



IP litigation is local, but those who litigate are global

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Abstract

The importance of managing intellectual property (IP) on a global basis has been widely acknowledged by scholars and practitioners alike. However, we still have limited understanding of how multinational enterprises (MNEs) choose – among all the countries they do business in – where to file for IP protection and where they exercise their IP rights through litigation. In this study, we examine MNEs' strategic choices of patenting and litigation locations through the lens of global competition. We argue that, while IP protection is local, relying on local policies and institutions, firms engaging in litigation are global. Thus, they prefer to litigate in the few countries with substantial track records to send strong signals to competitors elsewhere. This is particularly true for highly concentrated industries, where the same competitors face off in various countries, and for firms with radical innovations, which require expertise for a convincing verdict. We find supportive evidence of country, industry, and firm effects from extensive interviews with industry insiders and a comprehensive dataset documenting all the IP-related activities of Fortune Global 500 companies from 2007 to 2014. We discuss how the strategic choices made by global firms, in turn, influence the effectiveness of local policies and IP harmonization efforts across countries.

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INTRODUCTION

Intellectual property (IP) has been playing an increasingly important role in firms' globalization efforts (Somaya, 2000). On the one hand, multinational enterprises (MNEs) spread their value chains across multiple countries (Alcácer, Dezso, & Zhao, 2013; Cantwell, 1989; Chung & Alcácer, 2002; Kogut & Chang, 1991), making it necessary for them to develop and defend IPs on a global basis (Alcácer, Beukel, & Cassiman, 2017). On the other hand, institutions in different countries are as diverse as ever (Graham & Harhoff, 2014; Graham & Van Zeebroeck, 2014), forcing MNEs to devise IP strategies that cater to unique local environments (Somaya, 2000). The strategic choices that firms make – where to conduct business, where to innovate, where to patent, and where to engage in IP litigation – in turn, influence the effects and trajectories of IP policies in different countries (Bessen & Meurer,

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2008). Thus we can deepen our understanding of national IP environments through the lens of the global strategies of MNEs.

In particular, we argue that, while litigation is local, subject to local institutions and producing locally binding outcomes (Somaya, 2000), firms that engage in litigation are competing with each other across a wide range of countries. While countries with large markets are typically where intense IP battles occur (Alcácer et al., 2017; Graham & Van Zeebroeck, 2014), the choice of battleground is not made in isolation. Instead of litigating in every important market, firms strategically choose locations to file and defend their IP, understanding that the outcomes in one location will affect the strategic positions they hold elsewhere in the world (Bessen & Meurer, 2008).

Building on this premise, we analyze the country-, industry-, and firm-level characteristics that may shape the choices of patenting and litigation locations. First, courts in countries with a substantial track record for IP litigation would send a stronger signal to global competitors than courts with little experience. Since the signaling effect is specific to MNEs, we would expect a higher percentage of MNE cases at such locations. Second, the signaling effect of litigation decisions, as well as the information revealed in the litigation process, is stronger if the same global firms compete in multiple countries. Hence MNEs would choose a small selection of patenting and litigation locations, relative to the locations of their business activities, in industries featured by oligopolistic competition. Finally, there is significant heterogeneity across firms regarding the type of patents in their portfolios. Cases on radical innovations, for example, present more challenges to the courts due to their technological complexity and the difficulty in finding comparable cases as benchmarks. Thus litigation results from a few of the strongest courts would serve as benchmarks to other jurisdictions, which means that MNEs will likely prefer more concentrated litigation locations when they possess radical innovations in their patent portfolios.

We apply this theory to in-depth interviews with twelve legal professionals and industry insiders specialized in global IP, and tousing a large dataset covering all the IP-related activities of Fortune Global 500 companies (excluding retail and finance) from 2007 to 2014. This dataset tracks the business activities of the MNEs and their global subsidiaries (> 328K), their patenting activities worldwide (> 3.6M new filings and > 15M total

patents), and their IP litigations in all major economies (> 700K decisions involving > 450K cases). This database allows us to take a more holistic view of the strategic actions MNEs take to create and protect their technologies on a global basis. To the best of our knowledge, this is the first multi-country study that covers the entire spectrum from knowledge creation to knowledge appropriation. We found supportive evidence that, controlling for market size and business activities, patenting and litigation activities tend to be concentrated in countries with extensive litigation experience, in highly concentrated industries and in firms with radical innovation.

By including global competition in the study of local litigation, we hope to highlight the interaction between global strategies and local policies. From the strategy perspective, we contribute to the literature by studying litigation as a location choice. From studies in international business, strategy, and economic geography, we have gained substantial understanding of firms' international location decisions regarding manufacturing (Guillen, 2003; Henisz & Delios, 2001) and R&D (Nandkumar & Srikanth, 2016; Zhao, 2006), but with the exception of within-country analyses (e.g., Somaya & McDaniel, 2012), we have rarely considered the strategic location choices related to litigation, which is arguably the activity most associated with the local institutional environment.

Furthermore, this study shows that the effect of local policies on value creation and value appropriation cannot be analyzed in isolation. The conventional wisdom is that firms should seek IP protection where they conduct business and resort to litigation where their IP rights are compromised, which highlights the importance of local policies for firm strategy and economic growth (Branstetter, Fisman, & Foley, 2006; Javorcik, 2004; Lai, 1998). However, the ability to mobilize and control resources across countries is a core attribute of MNEs (Hymer, 1976). In industries dominated by a few global players, firms can carefully select certain countries – together with their policies and institutions – to settle the case for multiple countries. Hence the policies of the chosen locations will have a spillover effect on the economic activities in other locations, rendering the policy environments in the latter less relevant. From this perspective, the role of local policies should be studied as part of the dynamic interaction between policy differences around the world and firms' strategic decisions to



arbitrage across the differences (Ghemawat, 2007; Zhao, 2006).

Finally, policies and institutions are, in turn, shaped by the strategies of global companies. Past studies have shown that the growth of domestic industries is often an instigator of institutional change (Peng, Ahlstrom, Carraher, & Shi, 2017). Moreover, the heterogeneity of firms in an economy – whether they are subsidiaries of MNEs or local entrepreneurs – leads to different trajectories of institutional development (Zhao & Yeung, 2008), the result of a co-evolutionary process of firm activities and institutional development (Cano-Kollmann, Cantwell, Hannigan, Mudambi, & Song, 2016; Cantwell, Dunning, & Lundan, 2010). In this study, we show that institutions may be affected not only by firm activities within the country but also by global competition beyond the national border. For example, courts and locations known for their IP expertise would attract more MNEs to litigate there because outcomes from strong courts can send stronger signals – both to the opponents and to judges in other countries. Such location choices by litigating firms bring even more IP expertise to those courts, giving rise to a litigation map that is quite different from the map of global innovation. We discuss the ensuing policy implications in detail in a dedicated section.

LITERATURE REVIEW

There has been extensive scholarly interest in IP in the fields of strategy and economics (for two recent literature reviews, see Somaya, 2012 and James, Leiblein, & Lu, 2013). Past studies on IP strategies have helped us gain a better understanding of the propensity to patent (e.g., Arora, 1997; Cohen, Nelson, & Walsh, 2000; Levin, Klevorick, Nelson, Winter, Gilbert, & Griliches, 1987; Somaya & McDaniel, 2012; Ziedonis, 2004), the likelihood of IP litigation (e.g., Somaya, 2003; Lanjouw & Schankerman, 2001), and the connections between IP and firms' business activities (e.g., Arora & Ceccagnoli, 2006; Pisano, 2006; Teece, 1986). In this section, we closely examine three streams of literature: IP for value appropriation, IP for strategic competition, and IP as a location choice.

IP for Value Appropriation

IP protection for innovation is known to be imperfect (Cohen et al., 2000; Lemley & Shapiro, 2005). The extent to which IP can help innovators or other IP owners exert their rights against potential

infringement depends on a number of factors. For example, industry characteristics influence the usefulness of IP for value appropriation (Cohen et al., 2000; Levin et al., 1987). Patents are more precise and less obscure for certain technologies, such as pharmaceutical formulas (Mansfield, Schwartz, & Wagner, 1981), and thus serve as a more effective defense against imitation, whereas secrecy and lead time are important tools for the development of electronics and software. The type of knowledge also matters; patents are often used in combination with secrecy to enable firms to exploit both tacit and codified knowledge (Arora, 1997).

Of course, industry effects present themselves in the context of specific appropriability regimes. Although IP protections include the right to sue (Nerkar, Paruchuri, & Khaire, 2007) and hence represent a threat to potential infringers of the IP right (Agarwal, Ganco, & Ziedonis, 2009), actual patent litigation is a relatively rare event (Lanjouw & Schankerman, 2001; Somaya, 2003). Not only is it difficult to identify infringement, litigation is also complex and expensive (Lanjouw & Lerner, 1998), with unpredictable results (Encaoua & Lefouili, 2005; Shane & Somaya, 2007). This is particularly the case in countries with weak institutions (Zhao, 2006), forcing firms to look for alternative strategies.

Teece (1986) outlined how tight and loose appropriability regimes affect firms' innovation strategies and their reliance on complementary assets, such as manufacturing and marketing capabilities, for value appropriation. The importance of complementary assets may explain why smaller firms tend to prefer secrecy and speed rather than patenting (Leiponen & Byma, 2009). Pisano (2006), however, used open software systems to illustrate how firms actively take part in determining the appropriability regime of the industry. For example, the strategic decisions made by IBM in the mid-2000s to not assert its patents against the OSS community stimulated OSS product development by entrepreneurs (Wen, Ceccagnoli, & Forman, 2016).

IP for Strategic Competition

IP can also be used by firms to manage the competitive landscape, beyond the direct purpose of value appropriation. For example, patents that serve as the foundation of subsequent patents are more likely to become litigation targets (Lanjouw & Schankerman, 2001), and firms in highly fragmented markets, such as semiconductors, patent

more to hedge themselves against litigation risks (Ziedonis, 2004). Another example is the early stage of the LED lighting industry; the innovating firms were embroiled in patent thickets and extensive litigation before settling with cross-licensing (Sanderson & Simons, 2014). As Somaya (2012) observed, patent strategies can be driven by specific business strategies being pursued in the associated product markets. Not surprisingly, without the necessary bargaining chip for cross-licensing, patents owned by individuals and firms with small patent portfolios face higher litigation risk (Lanjouw and Schankerman, 2004), motivating start-ups to take a more collaborative approach when entering the market (Gans & Stern, 2003).

Occasionally, IP litigation – even without a final verdict – may clarify obscure boundaries around patents (Linden & Somaya, 2003; Teece, 2000) and thus redefine relationships among competitors. For example, the value of an untested patent is much less than one that has been proven valid in a court or one that has been infringed upon (Sherry & Teece, 2004). Since firms can choose to settle at any time, request injunctions for immediate market disruption, or pursue litigation all the way through the appeals process (Lanjouw & Lerner, 1998; Somaya, 2003), such choices can make a difference to the strategic positions of all parties involved.

IP as a Location Choice

While international treaties and institutions, such as the Paris Convention and the Trade-Related Aspects of Intellectual Property Rights (TRIPs) Agreement, have resulted in the greater integration and harmonization of national patent systems in the past few decades (Park, 2008), national patent systems largely operate independently and exhibit significant differences (Westlaw 2006). For example, courts in the US are less deferential to administrative authority than Japanese or European courts (Somaya, 2000), and opposition rates are about three-times higher for patents issued by the European Patent Office (EPO) than for the patent equivalents issued by the US Patent and Trademark Office (USPTO) (Graham & Harhoff, 2014). There are even stark differences between European courts (Graham & Van Zeebroeck, 2014). Given that MNEs compete on a global basis, choosing where to patent and where to litigate, in the sense of institutional targeting (Somaya & McDaniel, 2012), becomes an important strategic decision.

Home bias is an obvious consideration. Alcácer et al. (2017) show that the global IP footprint is

highly fragmented, and most countries are locally oriented in IP enforcement. For example, foreign applicants account for half the patent applications in the US, whereas less than a fifth of patent litigations are instigated by foreign plaintiffs. The type of firm also has a significant impact on location choices. In strong IP regimes, small firms try to avoid competitive patent subclasses to reduce litigation costs (Lerner, 1995). In weak IP regimes, potential infringers can be numerous and widely dispersed, directly increasing the cost of identification and litigation (James et al., 2013). This reduces the incentive for firms to resort to formal institutions, and motivates the use of alternative strategies for firms with the right organizational capabilities (Zhao, 2006).

In the next two sections, we build on the above literature and analyze how focusing on global competition among MNEs would shed new light on our understanding of strategic patenting and institution targeting across countries.

THEORY DEVELOPMENT

We start with the premise that MNEs compete on a global basis, often interacting with each other through multimarket contact (Jayachandran, Gimeno, & Varadarajan, 1999; Yu & Cannella, 2013), if not for the purpose of containing competition (Hymer, 1976). Thus two simultaneous forces are in effect. First, IP litigation is local. The legal process is subject to local institutions and norms, and the outcome from any IP litigation is binding only in the same jurisdiction. This explains why countries with large markets usually attract more patenting and litigation activities. However, MNEs who engage in litigation are often competing with the same set of competitors across a wide range of countries, each featuring a different institutional environment. Therefore the profile of global competition often affects firms' decisions on where to patent and where to litigate.

Transmission Mechanisms Across Countries

Litigation outcomes from one country may spill over to other countries through various channels. Based on the literature and our conversations with twelve IP experts and industry insiders, totaling more than 14 h of recorded interviews, these mechanisms can fall into three categories.

First, patent officers and judges may refer to prior decisions and litigation results in other countries when making their own decisions. This is



particularly true if the prior decisions are from countries with a strong institutional reputation. One IP lawyer we interviewed explained:

When the patent is litigated here, we try to build the past wins in other countries into our arguments, as long as those countries share similar legal frameworks. (IP lawyer, MNE)

Second, the plaintiff and defendant may reach settlement agreements that cover multiple countries, if the patents granted in other countries are in the same patent family as, or share resemblance to, the patent under current litigation. Even in the absence of such agreements, there is enough information revealed in the litigation process to affect the behaviors of global suppliers and customers. One internal lawyer in a large MNE told us:

Our favorite position in the litigation is that we litigate in a number of countries where we see a business reason to do so, and then we will end up having an agreement that covers the world. (IP lawyer, MNE)

Another IP lawyer agreed:

Lawsuits around the world are interconnected even though the judges will not officially cite each other. A decisive win in one market may increase the chance of a global settlement. (IP lawyer, MNE)

Finally, MNEs may use the same internal teams and external law firms for their IP-related activities worldwide. Once a verdict or settlement agreement is reached in one country, experience transferred from one office to the other within the same firm may discourage similar litigations from occurring in other countries. For example, Rouse, the global IP consultancy, represents many well-known international rights owners. One interviewee told us:

...when we have established a good relation with some external partners and we think the cooperation works, then there is no need to go out and find someone new. In particular, if we are the defendant in a litigation, there is a rush to get the litigation team in place in a small period of time. It is easier when you can use external partners that you have good relations with and already know. (IP lawyer, MNE)

When the same teams interact in different countries, the spillover effect is intensified.

Thus instead of litigating in every important market, firms make location choices for their patenting and litigation activities with the understanding that the outcomes in one location will send a signal to existing or potential IP disputes elsewhere in the world. We focus on the effect of this signal and analyze the country-, industry-, and firm-level characteristics that may influence the transmission of the signal.

Country Effect: The Strength of Local Institutions

Courts in countries with a substantial track record for IP litigation would send a stronger signal to global competitors than courts with little experience. While purely domestic firms have no options regarding where to assert their IP rights, MNEs contemplating a world map would be drawn to locations that can send a stronger signal. The strength the signal a court sends depends on a number of factors.

First, the strength of the signal is affected by predictability. When a court has a long track record, both parties expect the court to make a judgment based on its previous experience, which is documented in written verdicts. The parties can then decide, based on their assessment of the past verdicts, how to pursue the case further. Filing a case in an experienced court therefore minimizes the uncertainty for both parties and leaves less room for reinterpretation – potentially establishing a clearer position between the competitors going forward. As an interviewee explains:

The more experience a particular court has, the more times you can read their verdicts through, verdicts from the same judges. Thus, you can use them as input data to predict how a case will fall out; therefore, with experience, the court gets to be more and more predictable – and that is exactly what you want when analyzing what your chances are of winning and the type of settlement you can get. (European EPA, external legal advisor)

Second, the strength of the court also matters in terms of the scope of a settlement after the focal litigation has ended. There are spillovers between courts, as courts are inspired by the argumentation of other courts. As an interviewee explains:

You may sue in a few markets – but then you settle for ALL markets. But to get the right settlement, it matters in which court you sued – it needs to be a market that matters financially and a legal system that is trusted. If the patent family is similar in other countries, you can expect these courts to derive at similar conclusions. (Lead litigator, MNE)

Third, all interviewees emphasized the importance of choosing the ‘right’ court and had a list of courts that they would generally choose to litigate in if possible (a patent must be valid in the country and the infringement must be detected and evidenced in the same country). The Eastern District of Texas in the United States had long been the favorite among non-practicing entities (NPEs) until the Supreme Court ruling on the TC Heartland case. In Europe, Dusseldorf and London were most often mentioned. However, the location chosen for litigation was also case dependent. For example, if the

case needs access to evidence, then the United States and the United Kingdom were mentioned because of their disclosure process, and if police assistance is needed for gathering evidence, then France was mentioned as the location of choice. Below, an IP director from the pharmaceutical industry explains:

The court is very important, very important, you have what you call forum shopping... And the level of experience varies a lot, but then for example there is Delaware where you have four judges that do a lot of patent litigation because there are many pharma companies incorporated in Delaware, so this is an often-used jurisdiction, and you have high quality judges, and high-quality judges means higher levels of predictability for all parties involved, so you have a tendency to choose Delaware. (IP Director, MNE)

The danger of using a less experienced court is that they may not have the technological depth or ability to identify and understand recent cases in the field. An interviewee even compared filing a suit in a less experienced court to tossing a coin:

If you choose a court without experience it can be like tossing a coin, you wouldn't have an idea of where it would end – no serious businesses would run that risk if they had an alternative. (Director of IP, MNE)

Therefore as MNEs are globally present, aware of the differences among local courts, and cognizant of the value of signals from more experienced courts, we would expect a higher percentage of MNE cases at locations with greater IP experience, even after controlling the market size effect.

Industry Effect: The Degree of Industry Concentration

The signaling effect of litigation decisions – and the information revealed in the litigation process – is stronger if the same MNEs compete with each other in multiple countries. For example, an IP lawyer told us:

It is often the same players we see in all markets ... simply because of the muscle and size. Company X is the competitor we have most of the conflicts with simply due to our and their volume. (IP lawyer, MNE)

Thus at the firm level, “reputations for being tough in IP enforcement” (Agarwal et al., 2009) may be known among competitors, and this information is transferable across countries. At the case level, when litigation in one country removes the “fuzziness” related to the focal technology (Linden and Somaya, 2003; Teece, 2000), it clarifies the competitive positions of the involved parties in other countries, as well. Hence MNEs in industries characterized by oligopolistic competition would

choose a small selection of patenting and litigation locations relative to the locations of their business activities. An interviewee in an industry with only three major global players explains:

Because we are in a very concentrated industry with a few large players, litigation is used as a tool for competition ... And as most litigations end up in settlement, we choose to fight in larger markets, as it then will be easier to get worldwide settlement. (Lead litigator, MNE)

Another industry player in a very centralized industry makes the point that location choice is not only a matter of market size but also whether a litigation team is in place for that country:

Setting up a case means having the external network in place; if we want to start up a case in Dusseldorf, we just call our regular lawyer, and it is plug-and-play. Therefore, if you only face a few competitors that are global, you are more likely to stick to a few courts. It is like, when you decided on a coffee brand, you stick to that. (Director of IP, MNE)

Therefore we expect litigation activities to be more concentrated in industries characterized by oligopolistic competition. Given that the signal from a certain court has implications for worldwide settlements, MNEs would concentrate their litigation activities on courts that are important for the industries they operate in. In contrast, IP disputes with small and mostly domestic companies must be addressed in individual markets and are therefore geographically dispersed.

Firm Effect: The Characteristics of Patent Portfolio

There is significant heterogeneity across firms regarding the type of patents in their portfolios. Patent litigation is complex, especially if it involves cutting-edge technologies (Kesan & Ball, 2011). While almost all countries handle IP litigation, few have the knowledge and expertise to handle disputes on radical innovations, which are technologically challenging and where comparable benchmarks to prior verdicts may be non-existent. Therefore litigation results regarding radical innovation from the few experienced courts would carry more weight for the rest of the world. Knowing this, MNEs with radical innovations in their patent portfolios are more likely to pursue a strategy of concentrated litigation. The IP director of an MNE explains:

You need a court where a lot of patent cases happen, a court that is familiar with patent cases, a court that has judges that are familiar with patent cases, judges that understand technology. (IP Director, MNE)

Another issue regarding radical innovation and litigation activities concerns the likelihood of



litigation. Not only would an MNE seek a litigation location with experienced judges, but the following interviewee also suggests that radical innovations are more prone to litigation because they are likely to be patented with a broader scope.

If it's radical and gets to the market, they're probably more prone to litigation. If you have something radical, you often get broader patent claims. And these claims can give more of a rise to litigation because you are claiming more of a territory. It would definitely attract more litigation actions, which I see on a constant basis. (IP Director, MNE)

This line of considerations aligns with the literature on patent scope (Merges & Nelson, 1990), which argues that “the larger the patent scope, the larger the number of competing products and processes will infringe the patent” (p. 839). Therefore new radical innovations attract attention from competitors, who will likely try and invent around the innovation or propose similar products. An efficient way to handle the expected increase in litigation activities is to centralize the litigation effort in courts where the judges are capable of examining the novel technology, and then try to reach settlements with multiple parties in multiple locations.

BRINGING THE THEORY TO THE DATA

In this section, we bring the theory to the data and try to identify quantitative patterns in global patenting and litigation. To that end, we need all IP-related activities of global firms across countries and across industries.

Data Sources

We first sorted and identified all the firms on the Fortune Global 500 list from 2007 to 2014, for a total of 856 firms given the changes over the years. From the list, we removed the purely financial and retail firms for two reasons: They are, on average, not active innovators or active users of IP as a strategic tool, and they tend to have thousands of branches and subsidiaries for which the location choices are unrelated to the IP environments. Then, for each of the 621 firms remaining on the list, we identified their global IP litigations, global patenting activities, and global business presence, mainly using the following three data sources:

- From Darts-IP, a Belgium-based patent litigation analytics firm, we obtained proprietary data from 2007 to 2014. In total, we obtained access to 703,732 dispute decisions from 3,347 courts in 65 countries involving 452,908 unique patents. The

data allow us to observe the type of case, plaintiffs and defendants, and case outcomes.

- From ORBIS, a dataset owned by Bureau Van Dijk, we retrieved annual data on the MNEs' financial information, patent portfolios, and corporate affiliations. In total, our sample firms have majority ownership ($\geq 50\%$ aggregated ownership) in 328,344 subsidiaries in 190 countries. These firms altogether have a portfolio of 15 million patents, which belong to 5,438,179 unique International Patent Documentation Center (INPADOC) patent families. Of these patents, 3,619,842 were applied for in the period of 2007–2014. Due to frequent mergers and acquisitions, data on corporate affiliations were reconstructed every year.
- From PATSTAT, offered by the EPO, we obtained detailed information about each patent, such as inventor locations, filing dates, and filing countries.

We supplement the data with more patent characteristics obtained from the OECD Patent Quality Indicators Database, and industry characteristics obtained from the United States Census Bureau. Annual data from each of the data sources were painstakingly cleaned and matched using computer algorithms and extensive manual verification.

Variables

We focus on three outcome variables:

- *Litigation concentration: Herfindahl–Hirschman index (HHI) litigation relative to HHI turnover*
We try to capture the concentration of litigation activities relative to the concentration of business activities, since litigation is naturally drawn to the largest markets where business activities occur. The HHI of litigation is based on the number of infringement cases in which the focal firm and its subsidiaries are involved across countries, and the HHI of turnover is constructed based on their business turnover across countries in the same year. We then divide the HHI of litigation by the HHI of turnover. As the turnover data are not available for all subsidiaries, we create an alternative measure for litigation concentration: the HHI of litigation divided by the HHI of the number of subsidiaries across countries (*HHI litigation relative to HHI subsidiaries*).
- *Patent concentration: HHI patenting relative to HHI turnover*
Similarly, firms tend to patent more often in important markets. For each firm, we sum the

number of new patent applications filed by the parent and all the subsidiaries in each country from 2007 to 2014 and then calculate the HHI of patenting. This measure is then divided by the HHI of turnover. Similar to the alternative measure of litigation concentration, we create an alternative variable (*HHI patenting relative to HHI subsidiaries*) in which the denominator, HHI of turnover, is replaced by the HHI of the subsidiary counts.

- *Percentage of court cases by MNEs*

To highlight the unique strategies of MNEs relative to the population, we want to identify courts particularly favored by MNEs. Thus we divide the number of IP infringement cases in which an MNE is either a plaintiff or defendant by the total number of infringement cases the court has handled in the given year.

In the policy analysis, we also calculate the changes in the locations of subsidiaries, patenting activities and litigations to capture the possible responses firms have towards their litigation experiences in specific countries. We then link these outcome variables to the country, industry, and firm characteristics that are captured by the following variables:

- *Court track record*

There are 3,347 individual courts available in the dataset. We estimate every court's experience by counting the number of infringement cases the court has issued decisions on in the last four years.¹ The numbers are then aggregated at the country level.

- *Industry concentration: HHI industry*

We use the HHI retrieved from the United States Census Bureau² as our measure of industry concentration, with the assumption that concentrated industries in the US are more likely to be concentrated at the global level. We use the HHI in two ways, first by considering only the industry of the parent company, and second by using a weighted average based on the industries of both the parent and subsidiaries, where the weights are the sales shares for each industry. The Census Bureau data, however, are only available for the manufacturing industry. To supplement this measure, we obtained global industry concentrations from Freund and Sidhu (2017), which, for all industries, provides calculations for the percentage of total revenue worldwide that is accounted for by the largest four companies.

- *Radicalness of the patent portfolio*

We follow prior literature (Shane, 2001) to

calculate the radicalness of each patent. Instead of using the three-digit measure proposed by Shane (2001), we use the four-digit measure provided by the OECD Patent Quality Indicators database to capture more variance across firms. The radicalness of a patent "is measured as a time invariant count of the number of IPC classes in which the patents cited by the given patent are included, but in which the patent itself is not classified; the more a patent cites previous patents in classes other than the ones it is in." (Squicciarini, Dernis, & Cricuolo, 2013: 54). Then, we aggregate the measure to the firm level by summing each patent's radicalness and dividing it by the total number of patents in the firm's portfolio.

For policy analysis, we also identify the track record of each MNE in a given country-year. That is, for each patent litigated in a case we identify whether the MNE (either as plaintiff or defendant) won, lost, or had a split win. We thereafter sum up these numbers at the firm-country-year level.

To complement the statistical analysis we conducted 12 interviews with leading global IP experts. We selected the interviewees based on their experience in litigating globally for MNEs. In total our interviewees represent more than 280 years of global litigation experience. We also ensured variation in interviewees by choosing representatives from different industries, different geographical origin, as well as both internal and external IP representatives.

Table 1 presents a summary of the above variables, and Table 2 gives a detailed breakdown of cases across courts and across years in the ten most active countries in terms of IP litigations in 2014. As expected, the numbers show a highly skewed distribution across countries and a large variance in the level of involvement of MNEs.

FINDINGS

Figures 1A, B, C present the business presence, patenting activities and litigation activities of the MNEs in our sample. To the best of our knowledge, this is the first time that global IP activities have been analyzed at the firm level, demonstrating the strategic location choices by MNEs. Two patterns are immediately apparent. First, while all three maps show an uneven distribution of activities across the world, there are significant differences

Table 1 Descriptive statistics

	Mean	Std. Dev.	Min	Max
HHI litigation relative to HHI turnover	.843	.392	.244	3.588
HHI litigation relative to HHI subsidiaries	5.725	3.661	.569	18.395
HHI patenting relative to HHI turnover	.373	.322	.0558	2.399
HHI patenting relative to HHI subsidiaries	1.734	1.311	.223	8.566
Percentage of court cases by MNEs	.137	.239	0	1
Court track record	92.572	286.632	1	4915
HHI industry (parents)	827.645	780.111	46.144	2683
HHI industry (subsidiaries)	649.680	534.149	42.3	2683
Average radicalness of IP portfolio	39.283	8.789	12.5	91.667
Number of successful litigations by country	.219	2.649	0	177
Business presence (share of subsidiaries)	5.749	15.997	.0359	100

among these three variables. Business activities are much more prevalent than patenting and litigation, and litigation is the most selective among the three. Second, there is an obvious market effect, which indicates that patenting and litigation activities are concentrated in the largest markets, such as the US, Europe, and China.³

However, there are obvious differences across countries even after controlling for market effect. The US stood out as the country where most IP litigations occur. In fact, after normalizing the data by GDP, the US is used four times more frequently for patent litigations than the second most common location, Finland. As shown in Table 2, the Texas Eastern District Court and the Delaware District Court in the US accounted for 25% of all IP litigations worldwide in 2014. The concentration of IP litigations in the US may explain the focus of academic scholars on the country (e.g., Agarwal et al., 2009; Janicke & Ren, 2006; Lanjouw & Schankerman, 2001; Moore, 2003; Polidoro & Toh, 2011; Somaya, 2003; Somaya & McDaniel, 2012). The litigation map also confirms the interest of MNEs in litigating in Germany, the United Kingdom, and France, which are countries with reputable IP institutions. These patterns generally align with the descriptive data in Graham and Van Zeebroeck (2014) and Cremers et al. (2017).

We can also see obvious differences among BRIC countries. Whereas there is a strong business presence and some patenting activities in all four countries, we see very limited IP litigation in Russia and India. India may be a less used location for litigation because the TRIPS Agreement was not binding for India until 2005. Enforcement in Russia is also challenging, as Russia rulings have no

precedent, meaning that previous rulings might not be followed.

In Figure 2A, we present the country effect – the scatterplots for the relationship between a court's track record in patent litigations in the last four years and the percentage of its cases associated with MNEs. The left graph shows the full dataset, in which a few courts are clearly outliers, having made decisions in more than 3,000 litigation cases over the past four years. In the right graph, we removed the outliers (> 3,000 litigations). Both graphs show a significant and positive correlation between the percentage of court cases associated with MNEs and the experience of the court (full sample: slope = 0.0744 and p value = 0.0025; without outliers: slope = 0.1309 and p -value = 0.000). This finding corresponds with what we learned from the interviewees, who emphasized the importance of winning in the “right” court. Prior cases that were addressed in a court helped it to develop a reputation for its judgment, which is particularly helpful to MNEs hoping to settle other cases beyond the focal jurisdiction.

Figure 2B presents the industry effect – the correlation between industry concentration and the within-firm concentration of IP-related activities. The graph to the left shows that the concentration of patenting activities (y-axis) and industry concentration (x-axis) are positively correlated, although the correlation is only significant at the 10% level (0.1152, p -value = 0.0967). Consistent with the maps in Figs. 1A, B, C, firms usually build their defense (i.e., patent portfolios) in many jurisdictions where they are not litigating (yet). Given that patents have a life-span of 20 years, they are often used as hedge against future uncertainties, especially in countries expected to become large

Table 2 Main courts and share of litigations by Global Fortune 500 firms (either as plaintiff or defendant) in 2007, 2010 and 2014

	Year 2007			Year 2010			Year 2014		
	Total number of litigations	Share of litigations by country (%)	Share of litigations w. MNE (%)	Total number of litigations	Share of litigations by country (%)	Share of litigations w. MNE (%)	Total number of litigations	Share of litigations by country (%)	Share of litigations w. MNE (%)
1. United States	3,311		38.1	3,823		42.3	6,235		35.5
Texas Eastern District Court	418	12.6	60.8	394	10.3	67.3	1,498	24.03	32.1
Delaware District Court	224	6.8	55.4	382	10.0	64.4	1,094	17.55	48.5
California Northern District Court	136	4.1	36.0	283	7.4	27.2	451	7.23	42.4
New Jersey District Court	230	6.9	59.6	228	6.0	65.8	366	5.87	42.6
California Central District Court	58	1.8	27.6	177	4.6	53.1	318	5.10	37.4
	1,557		3.3	1,186		2.2	2,490		11.8
2. China	52	3.3	0.0	177	14.9	7.9	190	7.63	2.6
Guangdong High Court	41	2.6	2.4	3	0.3	0.0	135	5.42	0.0
Jinan Intermediate Court	54	3.5	0.0	28	2.4	0.0	117	4.70	0.0
Zhengzhou Intermediate Court	54	3.5	1.9	44	3.7	0.0	101	4.06	3.0
Shenzhen Intermediate Court	64	4.1	6.3	112	9.4	2.7	91	3.65	3.3
Shanghai First Intermediate Court	129		14.0	192		9.4	365		27.0
3. Brazil	17	13.2	41.2	80	41.7	11.3	173	47.40	8.1
Sao Paulo (TJSP)	30	23.3	16.7	28	14.6	3.6	74	20.27	14.9
Rio Grande do Sul (JFRS)	12	9.3	16.7	18	9.4	11.1	39	10.68	20.5
Rio de Janeiro (TJR)	8	6.2	25.0	7	3.6	14.3	18	8.77	28.1
Superior Tribunal de Justica Parana (TJPR)	269		17.8	327		23.2	300		18.9
4. Germany	176	65.4	20.5	202	61.8	21.8	184	61.33	25.5
LG Dusseldorf	36	13.4	13.9	83	25.4	25.3	48	16.00	18.8
OLG Dusseldorf	15	5.6	33.3	17	5.2	35.3	36	12.00	50.0
Mannheim	17	6.3	0.0	8	2.4	0.0	15	5.00	20.00
LG Munchen	3	1.1	0.0	1	0.3	0.0	10	3.33	20.00
OLG Karlsruhe	227		26.4	183		24.6	249		22.1
5. France	140	61.7	28.6	117	63.9	24.8	194	77.9	22.2
TGI de Paris	54	23.8	27.8	36	19.7	30.6	41	16.5	19.5
Cour d'Appel de Paris	17	7.5	17.6	10	5.5	40.0	8	3.2	37.5
Cour de Cassation	0			4	2.2	0.0	2	0.8	50.0
Colimar	0			2	1.1	0.0	1	0.4	0.0
Aix-en-Provence	24		20.8	67		37.3	195		39.5
6. Japan	19	79.2	21.1	30	44.8	30.0	106	54.4	40.6
Tokyo District Court	2	8.3	0.0	25	37.3	48.0	74	37.9	40.5
Intellectual Property High Court	2	8.3	0.0	11	16.4	36.4	14	7.2	21.4
Osaka District Court	9		0.0	119		3.4	163		4.3
7. Taiwan	0			113		3.5	114		4.4
Intellectual Property Court	0			3		0.0	49		4.1
The Supreme Court									

Table 2 (Continued)

	Year 2007			Year 2010			Year 2014		
	Total number of litigations	Share of litigations by country (%)	Share of litigations w. MNE (%)	Total number of litigations	Share of litigations by country (%)	Share of litigations w. MNE (%)	Total number of litigations	Share of litigations by country (%)	Share of litigations w. MNE (%)
8. India	9		11.1	19		42.1	82		51.2
Delhi High Court	3	33.3	33.3	14	73.7	50.0	75	91.5	54.7
Madras High Court	1	11.1	0.0	1	5.3	100.0	3	3.7	0.0
9. United Kingdom	23		43.5	28		32.1	70		48.6
Eng & Wales High Court	16	69.6	56.3	15	53.6	40.0	48	68.6	60.4
Eng & Wales Court of Appeal	7	30.4	14.3	9	32.1	22.2	12	17.1	41.7
IP Enterprise/Patents County Court				1	3.6	0.0	8	11.4	0.0
10. Australia	21		23.8	31		38.7	44		34.1
Federal Court of Australia Single Court	17	81.0	29.4	28	90.3	35.7	36	81.8	30.6
Federal Court of Australia Full Court	3	14.3	0.0	2	6.5	100.0	8	18.2	50.0
Total (all countries)	5,921		26.0	6,554		30.3	10,612		26.0

Note: A case is counted only once per year regardless of the number of events recorded about the case. A case is included in the count of a given year if, for this case, any of the following events occurred: a preliminary proceeding, a complaint, a hearing, a procedural decision, a settlement, or a verdict/decision.

markets in the future (Alkaersig, Beukel, & Reichstein, 2015).

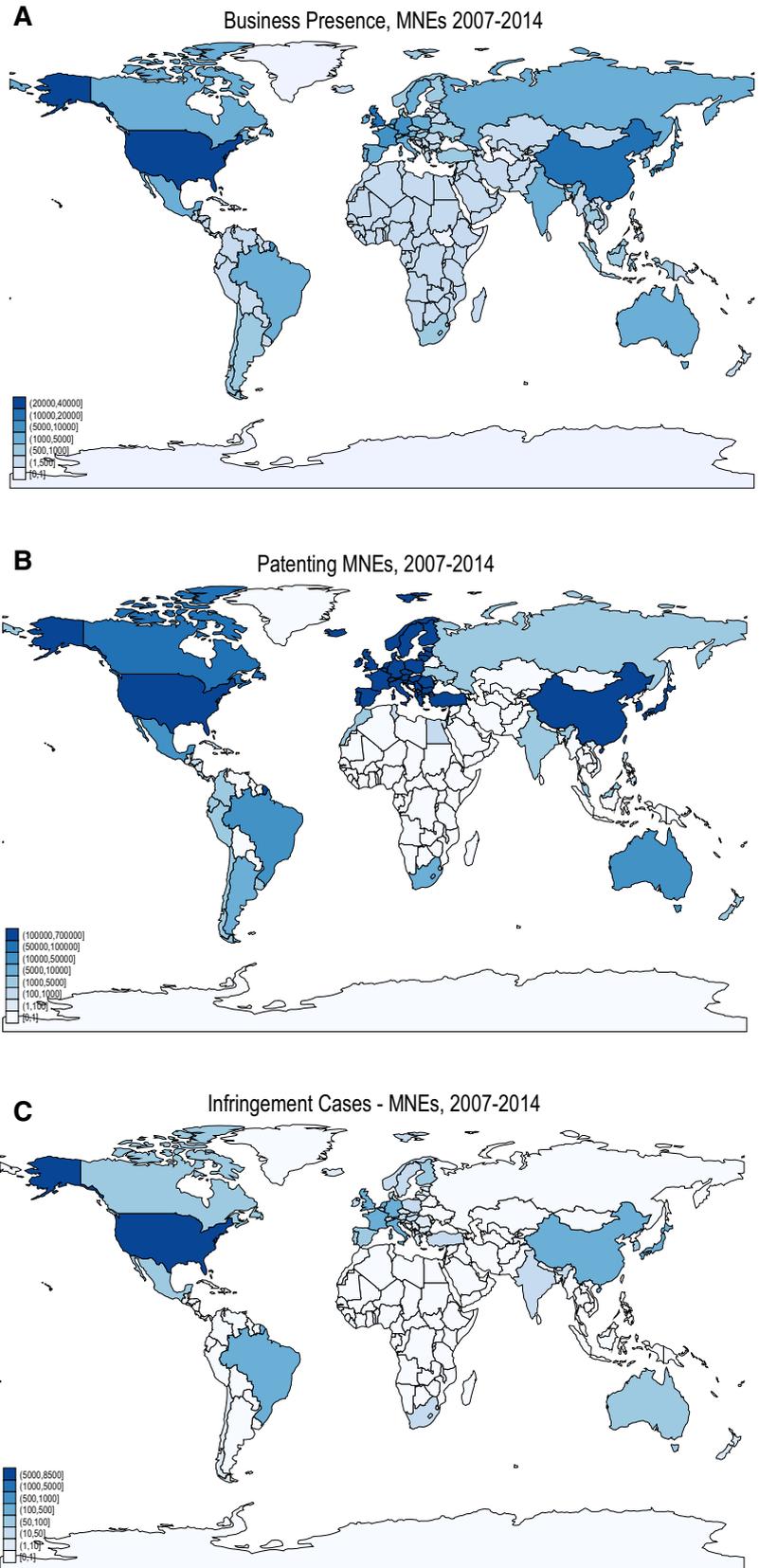
The right graph indicates that a strong positive correlation exists between industry concentration and within-firm geographic concentration of litigation relative to the within-firm concentration of business activities (slope = 0.2930, p-value = 0.0001). This result suggests that when an industry is led by only a few large players, the competitors tend to sort out their IP disputes in a few selected countries even though they operate in many markets. In fact, it is precisely MNEs' business presence in a large number of countries that allows them to choose the venue for litigation, and given the large variation across courts, MNEs will select a venue where the litigation will have the largest influence on their equally global competitors.

There are two main concerns for the measures in Figure 2B. First, industry is defined at the parent level, but many MNEs in the sample are conglomerates covering a wide range of industries, General Electric being the prime example. In Figure 2C, we replicated Figure 2B by including both the parents and the subsidiaries in the calculation of industry concentration, an average weighted by sales. The results confirm the correlations observed in Figure 2B: the graph to the left shows a strong correlation between within-firm concentration of patenting and industry concentration (slope = 0.1954, p-value = 0.0004) and the graph to the right shows a strong correlation between within-firm concentration of litigation and industry concentration (slope = 0.1433, p-value = 0.0229).

The second concern about Figure 2B is that the sporadic turnover data at the subsidiary level may bias the measure toward developed countries where data coverage is better. In Figure 2D, we replicated Figure 2C by using the HHI of subsidiaries as the denominator instead of the HHI of turnover. The results again show a strong correlation between within-firm concentration of patenting and industry concentration (slope = 0.2338, p-value = 0.0000) and between within-firm concentration of litigation and industry concentration (slope = 0.1600, p-value = 0.0096).

The final set of graphs in Figure 2E presents the relationship between the radicalness of patents in a firm's patent portfolio and the within-firm concentration of patenting and litigation activities. The graph to the left shows a negative and marginally significant correlation (slope = - 0.1378, p-value = 0.0587) between patenting concentration and patent radicalness, which indicates that firms

Figure 1 **A** Business activities of sample firms. **B** Patenting activities of sample firms. **C** Litigation activities of sample firms.



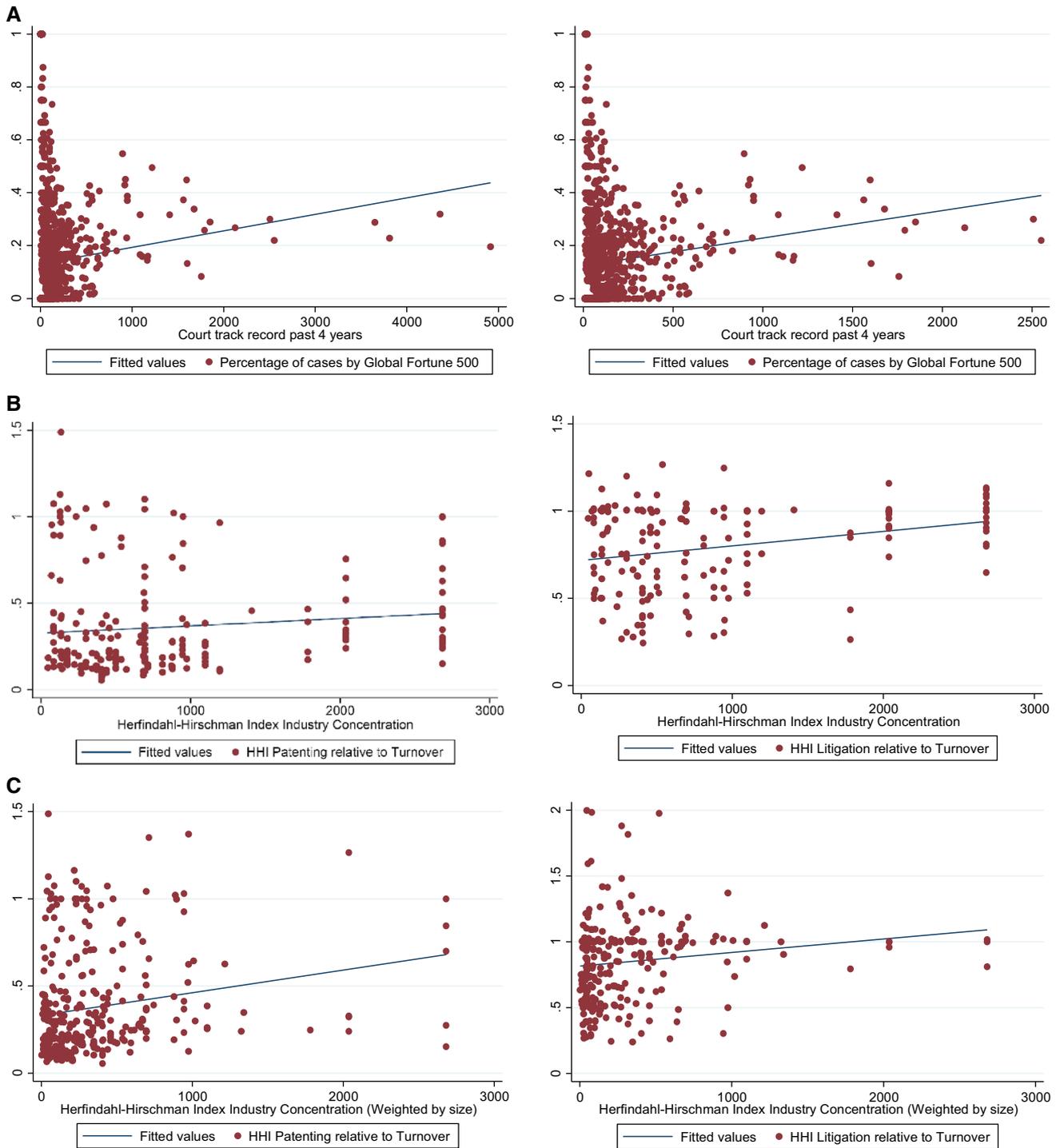


Figure 2 **A** Court track record and the share of MNE cases. (Left: 0.0744, p-value = 0.0025; Right: 0.1309, p-value = 0.000). **B** Within-firm concentration of litigation locations and industry concentration. (Left: 0.1152, p-value = 0.0967; Right: 0.2930, p-value = 0.0001). **C** Within-firm concentration of litigation locations and industry concentration (including subsidiaries) (Left: 0.1954, p-value = 0.0004; Right: 0.1433, p-value = 0.0229). **D** Within-

firm concentration of litigation locations (divided by the concentration of subsidiary counts) and industry concentration (including subsidiaries). (Left: 0.2338, p-value = 0.0000; Right: 0.1600, p-value = 0.0096). **E** Within-firm concentration of litigation locations and patent radicalness. (Left: -0.1378, p-value = 0.0587; right: 0.1863, p-value = 0.0182).

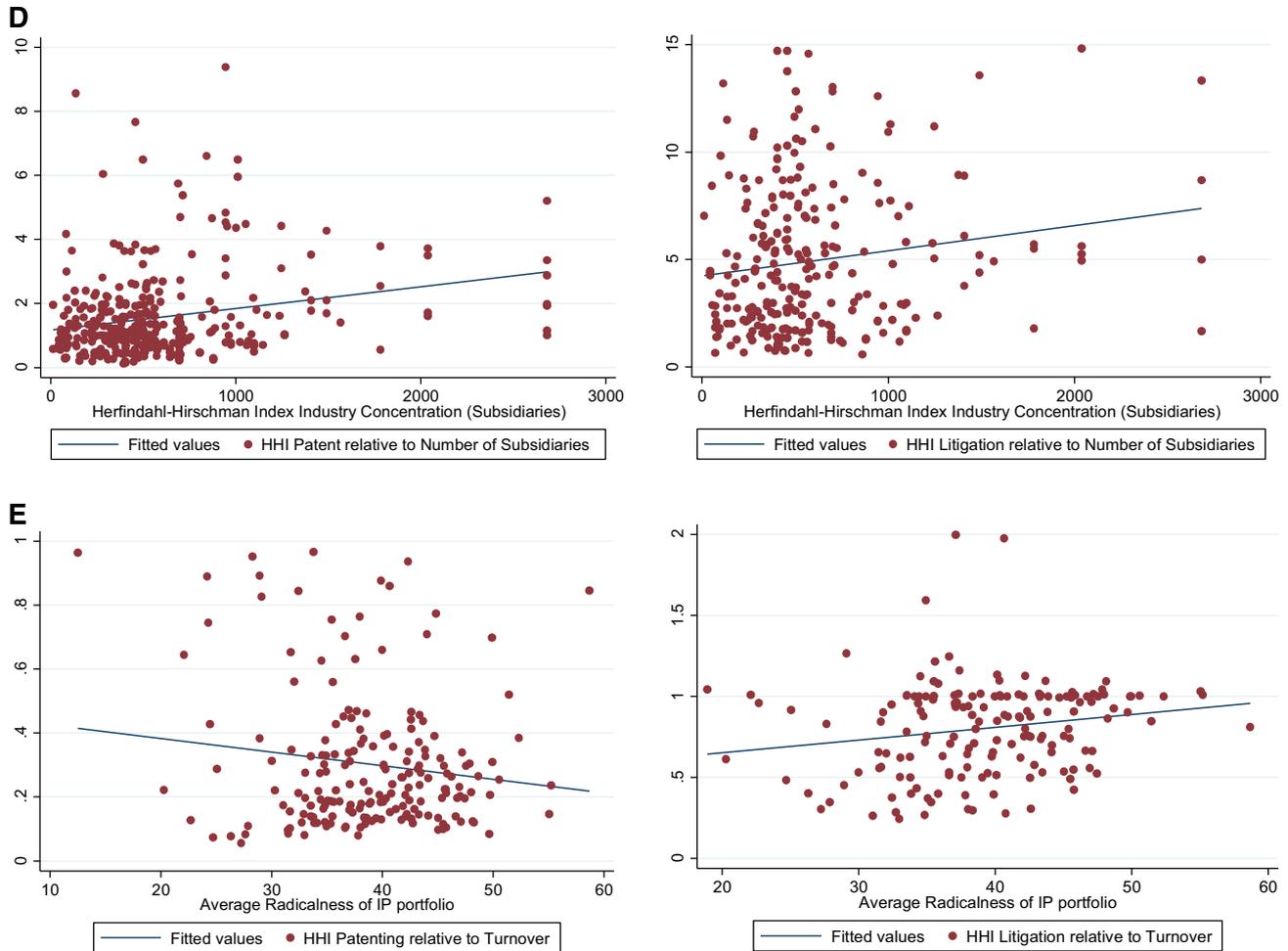


Figure 2 continued

would cast a wide net of patent protection for their new ideas – often the result of large R&D investments. The right graph, however, presents the opposite relationship: In contrast to patent concentration, patent radicalness and litigation concentration show a positive and significant relationship (slope = 0.1863, p-value = 0.0182).

This contrast is not surprising given our theory on global competition: Firms need wide patent protection for their new ideas, but the effectiveness of these patents is not solely dependent on local institutions. Rather, the more radical ideas are, the more important it is that they are contested in the most reputable courts, which have deep knowledge and special expertise to make credible judgments. The litigation results from these selective courts would subsequently increase the value of the MNEs’ global patent portfolio.

POLICY IMPLICATIONS

Given the strategic location choices of MNEs, it is worth discussing in more depth two interrelated policy questions: How will the nature of global competition change the effectiveness of national policies in terms of influencing cross-border investment and knowledge flow? And how will firm strategies affect the role of regional or even global IP harmonization?

It has been well acknowledged in the literature that institutions and policies are crucial to attracting investment and knowledge flows (Branstetter et al., 2006; Javorcik, 2004; Lai, 1998). Meanwhile, the ability of MNEs to “borrow” institutions from other countries (Siegel, 2005) or arbitrage institutions across countries (Zhao, 2006) also means that MNEs can do business in a country without relying completely on the local institutions. In the context



of IP litigations, we have seen companies suing in one country for the purpose of defeating competition in multiple countries. Thus the attractiveness of a location for litigation is different from the attractiveness of the location for business, especially in the most concentrated industries.

In fact, we conducted additional tests and did not find any significant correlation between a firm's litigation activities in a country – even the number of cases won in the country – and the changes in its share of new investments or new patents there. This lack of significant correlation, partly driven by the MNEs' strategies, may in turn reduce the urgency for local policymakers in smaller countries to shore up their institutional development. The different toolboxes available to MNEs versus domestic firms may also explain why the rise of domestic industries usually generates stronger pressure on policy changes (Peng et al., 2017) than the presence of MNEs.

The decoupling of IP environment and MNE activities introduces the next question: If MNEs are less reliant on local institutions, why are they pushing for IP harmonization such as the Paris Convention and TRIPS? Our earlier analysis may help shed light on this question: IP harmonization does not mean that firms will just walk into any court for litigation. Instead, the opposite may be true. Currently, the inconsistency of decision-making in the European patent system attracts firms to file litigations in multiple countries, hoping for a different outcome (Cremers et al., 2017). With harmonized rules across countries, we would expect more consistency and less uncertainty with regard to court decisions. Hence MNEs can sue in one country and then use the ruling to deter potential competition – or settle with existing competitors – in other participating countries, which should increase, not decrease, the concentration of firms' litigation activities.

For example, Table 2 shows a sharp increase in the percentage of patent cases in India that involve MNEs, driven mostly by disputes between global pharmaceutical giants and local Indian firms. With India joining the TRIPS Agreement in 2005, litigation results from India became relevant not only for the Indian markets, but also for similar markets bound by the same agreements, which incentivized the MNEs to “make a case” there.

A recent attempt at IP harmonization is the Unified Patent Court (UPC) in the European Union (EU). Once effective, a centralized court will be allowed to accept litigations on Unitary European

patents – which are different from patents granted by individual European countries – and make its decisions effective across the entire EU. Whether the UPC can gain traction, however, depends on whether it can offer more credibility than the national courts in which MNEs have accumulated significant experience. Although national courts do not have legal authority over other countries, they can influence other countries through their effect on global competition. That is, if Dusseldorf can send a strong enough signal to global competitors, then a verdict from Dusseldorf is binding in Germany *de jure* but effective globally *de facto*. In such circumstances, the extra coverage offered by UPC can be significant to local firms but marginal to the MNEs. It may take years for the UPC to gain enough credibility to convince the MNEs to migrate.

CONCLUSION

Due to the large variations in IP institutions across countries (Berry, 2017; Zhao, 2006), there have been many attempts by national governments and international organizations to harmonize policies (e.g., the TRIPS Agreement) or centralize IP litigations (e.g., the UPC). The effect of such policies, however, depends crucially on the responses of firms. While there have been many studies on how IP regimes, both formal institutions and informal norms, affect firms' strategic choices in knowledge creation and knowledge appropriation, we still know relatively little about how firms make decisions across institutions and how their strategic choices affect the effectiveness of policies (Zhao & Yeung, 2008).

This article is an attempt to address this gap. By conducting in-depth interviews and exploring a large proprietary dataset on MNE activities, we propose that country-, industry-, and firm-level characteristics can have a significant impact on where firms file for IP protection and where they bring IP cases to litigation. At the country level, MNEs are drawn to locations that can send strong signals to potential disputes in other parts of the world – courts that are experienced in handling IP disputes. At the industry level, firms in highly concentrated industries, which have clearly identified recipients of these signals, are more likely to concentrate their patenting and litigation activities in a few countries relative to the geographic concentration of their business activities. At the firm level, if firms have patent portfolios featuring radical innovation, they are more likely to bet on the litigation outcomes in a small number of countries. As such, MNEs are not only responding to local environments

but also arbitrating across institutions, as are their global competitors (Ghemawat, 2007).

We consider this study a call to go back to the root of MNEs: organizations actively managing knowledge and risks across multiple markets and institutions (Ghoshal, 1987; Hymer, 1976). MNEs have every reason to defend their IP rights in every country that offers a sizable market, but they do not have to litigate in every market if a selective number of court battles are enough to send a signal to their global competitors. In essence, by strategically choosing certain locations for litigation and then leveraging the litigation outcomes in other markets, firms are already fulfilling part of the harmonization goal set forth by policymakers.

This article is far from providing a definitive answer regarding the relationship between local institutions and global competition. While merging the three large datasets and incorporating the information of all the subsidiaries and patent families already constitutes an enormous effort, this article stops at mapping the general patterns of IP activities by large MNE and discussing the ensuing policy implications. Much more work is needed to answer specific research questions in that regard. For example, we are in the process of documenting the details of global competition, including competition in the product market as well as competition in the race for technological innovation (Alcácer & Zhao, 2012) to analyze the effects of competition on patenting and litigation activities.

Understanding the nuanced interactions between local institution and global competition is important because they not only affect the effectiveness of local policies, but also influence the trajectories of institutional development in different countries, much like the co-evolutionary process (Cano-Kollmann et al., 2016; Cantwell et al., 2010) described in the context of technology clusters. For example, if the UPC eventually becomes the preferred court among MNEs, the

centralization of cases will help build the experience of the court, attracting even more MNEs to sort out their global IP disputes there. The “skipped” countries, however, would have fewer incentives (because the most powerful firms are no longer dependent on them) and resources (because talent navigates toward reputable institutions) to improve their IP institutions, leaving the small domestic firms bound by local institutions. Interestingly, the more globalized the business activities of the MNEs, the more divergent the quality of institutions may become, even though globalization is supposed to facilitate institutional convergence (Dowrick & DeLong, 2003).

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NOTES

¹Since the interviewees mentioned 3–5 years of experience, we chose the number four in this exercise. Given that we only have eight years of data, there is a tradeoff between the years counted in the experience and the number of observations we can have in the sample.

²https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2007_US_31SR13.

³Table 2 adds to this picture and shows that, even within countries, cases are concentrated in a few courts, e.g., Germany (LG Düsseldorf), France (TGI Paris), Japan (Tokyo District court), and the United Kingdom (Eng. & Wales High Court).

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