well as to compete in the short term	*Dependent on fertilisers and are water-intensive*
Slow the adoption of approved but environmentally (unsound) technologies, e.g. technologies such as GM seeds, synthetic fertilisers and pesticides and purchase of economically costly staples	*Erosion of indigenous knowledge – such as manuring and compost for soil replenishment*
Rapid price escalation	*Excessive pricing has been observed and fined*

Dependency on high-tech seeds by farmers in India, due to the instant gains, has been historically evidenced.[51] They have in turn added to the regulatory woes while governing food security in India.

3.1.1 Capitalism and Competition Concerns

There exists high degree of concentration in the agriculture sector on a global scale. China National Chemical Corporation acquiring Syngenta,[52] and more recently Bayer, the world's second largest agro-chemicals concern, taking over Monsanto, which is the world's largest Seed and Genomics Company exemplify it.[53] Reportedly,

[51] See Ministry of Agriculture, "Cultivation of Genetically Modified Food Crops: Prospects and Effects" New Delhi, Loksabha Secretariat, 2012 ['*The Acharya Report*']; see also Tripathy, S and Rosencrantz, A., "Climate impacts food security and health" (March 25, 2018) The Statesman *supra* n.13 – [l]ow-cost or subsidized chemical-intensive farming has led to the depletion of traditional manuring practices that are a sustainable alternative. For a long-term solution to the problem, incentivizing traditional agricultural practices with resource management through a decentralized participatory approach needs to be adopted. Self-government authorities, namely, the Village Panchayats and the Gram Sabhas, can help with data collection at the grassroots level so as to comprehend the risks and uncertainties in their completeness. Otherwise, such glaring evidence gaps can lead to incorrect health narratives and polarize public debate on what should constitute as sustainable food system, without offering alternative workable solutions best suited for the Indian population.

[52] See Media Release on the ChemChina Syngenta acquisition, "Syngenta shareholders accept ChemChina Offer" (May 05, 2017) available online https://www.syngenta.com/media/media-releases/yr-2017/05-05-2017; see also Press release on the DowChemicals and DuPont 'Merger of Equals,' "DowDupont Merger Successfully Completed" (Sept 01, 2017) available online https://www.dow.com/en-us/news/press-releases/dowdupont-merger-successfully-completed

[53] See News Release on the Bayer Monsanto Acquisition, "Bayer Closes Monsanto Acquisition" (June 07, 2018) available online https://monsanto.com/news-releases/bayer-closes-monsanto-acquisition/

DuPont, Limagrain, Monsanto and Syngenta control over 50% of global seed sales, and three firms, Archer Daniels Midland, Bunge and Cargill, control 90% of global grain trade.[54] Incidences of anticompetitive behaviour and wilfully subverting operation of free markets have been proven to cause inflated prices to purchasers or depressed prices to suppliers in several markets.[55] These instances have severe negative effects on food security.

Increasing number of farmer suicides and poor seed sector governance are interlinked in India.[56] The average farmer grapples with concerns related to income as well as basic livelihood, and these factors are magnified with further concentration through mergers and acquisitions. The fear that the acquisitions would further limit the number of sellers of seeds, chemicals, machinery and equipment from whom they have to buy, and also limit the number of customers for crops and livestock to whom they can sell, is pervasive. Thus, much depends on the government action through responsive regulation that will alleviate these fears by reforming systems that play the crucial role in reinvigorating the whole demand-supply affecting the agricultural produce in India.

3.1.2 Seed Regulation and GMOs in India

Crops involving the introgression of certain genes of *Bacillus thuringiensis* (naturally occurring bacteria) commonly referred to as Bt technology altered crops have been particularly controversial in India. Let us take the example of Monsanto, which was able to enter the Indian seed market due to the 1988 Seed Policy imposed by the World Bank,[57] requiring the government to deregulate the seed sector in favour of private players. This

[54] Bailey, R., Oxfam International Report on "Growing a Better Future: Food justice in a resource-constrained world" (May 31, 2011) at 6; see also "Global Seeds Business Market 2015–2022: Monsanto, DuPont, and Syngenta Leading Seed Companies Worldwide" (June 26, 2018) available online: https://www.prnewswire.com/news-releases/global-seeds-business-market-2015-2022-monsanto-dupont-and-syngenta-leading-seed-companies-worldwide-300672455.html; for detailed analysis with seed company profiles, see Research and Markets, "Seeds – Global Strategic Business Report" (April 2018) available online: https://www.researchandmarkets.com/research/8zmc4z/global_seeds?w=5

[55] The practices include abuse of patented seed technologies, price-fixing, the allocation of customers, etc. that have resulted in antitrust scrutiny and even fines and criminal charges in the USA. For detailed reference on the US episodes, see, Tuncak, B, "The 'new normal': Food, Climate Change and Intellectual Property" in Brown, A ed., Environmental Technologies, Intellectual Property and Climate Change (Edward Elgar, 2013) at 233.

[56] See generally, Tripathy, S and Rosencrantz, A., "Climate impacts food security and health" (March 25, 2018) The Statesman *supra* n.15 – farmer suicides in India have been frequently associated with cotton farming, a non-food agricultural commodity that has been severely affected due to the pricing strategies and market practices of corporate conglomerate Monsanto. Monsanto's required annual repurchase of its "super-seeds" forces the farmer-purchasers of these seeds to incur unsustainable debt, leading to thousands of farmer suicides over the years; see also Gruère G and Sengupta D, 'Bt Cotton and Farmer suicides in India: an evidence-based assessment" J Dev Stud. 2011; 47(2):316–37; see also Merriott D. "Factors associated with the Farmer suicide crisis in India" J Epidemiol Glob Health. 2016 Dec; 6(4):217–227. Epub 2016 Apr 11.

[57] New Policy on Seed Development, 1988 (September 16, 1988) available online: https://seednet.gov.in/PDFFILES/NEW_POLICY_NPSD.pdf

seed policy resulted in Indian companies being locked into joint ventures with Monsanto. Eventually, the 'common heritage principle – promotion of free exchange of seeds amongst farmers' was replaced with the corporate's dominance as the IP right holder, and open pollinated seeds came to be replaced by hybrids in the market.[58] Cotton now had to be cultivated as a monoculture, and this increased vulnerability to pests, disease and drought and crop failure.[59] A stark increase in pesticide use on farms was noted.[60] Eventually the bollworm became Bt resistant.[61] However, Monsanto continued to push public resources to make the genetically modified seeds through public-private partnerships.[62]

The world's largest cotton producer and second-biggest cotton exporter, next only to China,[63] the India case study on food regulations requires an understanding of the Bt cotton controversy, typically as a top-down approach with grave consequences. The field trials for Bt cotton were not done in accordance to the legal procedure and were in violation of the Environment Protection Act at the time. The unauthorized large-scale, multicentric, open-field trials of Bt cotton in 40 locations spread across 9 States in India,[64] while initializing crops to GM technology has been

[58] For reference on protection for new varieties and hybrids, see Ramanna, A and Smale, M., "Rights and access to plant genetic resources under India's New Law" Dev Pol Rev. 2004; 22(4) 423–42; See Peschard, K., "Farmers' Rights and Food Sovereignty: Critical Insights from India" J. Peasant Stud 2014: 1085–1108.

[59] Ho, MW., "Farmer suicides and Bt cotton nightmare unfolding in India," Science in Society, 2010 http://www.i-sis.org.uk/farmersSuicidesBtCottonIndia.php

[60] Shiva, V., "Introduction" in Shiva V, Barker, D and Lockhart, C eds., *The GMO Emperor Has No Clothes: A Global Citizen's Report on the State of GMOs* (New Delhi: Navdanya, 2010), 11 to 26. See also Thomas, G and Tavernier, J-D., "Farmer-suicide in India: debating the role of biotechnology" Life Sci Soc Policy, 13:8, 2017. The practice of monoculture, increased chemical fertilization, rising resistance of bollworms, new pests and the destruction of predator species that control pests were responsible for pest-proneness in Bt cotton. As a result a 13-fold hike in pesticide use in comparison to the pre-Bt cotton era.

[61] See Cummins, J., "No Bt Resistance?" Science in Society 20, 34–35, 2003; see Kalaspurkar, R., "Deadly gift from Monsanto to India" Science in Society38, 51, 2008; see also Ho, MW., "Mealy Bug Plagues Bt Cotton fields in India and Pakistan" Science in Society 45, 2010.

[62] Shiva, V., "Monsanto in India- A Story of Corruption, Biopiracy, Seed Monopoly and Farmers' Suicides" in Shiva V, Barker, D and Lockhart, C eds., *The GMO Emperor Has No Clothes: A Global Citizen's Report on the State of GMOs* (New Delhi: Navdanya, 2010), 143–185.

[63] See Times of India "Cotton exports likely to jump 43% in 2018–2019" (June 14, 2018) available online: https://timesofindia.indiatimes.com/business/india-business/cotton-exports-likely-to-jump-43-in-2018-19/articleshow/64586372.cms. India's cotton exports are expected to jump 43% to 10 million bales (of 170 kilograms each) in the 2018–2019 marketing year on strong overseas demand, especially from China, according to industry body Cotton Association of India (CAI).

[64] The Biosafety Framework of India calls for prior authorization from the Genetic Engineering Appraisal Committee (GEAC) of the Department of Environment Forests and Wildlife (now Ministry of Environment Forests and Climate Change), for conducting any trials related to GMO in India. See Article 4 of the Biosafety Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro Organisms, Genetically Engineered Organisms or Cells (notified under the Environmental Protection Act, 1986) available online: http://www.geacindia.gov.in/acts-and-rules.aspx; for information on GEAC, see specifically, the Institutional Biosafety Committee u/Article 4 (3) (1) on Competent Authorities, http://www.geacindia.gov.in/resource-documents/biosafety-regulations/acts-and-rules/Rules-for-the-manufacture-use-import-export-and-storage-1989.pdf

criticized as regulatory failure.[65] The contamination due to the trials is said to have severely compromised food safety by negatively impacting the entire food chain and overall health of consumers in India.[66]

Monsanto violated the Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro-organisms, Genetically Engineered Organisms or Cells, 1989 (notified under the Environment Protection Act, 1986),[67] by failing to seek approvals from the authorized government body, namely, the Genetic Engineering Appraisal Committee (GEAC) prior to importing over 100 grams of cottonseeds containing the MON531-Bt gene into India through its Indian subsidiary company, Mahyco, in 1995 for conducting the large-scale open-field trials.[68]

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[65] See Ramaswamy, B et al., "The spread of illegal transgenic cotton varieties in India: Biosafety regulation, monopoly and enforcement" World Dev. 2012, 40(1):177–88; See opposing view, Herring, R., "Why did 'operation cremate Monsanto' fail? Science and class in India's great terminator-technology hoax" Crit Asian Stud 2006; 38(4): 467–93; see Herring, R., "State Science, Risk and Agricultural Biotechnology: Bt Cotton to Bt Brinjal in India" J Peasant Stud 2015, 42(1) 159–86 (Monsanto gained from an advantaged market position thanks to India's bio-safety regulations and not due to monopoly in seed sector.)

[66] Shiva, V., "The Seeds of Suicide: How Monsanto destroys Farming" available online http://www.globalresearch.ca/the-seeds-of-suicide-how-monsanto-destroys-farming/5329947; some discussion on the successful adoption of technology also exists. For instance, Keith Kloor views differently from Vandana Shiva; "Bt cotton has been all the rage in India since it was officially approved in 2002. The technology has been adopted by over 90% of Indian cotton farmers. Multiple studies point to significant reduction in pesticide spraying and subsequent cost savings for cotton farmers. India has harvested an average of 5.1 million tons of cotton per year, which is well above the highest production of 3 million tons before the introduction of Bt cotton". See Kloor, K., "The GMO-Suicide Myth." Issues in Science and Technology 30, no. 2 (Winter 2014). Note that similar findings attest to the same in China, where Bt cotton accounts for 80% of its crop. See for example, Lang, S., "Seven year glitch: Cornell warns that Chinese Bt Cotton farmers are losing money due to 'secondary' pests" ChronicleOnline Cornell University (25 July 2006) http://news.cornell.edu/stories/2006/07/bt-cotton-china-fails-reap-profit-after-seven-years See especially, Ho, MW., "Farmer suicides and Bt cotton nightmare unfolding in India," Science in Society, 2010 http://www.i-sis.org.uk/farmersSuicidesBtCottonIndia.php (China was initially held up as the success story on Bt cotton […]. It first granted permission to Monsanto to grow the crop in 1997, and for the first several years reported great reductions in the use of pesticides. Early warnings appeared in a study published in 2002 by researchers at an institute funded by China's Environmental Protection Agency. It found that although Bt cotton was effective in controlling bollworm, it had adverse impacts on the bollworm's natural enemies and was not effective in controlling many secondary pests. A second study published in October 2004 found that Bt cotton did not reduce the total numbers of insecticide sprays because additional sprays were needed against sucking pests. A study of 481 Chinese farmers by researchers at the Cornell University released in 2006 reported that after 7 years, populations of other insects such as mirids have increased so much that farmers have had to spray their crops up to 20 times a growing season). For similar discussion in regards to Indonesia and United States as well, see Gala, RM., "GM Cotton Fiascos around the world" Science in Society 26–27 (2005).

[67] See Article 7 on Approvals and Prohibitions in the Biosafety Rules, http://www.geacindia.gov.in/resource-documents/biosafety-regulations/acts-and-rules/Rules-for-the-manufacture-use-import-export-and-storage-1989.pdf

[68] Mahyco, a Monsanto joint-venture had obtained permission for small controlled trials from the Review Committee of Genetic Manipulation (RCGM) under the Department of Biotechnology. The RCGM is a body that monitors the safety of on-going research projects and activities involv-

These field trials were conducted without following the evaluation protocol and exposed the environment to biosafety risks and genetic pollution. Further no postharvest management of transgenic plants or disposal precautions as required by the Biosafety Guidelines, 1994, was observed.[69] The infected fields were replanted with food crops in less than a year, and the food chain was irreversibly plagued by GMOs that were unverified and potentially unsafe for both health and environment. The integrity of the genetic engineering regulatory procedures was questioned by a public interest litigation (PIL) filed before the Supreme Court of India in 1999.[70] This led to a temporary ban on the field trials until the GEAC could satisfactorily confirm that the safety to human health and environment was guaranteed.

Meanwhile, former US President Bill Clinton's India visit in March 2000 culminated on a high note, when despite the pending PIL Monsanto's Bt cotton was handed the necessary biosafety approval by the Department of Biotechnology (DBT). Furthermore the procedural rules were amended such that the RCGM under DBT was now empowered to approve multilocational small-scale field trials for a total of 20 acres up to 1 acre each.[71] A classic case of regulatory capitalism in action,[72] Monsanto's transgenic seeds found their way into the Indian farms despite several pending trials at the time and eventually replaced indigenous cultivars with hybrids as a result of self-pollination.[73] Easy provisions of micro-credits from local banks and at times distribution of free samples for initial plantation were incentives designed to establish Monsanto's seed sales in India. Thus farmers became GM seed-dependent and incurred debt to overcome increasing input costs of seed purchase, water and pesticides. Low yield or at times no returns resulted in severe life

ing GMOs by prescribing guidelines specifying the regulatory procedure while conducting high-risk and controlled field experiments (lab research) with them. Its mandate is to review the compliance of such guidelines from a safety standpoint. It is not the authorized body for approvals for large-scale experiments and importation concerning GMOs. For information on RCGM, see specifically, Article 4 (2) on Competent Authorities ["Biosafety Rules"]

[69] Shiva, V., "Seed Satyagrah: A Movement for Farmers' Rights and Freedoms in a World of Intellectual Property Rights, Globalized Agriculture and Biotechnology" in Tokar, B., *Redesigning Life?: The Worldwide challenge to Genetic Engineering* (McGill-Queen's University Press, Montreal, 2001) at 355.

[70] Research Foundation for Science and Technology v. Union of India, filed on January 06, 1999; See especially, Kumar, S et al., "The legal battle over field trials of GM crops" *Nature* (January 31, 2014) available online: https://www.natureasia.com/en/nindia/article/10.1038/nindia.2014.14

[71] Damodaran, A., "Re-engineering biosafety regulations in India: Towards a critique of policy, law and prescriptions" Law Environ Dev Journal, 2005 1(1):1–20.

[72] Regulatory Capitalism refers to a trend that demonstrates how the pursuit of capitalistic growth often gives rise to more regulation and bureaucracy. See Levi-Faur, D, "The Global Diffusion of Regulatory Capitalism," Annals of the American Academy of Political and Social Science, 598:12–32 (2005).

[73] See Shiva, V., "25 Years of Bija Swaraj" in Shiva V et al eds, *Seed Freedom: A Global Citizen Report by Navdanya* (New Delhi: Navdanya, 2012), 57–85; see also Scoones, I., *Contentious Politics, Contentious Knowledges: Mobilising Against GM Crops in India, South Africa and Brazil* (Sussex: Institute of Development Studies, 2005). *Bija Panchayat* or Seed Tribunals were especially set up in 2000 in Indian villages for conducting hearings against Monsanto before jury comprising of village heads and farmers.

stresses for farmers in several regions of agrarian India. Overtime the Bt cotton production significantly declined causing an uproar of identity politics and public outcry.

3.1.3 Litigation Concerning Ag-Biotech (Gene) Patents in India

Monsanto was granted patent on second-generation Bt gene technology (licensed under the trademark Bollgard II variety), which increases resistance of the cotton seeds against the bollworm, a pest of the lepidopteran species on March 20, 2009.[74] Mahyco Monsanto Biotech (India) Ltd., a joint venture company, issued sublicenses to Indian breeders and seed companies to develop varieties introgressed with Bt gene technology.[75] The breeders would pay a technology licensing fee to Monsanto and sell the genetically modified seed varieties to farmers, who were charged retail prices. Without any patent on the first generation of the Bt gene technology, Monsanto had to lower the technology licensing fee for the breeders to enjoy benefits of market entry. However, Monsanto was found to be charging excessively for its patented version of the technology later.[76] With the retail price of the seeds escalating, the State governments passed price control legislation to ensure seed affordability.[77] To sidestep these regulatory hurdles, Monsanto proceeded with filing a patent for the second-generation Bt gene technology and was granted exclusive rights to commercialize and price it for specified period of 20 years. The breeders were now paying higher royalty accounting for the 'trait value' and 'technology license fees', and subsequently profits from sale of seeds were unstable due to the State law. Thus conflicts arose. Non-payment of royalty by the eight Indian seed companies (or breeders) led to the termination of their license agreements. Series of arbitration proceedings[78] and patent infringement suits[79] were also instituted by Monsanto. The Indian seed companies led by Nuziveedu Seeds Limited have countered the court action by questioning the validity of Monsanto's patent and the legal basis for charging royalty rates that are higher than the government fixed rate under the Cotton Seeds Price Control

[74] See Indian patent 232681 claim description available online: http://www.allindianpatents.com/patents/232681-cotton-event-mon15985-and-compositions-and-methods-for-detection. It draws priority from US 60/297, 406 for the 'Cotton event Mon 15985 and compositions and methods for detection.

[75] For understanding of the Plant Varieties Protection Regime in India, and the infringement action under the Act, see Chap. 16 of this book by Lakshmikumaran, M.

[76] See Overwalle, G and Dycke, L., "Genetically Modified Crops and Intellectual Property Laws: Interpreting Indian Patents on Bt Cotton in View of the Socio-Political Background, 8 (2017) JIPITEC 151.

[77] For instance, see The Andhra Pradesh Cotton Seeds (Regulation of Supply, Distribution, Sale and Fixation of Sale Price) Act, 2007 (Act No. 29 of 2007).

[78] See Monsanto's arbitration proceedings before Bombay HC discussed generally by Reddy, P., "Delhi High Court Declines to Grant Monsanto an Interim Injunction in Dispute with Nuziveedu" *SpicyIP* (March 29, 2017) available online: https://spicyip.com/2017/03/delhi-high-court-rules-declines-to-grant-monsanto-an-interim-injunction-in-dispute-with-nuziveedu.html

[79] Monsanto v Nuziveedu Seeds Ltd. (Delhi HC) decided on March 28, 2017 by Single Judge R. K Gauba. Order available online: http://lobis.nic.in/ddir/dhc/RKG/judgement/28-03-2017/RKG28032017IA24062016.pdf

Order (CSPCO), 2015.[80] The single judge of the Delhi High Court held the patent to be prima facie valid but directed that the royalty rate be aligned to the CSPCO[81] rate. An appeal was preferred, and the Division bench of the High Court summarily held that Monsanto's invention was ineligible under Section 3(j) of the Indian Patent Act, 1970. The provision, that excludes plants from patent eligibility in India.[82] This decision was appealed before the Apex Court.

Meanwhile, several attempts at fixing the licensing fee through specialized price control orders for regulating the cotton seed industry nationally has been made. These include: appeal for standardization,[83] and seeking enhancement in the supply of the patented technology through applications for compulsory licensing.[84]

On May 18, 2016 a new set of licensing and formats for GM technology agreements guidelines were issued with a fixed rate of royalty.[85] These guidelines required Monsanto's Bollgard II to be considered as a 'standard essential patent,' thereby stating among other things that 'all patentees of GM technology [are] to offer technology on fair, reasonable and non-discriminatory (FRAND) basis to any seed company willing to pay Monsanto, a government mandated royalty'. Drafted under clause 5(8) of the CSPCO,[86] these guidelines were later withdrawn as they were held to be ultra vires the scope of the Essential Commodities Act, 1955.

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[80] Ibid, at *paras* 17 and 18 discussing the defendants written statements

[81] Gazette Notification No. G.S.R.936 (E) dated December 7, 2015, under Section 3 of the Essential Commodities Act, 1955. Legislation used to control the royalty or licensing fee for the use of a patent or for technology transfer. The legislation vests in the government, powers to control the prices of a wide range of essential commodities such as drugs, food crops, sugar, foodstuffs, etc. for the purpose of securing the "equitable distribution and availability of these commodities at fair prices or for maintaining or increasing supplies of the same." For the text of the Legislation, see: https://consumeraffairs.nic.in/consumer/sites/default/files/userfiles/ecact1955.pdf

[82] Monsanto v Nuziveedu Seeds Ltd. (Delhi HC, Division Bench) decided on March 09, 2018 by the Division Bench of Justices Rohinton Nariman and Navin Sinha. See also DB Order dated May 08, 2017, available online: http://delhihighcourt.nic.in/dhcqrydisp_o.asp?pn=98458&yr=2017

[83] See generally, Fernandes, V., "Why is Prabhakar Rao of Nuziveedu Seeds fond of FRAND licensing?" (Dec 17, 2015) available online: http://www.smartindianagriculture.in/why-is-prabhakar-rao-of-nuziveedu-seeds-fond-of-frand-licensing/to be read with Vacca, R, Cole, BM and Brent, BJ., "Food for Thought: Genetically Modified Seeds as De Facto Standard Essential Patents" (March 12, 2014) 85 University of Colorado Law Rev. 313 (2014); U of Akron Legal Studies Research Paper No 13-7, available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2245887 for assertion related to GM Seeds as standard essential patents; For understanding of Standard Essential Patents and FRAND Licensing generally, see Chap. 5 of this conference volume by Dhar, B on India's technology industry.

[84] For understanding of compulsory licensing as a part of the patent policy generally, see Chap. 12 of this volume by Racherla, U.S., "The Historical Evolution in Patenting in the Indian Pharmaceutical Industry and Its Impact on Innovation."

[85] Ministry of Agriculture Notification u/clause 5(8) of CSPCO (May 18, 2016) "Licensing and Formats for GM technology Agreements Guidelines, 2016" [*The 2016 Guidelines*]

[86] The *'CSPCO'* derives its authority from the Essential Commodities Act, 1955. Legislation used to control the royalty or licensing fee for the use of a patent or for technology transfer. The legislation vests in the government, powers to control the prices of a wide range of essential commodities such as drugs, food crops, sugar, foodstuffs, etc. for the purpose of securing the "equitable distribu-

To add to the fiasco, State government of Andhra Pradesh and the Department of Industrial Policy and Promotion (DIPP), which functions under the Ministry of Commerce and Industry, sought for outright revocation of Monsanto's patent, on the grounds of it being mischievous and prejudicial to public interest (Section 66 of the Indian Patent Act, 1970).[87] Furthermore, the State government of Andhra Pradesh urged that the central government invoke powers under Section 92 of the Patent Act and issue a compulsory license for making Monsanto's seed available at reasonable prices, as it was charging excessive royalties. The declaration of a compulsory license under Section 92 is made only in cases of national emergency or in case of extreme urgency or public noncommercial use. Therefore, such a compulsory license would not only interfere with the freedom to contract norms but also strengthen the provision as an enforcement mechanism or competition remedy within the patent regime.

Finally, based on the reference received from the Ministry of Agriculture and a complaint by the Indian seed company (Nuziveedu Ltd), Monsanto's licensing practices were subject to competition scrutiny in India.[88] A prima facie case of abuse of dominant position and restrictive licensing practices has been established as well.[89]

More recently, on January 8, 2019 the Apex Court decided the aforementioned commercial dispute between Monsanto and Nuziveedu Seeds Ltd.[90] The question of

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tion and availability of these commodities at fair prices or for maintaining or increasing supplies of the same." For the text of the Legislation, see: https://consumeraffairs.nic.in/consumer/sites/default/files/userfiles/ecact1955.pdf

[87] Section 66 of the Patent Act, 1970: *Revocation of patent in public interest – Where the Central Government is of opinion that a patent or the mode in which it is exercised is mischievous to the State or generally prejudicial to the public, it may, after giving the patentee an opportunity to be heard, make a declaration to that effect in the Official Gazette and thereupon the patent shall be deemed to be revoked*. For a historical account of the two episodes of patent revocations u/S 66, see the case of Agracerus's process patent on 'the method of producing transformed cotton cell lines by tissue culture' (Indian patent number 168950) which was revoked in the year 1994, for being prejudicial to the interests of Indian farmers as it had 'far-reaching implications for India's cotton economy'. See also the case of Avasthagen's patent on 'synergistic ayurvedic/functional food bioactive composition' (Indian patent 1076/CHE/2007) used as a medicine to treat diabetes, which was revoked in the year 2012 on the finding that it was based on the traditional medicinal knowledge held by indigenous communities in India.

[88] See specifically, CCI Reference Case No. 2 of 2015 and Case No 0.107 of 2015: https://indiankanoon.org/doc/122804601/?type=print; based on Justice BN Srikrishna's recommendation, the National Seed Association of India (NSAI) has sought suitable corrective action through the CCI; see Economic Times Report, "Hybrid seed producers want government to move CCI against Mahyco Monsanto" (October 15, 2015) available online: https://economictimes.indiatimes.com/news/economy/agriculture/hybrid-seed-producers-want-government-to-move-cci-against-mahyco-monsanto/articleshow/49367624.cms; also see CCI Order dated July 26, 2016, available online: https://www.cci.gov.in/sites/default/files/Ref%20Case%20022015%20%26%20others.pdf;

[89] CCI's prima facie order u/S 26 (1) against Monsanto (Order dated June 09, 2016): https://www.cci.gov.in/sites/default/files/Ref%2002-2015%20and%20107-2015%20-26(1)%20order_10.02.2015.pdf

[90] Supreme Court of India, Monsanto v Nuziveedu Seeds Ltd. decided on January 08, 2019, https://www.sci.gov.in/supremecourt/2018/16059/16059_2018_Judgement_08-Jan-2019.pdf

patent validity has been reverted back to the trial court for a full-fledged hearing, while the license arrangements with the Indian seed companies have been revived on the condition that royalty be paid as per the CSPCO rates. Thus Monsanto's patented seed can be used by the Indian companies to develop the plant varieties upon fulfilment of the royalty condition.[91] Clarity on the legality of ag-biotech patents in India will be gained once the question of validity is settled in the near future. That will also allow deliberation on the necessary regulatory robustness needed to minimize risks associated with the working of such ag-biotechnology products and processes as well as their overall impact in the long run.

3.1.4 Other Noteworthy Developments

Another significant example in terms of regulating use of Bt technology for developing GM food in India is that of 'Bt Brinjal'. The gene modification claims to make the plant pest resistant. Indian farms were affected as a result of pollen drift from Bangladesh. The Ministry of Environment and Forest (MoEF) ordered for a moratorium in 2010 calling for a better understanding of the impact of such pollen drift – safety studies to assess impact on environment as well as human health and for eco-labelling practices.[92] Despite the safety concerns, the increase in price of the seeds in Bangladesh was noted to be almost three times more, and no seed saving was registered.[93] With reduced price of pesticides, the GM seed sales were offset. The crop losses to pests were found to be fewer, while the crop yield from the Bt plant was disappointingly lower than expected.

Learning from the Bangladeshi experience, the government of India called for consultations on the Bt brinjal adoption. The mandate was to develop institutional structures and capacity to ensure safety to the environmental and human health, farmers' and

[91] Basheer, S., "The Monsanto Bt Cotton case is not over yet" *Hindustan Times* (January 10, 2019) available online: https://www.hindustantimes.com/analysis/the-monsanto-bt-cotton- case-is-not-over-yet/story-weAMtHbuDSsCumrhpLzfIK.html?fbclid=IwAR0AJIfEtRdFIO750FX_cqRfpkIsLXxOVhRT_8VPofMF1oucyzM6avk4kL8

[92] Bt Brinjal moratorium 2010; also note that Bt cotton has been more expensive than Bt Brinjal, but the yield still returned a net profit of Rs. 5,294 in 2003 as compared to Rs. 3,133 per acre for conventional cotton. See Brooke Glass-O'Shea (7 J. Food L. & Pol'y 1 2011) – regional variations in yield returns are due to geographic conditions, droughts and over use of pesticides which increased the input costs – especially in the State of Andhra Pradesh. Average yield gains in states other than Andhra Pradesh were up to 42% to 59%.

[93] See, Robinson, C., "Bt Brinjal on "life support" in Bangladesh" *GMWatch* (November 17, 2015): https://gmwatch.org/en/news/latest-news/16535; for counterview see Shelton AM, Hossain MJ, Paranjape V, Azad AK, Rahman ML, Khan ASMMR, Prodhan MZH, Rashid MA, Majumder R, Hossain MA, Hussain SS, Huesing JE and McCandless L (2018). Bt eggplant project in Bangladesh: History, present status, and future direction. Front. Bioeng. Biotechnol. 6:106. doi: https://doi.org/10.3389/fbioe.2018.00106; see also Antoniou MN, Robinson CJ (2017). Cornell Alliance for Science evaluation of consensus on genetically modified food safety: Weaknesses in study design. Front. Public Health. 13 April. https://www.frontiersin.org/articles/10.3389/fpubh.2017.00079/full; see especially, GMWatch, "GM Bt Brinjal in Bangladesh: GMO win or smoke and mirrors?" (September 03, 2018) available online: https://gmwatch.org/en/news/latest-news/18447-gm-bt-brinjal-in-bangladesh-gmo-win-or-smoke-and-mirrors

consumers' rights and inclusive decision-making for GM crops. However, not a single attempt has been made in this direction since the consultation.[94]

However, GM mustard – Dhara Mustard Hybrid (DMH-11)[95] which has been developed by scientists at Delhi University for a project that is part-funded by the Department of Biotechnology, a division of the Science Ministry – has come to be the first transgenic food crop to be allowed for commercial cultivation in India. The GEAC after conducting a safety study cleared it to be commercially cultivated for 4 years. However, independent safety study has been requested by citizen groups which have led to a stay on the introduction pending re-release and evaluation of the study. The Supreme Court is awaiting the status report from the centre[96] on the matter. Thus, the issue of GMOs is likely to continue testing the workings of the existing regulatory framework in India.

4 Conclusion

With a paucity of studies that validate the impact of GM crops on human health, regulation in this area has been problematic for India.[97] Moreover the current trend of stronger IP favours a regime where the industrial style of agriculture – one which promotes dependency on synthetic chemicals and monoculture production models – thrives. Monocultures are ill-suited for traditional models of farming dependent on diverse crop varieties and traditional techniques.[98] Apparently, from more than 100,000 varieties of rice during the 1970s in India, only 6000 varieties are available today.[99] Gene diversity requires a diversity of knowledge forms. The sector calls for

[94] See MoEF, Government of India, "National consultation on Bt Brinjal" available online: http://www.moef.nic.in/downloads/public-information/Bt%20Brinjal%20Primer.pdf; see also Report of the Expert Committee (EC-II) on Bt Brinjal Event EE1.: (2009) Developed by: M/s Maharashtra Hybrid Seeds Company Ltd. (Mahyco), Mumbai, University of Agricultural Sciences (UAS), Dharwad and Tamil Nadu Agricultural University (TNAU), Coimbatore. Genetic Engineering Approval Committee, Ministry of Environment and Forests, Government of India, New Delhi, available online: http://www.moef.nic.in/downloads/publicinformation/Report%20on%20Bt%20brinjal.pdf

[95] This variety has two main functions that could be attributed to its GM traits. The first is it makes hybridization for mustard easier, since mustard is a self-pollinated plant, and it is not easy to produce hybrids for mustard. Second, it has a gene that provides the plant with herbicide tolerance.

[96] Press Trust of India, "Supreme Court seeks Center's reply on field trials of GM Mustard crops" NDTV (October 30, 2018) available online: https://www.ndtv.com/india-news/supreme-court-seeks-centres-reply-on-field-trials-of-gm-mustard-crop-1940273

[97] For a comparative understanding of the European experience while regulating GMOs, Hartley, S and Millar, K.M., "The Challenges of Consulting the Public on Science Policy: Examining the development of European Risk Assessment Policy for Genetically Modified Animals" Review of Policy Research, 31:6, 2004 at 481.

[98] See Kochupillai, M, *Promoting Sustainable Innovations in Plant Varieties* (Springer 2016).

[99] Basheer, S "Pest Policy: Confusion, Capture or a Fetish for the Foreign?" (October 30, 2017) SpicyIP, https://spicyip.com/2017/10/pest-policy-confusion-capture-or-a-fetish-for-the-foreign.html

a greater understanding of the relation between regulation and risk, since collective well-being is at stake.

With the Intergovernmental Panel on Climate Change (IPCC) Special Report 2018, informing that the planet is likely to die sooner than later,[100] ignoring the cumulative risks of regulatory failure in addressing food insecurity, poor nutritional health and climate change is no more a *black swan* event but a definite certainty.[101] Failure to acknowledge the nature and magnitude of harm is not an option anymore. In order to avoid terrible hindsight, the Indian bio-economy requires serious attention and proactive action from all quarters of government and citizenry.

It serves to question at this point, *how far science at its self-reflective best can go to create a case for ecological science as 'the sustainable solution'*? As the UN Committee on Economic Social and Cultural Rights in general comment 12 – realization of a 'right to food' is everyone's responsibility – stated, the transfer of technology for adaptation that is informed by human rights would increase the overall effectiveness of international efforts for protecting human health and environment.[102] Thus, a right-based approach to regulation, in this case, *a right to food*, requires full regulatory thrust to play an influential role in discussions over adaptation, as well as the innovation of and access to climate-related technologies and know how. The effectiveness of NFSA depends on successful implementation of such an approach.

Measures to involve key private sector partners to invest in sustainable agriculture will encourage financing mechanisms for developing climate resilience and access and benefit-sharing regimes.[103] There is a pressing need to develop consensus on private sector investor advisory for adaptation funding so as to further sustainability goals.

Agricultural productivity has direct implications for poverty alleviation. Labour-intensive farming in populous countries such as China and India can particularly benefit from increase in produce, as not only wages for farmers would improve as a result, but the cost of basic foods which make up a large share of the poor's expenditures is likely to plummet as well.[104] Till such time, the claim made by the

[100] IPCC Special Report, 2018, see https://www.ipcc.ch/sr15/ Global temperatures could rise by 1.5 °C by as early as the year 2030 and we ought to become carbon neutral urgently by 2050.

[101] A black swan event is referred to as an occurrence that deviates beyond what is normally expected of a situation and is extremely difficult to predict. See especially, Taleb, N, *The Black Swan: The Impact of the highly improbable* (Penguin Books, 2007).

[102] UNHCHR, the general comment 12, contained in document E/C.12/1999/5.

[103] For an early discussion about developing sustainable food systems in India from an ecologists' perspective, see Ho, MW et al., (2008) "Food Futures Now" available online http://www.i-sis.org.uk/foodFutures.php

[104] See Ravallion, M and G. Datt 1996 "How Important to India's Poor Is the Sectoral Composition of Output?" World Bank Economic Review 10(1):1–25; see also Loayza, N and C. Raddatz 2010 "The Composition of Growth Matters for Poverty Alleviation" Journal of Development Economics 93:137–51; for a comparative discussion, see especially, Ivanic, M and W. Martin 2016 Sectoral Productivity Growth and Poverty Reduction: National and Global Impacts. Mimeo. International Food Policy Research Institute.

UN agencies of having achieved the promised halving of the number of the hungry in the developing world in 2015 seems to be a fiction, at least in the Indian context.

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Part VI

Automobile Industry

Challenges in Reshaping the Sectoral Innovation System of the Chinese Automobile Industry

Kaidong Feng and Junran Li

Abstract

The aim of this chapter is to analyze and review the progress of China's technological innovation in the automobile sector. First, the structure of the Chinese automobile industry and its relevant innovation system are characterized by multiple camps of actors – namely, multinationals, large state-owned firms, and new local entrants – with different business goals, innovation objectives, and technological capabilities. Secondly, different camps of actors entered the Chinese automobile sector in different phases of the developmental strategies of China. Thus, China's policy transition during 2005–2006 to indigenous innovation created a drive among all indigenous firms toward technology and product development, and the demand for electrical vehicles created a valuable opportunity. However, the internal dynamics or rigidities of the different camps of actors appear to show significant path resistance. Only a persistent push by the Chinese government for indigenous innovation will enable a total structural change, particularly involving the large state-owned enterprises.

Keywords

Automobile industry · Indigenous innovation · Trading market for technology · Patent · SOE

K. Feng (✉) · J. Li
School of Government, Peking University, Beijing, China
e-mail: k.feng@pku.edu.cn

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_18

Peter Drucker termed the automotive industry "the industry of industries."[1] Indeed, the automotive industry around the world has played a vital role in driving the industrialization of large modern economies. Naturally, the Chinese society also expects this to be the case. This chapter discusses the growth and development of the Chinese car-making industry in two fields: "traditional" internal combustion engine (ICE) cars, also known as fossil fuel vehicles (FFVs), and electric vehicles (EVs). We also highlight the significant differences in research and development (R&D) between the two groups of major local producers: the traditional large backbone state-owned enterprises (backbone SOEs)[2] and those that have entered this industry only after the second half of the 1990s (new local entrants; see Appendix 1 for a list of firms). We found that there are significant differences in the technological progress of the Chinese car-making industry between the two enterprise groups, and the differences are induced by a historical policy structure. Furthermore, there are also significant differences in the innovation achievements of Chinese enterprises in the fields of FFVs and EVs, which are dependent on technological characteristics and maturity.

On the whole, although China has become the world's largest automotive producer and consumer, the indigenous car-makers of China are far from being global technology leaders. However, the developmental pattern of China's indigenous car-making industry shows positive transformation. Thus, the previous dominant strategy of the automobile firms, involving the assemblage of imported foreign designs only, has already given way to the strategy of indigenous innovation. Despite being a latecomer, China has started to develop products and technologies locally, and Chinese manufacturers are gradually becoming competitive in the global automobile market during the rise of EVs.

1 Introduction: Two Camps and Two Catching-Up Trajectories in One Industry

For the Chinese society, the car-making industry is always an appealing topic. On the one hand, this industry had long been left aside by the state planning system. Due to the emphasis on industrial capital goods rather than consumer goods, the passenger vehicle sector (including car-making) was not listed by the central planner as a key industry for decades, which is a typical Gerschenkronian strategy of industrialization.[3] It was not until China's introduction of "the 1994 automobile

[1] Drucker, Peter F. (1946) Concept of the Corporation, New York: John Day

[2] The compound term "backbone SOEs" in this chapter refers to large SOEs directly influenced by the central government. "Backbone" indicates large size, and a critical role within their corresponding sectoral systems, particularly in the previous central planning era. Even in the current reform era, through direct oversight by the State-owned Asset Supervision and Administration Commission (SASAC), the central government still influences their strategy making. By contrast, the term "SOE" in this chapter is defined by the ownership of a firm, in which some state investors own significant stock shares.

[3] The Gerschenkronian strategy refers to a typical state-led pattern of industrialization: The state plays a critical role in resource mobilization in society and pinpoints the selected areas for strategic

industry policy" that car-making has been recognized as a national pillar industry along with the entire sector of automobile manufacturing. Nevertheless, the car industry has been of high interest to the Chinese society for decades. The transformation of China's developmental strategy, from emphasizing "trading market for technology (TMFT)" to focusing on indigenous innovation, was triggered by public dissatisfaction with the pace of technical progress in the domestic car-making industry. The policy transformation was marked by the "National Medium- and Long-term Program for Science and Technology Development (2006–2020) Outline," which was promulgated in 2006. That is to say, the concern over the lack of technological capability in the car-making industry has promoted the transition of development strategy at the national level. This concern also has pushed the industrial regulator to change its previous practices, allowing a group of new, local, innovative firms to enter the industry.

However, even with the current favorable environment, which supports indigenous innovation, it remains challenging for late-coming firms to accumulate technical competitive advantage in a global industry consisting of a large number of complex technologies and components. The following four factors determine the extent to which technical capability accumulates in the automotive industry, thereby increasing the difficulty for the latecomers to catch up in technology.

First, the car-making industry is closely related to many other industries and technology domains, such as the steel, machine tool, and electronics industries and materials engineering. Manufacturing in this industry also relies heavily on the capability of the national industrial system. Second, much of the technical knowledge in the automotive industry is tacit in nature and often protected by intellectual property (IP) rights. This makes it difficult for latecomers to directly imitate complicated technologies of the first-movers. Third, the dominant design of a car was primarily determined in the 1920s.[4] Although some new technologies, such as materials and electronics, have been gradually added to the dominant design over the century that followed, and the value created by these new technologies is becoming more and more important, these new technologies do not change the core design. Thus, the relevant innovations are competence-enhancing rather than competence-destroying for the incumbents.[5,6] Finally, a great deal of key knowledge of car-making is highly embedded in specialized social networks

investment. The strategy implemented by Korea during the Park Chung-Hee administration (1961–1978) is a representative case. For detailed discussion, see Amsden, Alice H. (1989) Asia's Next Giant: South Korea and Late Industrialization, New York: Oxford University Press.

[4] Clark, Kim B. (1985) "The interaction of design hierarchies and market concepts in technological evolution." Research Policy, 14(5): 235–251

[5] Tushman, Michael L. and Philip Anderson (1986) "Technological discontinuities and organizational environments." Administrative Science Quarterly, 31:439–465

[6] Anderson, Philip and Michael L. Tushman (1990) Technological discontinuities and dominant designs: a cyclical model of technological change. Administrative Science Quarterly, 35: 604–633

among the collaborating firms.[7] This type of knowledge is difficult to be transferred as a simple sum of information, and difficult to be withheld by individual participants, which greatly enhances the stickiness of knowledge, making it hard for the latecomer to grasp easily.[8]

In short, unlike a science-based industry, the car-making industry is manufacturing-intensive and scale-intensive.[9] In this industry, key knowledge is embedded in manufacturing or design experience, and does not appear in explicit forms such as utility and invention patents. Although patents are becoming increasingly important, a vast majority of "know-how" or "know-whom" kind of knowledge in this industry cannot be mastered by a firm through the acquisition of patents or patent licenses. Indeed, the technical trade and R&D collaboration of many core businesses are through engineering services, design transfer (usually including engineering services), and component supplies. Hence, capacity building in this industry is a long-term process and may take many decades for latecomers, although imitation and reverse-engineering are emphasized as the methods for learning technology.[10]

Technological catching-up by domestic Chinese manufacturers in the FFV industry highlights a two-sided story. On one hand, aided by national policy, a group of new entrants have successfully entered the mass automobile market by providing consumers with more cost-effective cars, gaining a relatively stable living space and continuing to climb the technical ladder. The success of these firms and the rapid expansion of China's car-making industry have proved the policy case for indigenous innovation. On the other hand, established Chinese auto manufacturers have faced difficulties in developing cutting-edge technologies and competing in the high-end market. The significantly accumulative characteristics of the industry in capacity building have left the indigenous Chinese manufacturers behind global auto industry leaders. Thus, while the domestic market share held by new local entrants has been stable for a long time at about 30%, the Chinese automakers have been able to penetrate only the middle- and low-end segments of the third-world markets, though they are increasingly being recognized globally.

Development of EVs has created an alternative landscape for the Chinese government as well as the indigenous Chinese firms. EVs are returning to the mass market because of the need for energy conservation and environmental protection, and this change is to some extent an innovation with technological discontinuities.[11] In EVs,

[7] Clark, Kim B. and Takahiro Fujimoto (1991) Product Development Performance: Strategy, Organization, and Management in the World Automobile Industry. Boston, MA: Harvard Business School Press

[8] von Hippel, Eric (1998) "Sticky information" and the locus of problem solving: implications for innovation, In Alfred Chandler et al. (eds.), The Dynamic Firm, New York: Oxford University Press: 60–77

[9] Pavitt, Keith (1984) Sectoral patterns of technical change: towards a taxonomy and a theory. Research Policy 13(6): 343–374

[10] Kim, Linsu (1997) Imitation to Innovation: the dynamics of Korea's technological learning. Boston, Harvard Business School Press

[11] Tushman, Michael L. and Philip Anderson (1986) Technological discontinuities and organizational environments." Administrative Science Quarterly, 31:439–465

motors and batteries are employed to replace the engines and gearboxes of the FFVs. New requirements for complex technologies have also emerged, such as for controlling the batteries. Moreover, compared to FFVs, EVs are better able to interface with computer-based technologies, such as AI, the mobile Internet, and cloud computing. This has induced an explosive development of ICT technology applications on the car platform, creating an opportunity for China to pursue catch-up development.[12] The Chinese government has tabled a range of battery research and production projects and has enacted policies to encourage investment in development and industrialization of EVs while subsidizing investments in infrastructure, especially a network of rechargeable devices. These measures have enabled China to overtake the USA as the world's largest producer and consumer of EVs in 2015.

Compared to the incumbents in China's domestic car market, including backbone SOEs and multinationals, as well as the joint ventures (JVs) between these two groups of firms, the new local entrants also have more enthusiasm in developing EVs. Because they are challengers to the original pattern, they look forward to building their own competitive advantage by seizing this opportunity. They are the main driving force for the development of China's EV industry, followed by some new subordinate companies set up by backbone SOEs due to the pressure of indigenous innovation policy. In some areas of EVs, such as specific battery technologies and business models, Chinese innovation has reached the forefront of the world. This has paved the way for the Chinese automakers to become challengers in the global EV markets.

However, EVs are not radical innovations. Compared to an FFV, EV has revolutionized the engine and transmission modules, but many other modules of a passenger car, such as the bodywork design, chassis engineering, and security system, remain largely the same. More importantly, in terms of market reputation, consumers still follow traditions, perceiving the cars of multinational companies as higher quality compared to the Chinese cars. Also true in a developing country like China is that people associate the ownership of foreign-made, well-recognized global brands with social status. None of these factors is helpful to gain competitive advantage in the auto market for the new domestic Chinese entrants.

As a result, local Chinese firms also face difficulties in the EV sector, although much less so compared to the FFV sector. They have only captured some space in the middle- and low-end market segments, while multinationals such as Volkswagen, Toyota, Tesla, and BMW still dominate the high-end market. Also notable is the fact that though the EV market share of local firms may be increasing, the EV market pie itself is still very small compared to the size of the FFV market. This implies that local EV producers have difficulties quickly expanding scale through substantial economic gains from the market.

[12] Perez, Carlota and Luc Soete (1988) Catching up in technology: entry barriers and windows of opportunity. In: Technical Change and Economic Theory, eds. G. Dosi, C. Freeman, R. Nelson, G. Silverberg and L. Soete. London, Pinter: 458–479

2 Technological Catching-Up in FFV Sector

2.1 Through Strict Entry Regulation and TMFT

Before China's national development strategy turned to indigenous innovation, its original sectoral system of automobiles was mainly supported by two institutional pillars. The first pillar was strict regulation of entry permission. Through collaboration among the National Development and Reform Commission (NDRC); Ministry of Industry and Information Technology (MIIT); Ministry of Environmental Protection; General Administration of Quality Supervision, Inspection and Quarantine; and other ministries, the government has maintained substantive control over entry into the car-manufacturing sector. The core means is a regulative system based on the "product catalog management," according to which all car products formally launched into the Chinese domestic market for sale must have prior permission from the MIIT to be listed in a regularly updated product catalog. This policy is nominally based on product safety (e.g., collision safety), environmental protection (such as mandatory emission regulations), quality qualification (such as production consistency), and other conditions. Though some critics regard the "catalog-based regulation" a rigid legacy of the planned system, it continues even after the transition to indigenous innovation. At the same time, since the state plays a critical role in resource allocation in China, especially given its influence on the financial sector, local car producers seldom challenge the fundamental regulatory arrangements.

The second pillar was the national strategy of TMFT since the 1980s, which was originally developed to promote the expansion of local industrial capacity. This strategy literally involves the trading of market access for technology with the multinationals possessing advanced technology, as acquisition of intangible IP assets on technologies would be less productive without the benefit of associated operational learning and expertise. So, TMFT in practice encourages JVs between the backbone SOEs and multinationals. The approach began with a JV between Beijing Auto and American Motors Corporation (AMC) in 1984.[13] Then rapidly, all backbone SOEs, both those managed by the central government (such as First Automobile Work (FAW), Dongfeng Auto, and Shanghai Auto) and those managed by provincial governments (such as Guangzhou Auto, Nanjing Auto, and others), have been included in this wave. By 2000, a total of 71 such automobile-producing JVs had been established, in addition to five other cooperative projects involving multinationals. In order to promote the localization rate of manufacturing, another 557 JVs had been set up to produce components and parts by 1998.[14] By 2005, nearly all

[13] When the JV was set up, AMC was owned by Renault; later it was acquired by Daimler Chrysler.

[14] Feng, Kaidong (2016) Chinese indigenous innovation in the car sector: being integrated or being the integrator, Chapter 5 of Y. Zhou, W. Lazonick, and Y. Sun (eds.) China as an Innovation Nation, Oxford, UK: Oxford University Press: 133–164

multinationals active in the international market had entered China with car-producing JVs with Chinese SOEs.[15]

2.2 Through China-Foreign JVs

As the backbone SOEs focused their strategy on the operation of China-foreign JVs (except in rare cases),[16] they officially abandoned their own efforts to develop self-owned car brands.[17] Instead, they stressed production based on imported blueprints with the brands of their foreign JV partners. JV production was often dependent on the introduction of complete sets of equipment, technical licensing, knockdown components, and personnel training from the foreign value network. Before the policy transition to indigenous innovation in 2006, most backbone SOEs had only retained the functions of investment and administration while relying on cooperation with multinationals for product development, manufacturing, and branding.

After the policy transition to indigenous innovation in 2006, backbone SOEs were also required to innovate. However, they did not have sufficient motivation or technical capacity. They had gained great benefits through JV production, while doing indigenous innovation would have created huge risks, without providing a clear prospect of decent returns. Therefore, backbone SOEs generally adopted three strategies during the second half of the 2000s under political pressure and social appeals.

First, they acquired foreign assets. Some multinationals were weakened after the fierce global competition during the 1970s–1990s, which created good conditions for the Chinese to acquire them as a shortcut for gaining technological assets. Not only did the backbone SOEs have such a desire, but so did some new entrants. The well-known case of acquisition of Volvo in 2010 was by the new entrant Geely. However, as the backbone SOEs had not built up their absorptive capacity for assessing and assimilating technologies, they did not perform well in identifying quality assets and negotiating better prices. Beijing Auto bought most of the IPs of SAAB in 2009. However, as revealed by the media afterward, many high-value IPs had already been peeled off before the deal, as previously SAAB had been traded for several rounds on the market. So what Beijing Auto obtained were just two relatively aging platforms, the Saab 9–3 and Saab 9–5, the latest update of which was in the late 1990s.

[15] According to the author's rough calculation, there are at least Volkswagen, AMC, Peugeot, Chrysler, Citroen, Nissan, Mitsubishi, GM, Toyota, Honda, Fiat, Ford, GM, etc.

[16] Such as ChangAn Auto. For more details on this exceptional case, see Feng, Kaidong (2016) Chinese indigenous innovation in the car sector: being integrated or being the integrator, Chapter 5 of Y. Zhou, W. Lazonick, and Y. Sun (eds.) China as an Innovation Nation, Oxford, UK: Oxford University Press: 133–164.

[17] FAW was an exception keeping its own car brand, since the brand "Red Flag" has always been regarded as the national car with political symbolism. However, in the 1990s, FAW also gave up the technical platform of Red Flag and replaced it with that of Audi-100 while keeping the Red Flag name.

The Chinese acquisition of Rover was more dramatic. In 2005, two Chinese SOEs, Shanghai Auto and Nanjing Auto, announced acquisition of Rover's core assets. In fact, Rover successfully sold its assets to these two separate buyers, namely, the soft technologies (IP, drawings, etc.) to Shanghai Auto and the hard assets (production equipment and factory buildings) to Nanjing Auto. The chaos about the Rover technologies was not finally resolved until 2007, when Shanghai Auto acquired Nanjing Auto, which allowed it to combine the soft technologies and the hard assets from Rover. Of course, this approach can provide an initial shortcut for backbone SOEs to build their own technological capabilities. However, these firms still need to earn experience through indigenous innovation to become a genuinely competitive car developer for the long term. According to our observations, this has not happened yet.

As a second method to respond to the indigenous innovation drive, backbone SOEs established new brands through their JVs with multinationals. Looking for shortcuts, they often purchased the IPs of some existing or even outdated products (for more affordable cost) from abroad. Adjustments were done on the existing platforms, which were often very marginal, such as redesigning bodywork, installing new auto electronics, improving interiors, etc. However, most products of this nature were less satisfactory to local consumers, who have become picky as they have witnessed superior products entirely developed for them. Many of these self-built brands were soon marginalized on the market, such as the Everus brand launched by the Guangzhou Auto-Honda JV and the Ciimo brand developed by the Dongfeng Auto-Honda JV. Only those really based on localized R&D were able to survive through tough competition, such as the Baojun brand of the SAIC-GM-Wuling JV.

The third way was to buy technology from local developers. Some backbone SOEs have come to ally with new local entrants or directly procured technological packages from them. For example, in 2012 Guangzhou Auto signed an agreement with Chery[18] to obtain the basic technology of the A-class platforms from Chery, as well as the full package for a G3 model. With this agreement, Guangzhou Auto also outsourced the engineering service provided by Chery concerning the engines and the continuously variable transmission gearboxes adopted in the relevant car models. In fact, these inputs aided Guangzhou Auto in developing its own Trumpchi brand.

It is only after 2013, witnessing how the new administration of Xi continues to stress indigenous innovation, that the backbone SOEs have begun to take innovation seriously. Within these firms, the units running self-built brands get promoted in terms of resource support. Baojun, the brand of the Shanghai Auto-GM-Wuling JV, has become a competitive brand in the low-end market. The Trumpchi brand of

[18] Chery is one of the leading local firms that focuses on indigenous development of auto products. It was funded by the provincial government of Anhui and entered the car-making sector since 1997. For its distinguished performance in developing indigenous technologies, Chery was considered by the Chinese government as one of the representatives of new local entrants after the policy shift around 2005–2006.

Guangzhou Auto, as mentioned, also made its name in the mid-range market segment. The continual investment in R&D and relevant experience accumulation after the policy shift have forged their rise. But as newcomers to indigenous innovation, their trajectories of capability growth are not different from those of the forerunning local innovators such as Chery, Geely, BYD, and Great Wall. Longer periods of investment and experience accumulation are needed in order to develop sustainable capability building. All these facts will be clearly demonstrated by our patent analysis later on.

2.3 Through New Local Entrants

Since 1997, new local entrants such as Chery and Geely began to produce cars based on different strategies, suggesting the possibility of strategies other than TMFT.[19] But the entry of these manufacturers was "illegal" to some extent, because they had not been listed in the official catalog yet. These new entrants were mainly supported by local governments. As the spin-off effects of car-making on related industries were attractive, some local governments, in their bid to promote local GDP growth, risked supporting local firms even without official permission from the central regulator.[20] The support was vital for new entrants, as the local governments not only provided funds but also allowed them to sell their products in local areas.[21] It is important to note that these new entrants are not the industrial players directly managed by the central government, and represent only local economic power, which is critical for understanding the subsequent policy changes. At least in the car industry, the policy transition from TMFT to the indigenous innovation strategy has not happened in a completely radical manner. This is partly so because the leading cadres of the ministries of industrial administration, especially the MIIT, had often been the former heads of large SOEs. This explains why policy-makers acquiesce in the slow response of backbone SOEs to this strategic transition, especially in their continued emphasis on JV production.

The influx of new local entrants has fundamentally changed the rules of the game in China's car industry. They offer more cost-effective products and are more inclined to listen to the needs of local consumers by continually launching new products, which makes Sino-foreign JVs unable to sustain high profits by producing a handful of outdated models. Thus, since 2001, as the new entrants gradually obtained regulatory approval, the entire production scale and the amounts of new

[19] Lu, Feng and Kaidong Feng (2005) The Policy to Develop the Indigenous Automobile Industry (Fazhan Woguo Zizhu Zhishi Chanquan Qiche Gongye de Zhengce Xuanze). Beijing: Peking University Press

[20] Thun, Eric (2006) Changing Lanes in China: Foreign Direct Investment, Local Governments, and Auto Sector Development. Cambridge: Cambridge University Press

[21] See Chapter 3 in Lu, Feng and Kaidong Feng (2005) The Policy to Develop the Indigenous Automobile Industry (in Chinese). Beijing: Peking University Press, pp. 42–74

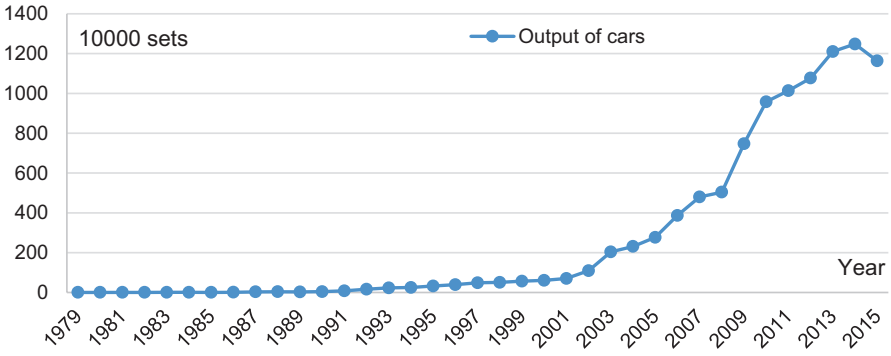

Fig. 1 Output of Chinese car sector. (Source: China Automotive Industry Yearbooks)

products launched annually in China's car industry have skyrocketed, due to the leveraging effects created by new firms (see Fig. 1).

As new local entrants often lack technology accumulation, their first-generation products were developed mainly by mimicking existing products. Thus, after 2001, when their threat to incumbents was recognized, multinationals sued China's new local car-makers for IP violation in a series of cases. These disputes affected public opinion and reinforced the notion that new local entrants were technologically backward.

Therefore, the new entrants who survived the initial phase of market competition demonstrated obvious commitment to developing self-owned technologies to solve their sustainability problems. Their efforts, though diverse, can be categorized into three types. Firstly, they invested heavily in in-house R&D. Chery, for example, was founded in 1997, and by 2005 it had an R&D center of more than 2000 professionals. In addition to the development of car models, Chery also has specialized in engines, gearboxes, new materials, electronic control systems, and so on. The cultivation of this R&D force was supported by high resource density: in 2005, on average, each of Chery's R&D personnel was involved in more than 12 projects at the same time. By 2012, Chery's R&D team reached its peak, with more than 6000 people and more than 120 ongoing projects for developing car models and important assemblies.[22]

The second type of activity that the surviving new entrants undertook was to establish their own core supply system to provide key technical modules, such as air-conditioning, automotive electronics, stamping molds, and so on. At the beginning, they had to rely on existing local suppliers. However, under TMFT, most car component suppliers, though not all, were attached to a Sino-foreign JV value network. As those incumbents, especially the multinational part, had tight control over core suppliers, i.e., the tier-1 suppliers, the new entrants could only reach tier-2 or even more marginal suppliers. However, the technologically inferior tier-2

[22] The data are collected by one of the authors through his annual on-site investigations and interviews at Chery during 2003–2012.

suppliers[23] were not willing to provide engineering R&D services to new enterprises, to avoid potential pressure from their car-making partners. All these constrained the scope and quality of components the new entrants could outsource.[24] To break through the roof, the new entrants had to set up their own tier-1 core supplier system. The concrete approach was to invest in cooperation with talented engineers who have already accumulated considerable experience through their prior work at giant international firms. For these engineers, the plans of Chery and Geely offered them a chance to start their own businesses. After witnessing their rapid growth, some established suppliers gradually became willing to set up JVs or specialized factories for these new players. Chery, for example, by 2012, had established a network of more than 200 tier-1 suppliers and already had several tier-1 suppliers to choose from in some areas. These achievements enable the new entrants to independently develop and produce cars and key modules, including a large number of patented technologies.

The third type of activity that the surviving new entrants underwent was a wide range of technical cooperation with international professional technology firms. After the 1990s, the growth of the global mainstream market had slowed, and some professional engineering technology providers began to develop strong incentives to open up the Chinese market, giving the new entrants opportunities to outsource engineering services and learn through cooperation with these service providers. As the earliest case of this kind, the Italy-based design house, Pininfarina, in 1991, took the initiative to approach Hafei Auto (a Chinese minibus manufacturer) to inquire into whether the latter was willing to employ its services.[25] This pattern quickly spread among local newcomers, who sought specialized services on the global market in different fields, such as systemic configuration, chassis engineering, engine calibration, and so on.

These kinds of cooperation were not just simple turn-key projects, but involved personnel training. Young and most elite Chinese engineers participated in these

[23] The terms "tier-1" and "tier-2" are defined by the closeness of suppliers to the flagship firms (car producers) in their value chains. When a project for developing new products is started by a flagship firm, its tier-1 suppliers are required to set up corresponding development projects in a parallel manner and send their representatives to join the development team of flagship firms. By doing so, the development activities both internally in the flagship firms and in each tier-1 supplier are integrated to serve the purpose of developing a product. Therefore, the tier-1 suppliers are obliged to develop their in-house technological capability and have close collaboration with the flagship firms in the long run. By contrast, the tier-2 suppliers are not included for participating in core activities of development immediately. Rather, they are expected to be the capacity buffer or to provide more options for the flagship firms when a product design has been solidified. Therefore, in most cases, the technological capabilities of tier-2 suppliers are incomparable to those of tier-1 suppliers. For the collaboration between flagship firms and their tier-1 suppliers, see Clark, Kim B., and Takahiro Fujimoto (1991) Product Development Performance: Strategy, Organization, and Management in the World Automobile Industry. Boston, MA: Harvard Business School Press.

[24] This also explains to some extent why the early products of new businesses are being criticized in the same way that multinationals produce vehicles through joint ventures.

[25] Lu, Feng and Kaidong Feng (2005) The Policy to Develop the Indigenous Automobile Industry (in Chinese). Beijing: Peking University Press, p. 45

Table 1 Newly launched car models in the Chinese market

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
New models	13	28	50	50-	80+	117	90	107	221

Source: Feng (2016), p. 151)

projects. The foreign partners had to cooperate in such learning schemes to win a long-term place in the emerging Chinese car market.[26] In such schemes, the Chinese participants played a more dominant role in cooperation, which helped them better identify technologies at the systemic level and explore more frontier issues.[27]

New local entrants kept their focus on technological progress for sustainable survival, which also changed the behaviors of multinationals. Before they were challenged by new local entrants, multinationals rarely launched new products on the Chinese market, despite the fact that a large number of multinationals had actually established their Sino-foreign JVs before 2001. In 2001, there were only 13 new car models in China by 12 vehicle-producing JVs set up by international giants (see Table 1). Only after the new local entrants were allowed to enter the industry was product-based competition triggered. After that, the rules of the game have changed, and the amount of new products on the market every year has increased rapidly, above 100 for most of the years after 2006, many with investment by multinationals.

3 China's Technological Innovation in EV Industry

3.1 Government-Backed Development

3.1.1 Central Government

The technological progress in the Chinese EV sector presents a series of characteristics dissimilar to the FFV sector. The discontinuity of automotive technological progress, created by the rise of EV, is perceived as an opportunity for latecomers to overtake their competitors. The Chinese government has provided long-term and consistent support for indigenous innovation in this domain. This measure

[26] It is important to note that developing new models is an expensive investment activity, so in the original international market, the opportunity to participate in new model development projects is highly valuable and limited; only these new enterprises from China are extravagantly spending efforts to save money from other areas to start one after another. The new model project has become a new opportunity that technology service companies cannot give up. Even if Chinese companies are more concerned about learning technology from them, they are still passively accepting this. In fact, they have also gained great benefits from the development of the Chinese auto industry. After the growth of new Chinese companies, these international technology companies continue to obtain cooperation contracts, although their cooperation is no longer clearly "teacher-student" relations, so they have successfully nurtured a new group of consumers.

[27] Feng, Kaidong, Tongyao Yin, and Yanmin Wang (2007) Innovation pattern of Chery (Qirui de Chuangxin Moshi). China Soft Science. No.3: 76–84

incentivizes local actors to innovate and helps to shape an active ecology where developers of relevant technologies, such as the mobile Internet, big data, and AI, take it as a good chance to extend their business to the automobile industry. Under such circumstances, not only new local entrants but also some backbone SOEs have better performance in EVs than in FFVs.

The Chinese government began to aid EV development projects in 1992. At that time policies were initiated to address the concern of "(petroleum) energy consumption." The Ministry of Science and Technology (MOST) was the first at the central government level to act on the EV issue. As MOST was not set up for economic planning or industrial administration, it paid more attention to technological advances and did not strictly follow the TMFT strategy. Furthermore, it emphasized indigenous innovation when subsidizing EV development. Later, NDRC and MIIT took part in the support of EV after the 2006 policy shift and treated the advent of EVs as an opportunity to implement a leapfrogging strategy. NDRC and MIIT have gradually become the ministries steering EV policies, as they command more resources and administrative power.

However, the ministries were not directly involved in commercial competition, could not perceive potential targets still under water, and were not sensitive to various commercial considerations and technological choices. What they could identify as targets for leapfrogging strategy were technologies already on the market and advocated by international giants. Then they set metrics for the measurement of technical objectives for a given period of time, which was typical of "technological mounting" programs, namely, to mobilize domestic actors to achieve breakthroughs.[28] In the special program for EV under the National Technology Research and Development Program (the "863 Program"),[29] which is part of the 10th Five-Year Plan, planners from the central government emphasized fuel cell vehicles, traditional non-plug-in hybrid EVs (HEV), and pure electrical vehicles (PEV) as the three selected technologies that government supported since 2001. Among them, the HEV and fuel cell vehicles had long been advocated by Japanese car-makers. However, due to the lack of the battery technologies for PEV, people still had their eyes fixed on traditional lead-acid and Ni-MH batteries. Lithium batteries, which were later proven to be a better choice, had not been included for policy consideration at that time due to cost and safety issues.

The government is also a critical player in shaping the technological trajectory of the rise of Chinese EVs. To circumvent the advantages of international giants, such as that of Toyota in HEVs, the Chinese government released policies such as the

[28] Technological mounting program was a traditional pattern for Chinese central planners to facilitate technological progress. In such kind of programs, ministries would mobilize all the major units in relevant domains, including those of universities, research institutes, factories, and so on. Collaboration between these units would be arranged by the ministries with great details, so would the tasks of technological progress for each participant.

[29] The "863 Program" is a national program for basic research. It is led by the Chinese central government and focuses on a series of selected areas only. This program is named after its starting date, namely, March (the third month) of 1986. It is always regarded as a signpost for the governmental emphasis on research.

"Administrative Regulations on New Energy Vehicle Production Enterprises and Product Access" in 2017 to clearly exclude the HEV from the officially defined "new energy vehicles" in China. Therefore, only the PEV, plug-in hybrid EV (PHEV), and fuel cell vehicle development can receive governmental incentives and other special treatments, leading local Chinese firms to spend more on PEV and PHEV.

3.1.2 Local Governments

In addition to the catching-up strategy of the central government, the rise of EV also benefited from the policy actions of provincial governments. The "image creation" campaign by provinces and cities provides a rising market for EV. Nowadays demonstration of commercial operation of EV has become an important element of large international events and exhibitions organized by Chinese cities. For example, the first Chinese EV demonstration was at the Beijing 2008 Olympic Game. Shenzhen hosted the 26th Summer Universiade in 2011, which became the start for a new round of EV demonstration by BYD. The municipal government of Shenzhen launched a project to sponsor the public transportation service to purchase 200 electric buses (BYD and another EV coach producer together were awarded the dominant share) and also invested in an EV taxi company, purchasing 500 BYD PEVs. This was the first large-scale commercial operation of EVs in China. As these projects became very successful, the Shenzhen government decided that all newly added public buses must be electrically driven, as well as all newly licensed taxis after 2014. These experiences were partly copied by the government of Beijing in 2014 (for the APEC conference) and Hangzhou in 2016 (for the G20 Summit).

Meanwhile, the central government also propelled the competition among regional governments for EV development. Regional governments have to compete against each other. In 2009, a "thousand EVs in each of ten cities" program was launched, and 13 cities were listed as pilots to promote EV application. In 2010 and 2011, another seven and five cities were included, respectively. In 2012 a broadened program, namely, the "New Energy Automotive Industry Development Plan (2012–2020)," was announced with a nationwide target of production and sales of over 500,000 new energy vehicles by 2015.[30] To implement these programs, the central government subsidizes EV purchasers and has ordered regional governments to follow its incentive plan. The sum of subsidies provided by central and regional governments usually reaches 50% of the purchase price. These policies create a series of consequences. Customers become more willing to buy; more particularly, regional governments are incentivized to provide subsidies to benefit the local economy. For example, Hangzhou's government has sponsored the rise of two EV manufacturers, Kandi and Zotye.[31] Beijing's municipal government incentivized and pressured Beijing Auto to start a subsidiary on PEV production.

[30] Shen, Qunhong, Kaidong Feng, and Xiaobo Zhang (2016) Divergent technological strategies among leading electric vehicle firms in China: Multiplicity of institutional logics and responses of firms. Science & Public Policy 43.4:scv056

[31] Kandi is a privately owned industrial group, established in 2002, focused on manufacturing compact cars. In 2013, Kandi and Geely jointly (50%–50%) invested in an EV producer, Kandi

Beijing Auto, JAC (an SOE owned by Anhui Province), and ChangAn Auto (an SOE originating from the state-owned weapon-making enterprise) are the first-movers among SOEs to take EV as an important business and a platform to rebuild their technical capabilities.

3.2 Chery-Led Development

The MOST encouraged local firms to participate in projects it commissioned and funded. Backbone SOEs, such as FAW and Dongfeng Auto,[32] were those that the the MOST needed to persuade to join in. However, some new entrants signed up for these programs and also invested their own money. A typical example is Chery, which took part in the 863 EV program in 2001 and infused its strategic resources into it.[33] Therefore, in the second half of the 863 EV program, which started in 2003, Chery has become the most important participant, and its automotive engineering institute was accredited by the MOST as "national engineering and technology center for energy-saving and environment-protection vehicles."

During this phase, Chery invested heavily in HEV, partly out of its eagerness to be recognized by the central government as a competent car-maker. It even invested in a series of collaborative developmental projects with Ricardo, a renowned British technological firm, starting in 2004. With intensive learning through a 4-year period, Chery mastered various mainstream HEV technologies, including a range of light, medium and full modes of electric motor-engine hybridization.

However, Chery's technological choice was problematic. As the development proceeded, Chinese developers found that Japanese manufacturers, particularly Toyota, have obvious first-mover advantage in this area. Leading Japanese firms had already patented a large number of high-value inventions, and many of these patented technologies were fundamental to this domain and difficult for latecomers to circumvent. Therefore, not only Chery but also giant firms from Europe and North America were hardly able to proceed with commercialization of their technologies. Technological ecology in the fuel cell EV was also similar, and some core patents were in the hands of a limited number of international giant firms.

EV. Zotye is also a private industrial group, established in 2003. It started to produce cars in 2003 and entered the EV market in 2009.

[32] FAW is the most privileged automobile producer in China. It was the first automobile works established in China in 1953 and had been always the largest Chinese automobile producer before 2005 (when overtaken by Shanghai Auto). Dongfeng Auto is also a leading backbone SOE established in 1969. As Dongfeng Auto was the second largest automobile group directly constructed under the instruction of the State Council, common Chinese also refer to it as "Second Automobile Works." This name also indicates the significance of Dongfeng Auto in China's automobile industry.

[33] MOST provided Chery only 0.5 million RMB in the first half of the project during 2001–2003. As a reference, Chery imported a Toyota Prius (the first mass-produced hybrid car worldwide) from abroad, which cost 0.8 million RMB.

3.3 The BYD-Led Development

The rise of BYD in EV is a story highly similar to that of the new entrants' rise in the FFV sector. BYD was originally below the radars of the government and traditional Chinese automotive community. BYD had built strong capacity in battery development by the early 2000s and became globally competitive in providing lithium and Ni-MH batteries for laptops and cell phones.

In 2005, a research team at MIT released their findings about lithium iron phosphate as the cathode material for batteries. BYD reacted quickly, launched its industrialization program in 2006, and started to produce large volumes of lithium iron batteries in 2009. The reason for BYD's efficient reaction lies not only in its long-term accumulation in battery technology but also in its research-oriented core organization. BYD was created by a group of former scientists of China's General Research Institute for Nonferrous Metals and maintained the tradition of carrying out wide-ranging developmental activities in-house, from researching metal materials to producing battery packaging and developing cars. After BYD successfully launched its EV models named F3DM and Qin, most of the EV manufacturers in China turned to PEV or PHEV. Chinese developers created a niche market and gave up their previous mistaken trajectory, the HEV.

3.4 Overall Assessment

China's EV industry outpaced the USA's to become the world's No.1 in 2015 and accelerated the technological development in China. Relevant suppliers of components and engineering service have been quickly established, including batteries, charging facilities, electrical and electronic control, etc. Taking the battery as an example, in addition to BYD, there are more than ten large-scale battery providers in China, including CATL, Fortunate Solar, Guoxuan High-Tech, Optimum Nano, and LiShen.[34]

New local entrants are the major drivers to China's EV rise, including BYD, Chery, Zotye, Geely (in cooperation with the Kandi Group), and Great Wall.[35] Attacking the previous industrial ecology, they actively embraced the disruptive change of technology to gain greater market share and greater government recognition.

[34] All the firms listed here are newly established private firms.

[35] Geely is a private firm and a leading one among the new local firms. It entered the automobile industry in

1997, focusing on compact cars and a low-price strategy during its early phase. For the EV business, Geely mainly relies on collaboration with the Kandi Group, as these two jointly invest in Kandi EV. Great Wall is also a privately run company with partial governmental ownership. It entered the automobile industry in 1996 and is well known for its SUVs.

4 Patent Analysis in China's Car-Making Industry

As mentioned previously, key technologies for car-making can be tacit and often embedded in complex technological or social networks. Therefore, for car-makers and technological inventors, patenting is just one of the several methods to extract economic benefits from innovations.[36,37] Even international giant firms may have reservations regarding how much to spend on patenting.[38] Thus, it appears that patent analysis may not be highly reliable for assessing the definite values of automotive technologies. Nevertheless, a comprehensive patent analysis is expected to be enlightening in this study. First of all, it can indicate the behavioral evolution of a select group of firms and the comparative tendencies among different groups. Secondly, the gaps in patenting strengths among different car-makers or groups in China are substantial rather than nominal; thus, analyzing patents becomes an effective method to demonstrate the capability gaps.

This section mainly analyzes the patent applications of 25 selected firms documented by China's State Intellectual Property Office (SIPO). According to the China Automotive Industry Yearbook (2016), the 25 firms are directly related to the top 12 Chinese car-makers, including multinationals, SOEs, and new entrants, with each producing more than 400,000 vehicles in 2015 (see Appendix 1). In the following, we categorize them into three groups, the multinationals, the backbone SOEs and their JVs with foreign partners, and the new local entrants.

4.1 General Patent Analysis

In China, patents are divided into three categories: inventions, utility models, and appearance designs. Among these, the invention patent requires the highest novelty and undergoes a more rigorous examination procedure, which gives it longer protection and higher value. Therefore, the patent portfolio of a firm can partly indicate its technical orientation. In the car-making industry, from 1999 to 2017, multinationals have submitted a total number of 87,089 patent applications in China, while new local entrants filed 66,043 and backbone SOEs and JVs filed 32,227. As for portfolios in the three categories of patent, multinationals have the highest ratio of inventions, at 79.53% (69,265), and a low ratio of utility models, merely 3.06%. The respective ratios for new local entrants are 32.84% and 50.24%, and for backbone SOEs and JVs 20.55% and 57.72% (see Fig. 2). The group of backbone SOEs and

[36] Levin, Richard C., Alvin K. Klevorick, Richard R. Nelson, and Sidney G. Winter (1987) Appropriating the returns from industrial research and development." Brookings Papers on Economic Activity, No. 3: 783–820

[37] Nelson, Richard (1990) Capitalism as an engine of progress. Research Policy 19(3): 193–214

[38] For example, it is well recognized within the automotive community that given the same conditions of technology, Japanese firms, especially Toyota and Honda, are obviously keener on patenting.

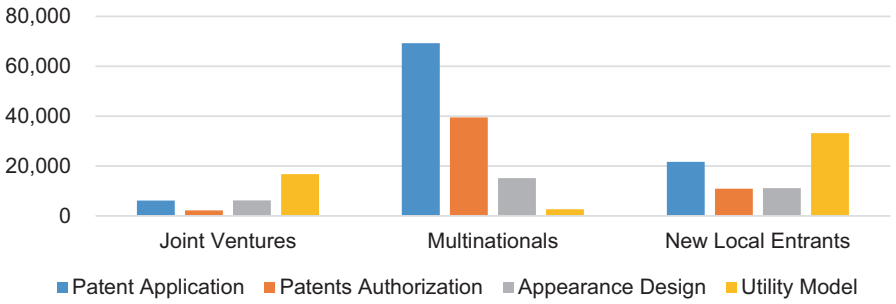

Fig. 2 Patenting activities of firms from three groups, 1999–2017. (Note: collected through incoPat)

JVs exhibits obvious weakness in patent applications, as 58% of their patents fall in the category of utility model (Yang and Mu 2009).

The patent grant rate is another index to look into. According to the report released by National Intellectual Property Administration in 2016, the rate for the JVs is just 35.35%, markedly below that of multinationals and new local entrants, which are 57.01% and 50.28% respectively.

Multinationals are the first-movers at implementing patenting strategy in China, accounting for the absolute majority of patents in automobiles prior to 2004 in China. However, due to the absence of strong rivalry in China, the patent portfolios of multinationals remained thin early on. Only after being challenged by new local entrants did their quantity of patent applications in China rise quickly after 2005. Toyota, GM, Honda, Hyundai, and Ford are the top five applicants for Chinese car-making invention patents, accounting for 56.3% in total among the 25 selected firms. Most patent applications of multinationals are submitted by entities from their home countries, which indicate that their collaboration with their JV partners in China remains highly irrelevant to their patent applications. For example, among the 16,708 patents applied for Toyota in China, there are only 5 patents with Chinese co-applicants. Toyota subsidiaries in China, including the Toyota (China) Research Center, FAW-Toyota R&D Center, and Guangzhou Auto-Toyota R&D Center, have only submitted 19 invention patent applications in the past 40 years. That is to say, the offshore R&D may have helped the multinationals to localize their technological capability to better fit the local market or forward local customers' feedback to their global headquarters to enhance R&D performance.[39] Anyhow, it indicates that multinationals such as Toyota do not allow their subsidiaries in China to cultivate real technological capability.

In 2003, GM claimed that the QQ model, a minicar product of Chery, violated its IP of the Matiz model, which was originally developed by Daewoo. In response to the lawsuit, Chery urgently submitted more than 20 patent applications to SIPO,

[39] Liu, Mengchun, and ShinHorng Chen (2012) "MNCs' offshore R&D networks in host country's regional innovation system: The case of Taiwan-based firms in China." Research Policy, 41(6): 1107–1120

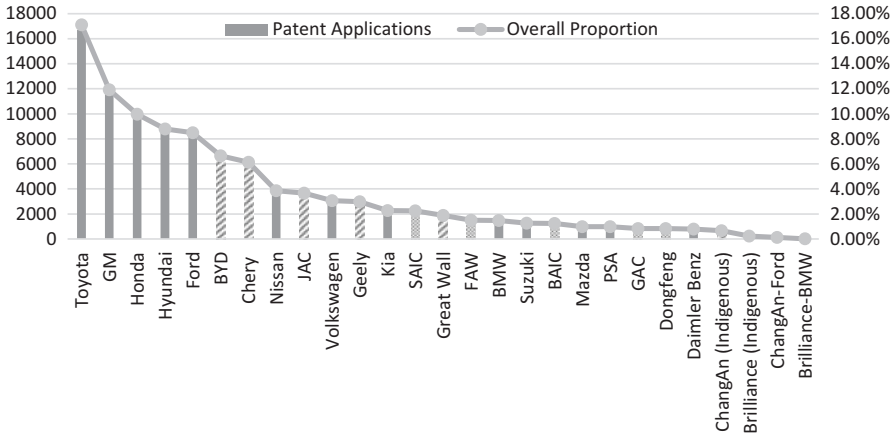

Fig. 3 Patent applications and overall proportion in Automotive, 1999–2017. (Note: Numbers of patent applications in China during 1999–2017, in the field of Automotive, collected from National Intellectual Property Administration, China.)

which could be considered the point at which local car-makers began to emphasize patenting. After that, we have witnessed the rise of new local entrants, which gradually become the second largest group of patent applicants, only after the multinationals. In 2016, the number of invention patent applications submitted by seven Chinese new local entrants has reached 3386, equivalent to a half of that submitted by the 13 multinationals. The leading group of new local firms, namely, BYD, Chery, Geely, and Great Wall, even exceed some multinationals, such as Volkswagen, Kia, and BMW, in patent applications (see Fig. 3).

We are not arguing that the technological expertise of these Chinese firms has already overtaken that of multinationals. However, at least data indicate a shift in their IP strategies in the Chinese market. In fact, the total number of invention patent applications submitted by the new local entrants has already surpassed the sum submitted by Toyota and Honda after 2012. This is remarkable, as the leading Japanese firms are always very active in patent applications. The growth rate of invention patent applications filed by the new local entrants as a whole is almost equal to that of the multinationals. As for Sino-foreign JVs, although the sum of their patent applications has also increased after 2010, the growth rate is still significantly behind that of the multinationals and the new local entrants.

4.2 Patents in FFV Sector: Engines As an Example

Multinationals started their patenting in China much earlier with much better performance. Over the past 20 years, multinationals have already submitted at least 7695 applications on engine technologies, and this has grown steadily, from less than 100 applications in 2003 to above 600 every year after 2011. US and

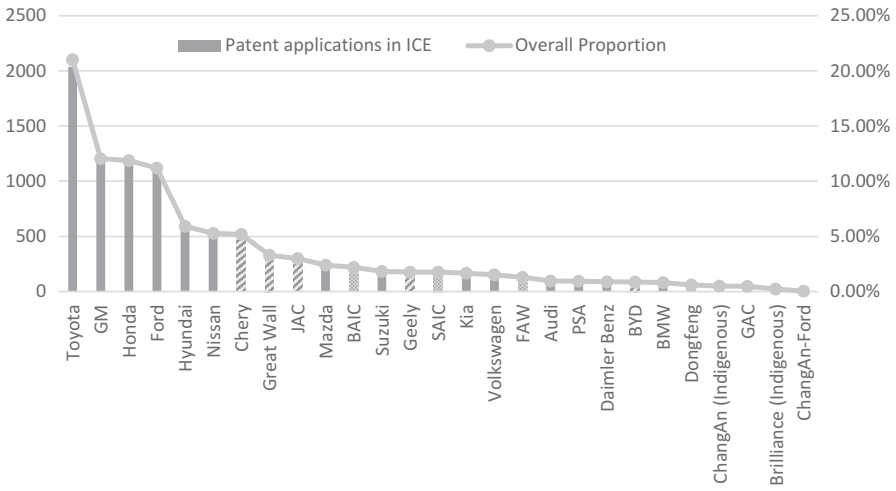

Fig. 4 Patent applications and overall proportion in ICE, 1999–2017. (Note: Numbers of patent applications in China during 1999-2017, in the field of ICE, collected from National Intellectual Property Administration, China.)

Japanese car manufacturers have striking advantages in this field, as Toyota has accumulated 2285 applications on engines, GM 1167, Ford 1084, and Honda 1049 (see Fig. 4). In recent years, although people are arguing about the American deindustrialization or the decline of Detroit's automotive industry, the American car-makers still maintain a higher innovation rate on engines than their overall general level through strengthening specialized R&D and utilizing links with European and Japanese collaborators.[40] Gradually, Japanese and Korean actors have already transferred their focus to the EV technologies rather than the ICE. For example, the invention patent applications of Honda for engine technologies in 2016 have declined by more than 50% from 10 years ago.

Compared with the leading group of multinationals, the new local entrants and backbone SOEs with their Sino-foreign JVs exhibit obvious disadvantages in engine technologies, with a total of only 1434 and 704 cumulative invention patents, respectively. Before 2002, only some backbone SOEs had the competence to patent engine technologies. However, the number of their applications was very limited, just one or two a year. Only with the rise of the new entrants did local applications in engine patents start to increase. For example, Chery's invention application started to top the local Chinese applicants in 2005, with about 40 annual applications on average.

In general, the patenting performance of new local entrants is far better than the backbone SOEs and their JVs with multinationals. Among the backbone SOEs,

[40] Hannigan, Thomas J., Marcelo Cano-Kollmann, and Ram Mudambi (2015) Thriving innovation amidst manufacturing decline: the Detroit auto cluster and the resilience of local knowledge production. Industrial and Corporate Change, 24(3): 613–634

Shanghai Auto has the best performing Sino-foreign JV, Shanghai Auto-GM. However, Shanghai Auto and its JVs have only 208 invention patent applications, clearly not comparable to the leading new entrants such as Chery or Great Wall. Out of the 208 applications, only 38 are co-submitted with its multinational partners, which again indicates the inefficiency of technological learning under the TMFT scheme.

4.3 Patents in EV Sector

Compared with the FFVs, the power of EVs mainly depends on new energy supplies such as batteries or fuel cells, which leads to remarkable changes in core modules and the overall design. The huge potential of the Chinese EV market has attracted multinationals to apply for patents in China. Thanks to the governmental incentive programs, local applicants have made rapid growth in EV patenting.[41,42] Prima facie, the group of multinationals still has an absolute advantage with over 16,758 invention applications compared to 938 from backbone SOEs and JVs and 4303 from new local entrants. Yet a closer look shows that among those multinationals, 6316 applications are submitted by Toyota alone. The gap between local Chinese applicants and multinationals is not as formidable as in the ICE sector. Especially BYD, together with GM, having 2188 and 2537 invention patent applications, respectively, has become the second-tier applicants, with visible advantages over the third-tier applicants, including Hyundai, Ford, Nissan, Honda, and Chery. Even a handful of backbone SOEs, such as Beijing Auto, Shanghai Auto, and ChangAn Auto, are incentivized by governmental policies to develop their own technologies and file for patents (see Fig. 5).

BYD, as the largest EV producer in China today, cooperates with Daimler-Benz in a JV, namely, the Denza, to produce PEV. BYD and Daimler-Benz collaborate on the bodywork design. And BYD leads most of the rest product development tasks in Denza. Indeed, the technological capability of BYD in EV, embodied in 2188 invention patent applications, is the reason why Daimler-Benz chose to collaborate with the young Chinese car-maker.[43]

In fact, only Toyota and GM can maintain their leading positions ahead of BYD, although the advantages of GM have begun to fade. Further, given that Toyota has long been more focused on HEV rather than PEV or PHEV, which are the domains that BYD stresses, more detailed analyses need to be done in the future to judge the leadership contest in each market segment.

[41] Zheng, Jie, Shomik Mehndiratta, Jessica Y. Guo, and Zhi Liu (2012) Strategic policies and demonstration program of electric vehicle in China. Transport Policy, 19(1): 17–25

[42] Yang, Lifeng, Jinhua Xu, and Peter Neuhäusler (2013) Electric vehicle technology in China: an exploratory patent analysis. World Patent Information, 35(4): 305–312

[43] Up to 2015, Daimler-Benz has only applied for 139 invention patents in China.

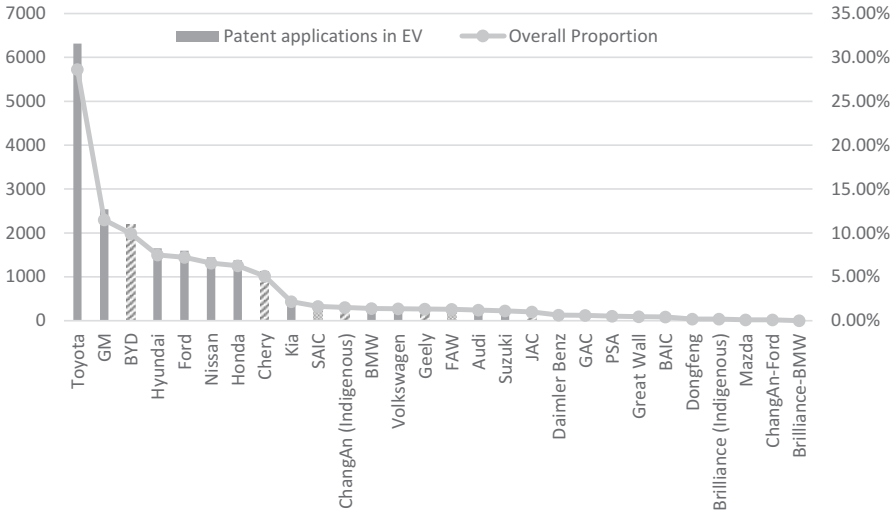

Fig. 5 Patent applications and overall proportion in EV, 1999–2017. (Note: Numbers of patent applications in China during 1999-2017, in the field of EV, collected from National Intellectual Property Administration, China.)

5 Conclusion and Prospects

The Chinese policy transition to indigenous innovation during 2005–2006 is a clear milestone for understanding the technological progress in this country. In the car-making industry, two rounds of invasion by newcomers, from the periphery to the central stage, are critical. The first round, represented by the entries of Chery, Geely, and so on, built the foundation for the policy shift. The second round was led by BYD, with a new mindset of developing EV. Overall, it is the new local entrants that have been steering China's automotive industry efforts to catch up in automotive technologies, while backbone SOEs have lagged behind as they have been shackled by their own previous policy practices. Guellec and van Pottelsberghe point out that the higher the ratio of indigenous innovation is, the easier it is for developing countries to free themselves from their reliance on foreign technologies. Our comparative patent analysis between the new local entrants and the backbone SOEs has also amply demonstrated this.[44]

The governmental support has provided a favorable environment for Chinese indigenous innovations, especially those in the EV sector. On the prospects for sustainable development in the long run, policy-makers in China have decided to shift the policies again, in order to create a more competition-oriented industry. As a

[44] Guellec, Dominique, and Bruno van Pottelsberghe de la Potterie (2001) The internationalisation of technology–analysed with patent data. Research Policy, 30(8): 1253–1266

result, the restrictions on foreign investment in China's EV industry have been removed in 2018; fully liberalized entry into the entire auto industry will be allowed in 5 years; the subsidy for purchasing EV will be totally abolished by 2020 and has already been gradually reduced since 2017. In addition, the long-existing JVs will lose all policy preferences that they have enjoyed, the backbone SOEs will not have the same attractiveness to multinationals anymore, and all EV producers need to enhance the cost performance of their products in order to compete against the FFVs. In short, there will be a reshuffling in the Chinese car-making industry, which can be another big opportunity for the new local entrants, as they have the most experience necessary to survive unfavorable institutional circumstances and tough competition.

Appendix 1: Firms in Different Categories (25 Firms Analyzed in This Chapter)

Multinationals
Toyota, Honda, General Motor, Ford, Hyundai, Nissan, Kia, BMW, Volkswagen (and Audi), Suzuki, Daimler-Benz, Mazda, PSA Peugeot Citroen
Backbone SOEs with Sino-Foreign JVs
FAW, Shanghai Auto (SAIC), Dongfeng Auto, Beijing Auto (BAIC), Guangzhou Auto (GAIC), ChangAn Auto (JV), Brilliance Auto (JV)
New Local Entrants
BYD, Geely, Chery, JAC, Great Wall, ChangAn Auto (indigenous), Brilliance Auto (indigenous)

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The Growth of the Indian Automobile Industry: Analysis of the Roles of Government Policy and Other Enabling Factors

Smita Miglani

Abstract

The automobile industry is one of the most important drivers of economic growth of India and one with high participation in global value chains. The growth of this sector has been on the back of strong government support which has helped it carve a unique path among the manufacturing sectors of India. The automobiles produced in the country uniquely cater to the demands of low- and middle-income groups of population which makes this sector stand out among the other automobile-producing countries. This chapter analyzes the roles of government policy, infrastructure, and other enabling factors in the expansion of the automobile and automotive component sectors of India. In 2017, India became the world's fourth largest automobile market, and the demand for Indian vehicles continues to grow in the domestic and international markets. To meet the future needs of customers (including the electrical vehicles) and stay ahead of competition, manufacturers are now catching up on upgradation, digitization, and automation. The chapter also analyzes India's national policy in light of these developments.

Keywords

Automobiles · Joint ventures · Government policy · Research and development · Intellectual property rights

All website information was accessed before August 2018.

S. Miglani (✉)
Indian Council for Research on International Economic Relations (ICRIER), New Delhi, India
e-mail: smiglani@icrier.res.in

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_19

1 Introduction

The automobile industry is an important driver of the economic growth in India and one of the successful sectors in which the country has high participation in global value chains (GVCs).[1]

This chapter analyzes the role of government policy, infrastructure, and other enabling factors in the expansion of the automobile and automotive component sectors and the direction they are likely to take for growth path in the next few years. The analysis in this chapter is organized into seven sections: The first section discusses the structure and makeup of the Indian automobile industry. The second section analyzes the growth of the sector over the past decades, while the third section discusses the role of government. The fourth section deals with other enabling factors in the growth of the industry. The fifth section analyzes initiatives in upgrading and innovation. The sixth section includes a discussion of the future scenario and the seventh section concludes.

2 Structure and Makeup of the Indian Automobile Industry

The Indian automobile industry – comprising of the automobile and the automotive components segments – is one of the key drivers of economic growth of India. Being deeply integrated with other industrial sectors, it is a major driver of the manufacturing gross domestic product (GDP), exports, and employment. This sector has grown on account of its traditional strengths in casting, forging and precision machining, fabricating (welding, grinding, and polishing) and cost advantages (on account of availability of abundant low-cost skilled labor), and significant foreign direct investment (FDI) inflows.

India was the sixth largest producer of automobiles globally with an average annual production of about 29 million vehicles in 2017–2018, of which about 4 million were exported.[2] India is the largest tractor manufacturer, second largest two-wheeler manufacturer, second largest bus manufacturer, fifth largest heavy truck manufacturer, sixth largest car manufacturer, and eighth largest commercial vehicle manufacturer. The contribution of this sector to GDP has increased

[1] The index of the length of GVCs helps ascertain the "number of production stages" involved in the industry. This index was above 2.5 for India (in 2008), indicating fairly high level of vertical linkages including stages of production located abroad. GVC participation can be measured through exports and imports of intermediate goods. The automobile industry exports have been growing continually. In the 1990s, the average annual growth of exports was around 15%. For details, see OECD (2012), Mapping Global Value Chains. TAD/TC/WP/RD (2012) 9.

[2] Approximate figures, based on Society of Indian Automobile Manufacturers (SIAM) Statistics. Available at http://www.siamindia.com/statistics.aspx?mpgid=8&pgidtrail=10. For more details, see Table 3 of this chapter.

Table 1 Indian Automobile Market and Market Share (%) by segment, 2017–2018

Commercial Vehicles	3
Three wheelers	3
Passenger vehicles	13
Two wheelers	81

Source: Society of Indian Automobile Manufacturers (SIAM) statistics

from 2.77% in 1992–1993 to about 7.1% now and accounts for about 49% of manufacturing GDP (2015–2016).[3] It employs more than 29 million people (direct and indirect employment). The turnover of the automobile industry is approximately US$ 67 billion (2016–2017)[4] and that of the component industry is US$ 43.5 billion (2015–2016).[5] As per the OICA[6] statistics, the Indian industry accounted for 4.92% of vehicle production globally in 2017 (5.38% of production in the car segment and 3.48% of production in the commercial vehicle segment).[7]

India is a prime destination for many multinational automobile companies with aspirations of business expansion in Asia. It attracted about US$ 14.48 billion (5.2% of total) in cumulative FDI equity inflows between 2000 and 2015.[8] The basic advantages that the country provides as an investment destination include cost-effectiveness of operations, efficient manpower, and a fast-growing dynamic market. In the past, major investments have come from Japan, Italy, and the USA followed by Mauritius and Netherlands. The industry manufactures a wide range of products to meet both domestic and international demands.

Table 1 shows the market share of different segments of the motor vehicles industry in 2015–2016. Irrespective of any policy regime, the two-wheelers segment has dominated the market share. Its share in production increased from around 54% in 1970–1971 to 80% in 1990–1991, close to 75% in the 1990s and 80% now.[9] Till the 1980s, the commercial vehicles were the second largest segment (after two-wheelers) holding around 20% share in production. After the

[3] Automotive Achievement Report 2016, Department of Heavy Industries. Available at http://www.makeinindia.com/article/-/v/automotive-achievement-report

[4] SIAM Statistics. Available at http://www.siamindia.com/statistics.aspx?mpgid=8&pgidtrail=10

[5] Automotive Component Manufacturers Association of India (ACMA) Statistics. Available at https://www.acma.in/industry-statistics.php

[6] OICA is the acronym for "Organisation Internationale des Constructeurs d'Automobiles," the French name for International Organization of Motor Vehicle Manufacturers.

[7] OICA statistics. Available at http://www.oica.net/category/production-statistics/2017-statistics/

[8] For details, see FDI in automobile industry, http://dipp.nic.in/sites/default/files/Chapter6.2.v_0.pdf

[9] Due to the size of lower middle-class population being very large in the country, the demand for two-wheelers has remained high because of its affordability and speed as a personal transport mode.

mid-1980s, passenger vehicles emerged as the second dominant segment, increasing its share from 7% in 1985–1986 to around 15% in 2011–2012 and 14% in 2015–2016. Sales of passenger cars touched 1.2 million units in 2006 and 3 million units in 2016–2017 to maintain the second largest market share in the industry.

Production in the sector is mainly concentrated around four large auto manufacturing hubs across the country: Delhi-Gurgaon-Faridabad in the north, Mumbai-Pune-Nashik-Aurangabad in the west, Chennai- Bengaluru-Hosur in the south, and Jamshedpur-Kolkata in the east of India.

3 Growth Path of the Indian Automotive Industry

3.1 From 1950 to 1980: Very Slow-Paced Growth

India's indigenous passenger car industry was launched in the 1940s with the establishment of Hindustan Motors and Premier Automobiles Limited. The two companies together garnered most of the market share till the 1970s, along with Telco, Ashok Leyland, Mahindra & Mahindra (M&M), and Bajaj Auto. The market for automobiles was not large given the low rate of economic growth in the country at this time, and thus the industry had a very slow-paced growth till the 1980s.

Efforts to establish an integrated auto component industry were initiated in the 1950s. The industry was protected by high import tariffs, and the production was catered to the demands of local automobile manufacturers. Manufacturing was licensed, and there existed quantitative restrictions on imports of automobiles and automotive components. However, a significant demand for passenger cars was emerging as the country's population and per capita income began to grow. The government felt the need to introduce modern, fuel-efficient, and low-cost utility cars that could also be affordable for "the common man."

3.2 First Wave of FDI from 1981 to 1991

FDI in automotive assembly was allowed in two major waves in 1983 and in 1993. This FDI was mainly "market-seeking" in nature.[10] Government policies such as import barriers and local content requirements contributed to the influx of FDI and helped the industry to compete with international players.

In February 1981, an Indian company called the Maruti Udyog Limited (MUL) was incorporated as a government company with Suzuki Motor Corporation as a

[10]The literature on FDI identifies three most common investment motivations: resource-seeking, market-seeking, and efficiency-seeking. For details, see Dunning, John H. (1993), "Multinational enterprises and the global economy." Workingham: Addison Wesley.

minor partner to make an efficient people's car for middle-income class in the country. In October 1982, the company signed the license and joint venture agreement with Suzuki.[11,12] Suzuki took up 26% equity in the company and made an investment of US$ 260 million. MUL created history by rolling out its first vehicle in 13 months, the Maruti 800 in 1984. This was the first domestically produced car in the country with completely modern technology. MUL made significant strategic moves including building a very strong ancillary vendor network around it and achieved an installed capacity of one lakh unit garnering about 62% of market share in a decade.[13] In 1989, Suzuki increased its equity stake to 40% and in 1992 to 50%.[14] However, private sector participation was still restricted in the passenger car segment with only three major players – MUL, Hindustan Motors, and Premier Automobiles Limited.

India also allowed four Japanese firms – Toyota, Mitsubishi, Mazda, and Nissan – to enter the market for light commercial vehicles through joint ventures (JVs) with Indian companies and some sharing equity with state-level governments in the 1980s.

Around this time, the government also put in place a Phased Manufacturing Programme (PMP) for localization of components, under which domestic original equipment manufacturers (OEMs) had to increase the proportion of domestic inputs used in their output over a specific period. The Indian companies went ahead to have JV collaboration with several Japanese and foreign OEMs. This enabled Indian companies to benefit from equity inflows and technology transfers.[15] This phase is widely regarded as the first wave of FDI in the sector.

3.3 Second Wave of FDI Since 1992

In the middle of 1991, the Indian Government made significant changes to its economic and industrial policies leading to the liberalization of the markets. This provided the impetus for the Indian automobile industry to flourish further. A new automobile policy was launched in 1993, facilitating the entry of global assemblers. Auto licensing was abolished in 1991, and the weighted average tariff was lowered

[11] At the time there were five passenger car manufacturers in India – Maruti Udyog Ltd., Hindustan Motors Ltd., Premier Automobiles Ltd., Standard Motor Production of India Ltd., and Sipani Automobiles.

[12] MUL was a venture of Sanjay Gandhi, son of Indira Gandhi, set up in 1971 with the mission of developing an indigenously designed affordable, cost-effective, low-maintenance, and fuel-efficient car. However, despite government support, the company had failed in its effort, and in 1980 the Government of India took over the company.

[13] MUL dominated the domestic passenger car market (with a market share of about 83%) till around 1996–1997.

[14] Amann, Edmund and John Cantwell (2012) (Eds.), "Innovative firms in emerging market countries," Oxford University Press, Oxford, United Kingdom

[15] Foreign companies typically entered the market taking local players as JV partners to gain local market knowledge and smooth out other operations.

Table 2 Mode of entry of selected companies, 1983–2007

Company	Mode of entry	Year
(a) Before 2000		
Suzuki	JV with government (Maruti)	1983
Mercedes-Benz	JV with Telco	1995
PAL-Peugeot	JV with Premier Automobiles	1995
Daewoo Motors	JV with DCM	1995
Honda Seil	JV with Shriram	1995
Ford Motors	JV with M&M	1996
General Motors	JV with Hindustan Motors	1996
Hyundai	100% subsidiary	1996
Toyota Kirloskar Motors	JV with Kirloskar	1997
(b) Post-2000		
Skoda (Volkswagen)	100% subsidiary	2001
Renault	JV with Mahindra	2005
Nissan	100% subsidiary	2005
BMW	100% subsidiary	2007

Source: Ramachandran J. (2011), "India Entry Strategy of Auto Majors, Tejas Article, IIM Bangalore," September

from 87% to 20.3% in 1997. The PMP policy ended in 1992. The Indian Government introduced a memorandum of understanding (MOU) system that continued to emphasize localization of components, up to 50%, for approving financial collaboration proposals on a case-by-case basis, which was raised to 70% later. Mass emission regulatory norms for vehicles were introduced, and a national highway policy was announced in this decade.

In 1997, automatic FDI approval of JVs with a 51% majority share for the foreign partner was allowed. Liberalized policies and the attraction of a huge unsaturated market made many globally competitive automakers to enter the passenger car market.[16] The most common route of entry was through JVs with Indian firms. Some manufacturers also left the market due to increased competition.[17] Table 2 illustrates the entry of major assemblers in the Indian market and their mode of entry for the period between 1983 and 2007.

Japanese participation in the Indian automobile industry brought significant changes to the structure of the passenger car market, including utility vehicles. Gradually, established players such as Telco entered the commercial passenger car segment capitalizing on their engineering capabilities, and economies of scale,[18]

[16] The major multinationals that entered the Indian market in the initial years of liberalization are Daewoo, Peugeot, General Motors, Mercedes-Benz, Honda, Hyundai, Toyota, Mitsubishi, Suzuki, Volvo, Ford, and Fiat. For details, see Krishnaveni M. and R. Vidya (2015), "Growth of Indian Automobile Industry," *International Journal of Current Research and Academic Review*, 3(2), 110–118. February.

[17] By the early 2000s, Daewoo, Fiat, PAL-Peugeot, and PAL had ceased their operations.

[18] D'Costa, Anthony P. (1995), "The restructuring of the Indian automobile industry: Indian state and Japanese capital," *World Development*, 23(3): 485–502.

and domestic players in the commercial vehicle segment started developing passenger cars on a limited scale. Indian companies such as Telco, M&M, Hindustan Motors, Premier Automobiles, and DCM entered into JVs with Ford, Mercedes, General Motors (GM), and Peugeot for assembly of medium-sized cars from knocked-down units. This increased the market competition and restructured pressures on existing players.

The post-1992 period is widely regarded as the second wave of FDI in the sector, which played a crucial role in bringing dynamism, diversification, and intense competition in the industry. Many companies started operating at a significant scale in the market and started operations in the midsize car segment. Indian companies such as Tata Motors introduced special purpose vehicles and platforms to enter the passenger car segment. This period saw creation of wide networks, as many companies had full technology and competence in producing state-of-the-art models of vehicles and had contractual arrangements with their component suppliers.

The role of foreign presence in the passenger vehicle segment grew much more than all the other segments of automobiles, followed by the multi-utility vehicle segment. Thus, foreign partners now hold all or a greater share of the equity in most of these cases even though most of them initially formed JV of equal sharing of equity.[19] The inability of the Indian partners to contribute toward capacity expansion allowed foreign partners to increase their stake or take total control by buying out their Indian partners.[20]

In both the waves of FDI that occurred in 1983 and post-1992 period, a significant amount of FDI by the multinational corporations (MNCs) flowed into the country to build modern plants. Maruti Suzuki's investment in the early 1980s was made possible mainly due to its willingness to invest capital. Subsequently, various MNC manufacturers have made investments of millions of US dollars in the country.[21]

In the post-2000 period, Indian firms such as Maruti Suzuki slowly started moving toward building its own design and development capabilities. Tata Motors made rapid strides toward developing an advanced level of technological capability by launching the first indigenously developed Indian car, "Tata Indica" (1998). In 2002, M&M launched "Scorpio" as a sport utility vehicle (SUV) – a product of in-house design and development effort. In 2004, Tata Motors signed a JV with Daimler-Benz for manufacturing Mercedes-Benz passenger cars in India. The Mercedes-Benz India Limited plant assembled completely knocked-down units imported from abroad.

[19] Mukherjee, Avinandan and Trilochan Sastry (1996), "Recent developments and future prospects in the Indian automotive industry," IMVP Working Paper, Cambridge: Massachusetts Institute of Technology, USA.

[20] Sagar, Ambuj D., and Pankaj Chandra (2004), "Technological Change in the Indian Passenger Car Industry," BCSIA Discussion Paper 2004–2005, Energy Technology Innovation Project, Kennedy School of Government, Harvard University.

[21] For details, see FDI Statistics, Department of Industrial Policy and Promotion (DIPP), Government of India, available at http://dipp.nic.in/publications/fdi-statistics; Ray, Saon and Smita Miglani (2016), "The role of FDI in fostering growth in the automobile sector in India," Tech Monitor, April–June 2016, available at http://techmonitor.net/tm/images/7/75/16apr_jun_sf3.pdf

Increased competition led to restructuring and cutting of costs, enhanced quality, and improved responsiveness to demand. MNC automakers such as Hyundai, Nissan, Toyota, Volkswagen, and Suzuki which had established production plants in India eventually started using India as an export platform for their overseas networks. The small car segment did particularly well, and India's potential as a global hub for manufacturing small cars began to be recognized.

Between the years 2001 and 2010, passenger vehicle sales grew at a compound annual growth rate (CAGR) of 15.67%. Of the total sales, roughly 10% were contributed by exports. Between 2000 and 2015, the average year-on-year growth rate of export of vehicles from the country was approximately 23%.[22] The industry is known for export of mini hatchbacks and an evolving export base for midsize cars and compact SUVs.[23] As per the World Trade Organization's World Trade Statistical Review 2017, India was the tenth largest exporter of automobile products worldwide in 2016, accounting for US$ 13 billion worth of exports.[24]

3.4 Since 2001 Fully De-licensed, Free Imports and 100% FDI Allowed

In the last decade again, various trade and investment restrictions were removed to speed up momentum for large-scale production. As of today, the government encourages foreign investment and allows 100% FDI in the sector via the automatic route. The industry is fully de-licensed, and free imports of automotive components are allowed. India is the second fastest-growing market for automobiles and components globally (after China).[25]

With an outward vision of component makers, and competitive pressures from international firms, the component industry had to upgrade process and product qualities and technology standards to gain and sustain capabilities.[26] Many

[22] Computation using SIAM data.

[23] Interestingly, India is evolving into one of the top global export bases of certain car models made by MNCs (e.g., Volkswagen's Vento, Hyundai's SUV Creta, GM's Beat, and Ford's EcoSport). This mix of export and local strategy is leading to better utilization in the industry. India has become a cost-competitive production base for these companies, and cars manufactured in India have found high levels of acceptance and are in demand in several markets.

[24] WTO (2017), World Trade Statistical Review 2017, available at https://www.wto.org/english/res_e/statis_e/wts2017_e/wts17_toc_e.htm

[25] Foreign companies, which had initially just outsourced manufacturing to local players, gradually made a shift from imports to indigenous production. Slowly, they also established technology development centers to meet their global requirements for single and multiple segments in some cases. More and more Tier 1 companies relocated whole and complex systems to India rather than building basic parts of processes. Continued inflow of foreign technological know-how and competition with other Asian production centers like China helped local firms make improvements in quality, capacity, and productivity. For details, see Ray, Saon and Smita Miglani (2016), "Innovation (and upgrading) in the automobile industry: the case of India," IC RIER Working Paper 320.

[26] Global assemblers and large component producers set stringent operational requirements in terms of cost, quality, delivery, and flexibility for their suppliers. They also introduced new technology – more composite parts needing new capabilities to produce them. The focus of innovations was on process changes and gradually shifted from assembling units to auto component units.

manufacturers now adhere to the global environmental norms regarding emission/technological standards and quality certifications. The industry grew by around 20% annually in the 1990s, and the average annual growth of exports was around 15% during that period.[27,28] Over the years, it has been able to modernize its technology and improve quality and has developed capabilities to manufacture components for new-generation vehicles. Indian companies maintained their traditional strengths in casting, forging and precision machining, and fabricating (welding, grinding, and polishing) at technology levels matching the required scale of operations. They achieved significant success in garnering engineering capabilities and adapted to local requirements through local design.[29] High growth has taken place in engine, drive transmission, and steering parts. Engine parts, being high value-added in its nature, have been contributing most to total production. Endowed with the potential of low-cost quality products, India edges over many other developing countries in component manufacturing.[30]

Table 3 provides the category-wise trends for automobile production, domestic sales, and exports (in numbers) from 2011–2012 to 2016–2017.[31] Further, using estimates from the SIAM of India, it is calculated that between 2001 and 2018, the CAGR of export of all vehicles from India was 20.02%.[32] The estimates for other parameters – production, domestic sales, and exports – as percentage of production are given under Table 4. Comparable data for the selected categories before 1995 is not available. However, calculations have been made by other authors for earlier periods and different segments.[33]

[27] For details, see Tiwari Rajnish and Cornelius Herstatt (2014), *Aiming Big with Small Cars: Emergence of a Lead Market in India*. (Switzerland: Springer International Publishing).

[28] The four companies in top ten list of India's auto component segment are Motherson Sumi, Amtek Auto, Bharat Forge, and Mahindra CIE. These companies have grown due to their focus on international acquisitions and efficient management post acquisition. For details, see Edelweiss (2014), "Auto Components: The Future Mega Trends, Mega Factors." Edel Invest Research.

[29] The component industry manufactures a wide range of products to meet both domestic and international demands. Domestic sales are dominated by power train, while globally it is spread across power train systems and exterior and interior systems. Indian vehicles lag their global counterparts in power train technology, safety and infotainment content, electronic stability control, ABS, front and side airbags, etc. For details, see Edelweiss (2014), "Auto Components: The Future Mega Trends, Mega Factors." Edel Invest Research.

[30] Following the international trend, Indian OEMs are also outsourcing modules to global component suppliers.

[31] Ray, Saon and Smita Miglani (2018), "Upgrading in the Indian automobile sector: the role of lead firms," ICRIER Working Paper 360, June; Tiwari Rajnish and Cornelius Herstatt (2014), "Aiming Big with Small Cars: Emergence of a Lead Market in India." (Switzerland, Springer International Publishing); Innomantra (2011), "Patent portfolio of major Indian automobile companies: An Indicative Measure of Innovation," Innomantra Consulting P. Limited.

[32] The share of exports in total output has been approximately 14–15% in the last 5 years.

[33] For instance, see Parhi, Mamta (2008), "Indian Automotive Industry: Innovation and Growth." India, Science and Technology: 2008, S&T and Industry. NISTADS.

Table 3 Automobile trends in India, 2011–2018

Category		2011–2012	2012–2013	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018
Passenger vehicles	Production	31,46,069	32,31,058	30,87,973	32,21,419	34,65,045	38,01,670	40,10,373
	Domestic sales	26,29,839	26,65,015	25,03,509	26,01,236	27,89,208	30,47,582	32,87,965
	Exports	5,08,783	5,59,414	5,96,142	6,21,341	6,53,053	7,58,727	7,47,287
Commercial vehicles	Production	9,29,136	8,32,649	6,99,035	6,98,298	7,86,692	8,10,253	8,94,551
	Domestic sales	8,09,499	7,93,211	6,32,851	6,14,948	6,85,704	7,14,082	8,56,453
	Exports	92,258	80,027	77,050	86,939	1,03,124	1,08,271	96,867
Three-wheelers	Production	8,79,289	8,39,748	8,30,108	9,49,019	9,34,104	7,83,721	10,21,911
	Domestic sales	5,13,281	5,38,290	4,80,085	5,32,626	5,38,208	5,11,879	6,35,698
	Exports	3,61,753	3,03,088	3,53,392	4,07,600	4,04,441	2,71,894	3,81,002
Two-wheelers	Production	1,54,27,532	1,57,44,156	1,68,83,049	1,84,89,311	1,88,30,227	1,99,33,739	2,31,47,057
	Domestic sales	1,34,09,150	1,37,97,185	1,48,06,778	1,59,75,561	1,64,55,851	17,589,738	20,192,672
	Exports	19,75,111	19,56,378	20,84,000	24,57,466	24,82,876	23,39,273	28,15,016
Total	Production	2,03,82,026	2,06,47,611	2,15,00,165	2,33,58,047	2,40,16,068	2,53,29,383	2,90,73,892
	Domestic sales	1,73,61,769	1,77,93,701	1,84,23,223	1,97,24,371	2,04,68,971	2,18,62,128	2,49,72,788
	Exports	29,37,905	28,98,907	31,10,584	35,73,346	36,43,494	34,78,268	40,40,172

Source: SIAM Statistics

Table 4 Segment-wise estimates of CAGR

Production				
Category	1995–2000	2001–2010	2011–2018	**2001–2018**
Passenger vehicles	6.82	15.01	3.53	11.10
Commercial vehicles	−6.91	14.91	−0.54	10.55
Three-wheelers	1.62	12.60	2.17	9.67
Two-wheelers	7.18	10.53	5.97	10.45
Grand total	6.19	11.41	5.21	10.51
Domestic sales				
Category	1995–2000	2001–2010	2011–2018	**2001–2018**
Passenger vehicles	9.80	12.52	3.31	9.76
Commercial vehicles	−6.96	15.41	0.81	10.94
Three-wheelers	2.28	9.15	3.10	7.03
Two-wheelers	7.10	9.24	5.99	9.63
Grand total	6.57	9.91	5.32	9.60
Exports				
Category	1995–2000	2001–2010	2011–2018	**2001–2018**
Passenger vehicles		27.50	5.65	17.23
Commercial vehicles		15.96	0.70	13.14
Three-wheelers		30.79	0.74	20.74
Two-wheelers		30.45	5.19	21.40
Grand total		29.06	4.66	20.02
Exports as percentage of production				
Category	1995–2000	2001–2010	2011–2018	**2001–2018**
Passenger vehicles		10.87	2.04	5.52
Commercial vehicles		0.92	1.25	2.34
Three-wheelers		16.16	−1.40	10.10
Two-wheelers		18.03	−0.73	9.91
Grand total		15.85	−0.52	8.60

Source: Author's calculations using SIAM Statistics

There are many reasons for the impressive growth achieved by Indian manufacturers over the last two decades. These are discussed in detail in the next section. The main strengths have been a large unsaturated domestic market for small cars (and presence of a large middle economic class), low production costs (on account of availability of low-cost labor and other inputs), and skilled engineering talent. Global affiliations and tie-ups also enabled technology upgrading and expansion of scale of production in the industry.

In the passenger car segment, there are more than 30 international quality models in the market, some of which are now being exported to MNCs' home markets. Leading Indian manufacturers are in the process of transforming from local players to global companies. India's domestic carmakers, viz., Tata Motors, M&M, and Ashok Leyland, have developed manufacturing facilities, significant R&D,

technology development, and testing centers.[34] In addition, Indian companies have bought capacity or made alliances with other manufacturers in East Asia, South America, Africa, and Europe.

Low cost of labor and economies of scale have made India an ideal export hub for small cars. The Indian auto industry is expected to be the world's third largest automotive market by volume by 2026.[35] Promotion of exports has been part of companies' business strategies for better utilization of installed capacities.[36] Low cost of manufacturing and economies of scale achieved as a result of catering to overseas markets have allowed vehicle makers to become competitive and offset weak demand in the domestic market. Companies which have had partnerships with foreign players or received FDI have benefited in terms of engagement in GVCs.

4 Role of the Government

The automobile industry has in many ways been shaped by the Indian Government's policy and nurtured in microeconomic environment it helped to create. Apart from the direct impact through fiscal policy instruments, the industry policy even influenced firm-level learning processes and shaped technological capability accumulation.[37]

Since 1970, the Indian Government gradually added the automotive industry to a list of its core or "pillar" industries, recognizing it as a significant driver to achieve economic growth since it had many forward and backward linkages.[38] The industry began to be prioritized in the manufacturing sector for promotion and favorable policy support to promote productivity. In 1975, as a general industrial policy, the government permitted an automatic capacity expansion by 25% every 5 years and removed price controls.[39]

The share of commercial vehicles and passenger car segment also changed in response to policy changes. Indian policy had favored the development of the commercial vehicles industry, i.e., light and heavy vehicles (for public transport of

[34] The largest carmaker is Maruti Suzuki India Limited with a market share close to 50%, followed by Hyundai Motor India Limited, with a share of around 17%, M&M (around 7%), Renault India Private. Limited and Toyota Kirloskar Motor Private Limited (approximately 5% each).

[35] For details, see https://www.investindia.gov.in/sector/automobile

[36] For details, see Ray, Saon, and Smita Miglani (2018), "Upgrading in the Indian automobile sector: the role of lead firms," ICRIER Working Paper 360, June. Innomantra (2011), "Patent portfolio of major indian automobile companies - An Indicative Measure of Innovation," Innomantra Consulting P. Limited.

[37] Kale, Dinar (2017). "Sources of innovation and technology capability development in the Indian automobile industry." *Institutions and Economies*, 121–150.

[38] The reason for this is that an automobile is composed of more than 10,000 parts and components; and the industry has strong backward and forward linkages with many other industries such as metallurgy, petroleum, chemistry, coal, light industry, electronics, and textiles.

[39] D'Costa, Anthony P. (1995), "The restructuring of the Indian automobile industry: Indian state and Japanese capital," *World Development*, 23(3), 485–502.

goods and passengers), as opposed to the development of passenger vehicles. Cars in particular were considered as luxury goods.[40] By the early 1980s, the government had realized the need to develop the passenger vehicle segment and took decisions like permitting increased foreign capital and overseas collaborations and reduced production licenses on manufacturing operations. In 1981, the policy of "broad-banded" licenses was announced – permitting vehicle manufacturers to produce different kinds of vehicles instead of just one kind decreed earlier. Firms were allowed greater flexibility in operations through policies such as minimum economic scale requirements, exemption from detailed Monopolies and Restrictive Trade Practices (MRTP) Act[41] notification procedures. The components sector was also de-licensed substantially.[42]

In the 1980s, government-funded training programs and cluster building also led to changes in supplier relations, enabling vendor development and effective supply chain management. More liberal import policies were introduced in 1986 when importers of capital equipment were allotted about 50% increase in their foreign exchange quota.

In July 1991, the New Industrial Policy was introduced which removed most of the constraints relating to investment, expansion, and foreign investment in the Indian industry. The system of industrial licensing was abolished for all (except 18) industries, and the passenger car industry was de-licensed in May 1993. Foreign investment was allowed on an automatic basis in 34 industries, including the automotive industry. Liberal policies of the 1990s led to the entry of new competitors and spillover benefits, especially on the technology side, and to increased expenditure on R&D and a desire to innovate to distinguish products in the market. The time span between productions of new products shortened rapidly. The policies remained tilted in favor of the domestic industry as MNCs were still required to make specified capital investments and meet export obligations. In 2001, the government removed auto import quotas and permitted 100% FDI in the sector. Excise duties were reduced to 24% on passenger cars.

High tariffs forced the OEMs to set up parts-manufacturing plants in India. Institutional support for developing supplier capabilities led to the establishment of flexible supplier relationships which further helped the industry in building

[40] D'Costa, Anthony P. (1995), "The restructuring of the Indian automobile industry: Indian state and Japanese capital," *World Development*, 23(3), 485–502; Narayana, D. (1989), "The Motor Vehicle Industry in India (Growth within a regulatory policy environment)," New Delhi and Trivandrum: Oxford& IBH Publishing Co. Private Limited; Singh, Jatinder (2014). India's automobile industry: Growth and export potential. *Journal of Applied Economics & Business Research*, 4(4), 246–262; Kathuria, Sanjay (1996), "Competing through technology and manufacturing: A study of the Indian commercial vehicles industry." Delhi: Oxford University Press

[41] The MRTP Act was passed by the Parliament of India on 18 December 1969 and came into force from June 1, 1970. It aimed to prevent concentration of economic power to the common detriment; provide for control of monopolies and probation of monopolistic, restrictive, and unfair trade practices; and protect consumer interest. It was later revoked and replaced by Competition Act, 2002.

[42] Kathuria, Sanjay (1996), "Competing through technology and manufacturing: A study of the Indian commercial vehicles industry." Delhi: Oxford University Press.

innovation capabilities as well.[43] An initiative specifically targeted in this direction was the setting up of the National Automotive Testing and R&D Infrastructure Project (NATRIP) under the Automotive Mission Plan 2006–2016 (AMP 2016),[44] costing US$ 388.5 million to enable the industry achieve parity with global standards.

The Indian car industrial policy also protected the domestic market by setting up challenges for firms such as requirements for higher local content. This policy helped the development of basic capabilities in manufacturing and laid foundations of the auto component supplier industry.[45] The protection policies of the 1980s and 1990s encouraged acquisition of basic production capabilities.[46] Local content requirements or indigenization[47] of up to 70% forced OEMs and their suppliers to make significant capital investments and created a chain of world-class component suppliers.[48,49] The process of indigenization has also been recognized as a key regulation responsible for enhancing technological capabilities.[50] This entailed collaborative effort between local suppliers and engineers from parent company and led Indian firms toward development of technological capabilities.

Key interventions undertaken by the government under this plan have been in areas of tariff policy, infrastructure (improved and expanded road network, development of auto wagon rakes, creation of few specialized ports in the private sector), R&D (setting up of NATRIP, upgradation of existing centers), and promotion of electric and hybrid vehicles. Currently, the automobile manufacturing policy in

[43] Saripalle, Madhuri (2012), "Learning and Capability Acquisition: A Case Study of the Indian Automobile Industry," Working Papers 2012–065, Madras School of Economics, Chennai, India.

[44] The AMP 2016 was announced in 2007, as a vision document of the government and the industry for targets under all areas in the next 10 years. Available at https://dhi.nic.in/writereaddata/Content/Automotive%20Mission%20Plan%20(2006-2016).pdf

[45] Kale, Dinar (2012). "Sources of innovation and technology capability development in the Indian automobile industry." Institutions and Economies, 121–150.

[46] Saripalle, Madhuri (2012), "Learning and Capability Acquisition: A Case Study of the Indian Automobile Industry," Working Papers 2012–065, Madras School of Economics, Chennai, India.

[47] Indigenization required modifying design to local needs, sourcing components from local suppliers, and validating all components and subsystems for Indian standards.

[48] Maruti 800 model, the maiden output of MUL in 1984, had 97% import content initially, and only tires and batteries were sourced locally. The government set a target of 93% indigenization within 5 years, and the company started to develop local vendors from scratch. The company attracted entrepreneurs by offering them land at its complexes and supplied electricity from its own power station. In addition, Suzuki engineers helped the new manufacturers with automation and management practices such as just-in-time manufacturing. For details, see Amann, Edmund and John Cantwell. (eds.) (2012), "Innovative firms in emerging market countries." Oxford University Press; and Kale, Dinar (2017), "Sources of innovation and technology capability development in the Indian automobile industry." *Institutions and Economies*, 121–150.

[49] By 1990, MUL had achieved around 95% local content. Tata Motors' best-selling compact car Indica launched in 1998 also had about 95% local content. Local engineering design capabilities allowed Tata Motors and M&M to develop entirely new vehicle platforms locally.

[50] Sagar, Ambuj D. and Pankaj Chandra (2004), "Technological Change in the Indian Passenger Car Industry," BCSIA Discussion Paper 2004–2005, Energy Technology Innovation Project, Kennedy School of Government, Harvard University

India is being governed by the Automotive Mission Plan 2016–2026 (AMP 2026),[51] which lays down the achievements and targets of the industry by 2026.

5 Other Enabling Factors in the Growth of the Industry

Other enabling factors in the growth of the industry include domestic market demand, FDI, JVs, and corporations' competitive strategies.

5.1 Role of Domestic Demand

A growing working population and an expanding middle-class have been the key demand drivers for automobiles in India. India has the second largest road network in the world at 4.7 million kilometers. Road development activity has gradually increased over the years with an improvement in connectivity between cities, towns, and villages in the country. The Government of India's policy to set aside substantial investment layout for infrastructure development in every 5-year plan has included the focus on the development of country's roads. This has given a fillip to the demand for cars and other vehicles.

India is home to the second largest population in the world. The estimated population is about 1.3 billion people. The GDP per capita has grown from approximately US$ 1432 in 2010 to US$ 1500 in 2012 and US$ 1939 in 2017.[52] Factors like increasing disposable incomes in the rural agriculture sector, presence of a large pool of skilled and semiskilled workers, and a strong educational system will continue to increase vehicle demand in future.[53] It is estimated that by 2020, migration on account of urbanization will be over 140 million.[54] India is projected to add over 68 million households to its already significant middle-class by 2030, which would drive an increased demand for automobiles. The number of registered motor vehicles per 1000 population was only 167 in 2015.[55] These facts point to a huge potential of increasing private vehicle ownership penetration in the future.

[51] Automotive Mission Plan 2016–26, http://www.siamindia.com/uploads/filemanager/47AUTOMOTIVEMISSIONPLAN.pdf

[52] The World Bank Database. Available at https://data.worldbank.org/indicator/NY.GDP.PCAP.CD

[53] Make in India website, Government of India, http://www.makeinindia.com/sector/automobiles

[54] Government of Andhra Pradesh, Automobile & Auto Components Policy 2015–2020, https://www.apindustries.gov.in/APIndus/Data/Industry1/Andhra%20Pradesh%20Automobile%20and%20Auto%20Components%20Policy%202015-20.pdf

[55] Open Government Data Platform, https://community.data.gov.in/registered-motor-vehicles-per-1000-population-from-2001-to-2015/

5.2 Impact of FDI

The impact of FDI can be seen in terms of output and productivity, technology, and better practices, all of which could make the industry more competitive.[56] These aspects are discussed in detail below.

5.2.1 Output and Productivity

FDI has positive impact of output and productivity growth. In the period 1947–1983, the output growth remained limited. The models of cars sold were unchanged for decades, and foreign models assembled in the country were primarily European. The number of models manufactured in the passenger car segment was 2 in 1982–1983, which rose to 8 in 1994–1995 and 28 in 2001–2002.

The most prominent spillover impact of FDI was on the component industry, whose turnover more than tripled from 1992–1993 to 2001–2002. Supplier productivity increased as foreign firms co-located suppliers (i.e., put them in a common area) and required home-country suppliers to invest in India. Competition was also provided by international MNCs which entered the sector to serve international assemblers, resulting in increased quality and reliability. This led to the establishment of a reliable component supplier industry, which encouraged more MNCs to enter the Indian market after the 1990s.

5.2.2 Technology

A significant infusion of global technology occurred with the entry of foreign firms. The first 192 cars to roll out of the Maruti Suzuki factory in December 1983 were almost entirely Japanese cars, with only tires and batteries sourced from MRF and Chloride India, respectively. Localization ambitions of Indian firms were facilitated through 40 JVs between Indian vendors and Japanese collaborators by the end of the century.[57]

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[56] The socioeconomic impact of FDI on a given host economy is examined through wealth creation, economic development, economic growth, improvement in standard of living, improvement in productivity, and supply chain connectivity. The literature indicates that while there are many benefits of FDI, certain preconditions seem necessary in host countries to enable them to reap the benefits. These preconditions range from infrastructure, to environment, which includes the nature of human capital, domestic fixed capital formation, government spending, trade orientation of the region, and the legal environment. In the case of innovation, public infrastructure such as educational institutions and publicly funded R&D also add to the absorptive capacity.

[57] Tiwari, Rajnish and Cornelius Herstatt (2014), 'Aiming Big with Small Cars: Emergence of a Lead Market in India.' (Switzerland, Springer International Publishing); and Bhargava, R.C. and Seetha, (2010), 'The Maruti Story', New Delhi: Collins Business. There are two competing arguments on the effect of FDI on innovation in an economy. One line of reasoning suggests that inward FDI leads to beneficial outcomes for local firms through knowledge spillovers and increased incentives to compete with the better-endowed foreign entrants. The other line of reasoning casts doubt on the ability of FDI to increase the level of innovation among local firms, suggesting that the increased competition that arises from the entry of new foreign firms relegates the domestic firms to less innovative market niches. Studies list four channels that allow for technological spillovers from FDI to the host country. These are: (1) Transmission of technology through imitation,

There were 50 greenfield investment projects[58] in the sector between 2000 and 2007.[59] In some clusters such as Pune and Chennai, global OEMs played important or even dominant roles in technology diffusion and were responsible for development of domestic innovation capability.[60]

5.3 Role of JVs

As mentioned before, JVs and technical collaboration played a vital role as a source of innovation for local auto component supplier firms in India. Some important partnerships in the Indian automobile industry are listed under Table 2.

Acquiring knowledge and skills through external collaboration is an efficient way to achieve innovation within automotive clusters. Collaborations result in frequent interactions, reflected in acquisition of knowledge, sharing, diffusing, and creation of it. Linkages among settings such as clusters result in learning through networking and interacting and are seen as important for innovative activities.[61]

There are a number of examples in India which have shown that the JV collaboration has been an efficient way of achieving greater growth in the industry through benefits such as technology sharing, learning best practices, and training of workers. For instance, MUL's first established plant was a close copy of Suzuki's Kosai plant in Japan in terms of plant layout, equipment, the organization of production, and

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subject to the legal system, regulations, infrastructure and human capital endowments; (2) Positive spillovers generated through training of local workers by foreign-owned companies; (3) Increased competition due to the presence of foreign firms, subject to the size of the technology gap between the foreign owned and domestic company, as well as the ease of entry into, and exit from the market; and (4) Vertical or backward spillovers resulting from increased demand for intermediate goods manufactured by foreign owned companies by domestic companies in the host nation. For details, see Saggi, Kamal (2002), 'Trade, Foreign Direct Investment, and International Technology Transfer: A Survey', *World Bank Research Observer*, 17, 191–235.

[58] These refer to a completely new investment projects, not building on anything already in existence.

[59] The reallocation of resources that accompanies the entry of foreign firms may not be immediate. Resources released in this process may be put to better use by foreign firms with superior technologies, efficient new entrants (both domestic and foreign), or by other sectors. Studies indicate that positive spillovers in the host country will occur if there is an environment conducive to inflows of FDI. The conditions range from human capital, private and public infrastructure, legal protection, educational institutions, and publicly funded R&D. The host country factors that are likely to attract export-oriented FDI involve the possibilities of fragmenting production geographically. Location factors that influence this type of FDI are labor costs, infrastructure, trade barriers, exchange restriction, and policies favorable to FDI. For details, see Ray Saon, Smita Miglani, and Neha Malik (2014), "Impact of American FDI in India." Academic Foundation, New Delhi.

[60] More, Rahul Z. and Karuna Jain (2013), "Innovation and competitiveness among the firms in the automobile cluster in Pune." Knowledge Forum: Annual International Conference Paper. Pune.

[61] Breschi, Stefano and Franco Malerba (2001), "Geography of innovation and economic clustering." Industrial and Corporate Change, 10(4), 817–33.

operating principle.[62] Also, it was the first firm to introduce a partial "just-in-time" and total quality management in India, which aimed to reduce inventory cost. MUL followed a strategy of massive investment in the program of vendor development, involving stable and close supplier relations with its first-tier suppliers (40 top suppliers), equity participation in key suppliers, and promotion of technical collaboration between its suppliers with Suzuki's suppliers in Japan.

Other lead firms[63] of Indian origin including the TVS Group, the Rane Group, and Ashok Leyland Limited have played critical role in the development of the Chennai automobile cluster. Ashok Leyland Limited, one of the largest manufacturer of commercial vehicles, trucks, and buses in India and the world, entered into an agreement with Leyland Motors, UK, to manufacture Leyland vehicles way back in 1950. Brakes India Private Limited was founded in 1962 as a JV between TVS and Lucas Industries Limited of the UK (100% subsidiary of ZF TRW) and is the largest manufacturer of braking components and systems in India with an annual turnover of more than US$ 600 million. It exports products to 35 countries and caters to over 60% of the domestic OEM market. The Rane Group which plays a dominant role in the component segment has had critical partnerships with foreign firms like ZF TRW (USA) and NSK and Nisshinbo (Japan) for a long time. Other group firms, such as Brakes India, Sundaram-Clayton Ltd., Sundram Fasteners Ltd., and Turbo Energy Ltd., were established in the 1960s, as JVs with British firms. M&M and Bajaj Tempo also operated through JVs and developed quality products over the years.[64]

5.4 Firm Strategies, Ownership, and Managerial Vision

In addition to the aforementioned reasons, an important role was played by firm strategies, ownership, and managerial vision of diversified and big business groups such as the Tata Group and M&M in building technological capabilities in the sector.[65] For instance, the ambition and vision of Tata's head Ratan Tata to develop the first "Indian car" and then "people's car" were the driving forces behind the development of Tata Indica and Tata Nano. The company's diaspora connections and family-owned diversified businesses also facilitated inter-sector learning and played a significant role.

[62] Okada, Aya and N.S. Siddharthan (2007), "Industrial clusters in India: Evidence from Automobile clusters in Chennai and the National capital Region," Discussion Paper No. 103, Institute of Developing Economies, JETRO.

[63] Large MNCs are usually referred by the name of "lead firms" or "governor firms" that largely determine production parameters and wield power over other firms in global production networks or chains. These firms decide the location of high value activities and conditions under which firms participate in these networks and thus largely also affect the upgrading outcomes of other smaller firms.

[64] More, Rahul Z. and Karuna Jain (2013), "Innovation and competitiveness among the firms in the automobile cluster in Pune." Knowledge Forum: Annual International Conference Paper. Pune.

[65] Kale, Dinar (2011), "Co-evolution of policies and firm level technological capabilities in the Indian automobile industry," Atlanta Conference on Science and Innovation Policy, September 13–17. Atlanta, GA, USA.

Firms like Tata Motors and M&M had global aspirations, and their business models were focused on domestic as well as markets in other countries with similar characteristics such as those in Africa, Latin America, and South Asia. In 2004, Tata Motors bought the Daewoo's truck-manufacturing unit in South Korea. In 2005, Tata acquired 21% share in Hispano Carrocera, SA, a Spanish bus-manufacturing firm. In 2005, M&M acquired Stokes Group, a leading auto component manufacturer in the UK. In 2008, M&M acquired Jaguar and Rover and established plants in Malaysia, Kenya, Bangladesh, Spain, Ukraine, and Russia to assemble knocked-down units exported to these countries. The same model extended to Australia, South Africa, Italy, and Uruguay. In 2006, M&M formed a JV with Marco Polo, a Brazilian firm to manufacture and assemble fully built buses and coaches. In November 2017, M&M opened its new manufacturing plant with an investment of US$ 230 million in Detroit, USA.

The profitability of group-affiliated firms exceeded that of other companies due to advantages such as greater access to funds, diversified and skilled labor, and other resources. These business groups or conglomerates were often able to fill the institutional gaps typically found in developing countries by building institutions for the benefit of group members.[66]

6 Upgrading and Innovation

Indian lead firms have made significant efforts toward upgrading over the years, including the use of advanced modular platforms, new materials, and platform sharing in India.[67] The concept of upgrading refers to the capacity of firms to make better products, more efficiently, and move into more skilled activities.[68]

The government has been encouraging R&D in this sector by offering tax cuts on such expenditure. The NATRIP project, initiated in 2005, was set up to enable the industry to adopt and implement global performance standards and provide low-cost manufacturing and product development solutions.

Among Indian companies, M&M and Ashok Leyland have made significant investment in R&D centers and technology development and testing centers and have ventured abroad. Global firms have been putting up development centers in India, either on their own or in partnership with local players (for instance, GM, DaimlerChrysler AG,

[66] Khanna, Tarun and Krishna Palepu (2000), "Is group membership profitable in emerging markets? An analysis of diversified Indian Business groups," *Journal of Finance*, 55, 867–891 and Kale, D. (2011), "Co-evolution of policies and firm level technological capabilities in the Indian automobile industry," Atlanta Conference on Science and Innovation Policy, September 13–17. Atlanta, GA, USA.

[67] For a detailed reference, see Ray, Saon, and Smita Miglani (2018), "Upgrading in the Indian automobile sector: the role of lead firms," ICRIER Working Paper 360, June.

[68] For details, see Kaplinsky, Raphael (2000), Spreading the Gains from Globalisation: What Can Be Learned from Value Chain Analysis? Institute for Development Studies, Sussex University, Brighton, and Giuliani, Elisa, Carlo Pietrobelli, and Roberta Rabellotti (2005), Upgrading in global value chains: lessons from Latin American clusters. World Development, 33(4), 549–573.

Table 5 Number of patents granted to some leading Indian manufacturers in India (January 1, 1990–July 31, 2018)

S. no	Name of company	1990–2000	2001–2010	2011–2018
1.	Tata Motors	–	10	57
2.	M&M Limited	–	16	29
3	TVS Motor Company Limited[a]		87	161
4.	Maruti Suzuki Limited	–	–	10
5.	Bajaj Auto Limited	–	13	14
6.	Ashok Leyland	–	4	11
7.	Sona Koyo Steering Systems Limited	–	4	2

Source: Author's compilation using Indian Patent Advanced Search System Statistics, Office of Controller General of Patents, Designs & Trade Marks under the Indian Ministry of Commerce and Industry, at https://ipindiaservices.gov.in/publicsearch

Note: [a]Filed individually or in collaboration with WABCO Holdings. Additionally, 12 patents were granted to Sundaram-Clayton Limited, between 2001 and 2010, a TVS Group company

Johnson Controls International Plc, Delphi and Bosch). These have helped their partners acquire the global best technologies and standards in short period of time. Several global OEMs such as Ford, GM, Hyundai, Toyota, and Volvo India Pvt. Limited (Volvo) have established technology centers in India for doing R&D in automobile design.[69] FDI in R&D and design in India has followed FDI in manufacturing. Collaborative R&D activities have opened avenues for material substitution, better vehicular design that are resource and energy efficient.[70]

With upgraded R&D, the innovative capacity goes up naturally. One outcome or measure of this is their intellectual property (IP) rights. Most leading automobile companies are actively engaged in filing for their IP in the country. The recent patent deployment strategies of established players demonstrate considerable improvement in areas such as propulsion technology, telematics, vehicle safety, and security.

Statistical data published by the World Intellectual Property Organization (WIPO) and the Office of Controller General of Patents, Designs & Trade Marks under the Indian Ministry of Commerce and Industry provide estimates related to patent applications filed by the automobile industry in India. Table 5 shows the number of patents granted to some leading Indian manufacturers in India between the period January 1, 1990 and July 31, 2018. It can be seen that the number of patent grants has increased in the last 10 years. Among Indian companies, TVS

[69] TIFAC (2006), FDI in the R&D Sector: Study for the pattern in 1998–2003, Report prepared by Academy of Business Studies, New Delhi. Tiwari Rajnish and Cornelius Herstatt (2014), *Aiming Big with Small Cars: Emergence of a Lead Market in India*. (Switzerland, Springer International Publishing)

[70] For details, see ARAI (2013), Light Weighting in Automotive Industry – Automotive Manufacturing Solutions India Conference. Shrikant R Marathe. Available at, https://automotive-manufacturingsolutions.com/wp-content/uploads/2013/12/AMSI_2013_Shrikant_Marathe.pdf

Group, Tata Motors, and M&M have been among the top Indian applicants for patents.[71]

The majority of Indian patent applications filed by automobile companies fall under the categories of mechanical engineering, in areas like arrangement or mounting of propulsion units, transmissions systems, instrumentation for vehicles, conjoint control of drive units, arrangements in connection with cooling, air intake, gas exhaust, or fuel supply of propulsion units in vehicles.

However, suppliers or vendors are often small and medium enterprises (SMEs) which do not have many opportunities or resources to upgrade. The major challenges faced by the indigenous component manufacturers are high cost of capital, nonavailability of skilled labor, and rising price of operational cost. Stiff competition from China and other Asian countries on the price front is also emerging. Under these pressures, converging toward international safety standards would encourage firms to adopt (and contribute to) international good practices. Adoption of automation and robotics in recent times has helped the industry to significantly improve quality, productivity, and delivery outcomes and reduce costs.[72] To meet the needs of the future (including electrification of vehicles) and stay competitive, SME manufacturers also need to rise up to the challenges of constant upgradation, digitization, and automation. However, in the process, they may require support from lead firms and the government.

7 The Future Scenario

The current policy debate in India is around the issue of achieving greater competitiveness, efficiency standards, and the need for introducing electric vehicles. The Draft National Automotive Policy 2018 formulated by the Department of Heavy Industries (Government of India) envisages increasing exports to 35–40% of the output and to make India one of the major automotive export hubs in the world. It also envisages long-term roadmap for emission standards beyond Bharat Stage VI and harmonization with the global standards by 2028.[73]

[71] Also, see IPI (2017), Annual Report 2016–2017, Intellectual Property India, The Office of the Controller General of Patents, Designs, Trademarks, and Geographical Indications, available at http://www.ipindia.nic.in/writereaddata/Portal/IPOAnnualReport/1_94_1_1_79_1_Annual_Report-2016-17_English.pdf; "TVS, Tata Motors, Bosch, M&M top 'innovators list' in Motown," Nandini Sen Gupta, April 17, 2017, The Times of India, https://timesofindia.indiatimes.com/business/india-business/tvs-tata-motors-bosch-mm-top-innovators-list-in-motown/articleshow/58073182.cms

[72] Ray, Saon, and Smita Miglani (2018), "Upgrading in the Indian automobile sector: the role of lead firms," ICRIER Working Paper 360, June.

[73] Bharat Stage emissions standards are emission standards instituted by the Government of India that regulate the output of certain major air pollutants by vehicles. They are comparable to the European emission standards and are upgraded from time to time. The India Ministry of Road Transport and Highways has mandated mass emission standard for BS-VI throughout the country with effect from April 1, 2020. See Press Information Bureau, Government of India. Available at http://pib.nic.in/newsite/PrintRelease.aspx?relid=159611

With a view to promoting electric mobility in the country, the Indian Government approved the National Mission on Electric Mobility (NMEM) in 2011, and subsequently a National Electric Mobility Mission Plan 2020 was unveiled in 2013. This Mission Plan was designed considering the fuel security and environmental pollution in the country. It aims for a cumulative fuel saving of about 9500 million liters equivalent resulting in reduction of pollution and greenhouse gas emission of 2 million tonnes with targeted market penetration of 6–7 million vehicles by 2020. As part of this mission, the Department of Heavy Industries launched a scheme called Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME-India) in April 2015. The scheme is proposed to be implemented over a period of 6 years, i.e., 2020, wherein it is intended to support the hybrid electric vehicles market development and the manufacturing ecosystem to achieve self-sustenance. The scheme has four focus areas – technology development, demand creation, pilot projects, and charging infrastructure. Under this scheme, 148,275 electric/hybrid vehicles have been given direct support by way of demand incentives amounting to approximately US$ 28 million since its launch on April 1, 2015 and till June 30, 2017.[74]

Another major initiative in this area has been the launch of the New Green Urban Transport Scheme in 2017. The objective of this scheme is to promote low-carbon sustainable public transport system in urban areas. The scheme is to be executed with the help of private sector including assistance from the central and state governments under a 7-year mission with a total cost of US$ 10.76 billion. It pushes for promotion of non-motorized transport, public bike sharing, bus rapid transit systems, intelligent transport systems, and urban freight management.

With the plans of introducing electric vehicles, car manufacturers in India are gearing up to new production processes and machines. In 2017, the NITI Aayog[75] suggested that 40% of private vehicles in the country could go electric by 2030.[76] Currently, M&M is the only manufacturer of an electric car – the e20, a micro vehicle at present. Mahindra Electric, a fully owned subsidiary of M&M, has announced its EV 2.0 platform roadmap for electric vehicles.

Maruti Suzuki has revealed plans to manufacture electric vehicles at a factory in Gujarat in 2017. Other companies like Volvo are also planning to expand their plug-in hybrid and electric vehicle portfolio in India. The major reason for the push toward electric mobility has been to steer India away from its overdependence on imported oil. However, about 50% of electric cars currently built by domestic companies are imported. This includes the batteries, the main part of the vehicle. Global

[74] PIB (2017), "Initiatives for production of electric Vehicles," August 2, Press Information Bureau, Government of India, Ministry of Heavy Industries and Public Enterprises, http://pib.nic.in/newsite/PrintRelease.aspx?relid=169437

[75] NITI Aayog, the acronym for National Institution for Transforming India, is a Government of India policy think tank, established to replace the Planning Commission.

[76] NITI Aayog (2017), "India leaps ahead: Transformative mobility solutions for all." May. Available at http://niti.gov.in/writereaddata/files/document_publication/RMI_India_Report_web.pdf

companies like Suzuki and Toshiba have announced plans to set up battery plants in India. However, challenges like capital investment and large-scale infrastructure development remain to be addressed.[77]

8 Conclusion

With its buoyant economy, a large young population, and growing foreign direct investment, India has been an attractive investment destination for global automobile and component manufacturers since the last two decades. Its growth story has been dominated by more homegrown lead firms. However, absorption of global best practices has been slower than in China. Strategies of firms in the Chinese auto industry provided a boost to technological learning more quickly and broadly than in India.[78] Capable of end-to-end production, India has also become an assembly hub for large cars and manufacturing hub for small cars. Firms have started exporting to other countries. India-based manufacturers are engaged in global innovation networks and sourcing suitable technologies from all over the world to complement their own R&D efforts.

The AMP 2026 envisions that by the year 2026, the Indian automotive industry will be among the top three of the world in engineering, manufacture, and export of vehicles and auto components, growing in value to over 12% of India's GDP and generating an additional 65 million jobs.

According to OICA statistics, the Indian industry accounted for just 5.38% of production in the cars segment and 3.48% of production in the commercial vehicle segment in 2017. It has also not created lead firms or MNCs of the scale that other more successful players like Japan, South Korea, and other western countries have created. In spite of the success of government policy in building auto supplier industry, India continues to be a net importer of auto components with its trade deficit for auto components increasing from US$ 210 million in 2004–2005 to US$ 4.4 billion in 2009–2010 and US$ 13.8 billion in 2015–2016.

The current policy debate is around the issue of how greater resource efficiency can be achieved and the need for newer materials in light of the industry's plans to produce electric vehicles in India. Innovation in new product development is lagging behind and remains critical for the future of India to achieve competitive superiority or at least maintain its low-cost advantage. Manufacturing technologies need to be upgraded continuously. Large investments for developing new indigenous technologies that are green and compliant with recognized high efficiency standards would help India move up the value chain.

[77] For details, see NITI Aayog (2017), "India Leaps Ahead: Transformative mobility solutions for all." May; and EY (2017), "Standing up India's EV ecosystem – who will drive the charge?" Ernst and Young. Kolkata, India.

[78] Sutton, John (2004), "The Auto-component Supply Chain in China and India - A Benchmarking Study." London School of Economics, STICERD Research paper no. EI 34.

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Part VII

The Culture of Sharing and the Sharing Economy

Development of the Sharing Economy in China: Challenges and Lessons

Yide Ma and Haoran Zhang

Abstract

With the growing Internet technology, mobile payment, logistics infrastructure, and huge demographic dividends, China's sharing economy has been leaping forward in recent years, reshaping China's economic pattern and becoming one of the priorities in China's economic development in the future. However, with the expansion of the sharing economy and the continuous emergence of various business models, a series of legal risks and challenges are restricting the development of China's sharing economy. This chapter starts with an analysis of the concepts, features, operating principles, and conditions of the sharing economy. In the second part, we introduce the development process of the internet economy, and the germination and status of the sharing economy in China. We then identify the main challenges that the sharing economy in China is now facing, and propose solutions before we end with a conclusion.

Keywords

Sharing economy · Intellectual property · Platform regulation · Platform liability · Platform monopoly

All online information was last visited on July 25, 2018.

Y. Ma (✉)
IP Research Center of Zhongnan University of Economics and Law, Wuhan, Hubei, People's Republic of China

H. Zhang
Renmin University of China Law School, Beijing, China
e-mail: hr.zhang@ruc.edu.cn

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_20

1 Introduction

The sharing economy is mainly reflected in the new economic modes that utilize information network technology to optimize the allocation and utilization of idle social resources. The rapid development of the sharing economy globally has profoundly changed the way of production and life, the consumption concept, and employment modes. Governmental support for the development of the sharing economy is commonplace. For example, a number of state governments in the United States have amended relevant laws and regulations to clarify the legality in the short-term lodging and for-hire transport sectors; the European Commission has published the European Agenda for the sharing economy[1] to eliminate unnecessary barriers and promote long-term development of the sharing economy in the EU; the UK has announced its plan to build a global center for the sharing economy and to provide policy support.[2] With the growing Internet technology, mobile payment, logistics infrastructure, and huge demographic dividends, China's sharing economy has been leaping forward in recent years, reshaping China's economic patterns.

In 2018, the Central Government Annual Work Report emphasizes the importance of "developing the platform economy and sharing economy, forming an innovation and entrepreneurship pattern, which combines the online and offline worlds, synergizes the industry with academic, research and application, and integrates small, medium and big enterprises."[3] To develop the sharing economy has become one of the priorities in China's economic development. This chapter first explores the concepts, features, operating principles, and conditions for the sharing economy. It then introduces the status and developmental process of the sharing economy in China. The third section focuses on the following prominent problems of the sharing economy in China and proposes suggestions to tackle them: repeated investment and vicious competition, conflicts between the sharing economy and old regulatory patterns and its coordination, transaction costs related to the supervision of opportunistic behavior, the problems of platforms, rights protection of laborers, protection of users' information, and tax issues. The last section is the conclusion.

[1] European Commission, A European agenda for the collaborative economy, available at http://ec.europa.eu/DocsRoom/documents/16881/attachments/2/translations, p3.

[2] Department for Business, Innovation & Skills and The Rt Hon Matt Hancock MP, Move to make UK global center for sharing economy, available at https://www.gov.uk/government/news/move-to-make-uk-global-centre-for-sharing-economy

[3] Premier Li Keqiang, 2018 Report on the Work of the Central Government (in Chinese) March 5, 2018 at the first session of the Thirteenth National People's Congress, available at http://www.gov.cn/premier/2018-03/22/content_5276608.htm

2 The Sharing Economy

2.1 The Concept and Characteristics

There is a wide-ranging debate over the exact meaning of the term "sharing economy." Some commentators argue that the word "sharing" is a misnomer employed to mask the essentially commercial nature of the activity on these platforms.[4] They feel the term misleadingly "frames technology-enabled transactions as if they were altruistic or community endeavors."[5] Others consider the term "sharing economy" vague, with a range of meanings.[6] There are various other phrases used to refer to these platform-enabled activities, including "collaborative consumption," "collaborative economy," "gig economy," "on-demand economy," and the "peer-to-peer economy."[7]

As defined by EC,[8] this chapter uses the term "sharing economy" to refer to all business models facilitated by collaborative platforms that create an open marketplace for the temporary usage of goods or services often provided by private individuals. The sharing economy involves three categories of actors: (i) service providers who share assets, resources, time, and skills — these can be private individuals offering services on an occasional basis ("peers") or professional service providers; (ii) users of these services; (iii) platforms that connect providers with users and facilitate transactions between them, and ensure the quality of these transactions, e.g., through after-sale services (handling complaints), insurance services, etc. Platforms can also provide services and goods themselves to serve customers, e.g., the OFO and Mobike, the two dominant bicycle-sharing platforms in China.

Sharing transactions often do not involve a change of ownership and can be undertaken in a profitable or nonprofitable way. The essence of the phenomenon is twofold: Firstly, the internet platform reforms the mode of production, i.e., the resources and production factors (information, laborers, financial means, and materials) that used to belong to traditional organizations are traded directly and matched accurately in accordance with information in a larger range, thereby producing index-level incremental value and increasing productivity. Secondly, as a result of increasing efficiency and transparency, suppliers are enabled to rent or

[4] See Abbey Stemler, The Myth of Sharing Economy and Its Application for Regulating Innovation, 67 Emory Law Journal. 199 (2017); Sarah O'Connor, The Gig Economy is Neither 'Sharing' nor 'Collaborative', FIN. TIMES (June 14, 2016).

[5] Natasha Singer, Twisting Words to Make 'Sharing' Apps Seem Selfless, N.Y. TIMES (August 8, 2015).

[6] See Rachel Botsman, The Sharing Economy Lacks A Shared Definition, available at http://www.collaborativeconsumption.com/2013/11/22/the-sharing-economy-lacks-a-shared-definition/

[7] See Gideon Lichfield, All the Names for the New Digital Economy, and Why None of Them Fits, available at http://qz.com/548137/all-the-names-for-the-new-digital-economy-and-why-none-of-them-fits/; also see EC, A European agenda for the collaborative economy, available at http://europa.eu/rapid/press-release_IP-16-2001_en.htm, p3.

[8] EC, A European agenda for the collaborative economy, available at http://ec.europa.eu/DocsRoom/documents/16881/attachments/2/translations, p3.

employ their assets, such as cars or apartments, for use by others, thereby improving utilization of those assets. In this sense, the sharing economy transcends traditional production organizations and relies on the redistribution of existing resources.[9]

To sum up, the sharing economy has the following characteristics[10]:

It is a new economic form that emerged when the information revolution reached a certain stage. The rapid development of modern information technology and its innovative applications, such as the Internet (especially mobile Internet), broadband, cloud computing, big data, Internet of things, mobile payment, and location-based service (LBS), allow the sharing economy to become possible.

It is a way of optimal resource allocation by effectively linking supply and demand. The sharing economy can quickly integrate all kinds of scattered and idle resources, accurately locate diverse needs, achieve rapid matching between supply and demand, and greatly reduce transaction costs.

It embodies the collective reflection of the new concept of consumption and view of development, and adapts to the development of the information society. As opposed to the industrial society which emphasizes the maximization of production and income and advocates the possession of resources and wealth, the information society exemplified by the sharing economy emphasizes a people-oriented conception and sustainable development, and advocates the best experiences and use.

2.2 The Operating Principles

Alvin Roth proposed that a well-functioning market should meet three conditions: marketplaces have to provide "thickness," i.e., they need to attract a large enough proportion of the potential participants in the market; they have to overcome the "congestion" that thickness can bring, by making it possible to consider enough alternative transactions to arrive at good ones; and they need to make it "safe" and sufficiently simple to participate in the market, as opposed to transacting outside of the market, or having to engage in costly and risky strategic behavior.[11] For the sharing economy, its development also requires guaranteeing the establishment of a market with sufficient supply and demand, an effective mechanism for search and matching, and a trust mechanism to ensure the security of the transaction.[12]

[9] See Hu Ling: On Legal Regulation of the "Sharing Economy" (in Chinese), 4 Beijing Cultural Review 112–115 (2015).

[10] Information Research Department of the National Information Center, Sharing Economy Work Committee of China Internet Association, China's Report on Collaborative Economy Development 2016 (in Chinese), pp. 6–7.

[11] Alvin E. Roth, What Have We Learned from Market Design? 118 Economic Journal, 285–310 (2008).

[12] USFTC, The "Sharing" Economy: Issues Facing Platforms, Participants & Regulators, available at https://www.ftc.gov/news-events/events-calendar/2015/06/collaborative-economy-issues-facing-platforms-participants-regulators, pp. 19–23.

2.2.1 Creating Sufficient Supply and Demand

A successful platform for the sharing economy requires that both sides of the market have sufficient market players. There are a large number of buyers and sellers on the platform, so each participant is able to correspond to a number of potential matches, thus increasing the chances of a successful match. In addition, increasing the number of buyers or sellers can prompt more counterparties to join the platform and participate in the transaction.

This leads to the common problem of a two-sided network effect (or indirect network effect) on the two sides of the platform market. According to a USFTC report,[13] the platform not only needs a large number of buyers to attract the participation of sellers, but also requires a large number of sellers to attract buyers' participation. In order to promote users' participation at both ends of the platform, the platform must have information about the price paid by the participants on each side of the platform, and often needs to subsidize the users. Taking the car-hailing services for example, the platform company may reduce the fare sharply to attract passengers every time they enter a new city, and pay drivers the full fare and even a certain reward by relinquishing profit for the platform itself. When there are enough users on both sides of the platform, the platform company will return to the normal pricing behavior.

2.2.2 Creating an Effective Mechanism for Search and Matching

An active market enables the presence of enough potential customers on both sides of the sharing economy platform to ensure market liquidity. However, a large number of potential users alone cannot guarantee the success of the transaction, and the platforms must be able to search for potential counterparties, find matches, and complete the transaction. According to the above-mentioned USFTC report, the "friction" of search and matching will increase the transaction cost, and whether the transacting party is willing to bear the search cost depends on the value that the transaction will produce. Effective search and matching requires proper definition or standardization of products and services that are to be bought and sold on the platform. But consumers' diverse demands for products and services make the platform face a certain degree of challenge when classifying products or services.[14]

The mechanism for platforms to define products, search, price, and match is dependent on the characteristics of the industry and the market, and the different needs of participants. For example, the platform for car-hailing services usually defines the service as "rapid transportation service from one location to another." The platform for car-hailing services receives passengers' requests, matches them with nearby drivers, and then establishes contacts between the two parties. Passengers have little chance to choose the drivers by themselves, and prices are usually determined according to the algorithm of the platform, which requires no further participation from either party. In contrast, the short-term apartment rental platform will show in detail the characteristics of accommodation services provided

[13] Ibid.

[14] Ibid.

by landlords. Customers can browse through lists, contact potential landlords, and negotiate further with regard to other transaction conditions. Compared to the low value and timeliness of the car-hailing services, and considering that the selection of a suitable residence can produce higher expected value, customers usually spend more time and participate more in searching and selecting a potential residence.

2.2.3 Creating the Trust Mechanism

If the platform does not establish mutual trust between the two parties, the participants will remain afraid that the other party may not perform properly. Such worries will undoubtedly discourage both parties from being involved in the transaction. Therefore, the platform must take measures to establish confidence of both parties. For example, the platform must check participants before allowing them to join, or set up a participant credit evaluation system based on previous transaction records, or provide security or insurance against bad results, or set up a prepayment mechanism, etc. Unlike traditional business models, the credit evaluation system and other trust mechanisms (such as insurance, guarantee, and prior review of participants) of the sharing platforms can effectively reduce concerns caused by information asymmetry on the two-sided market, thus reducing the demand for government regulation.[15]

3 The Development and Experiences of the Sharing Economy in China

In China, with the gradual popularization of smart mobile terminals, the Internet and mobile payment technology, and the social network ecology, the sharing economy is booming and has undergone a process from blind expansion to rationality. Many sharing websites have emerged rapidly. The sharing business models have penetrated various industries, from consumption to production, and account for a rapidly increasing share of the national economy.

3.1 Development of the Internet Economy and Third-Party Payment Platforms

In the late 1990s, with advancement in the construction of China's telecommunication infrastructure, the Internet economy flourished. The early Internet economy originated from traditional cultural industries like news, books, music, and movies. It attracted a large number of users through free use in exchange for their attention and patronage, resulting in a business model of "free basic service plus fee-based value-added service/advertising." After a decade or so of the Web 1.0 era, China's internet development entered the Web 2.0 era. The service architecture of the Internet transitioned from a one-way communication portal to an interactive

[15] Ibid.

communication service. Ordinary users could now become producers of information, and share their experiences and works with unspecified people. The formation of network effects has led to the rise of various platforms. Internet corporations have attracted users through partially free markets, and at the same time recovered costs and gained profit in the toll market, forming an ecosystem of various services. A large number of third-party service providers joined the platforms, shared the infrastructure, and conducted direct transactions with users.

In the early days of Web 2.0, the Internet provided fragmented information and services to consumers and was forced to abandon charges due to the lack of flexible and convenient payment methods, which also led to the limitation of knowledge sharing and expansion to other sharing areas. At that time, the construction of electronic banking by state-owned commercial banks had just commenced and was unable to accommodate many Internet companies. Big internet companies in China had to develop virtual currency by themselves that could be purchased by fiat currency to trade and exchange on platforms.[16] It was only when Alibaba's Alipay laid the foundation for online payment that the Chinese online payment system started to grow. The third-party payment platform not only solves the problem of payment inconvenience, but also that of trust among strangers in online transactions.[17] With a combination of other credit evaluation systems and real-name systems, third-party payment platforms provide a basic guarantee for online economic activities, which again gives rise to new practices surrounding sharing of physical assets.[18]

3.2 The Current Status of the Sharing Economy

In 2015, the size of the main sectors[19] of China's sharing market amounted to about RMB1,697.8 billion; in 2016, transactions amounted to RMB 3452 billion, an increase of 103% and accounting for GDP 4.6%. In 2016, over 600 million people participated in sharing economy activities in China. The number of participants in the service sector was approximately 60 million, with approximately 5.85 million

[16] One typical online payment tool at that time was the Q Coin, developed as a kind of virtual currency by Tencent. Q Coins can be purchased by telephone or credit card. Users can use the Q Coins to obtain related services or commodities on Tencent's website, e.g., membership services, electronic game props, and virtual commodities. However, these virtual currencies can only be exchanged on limited websites or platforms

[17] The basic model of Alipay is that the user pays first to the third-party payment platform, and the service provider delivers the goods. After the user confirms the receipt of goods, the third-party payment platform completes the payment to the service provider. The third-party payment platform functions as a transaction guarantor.

[18] See Hu Ling: On Legal Regulation of the"Sharing Economy" (in Chinese), 4 Beijing Cultural Review 112–115 (2015).

[19] The main sectors include sharing of knowledge, apartments, transportation, daily services, health care, and finance.

employees serving on the platforms. According to the State Information Center,[20] the sharing economy is expected to account for 10% of GDP by 2020, and 20% by 2025.

At present, the sharing economy has expanded to and penetrated all spheres of social life, with the following major industries and business models: (i) *Sharing of transportation*. This model mainly includes sharing of cars (such as DiDi[21]), driving, bicycles, and parking spaces, etc. Such transportation sharing is the most popular and influential sharing economy model, and one of the most controversial areas in the world for the sharing economy. (ii) *Sharing of apartments*. There are three main modes: the C2C open platform (such as Mayi.com[22]), the B2C open platform, and the "property-sharing + swap-sharing" two-dimensional sharing model. (iii) *Sharing of catering*. There are three modes: private kitchen & distribution, home kitchen & eat-in, and recipes in community. (iv) *Sharing of logistics* (the realization of optimal allocation of the logistics system by sharing logistical resources, such as Joybuy Yuncang[23]). (v) *Sharing of Finance*. There are crowd-funding networks, P2P loans networks (such as Hongling Capital[24]), and so on; (vi) *Sharing of knowledge* (knowledge and skills dispersed among individuals or institutions are shared between specific individuals or institutions), such as online Q&A (questions and answers), webcast, education, and services crowd-sourcing.[25] (vii) *Sharing of health care*, including online medical consultation (such as Chunyu Doctor[26]), and sharing of medical facilities.

[20] State Information Center, The sharing economy is expected to account for 10% of GDP in 2020, available at http://finance.sina.com.cn/roll/2017-04-18/doc-ifyeimzx6886194.shtml

[21] DiDi is the biggest sharing car platform in China. It provides vehicle rental information, user ride information, and driver service information between the car owners, users, and drivers to facilitate the transaction and profit from it.

[22] Mayi.com is a short-term lodging platform like Airbnb. The business model is that landlords with idle apartments publish lodging information on the platform; users can search for and rent those apartments and reach a lodging contract with the landlords on the platform.

[23] Joybuy Yuncang (http://jdyuncang.cn) is the logistics system, in which Joybuy puts other logistics companies' warehouses into its logistics system and shares them with third parties. As consideration, Joybuy provides access to its online platform, data analysis, and delivery service to third parties.

[24] Hongling Capital (https://www.my089.com) is one of the earliest P2P loan platforms in China. Users announce their need for a loan on the platform, third parties with funds bid for the opportunity to provide the loan, and parties reach loan contracts after review by the platform.

[25] The basic model of these crowdsourcing platforms is that users post rewards for custom services on the platform, which usually includes LOGO design, Flash design, website construction, programming, translation, etc., and third-party companies and individuals provide online creative work services.

[26] Chunyu Doctor (https://www.chunyuyisheng.com) is an online medical consultation platform where the users can consult on health issues, and doctors can answer their questions during their spare time and provide users with more convenient and professional medical advices and services.

3.3 Achievements of the Sharing Economy

Overall, the sharing economy in China has achieved the following: (1) the market structure has so far transformed from one of excessive dispersion to moderate concentration through horizontal mergers; (2) market competition has transformed from vicious competition to healthy competition as the market begins to mature and the competitive behavior of managers tends to be rational; (3) market emphasis has shifted from providing price subsidies to improving the consumer experience. Therefore, improvement in services and quality has become one of the main means of competition in the sharing market[27]; (4) activating the ideal resources in the market, especially making use of the ideal apartments in the real estate market; (5) the deindustrialization and decentralization of the sharing models allow more industry innovation, as everyone transforms from passive consumer to creator, and further releases individual creativity.[28]

4 The Challenges of the Sharing Economy in China and Their Solutions

The rapid growth of platforms has stirred considerable debate over the application of regulation to these platforms and their suppliers. On the one hand, regulatory measures may be needed to protect consumers, public safety, and legitimate governmental goals. On the other hand, regulation can chill incentives for innovation by increasing costs and thereby impede or prevent new entry and deprive consumers of the benefits of new product and service offerings. Lawmakers and regulators face a challenging task in balancing these concerns[29] and have to deal with duplicated investment and vicious competition, as well as the issues of sustainability and negative externalities.

4.1 Duplicated Investment and Vicious Competition

4.1.1 The Problem

The development of the sharing economy is based on high market liquidity, real-time matching system of supply and demand between buyers and sellers, and transactional security, which presupposes that platforms reach economy of scale and

[27] Wen Xueguo, Sharing Economy Faces the Problem of Monopolistic Platform, Restricted Access, etc. (in Chinese), available at http://money.163.com/17/0918/14/CUKE0H5L002598NV.htmlpage.

[28] Ding Yuanzhu. Several Thoughts to Promote the Development of Sharing Economy (in Chinese), 2 Journal of Chinese Academy of Governance 106–111(2016).

[29] USFTC, The "Sharing" Economy: Issues Facing Platforms, Participants & Regulators, available at https://www.ftc.gov/news-events/events-calendar/2015/06/collaborative-economy-issues-facing-platforms-participants-regulators, pp. 19–23.

possess certain market power. All of that imply that only a limited number of platforms can be winners in a specific area of the sharing economy. All the dimensions to competition between platforms, such as bribes (which are transferred to third parties), prices charged to consumers, quality, pure rent dissipation (such as investment in capacity that is never used), and so on,[30] may be used simultaneously by platforms. In China, duplicated investment and vicious competition become prevalent, which are diametrically opposite to the original intention of the sharing economy, namely optimal resource allocation.

The development of sharing bicycles can be a typical case. With the leading cycling companies OFO and Mobike successfully attracting financing, a huge amount of capital has flowed into the industry, and a large number of shareable bicycles were put into the market, and at the same time price wars were conducted in the form of free rides and "red envelopes" (subsidies in disguise) just for a larger market share, while neglecting all other efforts. Statistics show that by the end of June 2017, there were nearly 70 sharing bicycle companies in China, and more than 16 million bicycles were put on the market. Excessive distribution of these bicycles has even become a form of negative equity for society. Normal traffic operations were affected in first-tier cities like Beijing and Shanghai. Shareable bicycles in Shanghai at one time reached more than 1.7 million, far exceeding the demand. After overinvestment and vicious competition, most companies withdrew from the market due to financing failures. Currently, OFO and Mobike take up about 95% of the market. Others, such as sharing of trips, live broadcast platforms, and power banks, are also undergoing a similar process.

4.1.2 The Solution

To design an environment in which competition results in surplus which will be transferred to consumers, rather than wasteful rent dissipation, is clearly an attractive policy goal. According to the theory of institutional economics, the granting of exclusive property rights can reduce rent dissipation.[31] Therefore, creation and award of intellectual property rights for business models of the sharing economy have become the direction of exploration in China. As the "State Council's Opinions on Accelerating the Construction of Powerful Intellectual Property Rights under the New Situation" state, the Chinese government is pursuing to "perfect the intellectual property protection system for business patterns and patent protection system for utility models, to strengthen the study of intellectual property protection rules regarding the Internet, e-commerce, big data and other areas, and to promote the development of relevant regulations."[32] As a matter of fact, China is now exploring

[30] Hal R. Varian, Joseph Farrell, and Carl Shapiro, The Economics of Information Technology, Cambridge University Press, 2007:30.

[31] Steven Cheung, The Structure of a Contract and the Theory of a Non-Exclusive Resource, 13 Journal of Law and Economics, 49–70 (1970).

[32] State Council, Opinions on Accelerating the Construction of Powerful Intellectual Property Rights under the New Situation, available at http://www.gov.cn/zhengce/content/2015-12/22/content_10468.htm

ways to expand the range of patentable objects to protect new Internet business models, or to grant them short-term exclusivity through individual legislation, which will be revoked within 1 year. However, the ultimate question remains whether intellectual property rights should be given to Internet business models or not, and how to define the boundary between the exclusivity and the public domain to avoid hindering the development of the industry.

4.2 The Sustainability Issue

Unlike the efficiency in matching the supply and demand and the expansion of the market, which are greatly determined by technology advances, trust mechanisms can be easily destroyed by opportunistic behavior in practice, which would increase transaction costs, and make it difficult for the sharing economy to further develop.[33] Thus, opportunistic behavior, such as the infringement of consumer rights and the distortion of reputation evaluation systems, challenges the sustainability of the sharing economy.

4.2.1 Cases of Infringement of Consumer Rights Grow Rapidly

Due to the lack of market entry certification and regulation, cases of consumer rights infringement have grown rapidly. According to statistics on the "Customer Network,"[34] from January to August 2016, the website received a total of 736 consumer complaints about sharing economy businesses such as "online taxi-hailing," "online tourism," and so on. The amount of complaints received by local governments is also increasing. For example, the data released by Hubei Province Administration for Industry and Commerce shows that in the first half of 2017, the number of complaints about "sharing bicycles" and "online taxi-hailing" increased by 121.8% compared to 2016.[35]

The cause for the rise in consumer complaints lies in the unclear division of responsibilities among participants of the platform and the platform. Platforms' approach is to gain profits from participants' transactions without taking on too much responsibility for any illegal actions which may occur. For example, DiDi provides in its "Special Vehicle Terms of Use" Section 1 – "Our Services" that "DiDi platform does not provide rental, car rental or driving services. All we provide is related information about rental vehicles and drivers. DiDi is just a platform between you and the suppliers." Under the "Four-Party Agreement," users assume

[33] Lu Xianxiang, Collaborative Economy: Transaction Cost Minimization, Institutional Change and Institutional Supply(in Chinese), 9 Social Science Front 51–61 (2016).

[34] "Customer Network" (http://www.bjxf315.com) is a professional service platform for consumer rights protection supported by the Beijing Consumers Association. It accepts consumer's complaints and conveys that to the association, promotes communication between consumers and business operators, and releases information on consumers' right protection.

[35] Wan Jing, Sharing economy platforms must respect the antitrust law (in Chinese), Legal Daily (November 9, 2017).

primary legal responsibility as the renter of the vehicle and the employer of the driver. Thus, defining tort liability arising from sharing behavior becomes problematic.[36] However, doesn't a car hailing platform have to assume joint tort liability for the driver's fault? Doesn't an online platform have the obligation to guarantee the online shops' quality? Isn't it liable for contents searched? The absence of suitable regulation and clear rules on responsibility makes it difficult for users and consumers to safeguard their rights.

4.2.2 Distortion of the Reputation Evaluation System

The trust and reputation system is one of the important preconditions for the sharing economy market, which allows the parties to evaluate each other after the transaction is completed, serves as a reference for later decision making, and provides a reward and sanction mechanism for the provision of higher quality products and services. However, with the development of the sharing economy, false and malicious evaluation by paid users has distorted this credibility evaluation mechanism.

4.2.3 The Solution

An effective mechanism for consumer rights protection and defining responsibility needs to be clarified and improved expeditiously. The solution is to build a "government-enterprise-society" regulatory model of tripartite cooperation, to promote fair trading and self-discipline of trading subjects, mainly through the use of information regulatory tools.[37] In comparison with government regulation, platforms are better equipped than the government for the purpose of running background checks on sharing service providers, and responding quickly to conflicts among participants. Furthermore, platforms have the monetary incentive to look after their communities, and to ensure consumer satisfaction and safety.[38] At the level of business practice, some platforms like DiDi construct a platform credit evaluation system to guarantee the authenticity and credibility of the information of the transacting parties by ID verification, linking to mobile phone numbers and bank accounts, enhancing user experience by offering review and score functions, establishing a credit record of the transaction process and a "black list" system, and giving priority to those whose credit evaluation is excellent. Furthermore, some platforms cooperate with insurance companies to provide coverage for potential accidents of parties.[39]

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[36] See Hou Denghua, On Legal Status of Internet Platforms Under the Sharing Economy: the Study of Online Car-Hailing (in Chinese), 1 Tribune of Political Science and Law 157–164 (2017).

[37] Ying Feihu and Tu Yongqian. The Information Tool in Public Regulation (in Chinese), 4 Social Sciences in China 122 (2010).

[38] D. S. Evans, Governing bad behavior by users of multisided platforms. 2 Berkeley Technology Law Journal 1201 (2012).

[39] For example, Piggy Short-term Lodging cooperates with Zhongan Insurance(a Chinese insurance company) to provide accommodation accident insurance for tenants and comprehensive insurance for landlords' property. The "Home-to-Eat" company cooperates with the People's Insurance Company of China to promote "safety plans" for food safety; see Information Research Department of the State Information Center, Sharing Economy Work Committee of China Internet Association, Report on China's Collaborative Economy Development 2017, p. 15.

In addition, legal measures for the protection of consumer rights in China's online platforms is set by the "E-Commerce Law of the People's Republic of China",[40] which stipulates that e-commerce platform operators have an obligation to verify the authenticity of e-commerce business operators' identity information,[41] ensure network security,[42] preserve transaction information,[43] improve credit evaluation systems,[44] and take responsibilities in some cases.[45] However, whether it is to be established by the government, in which the government plays a more active role in regulation,[46] or by a third-party neutral entity, as some have suggested,[47] still requires further discussion.

[40] The E-Commerce Law of the People's Republic of China was adopted at the 5th session of the Standing Committee of the Thirteenth National People's Congress on August 31, 2018, and became effective from January 1, 2019.

[41] Article 27 of the E-Commerce Law prescribes: "An e-commerce platform business shall request a business applying for selling commodities or providing services on its platform to submit authentic information including its identity, address, contact information, and administrative permits, make verification and registration, establish a register, and make regular updates and verification."

[42] Article 30 of the E-Commerce Law foresees:"(1)An e-commerce platform business shall take technological measures and other necessary measures to ensure its cybersecurity and stable operation, prevent online illegal and criminal activities, effectively tackle cybersecurity events, and guarantee e-commerce trading safety.(2)An e-commerce platform business shall make a contingency plan for cybersecurity events and when a cybersecurity event occurs, it shall launch the contingency plan forthwith, take corresponding remedial measures, and make a report to the relevant competent authorities."

[43] Article 31 of the E-Commerce Law reads: "An e-commerce platform business shall record and retain the information on the commodities and services released on the platform and transaction information and ensure the integrity, confidentiality and availability of the information. The information on commodities, services, and transactions shall be retained at least for 3 years from the day of completion of the transaction, unless otherwise provided by any law or administrative regulations."

[44] Article 39 of the E-Commerce Law stipulates: "(1) An e-commerce platform business shall establish and improve a credit rating system, publish credit rating rules, and provide channels for consumers to make comments on the commodities sold or services provided in the platform.(2) An e-commerce platform owner may not delete any comment made by a consumer on the commodities or services sold or provided on its platform."

[45] Article 38 of the E-Commerce Law prescribes: "(1) Where an e-commerce platform business fails to take necessary measures, though it knows or should have known that an in-platform business sells commodities, or provides services, inconsistent with the requirements for guaranteeing personal and property safety, or otherwise infringe the lawful rights and interests of consumers, the e-commerce platform business and the in-platform business shall be jointly liable. (2) If, in respect of commodities or services relative to the life and health of consumers, an e-commerce platform business causes damage to a consumer by its failure to perform the obligation of reviewing the qualifications of an in-platform business, or the obligation of guaranteeing the safety of consumers, the e-commerce platform business and the in-platform business shall be correspondingly liable in accordance with the law."

[46] Jiang Shengyang, The Legal Regulations of Information Tools, Reputation Incentives, and Sharing Economy (in Chinese), 3 Postgraduate Law Review 141–150 (2016).

[47] Hong Zhisheng et al., Industrial Innovation and Economic Transformation Driven by the Concept of Sharing (in Chinese), Guangming Daily (May 11, 2016).

4.3 The Negative Externalities Issue

The current dominant economic and social management system is based on industrial mass production, which emphasizes regional and fragmented management, and requires prior approval. The network-based sharing economy is typically characterized by cross-regional and cross-industry networking, which brings a series of "negative externalities."

4.3.1 Regulatory Fairness

Many new industries in the sharing economy are operating in the ambiguous zone of law and supervision, and are even suspected of being "illegal" under the current system. Clearly, "equal" regulation subject some innovative practices to unreasonable institutional requirements; for example, companies engaged in Internet education are asked to deploy offline classrooms in order to be approved, etc. However, innovative business patterns in the sharing economy will inevitably be in a competitive relationship with the existent ones. The sharing economy model is based on network platforms, and a large number of operators do not need to obtain administrative licenses, which can considerably reduce operating costs. The resultant prices are more attractive than those of the existent operators, from whom users and consumers are taken away, leading to the issue of fairness in regulation and conflict of interests, as demonstrated by the online taxi-hailing service and traditional cruising taxis. The development of the sharing economy is challenging the administrative law control systems for property use, market access, and professional qualification.[48]

In designing new supervision over the sharing economy, the innovation of the sharing economy should not be stifled by excessive supervision. Challenging, though, in the process of policy adjustment is how certain behavior of the sharing economy can be identified as "innovation" that is worthy of encouragement, how to judge whether the regulation for the new sharing economy model should be the same as or equal to the traditional ones, and how regulation can adapt to the essential needs of new economic patterns.[49]

4.3.2 Monopoly Issue

According to the estimate of the State Information Center, China's sharing economy will maintain an average annual growth rate of 40% in the next few years, and there will be five to ten giant platform-oriented companies in the next 10 years.[50] However, the emergence of such giants may further heighten the risk of monopoly, because of

[48] Zhang Xiaoyu, Challenges in Internet Sharing Economy to Administrative Regulations and Responses to Them (in Chinese), 5 Global Law Review 151–161 (2016).

[49] Ranchordas, Sofia, Does Sharing Mean Caring? Regulating Innovation in the Sharing Economy,16 Minn. J.L. Sci. & Tech. 413 (2015).

[50] Information Research Department of the State Information Center, Sharing Economy Work Committee of China Internet Association, Report on China's Collaborative Economy Development 2016, p. 29.

the dominant feature of the sharing economy, namely the two-sided network effect. This effect means that an increase in the number of users at either side of the two-sided economic platform will lead to more users at the other side. As a result, sharing platforms have the chance to establish monopoly through subsidizing users at either side for free. Such effects may enable large platforms to accumulate huge numbers of users on both sides of platforms and thus have dominant market power. In contrast, smaller platforms are less attractive to users due to fewer participants, and fewer trading opportunities and options for buyers and sellers, and thus stand no chance in competing with large-scale platforms. Two-sided network effects may also lead to market entry barriers, as existing monopoly platforms can easily overwhelm new entrants.

The sharing platforms initially only served as intermediaries to match the supply and demand ends, and were themselves not direct suppliers of products or services. However, with gradual vertical integration, platforms are directly providing products and services to consumers through the employment of professional suppliers. Although such vertical integration can improve efficiency, once the vertically integrated platform owns and controls a large amount of supply capacity, buyers may no longer be willing to switch to other platforms with insufficient supply capacity, thus creating an anticompetitive blocking effect. Therefore, one of the antitrust agencies of China, the National Development and Reform Commission, pledges in Article 8 of the "Guiding Opinions on Promoting the Development of the Sharing Economy" "to encourage and guide the sharing enterprises to carry out effective and orderly competition, and to effectively strengthen the supervision and prevention of platform companies' monopolistic behaviors in the sharing economy field."[51]

However, due to concentration of immense market resources and nondisclosure of internal information on the sharing platforms, the limitations of traditional and governmental supervision means and capabilities are obvious. In the process of supervision, giving greater autonomy and rights to the market players on the sharing platforms, allowing stakeholders to engage in the governance of supervision, and constructing a "co-regulation" regulatory framework can be more effective.[52]

4.3.3 Protection of Laborers' Rights

Peer-to-peer exchange moves jobs away from traditional manufacturing and services to microservices.[53] Statistics from the Ministry of Personnel and Social Security in 2014 show that 9.6247 million people were directly employed through online stores, but more than 70% of them did not have any social insurance, and their average monthly wage was only RMB 2115 Yuan. The employment created by the sharing economy platforms is not all high-quality employment. The labor

[51] Fa Gai Gao Ji (2017) No.1245 (发改高技 (2017) 1245号), published on 3 July 2017.

[52] See Brhmie Balaram, How to Defeat Monopoly Power in the Sharing Economy, available at https://blog.p2pfoundation.net/how-to-defeat-monopoly-power-in-the-sharing-economy/2016/02/18

[53] Arvind Malhotra and Marshall Van Alstyne, The Dark Side of the Sharing Economy and How to Lighten It. 11 Communications of the ACM 27 (2014).

employment pattern under the sharing economy is very different from traditional industries. The most prominent feature is that workers have more freedom in terms of organizational attribution, economic independence, etc., which prevents them from receiving effective social security, which is deeply connected to the traditional labor employment relationship. Therefore, in the labor dispute of "Good Chef APP" and disputes between online drivers and platforms, some courts have ruled that "the relationship between laborers and platforms is not the traditional labor contract relationship but a cooperative relationship."[54] To provide corresponding labor and social security for new types of labor groups like network contract workers, the current labor law needs to expand the scope of protection to provide network contract workers with legal protection similar to that of traditional laborers,[55] or the existing institutional frameworks should be reconstructed to provide a social welfare system that is not attached to labor relations.

4.3.4 Protection of Users' Information

Sharing not only means sharing information or practical items between users and third-party service providers, but also often sharing users and data with platforms. Therefore, sensitive data, such as personal addresses, contact information, preferences and habits, and even the lifestyle of participants, are exposed to platforms. If there are no sound protection measures, once the information is leaked, the user's personal privacy will be damaged. Moreover, it may also involve national security risks if massive amounts of data and information were leaked.[56] The following questions need to be addressed for the sharing economy to continue to thrive: how broadly platforms can use information they have collected, whether they have a right to use them, whether they can transfer the right to third-party developers and advertisers, and how to ensure users' personal data and personality rights will not be compromised.[57]

[54] See for example Beijing First Intermediate People's Court (2014) Yi Zhong Min Zhong Zi No.6355 Civil Judgment, (2015) Yi Zhong Min Zhong Zi No.176 Civil Judgment, and (2015) Yi Zhong Min Zhong Zi No.1359 Civil Judgment.

[55] Ban Xiaohui, A Research on the Expansion of the Protection Scope of Labor Law in the Sharing Economy—From the Perspective of Hiring Cars by Internet Platform (in Chinese), 2 Journal of Sichuan University (Philosophy and Social Science Edition), 154–161(2017).

[56] Article 37 of Cybersecurity Law of China prescribes: "Personal information and important business data collected and produced by critical information infrastructure operators during their activities within the territory of the People's Republic of China shall be stored within the territory; where due to business requirements it is truly necessary provide it outside the mainland, a security assessment shall be conducted according to the measures jointly formulated by the national cyberspace administration and the relevant departments of the State Council. Where laws or administrative regulations provide otherwise, those provisions apply."

[57] See Hu Ling. On Legal Regulation of "Sharing Economy" (in Chinese). 4 Beijing Cultural Review 112–115(2015).

4.3.5 Tax Issues

The development of the sharing economy has caused two major regulatory difficulties for tax regulation. First is difficulty in regulating tax opportunism, as transacting subjects use the ambiguity of existing tax rules to evade taxes. An example in this context is the definition of the participants as "third-party settlement entity" to capitalize on the loopholes in regulatory systems to circumvent tax regulation. The second difficulty relates to supervising tax declarations. Many of the sharing economy participants are either microenterprises or traditional consumers who use their personal property for commercial purposes and gain relatively low income from each transaction, making supervision of tax filings difficult.[58] Therefore, the framework for tax declaration and regulation is in need of reform and restructuring to adapt to the revolution in business models.

5 Conclusion

In China, the sharing economy has experienced rapid expansion, is now covering many spheres of social life, and has become one of the priorities in China's economic development. The sharing models have effectively activated idle resources, expanded employment, and promoted industrial innovation. However, there are also challenges, namely duplicated investment and vicious competition, as well as the issues of sustainability and negative externalities. For the government to effectively deal with these challenges, it would be advisable to build a "government-enterprise-society" regulatory model to promote self-discipline through the use of information regulatory tools, and to create an environment for fair competition and leave enough breathing space for constant innovation. Only then can the sharing economy maintain its high growth momentum in China and serve as a development model for other economies.

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Knowledge Sharing and the Sharing Economy in India

Arul George Scaria and Shreyashi Ray

Abstract

This chapter argues for the recognition of knowledge sharing as an integral part of the sharing economy, by taking India as a case study. It analyses the attitudes and practices pertaining to knowledge sharing in India through a mixed methods approach. The quantitative data discussed in the chapter include data from two empirical studies – one on sharing practices of researchers in India and their attitudes towards openness, and the other on perceptions of Indian consumers regarding film piracy and copyright protection. The quantitative findings have been contextualised in an analysis of historical exclusionary structures in India which created intellectual monopolies for privileged sections of the society on lines of gender and caste. The chapter challenges dominant narratives which suggest that knowledge sharing was a common practice in ancient India. Further, the chapter examines two prominent and recent Indian policies which have a bearing on shaping incentives for innovation and creativ-

The authors thankfully acknowledge the research support given by Koirobi Biswas (National Law University, Delhi) and Ishaan Garg (Guru Gobind Singh Indraprastha University, Delhi). They would also like to thank Asang Wankhede (School of Oriental and African Studies, University of London), Kung-Chung Liu (ARCIALA, Singapore Management University), and Uday S. Racherla (Indian Institute of Technology, Kanpur) for their thoughtful comments and suggestions on the draft version of this chapter. Views expressed are personal.

A. G. Scaria (✉)
Centre for Innovation, Intellectual Property and Competition (CIIPC), Delhi, India

National Law University, Delhi, India
e-mail: arul.scaria@nludelhi.ac.in

S. Ray
Centre for Innovation, Intellectual Property and Competition (CIIPC), Delhi, India
e-mail: shreyashi.ray@nludelhi.ac.in

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7_21

ity in the sharing economy, but fail to take balanced and inclusive approaches. Through these analyses, the chapter seeks to establish the need for all stakeholders to recognise the need for equitable knowledge sharing and take appropriate steps to challenge and change the *status quo*.

Keywords
Knowledge sharing · Sharing economy · Intellectual property · Open access · Open science

1 Knowledge and the Sharing Economy

'Sharing economy', much like many other evolving phenomena, does not have a shared or universally accepted definition. The World Economic Forum defines it as an economic model which '*focus(es) on the sharing of underutilised assets, monetised or not, in ways that improve efficiency, sustainability and community*'.[1] The Oxford Dictionary defines it as '*an economic system in which assets or services are shared between private individuals, either free or for a fee, typically by means of the Internet*'.[2] Despite the differences in the way various people understand this term, it may be fair to say that the sharing economy usually entails the sharing of resources for their optimum utilisation.

The rapidly expanding discourse surrounding this economic system has made certain companies such as Uber and AirBnB instantly associable with it. The argument supporting this association is the model used by such platforms, whereby the utilisation of resources such as vehicles and living spaces is maximised through online platforms. For example, in the case of Uber, the platform connects drivers and travellers, and ensures more optimal utilisation of cars. Similarly, in the case of AirBnB, the platform allows more optimal utilisation of under-utilised residential spaces by connecting those who possess such spaces and those who are seeking accommodation. While these and other similar examples can indeed give rise to exciting discussions on the relevant economic models and desirable changes in the regulatory frameworks, the current discourse on sharing economy has largely ignored the potential of sharing knowledge, one of the most important non-rivalrous resources.[3]

Many studies have broken the myth that innovations are novel ideas generated by individuals; there has been growing realisation that most innovations are incremental in character, thereby highlighting the importance of knowledge sharing for

[1] World Economic Forum (2018). https://www.weforum.org/agenda/2017/12/when-is-sharing-not-really-sharing/

[2] English Oxford Dictionary (2018). https://en.oxforddictionaries.com/definition/sharing_economy

[3] 'A resource is considered as non-rivalrous in consumption, when the use of the resource does not deplete the resource.' Gillespie, T. (2007). *Wired Shut: Copyright and the Shape of Digital Culture* (p. 25). Cambridge: MIT Press.

fuelling innovation.[4] Even though developments in communication technologies have opened up enormous possibilities for sharing and collaboration, it is doubtful whether sufficient steps have been taken to ensure equitable access to knowledge and inclusiveness in knowledge creation. It is in this context that we need to broaden the discussions on the sharing economy to include knowledge resources, so that we can ensure that they, like cars and homes, are better utilised.

Knowledge is non-rivalrous in nature, but we cannot ignore the fact that some of the resources required to produce knowledge may be rivalrous in nature. Further, there may be many external factors that determine the extent to which people can participate in the knowledge creation process. For example, funds and research materials, which are necessary for a research project, may be rivalrous and also scarce, especially in developing economies. Similarly, factors like class, caste, gender, geography, language, and other socio-economic factors may also determine whether a person can access, grow, and succeed in formal systems of knowledge creation. Further, most of the outputs of research and innovation are either captured in different forms of intellectual property (IP) or published in journals and made available only in databases which are paywalled, and thus inaccessible unless hefty fees are paid.[5] All these factors, coupled with perceptions that trivialise knowledge produced outside mainstream processes, make knowledge production and consumption accessible only to a privileged few in the current scenario. Moreover, the alienation of traditional or grassroots producers of knowledge from the mainstream hinders mutual communication of knowledge and possible collaborations. Hence, any discussion on sharing of knowledge resources in the sharing economy has to necessarily go beyond the resources themselves; it has to include the broader context in which knowledge is produced and consumed.

Optimal utilisation of knowledge requires equitable access to existing knowledge. Since the factors restricting access to knowledge have not been adequately challenged and addressed, we are yet to witness unencumbered knowledge sharing in any country. This has considerably restricted the scope and diversity of innovation. The speed at which innovation can take place is also many a time retarded due to duplication of efforts, which can be prevented to a large extent by providing equitable access to existing knowledge resources. Hence it is important to realise that the discourse surrounding sharing economy is incomplete without studying how knowledge is shared in that economy, and devising mechanisms that can encourage knowledge sharing. This also necessitates broader discussions on sharing of rivalrous resources which underlie knowledge production.

This chapter takes a step in this direction by taking knowledge sharing in India as a case study. It critically analyses the history of knowledge sharing in India,

[4] For example, Mark Lemley has pointed out that innovation is merely an incremental step in an ongoing, widely known stage of research; see Lemley, M. (2012). The Myth of the Sole Inventor. *Michigan Law Review,* 110, 709.

[5] For example, a recent study has revealed that 65 of the world's 100 most cited articles are behind paywalls. The Authorea Team. *65 out of the 100 Most Cited Papers Are Paywalled*. https://authorea.com/users/8850/articles/125400/_show_article

examines some empirical findings on attitude towards knowledge sharing and intellectual property ownership in the contemporary Indian society, and, most importantly, explores whether due measures are being taken in India for fostering knowledge sharing in the sharing economy.

We have used the mixed methods approach for the underlying research.[6] Quantitative data used in the study include data from a survey conducted as part of the Open Science project of the Centre for Innovation, IP and Competition, National Law University, Delhi in 2017.[7] The respondents in this survey were researchers across various disciplines working in institutions located in India.[8] The data regarding attitudes towards IP protection are from another empirical study conducted by one of the authors on perceptions of people in India regarding IP infringements.[9] For the qualitative data used in the chapter, we have relied upon books and articles that examine the Indian attitudes and behaviour as regards knowledge sharing from a historical perspective. In order to infer whether appropriate efforts are being made in India for fostering knowledge sharing in the sharing economy, the chapter will critically analyse two of the recent innovation-related policies in the country – the National IP Policy, 2016 and the Startup India Action Plan, 2016.

2 Historical Perspectives on Knowledge Sharing in India

2.1 Perspectives on Knowledge Sharing in Ancient India

While not many scholars have engaged in a rigorous historical analysis of knowledge sharing in India, dominant narratives surrounding this issue have portrayed India as a nation which has historically been morally opposed to restrictions on knowledge sharing.[10] For example, Carl Malamud, prominent public domain activist and founder of PublicResource.org, has noted in his recent book, *Code Swaraj*, that he believes India is the ideal place for starting a global revolution in universal

[6] 'The mixed methods approach in research generally refers to research that involves collecting, analyzing and interpreting quantitative as well as qualitative data in a single study or in a series of studies that investigate the same underlying phenomenon.' See Leech, N.L. & Onwuegbuzie, A.J. (2009). A typology of mixed methods research designs. *Quality & Quantity* 43(2), 265. However, some scholars interpret the term broadly, to also include a mix of quantitative methods or a mix of qualitative methods. See, for example, Brannen, J. (2005). *NCRM Methods Review Papers, NCRM/005. Mixed Methods Research: A discussion paper* (p. 4). http://eprints.ncrm.ac.uk/89/

[7] Open Science Survey – India (2017). https://osf.io/9c6af/

[8] Centre for Innovation, Intellectual Property and Competition. Open Science Survey Methodology. http://ciipc.org/projects/open-science-for-an-innovative-india/open-science-survey/open-science-survey-methodology/

[9] Scaria, A.G. (2014). *Piracy in the Indian Film Industry*: *Copyright and Cultural Consonance* (pp. 103–137). Cambridge University Press.

[10] See generally: Ganapathi, J. & Pulla, V. (2015). *Intellectual Property Rights and the Ancient Indian Perspective*. http://www.spaceandculture.in/index.php/spaceandculture/article/view/147

access to knowledge as '*[it]…is a principle that runs deep in the history of India*'.[11] In order to justify this, he refers to translated excerpts from ancient Indian texts that say that knowledge can never be on sale, and that a teacher is bound to impart knowledge to a willing pupil.[12]

Similar views have also been expressed by Prabha Sridevan, a retired judge of the Madras High Court, and she too alludes to excerpts from different religious texts.[13] In her work, she has highlighted the emphasis of the Upanishads, one of the ancient Hindu texts, on the public benefit aspect of knowledge. She has also quoted excerpts from other texts which say that noble thoughts should come from all sides, and that knowledge alone can set one free.[14] She argues that India has always recognised that intellectual property rights are not natural rights.[15] In this regard, she points out the lack of any tradition in India that allowed teachers to claim authorship or other rights over knowledge.[16] She also highlights that most ancient texts indicate that taking monetary benefits for imparting knowledge was not a socially acceptable practice in ancient India.[17] According to her, teachers were viewed as mere custodians of knowledge who had the responsibility of imparting education for the benefit of the public.[18]

While it may be true that such references to virtues of knowledge sharing can be seen in many of the ancient Indian texts, it is important to look beyond literal translations of selected excerpts from ancient texts, in order to understand social realities. Imposition of monetary restrictions is not the only way to obstruct access to knowledge; many other dimensions like gender and caste must be taken into consideration for a more holistic view of the state of knowledge sharing in ancient India.

2.2 Gender-Based Restrictions to Knowledge

When one looks at the question of gender-based restrictions, it can be seen that like most of the rest of the world, such restrictions have been existing in the Indian society too. It is nearly impossible to understand and encapsulate with certainty and

[11] Malamud, C. & Pitroda, S. (2018). *Code Swaraj: Field Notes from the Standards Satyagraha* (p. 167). https://archive.org/details/CodeSwaraj

[12] Ibid., p. 168.

[13] Sridevan, P. (2015). *Intellectual Property in the Ancient Indian texts*. In Irene Calboli, Srividya Raghavan (Ed.), *Diversity in Intellectual Property: Identities, Interests, and Intersections* (p. 232).Cambridge University Press.

[14] Ibid., p. 234.

[15] Ibid.

[16] Ibid., p. 237.

[17] Ibid., p. 238. Some accounts suggest, however, that teachers used to collect non-monetary 'gurudakshina' or rewards from their students. See Shankar, S. (1994). The Thumb of Ekalavya: Postcolonial Studies and the 'Third World' Scholar in a Neocolonial World. *World Literature Today,* 68(3), p. 482.

[18] Sridevan, P. (2015). *Intellectual Property in the Ancient Indian Texts*. In Irene Calboli, Srividya Raghavan (Ed.), *Diversity in Intellectual Property: Identities, Interests, and Intersections* (p. 235).Cambridge University Press.

completeness the history of women's education in India. There are many reasons behind this, including the lack of uniform documentation and the diversity of women's experience on lines of caste, religion, class, and geography. Some historians are of the opinion that the Vedas, one of the oldest recognised scriptures of Hinduism, suggest that men and women should enjoy equal positions and freedoms in society with respect to education, religious sacrifice, and marriage.[19] According to them, universal education, minimum standard of education for all, gender neutral 'Upanayana' or initiation ceremonies for introduction to the process of learning, and knowledge of all known branches of culture, knowledge, and religion, were prescribed.[20] The same was apparently observed in Islam, where religious books laid down that seeking of knowledge is as incumbent upon a male as upon a female.[21]

While the exact timing or reasons behind complete divergence from these texts are not clearly known, social evils such as child marriage, sati, and the purdah system are considered possible ways in which the patriarchy sought to curb rights and freedoms of women. Child marriage forced prepubescent girls into marriage, often with much older men of higher social status. The practice of 'sati', followed by Hindus in some parts of the country, forced widows to give up their lives along with their dying or dead husbands. The purdah system, whose name originated from a Persian word meaning curtain, was prevalent in both Hindu and Muslim societies.[22] Women had to wear veils or pieces of clothing covering their heads, and were confined behind walls or partitions, segregated from the outside world which could only be enjoyed by men. Most Christian nuns also had to wear pieces of clothing covering their heads. A combination of such practices and traditions cemented women's roles in society as subservient and subordinate to those of men.

Owing to various social changes, women were denied entry to the study of sacred texts, Upanayana began being prescribed only for men, and gradually, right to all kinds of education were restricted.[23] At tols or pathshalas, which were Hindu schools of higher learning, boys belonging to families enjoying higher social status were given free education through stipends and scholarship donations from kings or wealthy persons.[24] Even elementary schools were attended only by boys belonging to upper castes, and sons of rich landlords and agriculturalists.[25] Among Muslims, Maktab or elementary school, which focused on Quran studies, were attended by both boys and girls, where they learned to read and write.[26] However, Madrasahs, which were Islamic institutions of higher learning, could only be attended by select

[19] Mathur, Y.B. (1973). *Women's Education in India 1813–1966* (p. 1). Asia Publishing House.

[20] Ibid.

[21] Bhattacharya, S., Bara, J., Yagati, C.R., Sankhdher, B.M. (Ed.) (2001). *The Development of Women's Education in India: A Collection of Documents 1850–1920* (p. 517). Kanishka Publishers.

[22] WikiGender (2015). https://www.wikigender.org/wiki/purdah/

[23] Mathur, Y.B. (1973). *Women's Education in India 1813–1966* (p. 2). Asia Publishing House.

[24] Ibid., pp. 2–3.

[25] Ibid.

[26] Ibid., p. 3.

groups of boys.[27] There are not many documented references relating to denial of education for Christian women in India that can lead to concrete conclusions on this matter. However, the fact that Christian women were also facing discrimination on most other issues like property rights makes one reasonably assume that their situation was not much different.

In Buddhism, comparatively more inclusive practices were observed as regards education of men and women. Buddhist ideology included belief in kindness towards all living beings, and faith in the essential equality of man and woman in the journey towards salvation.[28] Interestingly, while women were imparted education, their teachers were their fathers, brothers, and uncles.[29] Moreover, while women could enter monasteries and continue their education while being in the monastic order, there were different and discriminatory rules for men and women for entry into monasteries.[30]

Prohibition of women from education was motivated mainly by concerns regarding the subversion of patriarchal power. It was believed that education would make girls 'dushta' (wicked or immoral) and less amenable to discipline and submission to their parents' choice of husband.[31] Since they were 'too useful' in the house, education was feared to make them forget and despise ordinary household duties if they learned how to read and write.[32] Therefore, women's enlightenment was considered to be dangerous due to the apprehensions regarding the prospect of 'violent' social upheaval, the idea of women earning their own livelihood apart from their families was considered repugnant, and superstitions regarding educated women made society believe in misconceptions about educated women.[33] These superstitions propagated beliefs that educated women are likely to be childless and their husbands are likely to die young.[34]

The prohibition of women from meaningful education and enforcement of child marriage also had other related effects on women's education. For example, since women – particularly those from upper castes – were not allowed to have their own livelihood, and there was no tangible financial benefit arising out of their education, parents had no motivation to invest time in their education.[35] Further, insufficiency of educated and working women resulted in low numbers of women teachers in

[27] Ibid.

[28] Indian Woman Down The Ages (p. 45). http://shodhganga.inflibnet.ac.in/bitstream/10603/226/6/06_chapter2.pdf

[29] Indian Woman Down The Ages (p. 47). http://shodhganga.inflibnet.ac.in/bitstream/10603/226/6/06_chapter2.pdf

[30] Ibid., pp. 45 and 47.

[31] Mathur, Y.B. (1973). *Women's Education in India 1813–1966* (p. 40). Asia Publishing House.

[32] Bhattacharya, S., Bara, J., Yagati, C.R., Sankhdher, B.M. (Ed.) (2001). *The Development of Women's Education in India: A Collection of Documents 1850–1920* (p. 206). Kanishka Publishers.

[33] Ibid., p. 364.

[34] Ibid.

[35] Mathur, Y.B. (1973). *Women's Education in India 1813–1966* (pp. 40–41). Asia Publishing House.

schools, which further discouraged parents from sending their daughters to school.[36] While some scholars argue that the purdah system impeded women's education, some others suggest that parents' insistence on separate schools for girls and boys, and women teachers in girls' schools, benefitted girls' education in places like Punjab.[37]

Even when educational reforms were sought to be introduced, the supporting reason had little to do with women's rights and more to do with the advantages that could accrue to men as a result of women's education. While it is not clear if reformers cited such reasons as part of their strategy to convince men in power to remove prohibitions on women, it is interesting to note the glaring absence of women's rights discourses in these historical accounts. It was often claimed that women's education should be encouraged since the same has far greater impact on the educational and moral tone of the people than men's education does.[38] Apparently, impetus for reforms in women's education was given by educated men who wanted educated wives for their sons, and fathers who wanted to educate their daughters to increase their prospects of being viewed as superior wives and mothers.[39]

Moreover, some opinions suggest that the nationalist movements that arose in response to centuries of British rule in India subsumed the movement for women's education into its larger agenda of strengthening and enlightenment of Indian society.[40] Therefore, one may conclude that even the reforms that were initiated to strengthen women's education, reinforced the social roles prescribed by patriarchy or larger societal goals. It is thus no surprise to see that educational policies which were meant to be reformative, suggested that girls be taught 'feminine' subjects such as hygiene, domestic science, needlework, music, and home science; whereas subjects like physics, chemistry, and mathematics were considered as 'masculine' subjects.[41] The 1913 Resolution on the Educational Policy of the Government of India, recommended that while designing the curricula, 'practical bias' with reference to the social position women occupy would be important.[42] Books recommended for girls were simpler in treatment and narrower in the range of subjects than those recommended for boys, as considered appropriate according to dominant public opinion.[43] It may be safe to say that such restrictions and emphases on social

[36] Ibid.

[37] Chanana, K. (2001). *Interrogating Women's Education- Bounded Visions, Expanding Horizons* (pp. 101–102). Rawat Publications.

[38] Indian Educational Policy, Calcutta, 1904, p. 27, referred to in Mathur, Y.B. (1973). *Women's Education in India 1813–1966* (p. 10). Asia Publishing House.

[39] Mathur, Y.B. (1973). *Women's Education in India 1813–1966* (p. 62). Asia Publishing House.

[40] Bhattacharya, S., Bara, J., Yagati, C.R., Sankhdher, B.M. (Ed.) (2001). *The Development of Women's Education in India: A Collection of Documents 1850–1920* (p. xxx, Introduction). Kanishka Publishers.

[41] Education Commission of 1882, mentioned in Chanana, K. (2001). *Interrogating Women's Education- Bounded Visions, Expanding Horizons* (p. 111). Rawat Publications.

[42] Bhattacharya, S., Bara, J., Yagati, C.R., Sankhdher, B.M. (Ed.) (2001). *The Development of Women's Education in India: A Collection of Documents 1850–1920* (p. 368). Kanishka Publishers.

[43] Ibid., p. 353.

roles, which are based on patriarchal interests, still continue to hinder women from entering the knowledge production process, continuing in it, and breaking glass ceilings.

2.3 Caste-Based Restrictions to Knowledge

Apart from gender, it is impossible to provide any historical account of India without discussing the Chaturvarna system. It has impacted most aspects of social life in India, and has played a major role in preventing dissemination of knowledge. The Chaturvarna system divides the Hindu society into four groups called varnas, based on birth. Those who didn't fall into any of these four groups, known as 'Ati-shudras' in some parts of the country, were the 'avarnas' who were considered 'achhoot' or untouchable.[44] Although many texts use the terms 'caste' and 'varna' interchangeably, it must be clarified here that castes are sub-categories that may be classified under different varnas. Thus, a varna may encompass hundreds of castes as sub-categories.[45] Rights and obligations based on varna were reinforced by penal sanctions ordained in Manusmriti ('Laws of Manu'), one of the most authoritative Hindu law texts.[46]

According to Manusmriti, the Brahmins are supposed to cultivate knowledge, the Kshatriya should bear arms, Vaishya should engage in trade, and the Shudra should serve, and strict adherence to this framework is expected from all.[47] This hierarchical system based on birth has determined, and – in many contexts – continues to determine, many social rules and mores not just in the Hindu sections of India, but in Indian society as a whole. While Brahmins had the highest privileges ranging from access to temples to access to education and teaching, the Ati-shudras were treated as 'untouchables' in the society, based on rigid notions of purity and pollution.[48] Some significant legal efforts have been made in India to address many of the social evils which have their bases in the varna system, by incorporating specific provisions in the Constitution as well as through criminalisation of certain discriminatory acts with the help of special legislations.[49]

[44] Ambedkar, B.R. (2014). *Who Were the Shudras?* India: Ssoft Group. http://www.satnami.com/WHO%20WERE%20THESUDRAS.pdf. The untouchables predominantly carry out menial jobs which were considered 'impure' or unclean, such as manual scavenging (removal of human excreta for disposal with bare hands), burning corpses, skinning dead animals, etc.

[45] Galanter, M. (1969). Untouchability and the Law. *Economic and Political Weekly*, 4(1/2), 137.

[46] Ambedkar, B.R. (2007). *Annihilation of Caste* (p. 32). Critical Quest.

[47] Ibid., p. 33.

[48] Ibid., pp. 16–18; Ambedkar, B.R. (2014). *Who Were the Shudras?* India: Ssoft Group. http://www.satnami.com/WHO%20WERE%20THESUDRAS.pdf

[49] For example, the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013, prohibits caste-based practice of Manual Scavenging or cleaning of human excreta in dry latrines, and the employment of anyone as a 'manual scavenger' in India.

However, such prejudices and discrimination continue to exist in various extents in different socio-economic contexts.[50]

While the politics and social impact of the system can be studied in a plethora of ways, in view of the focus area of this chapter, we restrict our discussion to the role played by the varna system in limiting access to education and knowledge. According to Manusmriti, three important aspects of life – teaching of Vedas, performing sacrifices, and receiving gifts – were restricted to Brahmins.[51] Only when a Brahmin was unavailable for teaching was a person allowed to have a Kshatriya or Vaishya teacher.[52] Although originally the varna of a person was determined by an independent body and revised after every 4 years, the Gurukul system replaced this system.[53] The Purva Mimamsa, one of the most prominent ancient Hindu philosophical texts, said that as per this system, the Vedas could not be studied unless one undergoes 'Upanayana'.[54] Upanayana is a ceremony which marks the acceptance of a pupil by a guru or teacher by giving the former a sacred thread that he is supposed to wear thereafter. In this Gurukul system, only the Acharya of the Gurukul, who was of course a Brahmin, was responsible for performing the ceremony. Although Brahmins had no express right to deny Upanayana to anyone, they had exclusive right to officiate Upanayana, could be penalised for performing unauthorised Upanayana, and were deemed to be unworthy to partake in rituals before God if they instructed or were instructed by Shudras.[55] This effectively meant that Shudras and Ati-Shudras were continually denied Upanayana, and hence access to education.[56] By denying education to them, and restricting Kshatriyas and Vaishyas to military and trade, respectively, Brahmins assumed the power to become the only educated class which could control the entire society.[57] Thus, birth became the most important determinant of one's worth and rights.[58]

Apart from effectively deciding a person's rights to basic dignity and resources, the Brahmins also monopolised knowledge by forcibly dominating literary

[50] Narula argues that the 'Rule of Caste' superposes itself on 'Rule of Law' in India, making the legal safeguards ineffective in practice. See Narula, S. (2008). Equal by Law, Unequal by Caste: The Untouchable Condition in Critical Race Perspective. *Wisconsin International Law Journal,* 26, 287–289.

[51] Ambedkar, B.R. (2016). *Dr. Babasaheb Ambedkar Writings and Speeches,* Vol 3 (p. 278). https://archive.org/details/Dr.BabasahebAmbedkarWritingsAndSpeechespdfsAllVolumes

[52] Ambedkar, B.R. (2016). *Dr. Babasaheb Ambedkar Writings and Speeches,* Vol 7 (p. 174). https://archive.org/details/Dr.BabasahebAmbedkarWritingsAndSpeechespdfsAllVolumes

[53] Ambedkar, B.R. (2016). *Dr. Babasaheb Ambedkar Writings and Speeches,* Vol 3 (p. 287). https://archive.org/details/Dr.BabasahebAmbedkarWritingsAndSpeechespdfsAllVolumes

[54] Ambedkar, B.R. (2016). *Dr. Babasaheb Ambedkar Writings and Speeches,* Vol 7 (p. 172). https://archive.org/details/Dr.BabasahebAmbedkarWritingsAndSpeechespdfsAllVolumes

[55] Ibid., p. 174.

[56] Ibid., pp. 173–174.

[57] Ambedkar, B.R. (2016). *Dr. Babasaheb Ambedkar Writings and Speeches,* Vol 3 (p. 326). https://archive.org/details/Dr.BabasahebAmbedkarWritingsAndSpeechespdfsAllVolumes

[58] Ibid.

narratives.[59] Originally, the Puranas – which contained folk narratives – were written by Sutas, a non-Brahmin literary class. Sutas had the hereditary and prescriptive right to retain monopoly over the Puranas. However, they were later ousted by the Brahmins, resulting in the addition of fresh chapters, substitution of old chapters, and substantial change in the content of the Puranas.[60]

It would be a misrepresentation of history, if one looks away from the varna system and all its associated evils, while asserting that India has had an exemplary historical tradition in knowledge sharing. Interestingly, Malamud does mention in his book that Shamnad Basheer had reminded him about these institutionalised restrictions on knowledge flows.[61] During our conversation with Basheer, he reiterated his disagreement with Malamud on this issue.[62] Further, although Sridevan has in her work asserted that India has a rich tradition in knowledge sharing, she herself has alluded to social conditions and instances that suggest otherwise. For example, she talks about how there was no open publication of knowledge, and how knowledge was restrictively transmitted to prevent its abuse and dilution.[63] She also discusses the direct link of knowledge with religion which automatically caused exclusion.[64] Moreover, she discusses the perfect recitation, high qualification, and specific training or initiation required to access knowledge, apart from having to belong to a hereditary fraternity.[65] The ability to fulfil these conditions in order to access knowledge was heavily dependent on one's caste.

Although teaching for the sake of money or fee was prohibited, and the IP system as we know it now did not exist, it is important to acknowledge the ruthlessness, rigidity, and pervasiveness of the social systems which heavily restricted knowledge flows.[66] In many ways, such measures to restrict knowledge flows also resemble the working of the existing trade secrets system. The consequences of a Shudra or Ati-Shudra trying to break the law were inhuman and heinous in nature. Some scholars point out that merely hearing the Vedas could result in their ears being filled with

[59] Ibid., p. 255.

[60] Ibid., p. 255.

[61] Malamud, C. & Pitroda, S. (2018). *Code Swaraj: Field Notes from the Standards Satyagraha* (p. 168), available at https://archive.org/details/CodeSwaraj

[62] Telephonic Interview with Shamnad Basheer on 10 March 2018.

[63] Prabha Sridevan (2015). *Intellectual Property in the Ancient Indian texts*. In Irene Calboli, Srividya Raghavan (Ed.), *Diversity in Intellectual Property: Identities, Interests, and Intersections* (pp. 235–237).Cambridge University Press.

[64] Ibid., p. 234.

[65] Ibid., p. 235.

[66] Manu (III.150ff.): Classes of Brahmins deemed to be unworthy (to partake) of oblations to the gods and manes: 'He who teaches for a stipulated fee and he who is taught on that condition, he who instructs Shudra pupils and he whose teacher is a Shudra, he who speaks rudely, the son of an adulteress, and the son of a widow.' [Ambedkar, B.R. (2016). *Dr. Babasaheb Ambedkar Writings and Speeches,* Vol 7 (p. 124). https://archive.org/details/Dr.BabasahebAmbedkarWritingsAndSpeechespdfsAllVolumes]

molten lead and lac.[67] Pronunciation of the Vedas could result in slitting their tongue, and if they preserved the Vedas, their body was to be cut through.[68]

Even when some school reforms started being initiated in the nineteenth century, merely opening schools for all castes was not sufficient in breaking social barriers to education. The demands of upper caste Hindus refusing to study with lower caste students were prioritised over the rights of the lower caste students. The colonial government tried to reach a 'resolution' by forcing the few lower caste students who did attend school to sit in a verandah far away from their classroom and classmates.[69] In some schools, lower caste students were made to sit in separate rooms and barred from accessing the common water supply.[70] In a way, efforts for inclusion of people belonging to lower castes actually highlighted the stigma and prejudice against them and the discrimination was perpetuated through social exclusionary practices.[71] Given that most authorities reacted to the situation out of fear of boycott by upper caste Hindus, this interaction between students from various castes became cause for more direct humiliation and exclusion of lower caste students.[72] Many of them were also subjected to persecution when they were permitted entry into ordinary village schools – their stacks of hay were burnt down, arson was attempted on their houses, and they were physically assaulted.[73] It needs to be specifically mentioned that even conversion of religion did not save people from such exclusion and prejudices, and they continued to face discrimination.[74]

All these aspects highlight how religion and social mores entrenched social prejudice and exclusion against people belonging to certain social strata, and systemically deprived them of rights including that of access to education.

Even today, these prejudices remain alive in various forms and extents, and compensating for the socio-economic gap created by the caste system remains an uphill battle. A combination of socio-economic factors including caste, class, gender, location, and language used to and continue to determine the extent and kind of access one has to knowledge in this country.[75] One may have to examine present-day attitudes and practices with regard to knowledge sharing, in this socio-historical context.

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[67] Vatsa, R.S. (1912).*The Depressed Classes of India- An Enquiry into their Conditions and Suggestions for their Uplift* (p. 134). Gitanjali Prakashan.

[68] Ibid.

[69] Rao, A. (2009) *The Caste Question: Dalits and the Politics of Modern India* (p. 72).University of California Press. https://www.jstor.org/stable/10.1525/j.ctt1pp88k

[70] Ibid.

[71] Ibid.

[72] Ibid.

[73] Ambedkar, B.R. (2016). *Dr. Babasaheb Ambedkar Writings and Speeches,* Vol 5 (p. 41). https://archive.org/details/Dr.BabasahebAmbedkarWritingsAndSpeechespdfsAllVolumes

[74] For example, even after conversion to Christianity, Dalits are often referred to as 'Dalit Christians'. Pervasive caste hierarchies and prejudices continue even within the converted population. See Bauman, C.M. (2008). Redeeming Indian "Christian" Womanhood? Missionaries, Dalits, and Agency in Colonial India. *Journal of Feminist Studies in Religion*, 24(2), 5–27. http://www.jstor.org/stable/20487924

[75] Govind Guru observes the 'ghettoisation into inferiorised manual spheres' of persons belonging to lower castes, due to their generational exclusion from undertaking occupations which provide a

3 Perceptions Regarding Sharing of Knowledge Resources and Ownership of IP in the Contemporary Indian Society

While the previous section highlighted the socio-historical context of knowledge sharing in India, this section intends to provide some insight into the current status of knowledge sharing and perceptions regarding IP ownership in the contemporary Indian society. As mentioned earlier, this section relies primarily on empirical data from two different studies. The first one is an empirical study conducted by the authors with regard to knowledge sharing practices of academic researchers in India. Through this survey, the authors analysed – among other things – the extent to which, and the way in which, the researchers share their publications and data; their general attitudes towards openness and sharing; and the way they consume openly available knowledge. The second one is an empirical study conducted by one of the authors on attitude of consumers in India towards IP protection.[76] The data from this study provides some insights on perceptions regarding IP ownership, and in particular, the perceptions in Indian society regarding morality of copyright infringement.

3.1 Survey on Knowledge Sharing Perceptions and Practices of Researchers

Our survey on knowledge sharing practices of researchers in India was conducted in two phases; in the first phase, researchers from leading institutions in five disciplines (Economics, Law, Mechanical Engineering, Medicine, and Physics) responded to the questionnaire; whereas in Phase II, the survey was opened to researchers working in any institution in India and belonging to any discipline.[77]

Among the respondents, 86.86%[78] stated that they think openness is a core value of science. 84.71%[79] felt that open access improves research, and 87.4%[80] felt that it provides for more equitable distribution of information. In contrast, only 18.15%[81]

room for innovation and imagination. According to him, this has led to lack of context and conditions conducive to contribution to knowledge systems. [Guru, G. (2002). How Egalitarian Are the Social Sciences in India? *Economic and Political Weekly,* 37(50), 5004–5005].

[76] Scaria, A.G. (2014). *Piracy in the Indian Film Industry*: *Copyright and Cultural Consonance* (pp. 103–137). Cambridge University Press.

[77] Centre for Innovation, Intellectual Property and Competition. Open Science Survey Methodology. http://ciipc.org/projects/open-science-for-an-innovative-india/open-science-survey/open-science-survey-methodology/

[78] N = 373.

[79] N = 373.

[80] N = 373.

[81] N = 369.

of the respondents felt that open access reduces the quality of research and 31.3%[82] felt that it leads to free-riding. These data suggest that in general most of the respondents are in support of openness and sharing of knowledge. But is this support demonstrated in their practices?

In order to determine the nature and extent of their participation in the process of knowledge sharing, we inquired about their consumption of freely available publications and data, as well as their own sharing practices. As expected, a majority of the respondents have relied upon data (59.5%)[83] or publications (78.76%)[84] openly available on the internet for their research. However, when it comes to sharing their own publications, it was noticed that only 35.06%[85] share their publications through open access repositories. With regard to sharing of data, it was noticed that only a mere 8.4% share through open access repositories.[86] Similarly, only 9.72% share their publications through their personal website without restrictions, and 3.09% share their data this way.[87]

Interestingly, most of the respondents stated that they share their publications only upon request (56.6%).[88] Sharing on request is certainly not the most optimal approach for knowledge sharing as the process – knowing the existence of a publication, locating it, approaching the author, and receiving a response from them – involves multiple uncertain steps. Apart from this, 34.03% respondents stated that they share their publications with close friends and trusted acquaintances, 47.22% share with researchers working in their team, and 31.6% share with researchers working in their institution.[89] 3.82% do not share their publications with anyone.[90]

If the data regarding sharing of publications do not seem promising, those regarding data sharing are even less so. As many as 16.37% stated that they do not generally share data with anyone.[91] 37.17% share data with anyone who asks for them and as discussed above; this is not the most optimal approach with regard to sharing.[92] 48.67% and 20.35% also mentioned that they share data with researchers working in their team and institution, respectively.[93] 25.22% respondents said that they share data with close friends or trusted acquaintances.[94]

Evidently, the results of the survey as regards sharing practices of researchers are quite dismal. Why is that so? What are the factors discouraging them to share,

[82] N = 361.
[83] N = 321.
[84] N = 372.
[85] N = 288.
[86] N = 226.
[87] N = 226.
[88] N = 288.
[89] N = 288.
[90] N = 288.
[91] N = 226.
[92] N = 226.
[93] N = 226.
[94] N = 226.

despite being in agreement with the importance of sharing? Are they seeing any benefits while sharing at all? Before we address these important questions, it may also be helpful to look at data from two other important dimensions of our survey.

In any society/country, academic/formally educated researchers are not the only producers of knowledge. Citizens outside of the formal system have always produced rich knowledge. However, those within the formal system are generally perceived as the most prominent producers of knowledge, and their attitudes and practices as regards knowledge sharing have substantial impact on the sharing economy. In this context, it was important to explore how far researchers tried to make their knowledge resources accessible for the broader public. In the context of a multi-lingual country like India, we explored this in two dimensions. Firstly, we tried to explore how frequently the researchers tried to share simplified versions of their findings for laypersons. Secondly, we also explored how frequently research outputs are disseminated in regional languages. The findings on both the dimensions are disappointing. As many as 30.63% of the respondents never shared any simplified versions of research findings, while 29.19% do so only rarely.[95] Further, the vast majority of respondents (78.85%) never shared translated versions of their research in regional languages.[96]

All these data demonstrate a striking contrast between consumption and sharing habits of researchers in India. But why are Indian researchers reluctant to share their knowledge resources even today? While the socio-historical factors discussed in the previous section might be playing a role in influencing the norms in this regard, it is also important to note that not much effort has been made from the side of policy makers to undo the historical moulding of norms. The general incentive structure for academicians/ researchers today indicates that sharing of results and openness in research have not yet become a priority.

For example, if one looks at the Academic Performance Indicators (API), developed by the University Grants Commission (UGC) of India, it can be noticed that there has been inordinate focus on number of publications, impact factor of the journal they are published in, and whether the journal is 'national' or 'international'.[97] There is no regard for quality of the publication or the journal, the social relevance of the underlying research, or sharing practices. As API system has played a key role in determining the appointment and promotion of academics, it could very well be argued that the current system is not incentivising sharing of knowledge, but may only be supporting elitist practices of limiting the sharing of knowledge resources.

Some of our data regarding the perceptions of the respondents regarding benefits they have received from sharing confirm our views on the problems with the

[95] N = 346.

[96] N = 350.

[97] University Grants Commission Regulations on Minimum Qualifications for Appointment of Teachers and other Academic Staff in Universities and Colleges and Measures for the Maintenance of Standards in Higher Education, 2018. https://www.ugc.ac.in/pdfnews/4033931_UGC-Regulation_min_Qualification_Jul2018.pdf. Accessed 21 July 2018.

existing incentive structure. For example, as many as 42.8%[98] of the respondents stated that they have not received any benefits at all when they shared their publications. Similarly, 60.84%[99] could not perceive any benefits from sharing their data.

The data also show that fear of plagiarism (15.22%) and fear of use by others for their professional benefits (9.42%) are some of the reasons cited by the researchers for not sharing their publications.[100] In the case of data sharing too, the lack of incentives to share is reflected in the survey results. Most of the funding agencies and institutions in India do not have strong mandates with regard to sharing of data. The data show that lack of mandates from their funding agency and institution has discouraged 11.24% and 15.73% respondents, respectively, while lack of resources has discouraged 7.49% respondents.[101] It is also important to note here that as many as 11.61% stated that they do not consider data sharing to be important.[102] However, it is interesting to observe that the most prominent factor that discouraged data sharing is the reluctance to share data before having completed all possible research/ publications based on that data set (44.19%),[103] which again illustrates that publication, and not knowledge sharing, is the primary incentive for researchers in most Indian institutions.

3.2 Study on Attitude of Film Consumers Towards IP Protection

As discussed at the introductory part of this section, one may read the data and findings on sharing practices of researchers along with the data from another study on attitudes regarding IP protection, for a comprehensive understanding of the attitude towards sharing in the contemporary Indian society. This study was conducted in the context of piracy in the Indian film industry.[104] The objective of the study was to explore, among other aspects, the film consumers' engagement in piracy; and their perceptions regarding social costs, social benefits, legality, and morality of piracy.

While the study showed that the vast majority of respondents had consumed pirated movies through different channels, two dimensions of the study are important in the context of the present discussion – perceptions regarding social costs of piracy and perceptions regarding morality of piracy.[105]

[98] N = 243.

[99] N = 166.

[100] N = 276.

[101] N = 267.

[102] N = 267.

[103] N = 267.

[104] For a detailed discussion on the methodology used in the study as well as the questionnaire, see Scaria, A.G. (2014). *Piracy in the Indian Film Industry: Copyright and Cultural Consonance* (pp. 219–244). Cambridge University Press.

[105] For a detailed discussion and data on the exposure of the respondents in this survey to different forms of pirated products, see Scaria, A.G. (2014). *Piracy in the Indian Film Industry: Copyright and Cultural Consonance* (pp. 104–111). Cambridge University Press.

The perceptions of the respondents regarding social costs of piracy were measured at three levels – moving from macro to micro levels – perceptions regarding the effects piracy has on the economy, the movie industry, and individuals working in the movie industry. As many as 66.59%[106] respondents stated that they thought pirated movies would hurt the Indian economy, 69.25%[107] said that pirated movies would hurt the existence of the movies industry, and 71.11%[108] felt that piracy would affect the livelihood of diverse persons involved in the creation of movies.

One may read the above data along with the data on the respondents' perceptions regarding the morality of different acts which constitute piracy. Among the respondents, 66.37%[109] thought that it is immoral to stream pirated movies, and downloading of pirated movies was perceived to be immoral by 64.59%[110] respondents. Similarly, uploading pirated movies was considered immoral by 64.96[111]; and buying pirated movie VCDs/DVDs was considered immoral by 64.67%[112] respondents. Further, sharing of pirated movies with friends was considered immoral by a substantial percentage of respondents (57.43%).[113]

It needs to be specifically mentioned that similar to the findings from the knowledge sharing survey, the results of this survey also paint a very interesting picture of the Indian society – one can see stark divergences between what respondents think about a particular act and how they actually behave. In other words, even though most respondents in this survey were found to be deeply conscious about the social costs of piracy and immorality of different acts perceived as piracy, they were also admittedly engaging in those acts.[114]

The fact that majority of the respondents considered it immoral to engage in different acts that may constitute copyright infringement illustrates a strong sense of acceptance of intellectual property rights over informational goods. This may be contrasted with the findings from many other countries in Asia, particularly China, wherein some scholars have shown that the concept of intellectual property rights may have been alien to the society for a very long time.[115] For example, scholars

[106] N = 452.

[107] N = 452.

[108] N = 450.

[109] N = 455.

[110] N = 449.

[111] N = 448.

[112] N = 450.

[113] N = 451.

[114] For more detailed discussion and data on the exposure of the respondents in this survey to different forms of pirated products, see Scaria, A.G. (2014). *Piracy in the Indian Film Industry: Copyright and Cultural Consonance* (pp. 104–111). Cambridge University Press.

[115] See, for example, Alford, W.P., (1995). *To Steal a Book Is an Elegant Offense: Intellectual Property Law in Chinese Civilization.* Stanford: Stanford University Press. Some of the other Asian countries wherein scholars have tried to analyse IP infringements from a local/comparative cultural context include Indonesia and Thailand. See, for example, Arli, D., et al. (2015). The Impact of Moral Equity, Relativism and Attitude on Individuals: Digital Piracy Behaviour in a Developing Country. *Marketing Intelligence & Planning*, 33, 348 and Kini, R.B., et al. (2004). Shaping of Moral Intensity Regarding Software Piracy: A Comparison Between Thailand and U.S. Students. *Journal of Business Ethics,* 49, 91.

have highlighted the importance given in the Chinese society to sharing as a traditional Chinese cultural value, and examined how such values may affect perceptions of morality with regard to copyright piracy.[116] However, due to historical existence of restrictions to access to knowledge on lines of gender, caste, etc., restrictions based on IPR may not have come as a substantial culture shift in India. Hence, it may be reasonably hypothesised that the socio-cultural history of knowledge sharing in India may be contributing to acceptance of intellectual monopolies in India, even though it is difficult to illustrate this empirically.

4 Knowledge Sharing and Some Recent Policies

The previous sections, which focused on historical and contemporary aspects of knowledge sharing and IP protection in India, present a bleak picture regarding knowledge sharing in India. In this context, it may be useful to examine whether any major policy changes are being adopted in India to encourage sharing of knowledge resources in light of the opportunities enabled by the sharing economy. While policies and plans are not enforceable in a court of law, they might be useful documents to better understand the direction policy makers are taking in a relevant area. In order to gauge the degree of importance given by policy makers to knowledge sharing within the broader innovation policy framework, we would like to analyse two recent policies of the government of India – the National Intellectual Property Rights Policy, 2016 and the Startup India Action Plan, 2016. These two policies were chosen for this analysis because they are recent policies which emphasise on innovation. It would be interesting to see the praxis they seek to use to reach that goal and whether the same is conducive to a sharing economy. This part of the chapter provides a critical analysis of these policies from the perspective of a sharing economy which seeks to maximise and diversify innovation.

4.1 National Intellectual Property Rights Policy, 2016

The introductory statements in the National Intellectual Property Rights Policy include phrases such as 'holistic, conducive ecosystem', 'socio-cultural development', 'public interest', 'knowledge economy', and 'benefit of all'.[117] The vision

[116] See, for example, Swinyard, W. R., et al. (1990). The Morality of Software Piracy: A Cross-Cultural Analysis. *Journal of Business Ethics*, 9, 656 and Ang, S. H., et al. (2001). Spot the Difference: Consumer Responses Towards Counterfeits. *Journal of Consumer Marketing*, 18, 221. On the other hand, some studies have also shown how different, presumably conflicting, traditional cultural values in China may be interacting when it comes to decision making like buying IP infringing products. See, for example, Wan, W. W. N., et al. (2009). Do Traditional Chinese Cultural Values Nourish a Market for Pirated CDs. *Journal of Business Ethics*, 88, 187–194. However, it must be clarified that these studies should also be subjected to further analyses and verification.

[117] National Intellectual Property Rights Policy, 2016, p. 1.

statement even indicates that the policy was introduced envisaging an India where 'knowledge owned is transformed into knowledge shared'.[118] A superficial glance at these words and phrases may lead to the assumption that the policy seeks to draw attention to the importance of striking a balance between IPR and knowledge sharing.

However, a closer look at the policy document makes it clear that the provisions neither seek to nor end up achieving that. On the contrary, one of the most worrisome aspects of the policy is its singular and inordinate focus on strict IP protection for fostering creativity and innovation.[119] While IP protection may incentivise innovation and creativity in certain cases, it is merely one of the many potential incentives. As many empirical studies have shown, innovations and creativity also thrive in the so-called 'negative spaces of IPR', where IP protection either does not exist or IP protection is not enforced by right holders.[120] Moreover, in many ways, stringent IP restrictions may also limit knowledge flows in a way that further innovations that could have been made on the basis of the protected IP are hindered. In order to have a truly innovative society, educational, social, economic, and legal conditions need to work in harmony to ensure that the appropriate rights are prioritised depending on the context.

The introduction to the policy states that the perception that IP protection may not be required must be changed through awareness creation.[121] As one may recall from the discussions in the earlier section on historical aspects of knowledge sharing in India, the generalisation in this statement is based on the faulty presumption that IP protection is alien to Indian society, and that strict exercise of IPR is necessarily better for an innovator or creator.[122]

Objective 1 of the policy deals with IPR awareness, and emphasises the need to conduct outreach and promotion to make citizens from all sections of the society aware of the economic, social, and cultural benefits of IPRs.[123] While it might be important to make citizens aware of their legal and constitutional rights, portraying IPRs as the panacea that can magically transform the innovation landscape may be particularly harmful for the innovation ecosystem in a sharing economy. The policy even talks about high quality and cost-effective innovation in this context, although there is no clarity as to how increased awareness about IPRs would aid that.

Objective 2 focuses on stimulation of IP generation which is envisaged as an end in itself. IP should never be an end, but just one of the many tools which can be used

[118] National Intellectual Property Rights Policy, 2016, p. 1.

[119] Basheer, S. & Agarwal, P. (2017). India's New IP Policy: A Bare Act? *The Indian Journal of Law and Technology*, 13(2), pp. 6–13.

[120] See, generally, Raustiala, K. & Sprigman, C. (2012). *The Knockoff Economy: How Imitation Sparks Innovation.* Oxford University Press.

[121] National Intellectual Property Rights Policy, 2016, p. 3.

[122] See, also, Basheer, S. & Agarwal, P. (2017). India's New IP Policy: A Bare Act? *The Indian Journal of Law and Technology*, 13, p. 7.

[123] National Intellectual Property Rights Policy, 2016, p. 5.

to reach the goal of innovation.[124] Here, the policy talks about conducting IP audits, promoting IP registration, and using registered IPRs as a metric to evaluate one's performance. In the absence of any provision urging innovators to share their IP in certain contexts, this again indicates a narrow perception of innovation and may further prevent researchers from sharing their knowledge resources for the broader benefit of the society. Interestingly, the policy gives a cursory nod to 'open source-based research' such as Open Source Drug Discovery (OSDD) in this part, but does not provide any explanations or roadmaps.[125] While finer details of implementation of open source-based research may not be expected or desirable in this policy, more in-depth discussions on such initiatives would have better highlighted their importance. This is in contrast to many other parts of the IP policy wherein it has provided detailed guidance on how to increase IP awareness, registrations, and enforcement.

Objective 3 deals with the need to have strong and effective IP laws which balance the interests of the IPR holder with the public interest. Among other things, this section talks about the need to update outdated laws; consult stakeholders; enter into treaties; protect traditional knowledge, traditional cultural expressions, and genetic resources; simplify and streamline legal processes; make the legal processes efficient and transparent, and fill in gaps in the existing legal system. However, the lack of clarity as to how to strike the balance of interests leaves much to be desired as regards this policy objective.[126]

Objective 5 talks about the commercialisation of IPRs. The policy says that '*[t]he value and economic reward for the owners of IP rights comes only from their commercialization*'. We must reiterate that this assertion is unsubstantiated and misleading, since value should be decided by the individual in question, and the system should provide, or at least refrain from denying, non-monetary incentives for innovators and creators.[127] This part of the policy also mentions that free and open source software should be promoted and open standards should be adopted, but – in the

[124] Basheer, S. & Agarwal, P. (2017). India's New IP Policy: A Bare Act? *The Indian Journal of Law and Technology*, 13, p. 6.

[125] Open Science Drug Discovery is an initiative led by Council for Scientific and Industrial Research (CSIR), India which aims to provide a platform for global partnership and collaboration to evolve solutions to complex health issues and develop affordable healthcare. See Open Source Drug Discovery. http://www.osdd.net/home. Accessed 25 July 2018.

[126] Ibid., p. 15.

[127] Contrary to the perception that patents are primary drivers of innovation, numerous 'important' inventions such as penicillin, x-ray machine, and many life-saving vaccines were never patented by the respective innovators. See Fontana, R., Nuvolari, A., Shimizu, H., & Vezzulli, A. (2013). Reassessing patent propensity: Evidence from a dataset of R&D awards, 1977–2004. *Research Policy*, 42(10), 1780–1792. This is in sharp contrast to innovators like Thomas Alva Edison, who had as many as 1093 patents. See Rutgers School of Arts and Sciences. Edison's patents. Thomas A. Edison Papers. https://edison.rutgers.edu/patents.htm. Similarly, unlike The Gillette Company, which is (in)famous for its huge number of patents and closed innovation model, Tesla has shifted to an open innovation model and has promised not to initiate lawsuit against anyone who uses their patented technologies 'in good faith'. See Sansonetti, A., & Purificato, M. (2014). The Open Innovation Paradigm in Electric Vehicle Industry: A case study of Tesla Motors. *LUISS Guido Carli*, 73. https://tesi.luiss.it/13496/1/purificato-marco-tesi-2014.pdf, and Rivette, K.G., & Kline, D. (2000). Discovering New Value in Intellectual Property. *Harvard Business Review*, January–February, 58. http://secure.com.sg/courses/ICI/Grab/Reading_Articles/L07_A02_Rivette.pdf

absence of further explanation – we are not sure how exactly this relates to commercialisation of IPRs. Interestingly, although government bodies such as Cell for IPR Promotion and Management (CIPAM) have been given certain responsibilities here to help IPR holders commercialise their IP, no mention has been made of knowledge sharing, even by publicly funded institutions. In fact, the policy encourages publicly funded research laboratories, academia, and other institutions to commercialise their research outputs.

Objective 6 deals with the strengthening of enforcement and adjudication in case of IP infringement, and emphasises on creating awareness about the harm caused by IP infringement. As indicated in the earlier section of this chapter, data from our study show that most respondents were of the view that copyright piracy has social costs at both micro and macro levels. The emphasis on awareness regarding IP protection, in the absence of equal emphasis on knowledge sharing, may further strengthen such perceptions and adversely affect innovation and creativity.

Finally, Objective 7 deals with the strengthening and expansion of '*human resources, institutions and capacities for teaching, training, research and skill building in IPR'*. The prominent way in which this has been envisaged in the policy – introducing and strengthening IP courses in institutions at different levels, but without emphasising on the need for also educating the public about the exceptions provided under different IP legislation – is not likely to encourage creativity or innovation.

Interestingly, at a time when the unlimited potential of sharing and openness in innovation is being explored across the world, the term 'open' has been mentioned in only four sections of the policy, that too in an extremely vague manner.[128] The term 'share' also makes an appearance just once in this document - in the vision statement - clearly indicating the extent of importance policymakers in India attach to openness and sharing of knowledge resources. While the chances of this IP policy adding any value to the IP system and the innovation ecosystem are low, the extent

[128] The four sections of the National IPR Policy 2016, wherein the term 'open' appear are:

2.10 – Encourage R&D including open source based research such as Open Source Drug Discovery (OSDD) by the Council of Scientific and Industrial Research (CSIR) for new inventions for prevention, diagnosis and treatment of diseases, especially those that are life threatening and those that have high incidence in India;

2.17 – Promote 'infusion of funds to public R&D units' as a part of Corporate Social Responsibility to foster a culture of open innovation;

5.12 – Promote use of Free and Open Source Software along with adoption of open standards; possibility of creating Indian standard operating environments will be examined;

7.9 – Develop distance learning and on-line courses on IP for all categories of users; strengthen IP teaching in open universities and centres of skill development.

This is in contrast with the policy framework adopted in some other parts of the world. For example, the European Union has adopted 'Horizon 2020' to foster open access and open innovation for 'excellent science' and 'smart, sustainable and inclusive growth'. See The EU Framework Programme for Research & Innovation. (2014). HORIZON 2020 in Brief (p. 5). European Commission. https://ec.europa.eu/programmes/horizon2020/sites/horizon2020/files/H2020_inBrief_EN_FinalBAT.pdf

of damage it may cause to innovations and creativity in a sharing economy could be substantial due to the high emphasis it provides on IP ownership.

4.2 Startup India Action Plan, 2016

Startup India, a flagship initiative of the Government of India, seeks to build an ecosystem that nurtures startups and innovations, and believes that this can drive sustainable economic growth and create employment opportunities.[129] In this context, it seeks to expand the 'startup movement' sectorally and geographically; and the Startup India Action Plan, 2016 came with the objective of supporting this expansion. For the purpose of this chapter, it would be useful to critically analyse the provisions of the Plan that are meant to foster innovation and collaboration. We would like to highlight four aspects of the policy in this regard and raise some key questions.

Firstly, the Plan introduces a scheme for Startup Intellectual Property Protection (SIPP), which is aimed at facilitating the filing of patents, trademarks, and designs by innovative startups. The scheme mainly entails promotion of awareness about and adoption of IPRs; and provision of IPR services and resources, including fee rebates and fast-tracking of patent applications. The entire facilitation fee is supposed to be borne by the central government, and the startup would only be expected to pay statutory fees. But interestingly, no part of the document appears to give any indication that the policy makers asked the most fundamental question – are Indian startups IP consumers or IP producers, or a mix of both? The emphasis provided in the plan for IP protection clearly gives the impression that the policy makers drafted the action plan with the presumption that all startups in India are solely IP producers. If Indian startups are at least partly IP consumers, the Plan should have at least given equal emphasis on facilitating more access to protected IP, including acquisition of IP by the government and open access to such acquired IP.

Secondly, the Plan proposes organisation of fests for showcasing innovation by startups, and for providing platforms for collaboration.[130] While this is a laudable step, a closer look at the provisions makes one realise that these initiatives are more in the nature of networking platforms for the startups to connect with other stakeholders from the industry and the academia. The policy has completely missed the importance of building open collaborative platforms.

Thirdly, the Plan envisages the setting up of infrastructure and awards for fostering research and innovation. Importantly, it talks about 'Grand Innovation Challenge' awards to fund innovations concerning ultra low-cost solutions to local problems. It also lists various measures that the government is supposed to implement for promoting research and innovation among young students. These measures include

[129] This Plan defines Startup, for the purpose of government schemes, as an 'entity, incorporated or registered in India not prior to 5 years, with annual turnover not exceeding INR 25 crore in any preceding financial year, working towards innovation, development, deployment or commercialization of new products, processes or services driven by technology or intellectual property'. See Startup India Action Plan, 2016, p. 28.

[130] Startup India Action Plan, 2016, p. 19.

programmes for providing prototyping support for school children, and supporting student innovations and research. As regards research infrastructure, the Plan discusses the setting up of 31 'innovation centres' and 7 'research parks'. The innovation centres will be set up at certain national institutes to augment incubation and R&D efforts, by, inter alia, encouraging student-driven startups from host institutes and providing smooth approvals for incubators. The proposed research parks are expected to allow industry-academia collaborations by enabling research-focused companies to set up base in the park and utilise the hosts' expertise. The proposed research parks are supposed to have self-sustaining and world-class research infrastructure, and foster meaningful collaboration between startups and the academia. But would these parks be open for all or would it be limited to specific people? When public funds are used for creating infrastructure, it is also important to ensure that such infrastructure can be used by all people, including those from outside the host institutions. Unfortunately, the Plan has not given due importance to creating such open and shared infrastructure.

Finally, like the National IPR Policy, the Startup Plan has also failed to provide sufficient measures that can foster meaningful knowledge sharing and equitable opportunities for innovation. It would have enabled a far more optimal startup ecosystem in India if it had taken into consideration all the potentials of a sharing economy in the innovation process.

5 Challenging the Status Quo: The Way Forward?

The preceding parts of this chapter illustrate that the culture of sharing knowledge in India has historically been riddled by various socio-economic and legal restrictions. Despite the recognition of the need to create and innovate, and the introduction of policies and plans to foster the same, there is a lack of holistic analysis and insightful policymaking. As highlighted previously, inequitable access to knowledge hinders diversity and extent of participation in innovation. It is therefore important to challenge the status quo, and initiate and implement changes that can lead to sharing of both non-rivalrous knowledge, and rivalrous and scarce resources that are required to produce knowledge.

It is beyond the scope of this chapter to highlight the specific legal and policy recommendations for making significant changes to the status quo. However, we hope that the discussions in this chapter will trigger debates that can lead to changes in the attitude towards knowledge sharing. In this context, it is important to highlight that apart from providing access to non-rivalrous and rivalrous resources required for knowledge creation, it is necessary to address the social gaps that hinder participation in the sharing economy. It is therefore crucial to devise and implement meaningful measures to reduce socio-economic gaps based on caste, class, gender, geography, etc. Efforts should also be made to address language gaps and prejudices against knowledge creators from outside the formal research/innovation ecosystem. Only through such an inclusive approach in knowledge creation, can India explore the full potential of a sharing economy.

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K.-C. Liu, U. S. Racherla (eds.), *Innovation, Economic Development, and Intellectual Property in India and China*, ARCIALA Series on Intellectual Assets and Law in Asia, https://doi.org/10.1007/978-981-13-8102-7