DING Xiaohao, YANG Suhong, Wei HA

Trends in the Mincerian Rates of Return to Education in Urban China: 1989–2009

Abstract This study examines the trends in the Mincerian rates of return (MRRs) to education in urban China between 1989 and 2009 using two sources of data: the China Urban Household Survey and the China Health and Nutrition Survey, and attempts to explain the underlying causes of the trends. The authors find that while the rates of return to education had been rising steadily since 1992 in urban China, a trend consistent with earlier studies, they have stagnated and even shown a statistically insignificant and very small decline between 2004 and 2009. Using the conceptual framework of supply, demand and institution in labor economics, the authors show evidence that the rapid rise in MRRs since 1992 has been driven by the strong relative demand for skills and productivity unleashed by the market-oriented economic reforms of the late 1980s and 1990s when relative supply of skilled labor was by and large stable. However, the “great leap forward” in senior secondary and tertiary education since the late 1990s produced huge numbers of graduates by the mid-2000s, outpacing the growth of relative demand for skilled labor due to the economy’s overdependence on low value-added industries such as manufacturing and construction. The apparent slowdown in the deepening of marketization since the mid-2000s may have also contributed to the stagnation or slight decline in the returns to education in urban China.

Keywords Mincerian rates of return (MRRs), marketization, labor supply and demand

DING Xiaohao (✉)

Institute of Economics of Education, Graduate School of Education, Peking University,
Beijing 100871, China
E-mail: xhding@pku.edu.cn

YANG Suhong

Institute of Economics of Education, Graduate School of Education, Peking University,
Beijing 100871, China

Wei HA

UNICEF, Dar es Salaam, United Republic of Tanzania

Introduction

Since Jacob Mincer published his research on the labor force participation of married women in 1962 (Mincer, 1962), the Mincer Income Equation has probably been the most widely used empirical regression model in microeconomics (Becker, 1993). For nearly half a century, Mincer income functions have found extensive applications in various countries and regions (Heckman, Lochner, & Todd, 2006).¹

The Mincerian rates of return (MRRs) are of both intrinsic and instrumental value to study. First of all, MRRs are effective indicators to measure the role of education in economic growth. Human capital theory regards education as an investment which, like physical capital investment, can bring about benefits, and the MRRs can measure to what degree education contributes to economic growth as sources of productivity. Secondly, MRRs serve as important indicators on the extent of liberalization of the labor market. In a heavily regulated and rigid labor market where value of labor is highly suppressed, the rates of return to education will remain low. Thirdly, many households and individuals base their schooling decisions on the rates of return to education. A large income differential on education will entice students to pursue more schooling. Fourthly, MRRs are powerful tools for analyzing income disparities. In a society where the MRRs are substantial and the elites capture the best opportunities for education at the expense of the less advantaged, income inequality is likely to widen rather than narrow. Finally, they influence fiscal policies on public education. The MRRs, as useful tools for cost-benefit analysis in education, can serve as evidence bases for the development of education fiscal policy, such as cost sharing policy in education.

However, MRRs cannot be interpreted as causal effects of schooling in many of its applications because schooling decisions are rarely exogenous. A plausible scenario is that students with better endowed ability are selected to continue further education. Then the omitted variables of one's ability will lead to overestimation of the real instrumental effect of education on earnings. On the other hand, we cannot disentangle the productivity enhancing effects of the schooling premium from the signaling effect in the labor market (Spence, 1973). Yet due to the ease of interpretation of its functional form and its less demanding requirement on data, MRRs have gained such popularity in the literature that they become the most widely used gauge for rates of return to education or earning differentials of different years of schooling or levels of education over

¹ The Mincerian Income Equation expresses the log of income as a linear function of schooling years and quadratic terms of working experience. The coefficient on schooling in this regression is interpreted as a rate of return to schooling or Mincerian rate of return to education (MRR).

time and across countries.

Psacharopoulos (1989) first presented evidence on the declining returns to education over time in a large number of countries. Trostel, Walker, and Woolley (2002) analyzed the International Social Survey Programme from 28 countries, primarily European, from 1985 through 1995, and found that the rates of return declined slightly over this period for this group of countries. Psacharopoulos and Patrinos (2004) provided a further update on the trend of rates of return to education and showed that average returns to schooling have declined by 0.6% in the past 12 years. They suspected that the expansion in education supply may have dragged down the returns to schooling, *ceteris paribus*. In contrast to a somewhat qualified global pattern of declining rates of return to education, there are two groups of countries with diverse economic characteristics that have defied the trend. Hung (2008) compared the returns to education in transitional economies in Central and Eastern Europe (CEE) and in China in the 1980s and 1990s and showed that it took about a decade for the six CEE countries, and two decades for China, to raise their respective returns to education to the 10% level from a very low base (2–4% for CEE and below 2% for China). Two Anglo-Saxon countries, UK and US, also show rising rates of return to college education since the 1980s (Arias & McMahon, 2001; Silles, 2007).

This paper summarizes the findings of major studies on MRRs in urban China, then uses the data of the China Health and Nutrition Survey to verify the time trend of the MRRs in urban China and finally the paper also attempts to offer some suggestions on the likely causes of such trends in MRRs and future directions of research.

The Trends of the MRRs in Urban China

Four major sources of data are available for comprehensive and systematic study of the changes of MRRs in urban China (X. H. Ding, Q. M. Yu, & H. X. Yu, 2012). The first one is the China Household Income Projects (CHIPs), designed to explore the income distribution of urban and rural residents in China. The surveys were carried out in 1988, 1995, 2002, and 2007, with minor adjustments of the sample over time, and each wave of the surveys covered more than 9,000 urban households from 10 provinces and municipalities in China, with individual samples of up to and over 20,000. All survey samples had been drawn from the sampling frame of the National Bureau of Statistics for conventional household surveys. The questionnaires of the investigation had been designed by a team of local and international researchers, and the survey was carried out by the survey teams of the National Bureau of Statistics. The second database is the China Health and Nutrition Survey (CHNS), a joint initiative between the University of

North Carolina, US, and the Chinese Center for Disease Control and Prevention (China CDC). The follow-up surveys were conducted in 1989, 1991, 1993, 1997, 2000, 2004, 2006, 2009 and 2011. Each wave of the survey covered roughly 4,000 to 6,000 households from nine of China's provinces and municipalities. The third one is the Chinese General Social Survey (CGSS), initiated by the Department of Sociology, Renmin University of China, in collaboration with other institutions. The surveys were conducted in 2003, 2005, 2006 and 2008 respectively, covering over 40,000 households in 28 provinces and municipalities nationwide. Last but not least, the China Urban Household Survey (CUHS) of the National Bureau of Statistics (NBS) of China provides the most comprehensive information on the situation of urban households in China with extensive geographic coverage and the longest duration. This survey was carried out annually on tens of thousands of households living in urban areas of all provinces and covered income and expenditure of households. There are unique advantages for the study on the MRRs using the CUHS data. Firstly, it has greater representativeness due to large sample size and wide coverage of geographical areas. Secondly, a longer time span of the data facilitated trend analysis. Thirdly, questions on income are quite detailed in the survey with consistent questions over time, which enabled researchers to ascertain trends across surveys. Finally, the households recorded their income information in diaries rather than based on respondents' recalls.

MRRs Trends in Urban China between the Late 20th Century and the Early 21st Century

Taking advantage of the data above, domestic and overseas researchers conducted a large number of studies on the trends of MRRs in urban China, as shown in Table 1.

The analysis of Li and Ding (2003) revealed that the MRRs in urban China showed an upward trend between 1990 and 1999, from 2.43% in 1990, 3.64% in 1993, 4.81% in 1995, all the way to 8.10% in 1999. Yang (2005) analyzed the CHIPS data and showed that MRRs rose from 3.1% to 5.1% between 1988 and 1995. The MRRs in Chinese major cities estimated by Qi (2005) based on the CHNS data showed a continuous increase between 1991 and 1999², from 2.56% in 1991 to 6.40% in 1999. The MRRs to education of Chinese urban residents estimated by Liu (2006) using a Mincer extended model also indicated a sharp acceleration between 1988 and 2003, from 2.76% in 1988, 3.92% in 1995, 3.51% in 1996, 4.71% in 2000, and rising to 9.26% in 2003. Using the CUHS data, Chen et al. (2003) estimated that the MRRs to education increased from 2.95% in

² The years here means when the investigations were conducted.

1991 and 4.66% in 1995 to 8.53% in 2000. Wang and Yue (2009) employed the same CHUS data and semi-parametric estimation and showed a similar rise in MRRs from 2.81% in 1991 to 10.46% in 2004. Zhang et al. (2005) used a subset of the CHUS sample and found that the returns to a year of schooling more than doubled over the 14-year period, from 4.0% in 1988 to 10.2% in 2001. Yet the rise of MRRs was not a linear function of time. In fact they found two short spells of stagnation between 1989 and 1992 and from 1994 to 1996. In brief, by the early 2000s, the rates of return to education in urban China have converged on the global average.

MRRs Changes in Urban China in the Early 21st Century

Empirical Analysis Based on CUHS

Using the CUHS data collected by the NBS in 2002, 2004, 2006, 2008, and 2009, X. H. Ding, Q. M. Yu, and H. X. Yu (2012) analyzed the trends of MRRs of Chinese urban residents during this period. The annual sample size of the data ranges from 70,000 to 100,000, with cumulative sample size of more than 430,000 for these five years.

Table 2 is compiled based on the findings of X. H. Ding, Q. M. Yu, and H. X. Yu (2012). The figures in the table are the MRRs of Chinese urban residents. The primary extended Mincer equation includes control variables such as gender, industry, types of work unit, and region into the basic Mincer equation. The secondary extended Mincer equation is developed, by adding the dummy variables of years to the basic Mincer equation as well as their interaction terms with education (Model 5), while Model 6 controls for the influences of gender, industry, types of work unit, region, and other variables based on Model 5. Among the rest of the models, Model 1 and Model 3 are regressed with the single-year data respectively, while Model 2, Model 4, Model 5, and Model 6 are regressed with the pooled data by introducing the year dummy variables into the basic Mincer equation. The estimated MRRs of Model 1, Model 2, and Model 5 are gross Mincerian rates of return (Gross MRRs) without controlling for the influences of any other variables on the logarithm of income. Model 3, Model 4, and Model 6 yield relative net Mincerian rates of return (Relative Net MRRs) which control for the influences of the variables such as gender, industry, types of work unit, and region. These results are combined with estimates of MRRs from Chen et al. (2003) in Fig. 1 to show moderate growth of the Gross MRR and Relative Net MRR since 2000. However, both of them have lost momentum since 2004. Most of the existing studies on the trends of the MRRs (Table 1) with the exception of X. H. Ding, Q. M. Yu, and H. X. Yu (2012), estimated Mincerian equations separately for each single year. Therefore, while the coefficient

estimates from these regressions can be compared in size, it was difficult to determine whether the differences are statistically significant. Models 5 and 6 are regressed with pooled cross-sectional data, with years and their interaction terms with education as dummy variables. The p -values of coefficient estimates of the interaction items offer a formal statistical test of whether the MRRs to education are different from those in the reference year. Regression results in Fig. 1 show that the Gross MRRs in pooled data regression (Model 5) are very similar to the results estimated with the single-year data (Model 1), while the downward trend of the Relative Net MRRs (Model 6) after 2004 is more obvious than the single-year results (Model 3).

Table 2 Empirical Results of the Tendencies of the MRRs in Urban China since the Early 21st Century

		Pooled Data	2002	2004	2006	2008	2009
Basic Mincer equations	Model 1		9.74%	10.51%	10.18%	10.27%	10.33%
	Model 2	10.24%					
Primary extended Mincer equations	Model 3		6.29%	7.72%	7.74%	7.78%	7.89%
	Model 4	7.55%					
Secondary extended Mincer equations (pooled data)	Model 5		9.57%	10.42%	10.16%	10.39%	10.41%
	Model 6		7.13%	8.21%	7.81%	7.36%	7.31%

Note. The estimates of 2002 to 2009 are compiled based on the findings of X. H. Ding, Q. M. Yu, and H. X. Yu (2012). All estimates are statistically significant at 0.01 p -value except the estimate for 2009 in Model 5 and estimates for 2006 and 2009 in Model 6. Results of the full regression models are available from the authors upon request.

Fig. 1 Temporal Tendency of the MRRs in Urban China (1991–2009)

Note. The estimates of 2002 to 2009 are compiled based on the findings of X. H. Ding, Q. M. Yu, and H. X. Yu (2012), and the regression results for 1991, 1995 and 2000 are from Chen et al. (2003).

In order to capture the non-linearity in the returns to schooling, X. H. Ding, Q.

M. Yu, and H. X. Yu (2012) also estimated the MRRs of specific education levels relative to the next level below it. The results are shown in Fig. 2 and Fig. 3 for secondary education levels and higher education respectively. At the secondary education level between 2002 and 2009, only the junior middle school showed rapid growth in the Gross MRRs throughout the period. The rates of return to senior middle school and secondary vocational school showed a slight decline, and the Relative Net MRRs to junior middle school also began to decline after peaking in 2008. As for higher education, the MRRs to university and college

Fig. 2 The MRRs to Secondary Education in Urban China Compared with the Next Lower Education Levels

Note. The figure was compiled based on the results of X. H. Ding, Q. M. Yu, and H. X. Yu (2012). JMS = Junior Middle School, SMS = Senior Middle School, SVS = Secondary Vocational School. All point estimates are statistically significant at 0.01 *p*-value. Full regression models are available from the authors upon request.

Fig. 3 The MRRs to Higher Education in Urban China Compared with the Next Lower Education Levels

Note. The figure was compiled based on results of the study by X. H. Ding, Q. M. Yu, and H. X. Yu (2012). All point estimates are statistically significant at 0.01 *p*-value. Full regression models are available from the authors upon request.

education were stable in the first decade of the 21st century, while that to graduate education was gradually stabilized after experiencing a substantial rise from 2002 to 2004. On the whole, in recent years, the rates of return to education at all levels except junior middle school failed to maintain the trend of rapid growth as in the period from 1990s to the first five years of the 21st century. Rather the rates stabilized and even showed signs of slight decline.

Empirical Analysis Based on CHNS

To complement the results from CUHS data, the authors estimate the trends of MRRs using CHNS data. CHNS is one of the longest running household panel surveys in China. When estimating the MRRs, monthly wages including bonuses and subsidies were considered. Given the potential of measurement errors of self-reported income, 5% of the samples were deleted with the highest income for each survey year and education level. When the pooled data was used in analyses, the income data for each year to 1988 was rebased using the urban consumer price index by province. Subsequent analyses were all carried out using this selected sample. Table 3 presents the trends of MRRs estimated by pooled data. Model 1 estimates the Gross MRRs, while Model 2 adds control variables such as gender, occupation, nature of work units, and region to Model 1, estimating the Relative Net MRRs.

The results based on CHNS showed that both Gross and Relative Net MRRs, experienced a continuous and rapid increase for more than a decade since 1993, and after reaching the peak in 2004, both tended to be stabilized (see Fig. 4). This was consistent with the findings obtained by X. H. Ding, Q. M. Yu, and H. X. Yu (2012) presented earlier.

Both the analyses of CHNS data here and those by X. H. Ding, Q. M. Yu, and H. X. Yu (2012) using CUHS point to a clear pattern of MRRs in the last two decades, i.e., since 1992, the rates of return to education have shown a steady and robust increase among China's urban residents for more than a decade, and they gradually stagnated after the mid-2000s. To the best knowledge of the authors, this is the first time that such long term trends of MRRs to all levels of education in urban China have been rigorously analyzed up to 2009. He (2009) used CHNS data between 1991 and 2006 and found no declining trend of MRRs on years of education but significant narrowing of gaps in total earnings by education levels. However, the analysis did not take advantage of the pooled data and therefore one cannot be sure about the statistical significance of such trends. Zhou and Zhong (2010) used the CHNS data over the same time period (1991–2006) and documented the decline of MRRs by years of schooling but it did not take advantage of the pooled data either nor did it separate the study by rural and urban areas which operate in different context.

Table 3 The MRRs of Chinese Urban Residents Based on CHNS' Pooled Data

		Model 1	Model 2
Years of education		0.0823****	0.0679****
Working years		0.0170****	0.0168****
Square of working years		-0.0001****	-0.0002****
Year	1989	-0.4890****	-0.5699****
	1991	-0.4793****	-0.5481****
	1993	-0.2056**	-0.2487****
	1997	-0.1668*	-0.2193**
	2000	-0.1803*	-0.2086**
	2006	0.0942	0.1356
	2009	0.4473****	0.4741****
	1989* education	-0.0638****	-0.0618****
	1991* education	-0.0618****	-0.0608****
	1993* education	-0.0660****	-0.0665****
Interaction item of year and education	1997* education	-0.0472****	-0.0469****
	2000* education	-0.0238***	-0.0245***
	2006* education	0.0024	-0.0013
	2009* education	-0.0006	-0.0014
			0.0885****
Male	Specialized technicians		-0.0091
	Clerks and relevant staff		-0.0430**
	Commercial services staff		-0.1180****
	Production staff of agriculture, forestry, fishing, animal husbandry and water conservancy industries		-0.2841****
	Operators and staff members in equipment production and operations		-0.1160****
	Others		-0.1206***
			-0.0569****
Nature of work unit ⁴	State-owned and collective		-0.0579**
	Private		0.1363****
Regions ⁵	Eastern region		0.1291****
	Central region		
Sample amount		5016	4932
Square of R		0.7233	0.7428

Note. $p < 0.1$, *; $p < 0.05$, **; $p < 0.01$, ***; $p < 0.001$, ****.

³ The person in charge serves as a reference group.

⁴ Public sectors serve as a reference group. These include government agencies, state-owned institutions and research institutes. The state-owned and collective economic sectors include state-owned enterprises as well as collective enterprises. The private sectors include private, individual, and foreign-funded enterprises.

⁵ Western region serves as a reference group.

Fig. 4 The MRRs of Chinese Urban Residents

Note. Estimated from CHNS.

Explaining the Trends of the MRRs to Education in Urban China

Explaining the trends in MRRs is a much more daunting task than documenting them. While a conceptual framework has been developed in the U.S. literature to understand the changes in wage inequality from supply, demand, and institutional factors in the labor market (Freeman & Katz, 1995), there are fewer consensuses on their relative contributions. In the early 1990s, researchers overwhelmingly attributed the rise in wage inequality in the 1980s to the increase in the relative demand for skill driven by skill-biased technical change, i.e., computer and internet revolution (Lemieux, 2008). This was in stark contrast to the 1970s, when Freeman (1976) argued that returns to college took a nosedive in the 1970s due to a decline in growth of demands for higher education graduates in industries and an oversupply of baby-boomer college graduates in the US. However, increasingly, questions had been raised on the inapplicability of this theory to non-Anglo Saxon European countries who also experienced the same technical change but had far less growth in wage inequality. More attention was given to labor market institutions and social norms such as hikes in executive compensation, a decline in unionization and changes to minimum wages to explain the sharp concentration of wage inequality in the top end of the wage

distribution since the early 1990s. Despite the best efforts of researchers, the contribution of many of these factors remains unquantified (see Lemiux, 2008, for a comprehensive literature review).

While a full scale analysis of the causes for the trend of MRRs in urban China is beyond the scope of this analysis, we attempt to provide some suggestive evidence on this important topic using the conceptual framework of supply, demand, and institutions.

Market and Wage Setting Liberalization

It is widely believed that market oriented reform in urban areas starting in the mid-1980s and the new wage-setting mechanisms have rewarded more workers' skills and productivity and led to rising education returns (Zhang et al., 2005). Prior to the reform, the government effectively had monopsonic power in the urban labor market. Government not only controlled all job opportunities but also determined urban wages through a grade system. In this central planning system, wage differentials were not linked to productivity but to seniority or experiences. Wage differentials by education attainment were severely compressed (Zhang et al., 2005; Cai, Park, & Zhao, 2008).

In 1984, the "Resolution on Economic Institutional Reform" allowed enterprises, for the first time, to set their total wage bill according to their economic performance. After the "Temporary Regulations on the Use of Labor Contracts in State-Run Enterprises" issued by the State Council, workers on labor contracts as opposed to permanent employment had consistently risen (Zhang et al., 2005; Cai et al., 2008). However, the scale and impacts of these reforms were limited due to the lack of functioning labor market and social protection system (Qi, 2005).

After Deng Xiaoping's visit to Southern China in 1992 and the goal of establishing a Socialist Market Economy in China in 1993, China's economic reforms deepened. State Owned Enterprises' (SOE) management was given more flexibility and freedom to pursue profit-oriented objectives. Wages were increasingly linked to workers' skills and productivity as long as wage growth did not exceed labor productivity growth (Cai et al., 2008; Zhang, 2008). The Labor Law enacted in 1995 also heralded the deepening of the labor market and social security and insurance reform. From the late 1990s to 2003 the state sector had gone through the most far reaching transformation when small and medium-sized SOEs were privatized under the guiding principle of "grasping the big, letting go of the small" and those big SOEs belonging to industries deemed strategic were harshly restructured including massive layoffs (World Bank, 2012).

In the meantime, once-unknown non-state enterprises including foreign and

private enterprises had become a formidable force in the economy and the labor market. As shown in Fig. 5, during the 30 years from 1978 to 2009, the proportion of labor employed by private units expanded rapidly, and since 2005 it has exceeded the size of employment in the state-owned and collective units combined. This dramatic transformation of the labor market had at least two important implications for MRRs. First, non-state enterprises operating in the competitive market environment are more likely to set worker wages to reflect more of their productivity and in turn result in higher returns to education at least for those workers employed in the private sector rather than in collective and state-owned units (Chen, Chen, & Xia, 2003; Zhou & Zhong, 2010). Second, the non-state enterprises, through competition with the state sector for talent and skills, drive up the wage premium for skills in the state sector (Zhang et al., 2005).

Fig. 5 Ownership Structures in China's Urban Labor Market as Measured by Labor Share⁶

Source: National Bureau of Statistics of China (2012). 2012 中国统计年鉴 [China Statistical Yearbook 2012]. 北京, 中国: 中国统计出版社 [Beijing, China: China Statistics Press].

In short, the labor market liberalization and changing wage setting mechanisms have been the driving force behind rising MRRs between 1992 and the mid-2000s. Although the evidence so far has been patchy at best, the authors indeed managed to compile some information from various sources to document the slow-down in economic marketization around the mid-2000s. First, the World Bank (2012) and Zhang (2011) show that the deepening of state sector reform lost steam after 2003 probably due to the need to absorb the impact of the earlier radical reform and the increasing resistance from vested interests in the state sector. Second, the massive fiscal and monetary stimulus that the Chinese government unleashed to mitigate the impact of the 2007/08 global financial crisis has allegedly increased the dominance of the state sector in the economy (Peng & Zhan, 2010). While both are highly controversial topics, the latest efforts by researchers to track the progress of marketization since China began

⁶ Private units include private enterprises, investment units funded by Hong Kong, Macao, Taiwan of China and abroad as well as individuals.

reforms using a composite index do seem to indicate that the market liberalization of the Chinese economy has decelerated since mid-2000s after the rapid acceleration in the 1990s and early 2000s with the exception of Fan et al. (2011; see Fig. 6). Just as the earlier marketization seemed to explain the rising MRRs, its slow-down may have contributed to the stagnation and decline in MRRs since the mid-2000s.

Fig. 6 Different Measures of Marketization in China

Source: School of Economics and Resource Management, Beijing Normal University (2010), p. 239, 268, 320; Dong and Hao (2010); Fan, Wang, & Ma (2011); and Zeng, Shi, Zhao, & Dong (2010).

Labor Demand and Supply

Marketization is one way of explaining MRRs trends. Another interpretation comes from the perspective of labor market demand and supply. According to Jan Tinbergen's theory on "the race between education and technology" (Tinbergen, 1975), when the growth in relative demand for high-skilled labor exceeds the relative supply that the education sector can provide, the MRRs will be in an upward trend, and vice versa. The MRRs will remain unchanged when the relative demand for and supply of high-skilled labor are in equilibrium. This is also consistent with the conceptual framework in Freeman and Katz (1995).

While it is difficult to observe directly the labor demand for different education levels, we can infer it from the growth of the labor force in different economic industries over time as shown in Fig. 6. Between 2003 and 2011, secondary industry comprised of mining, manufacturing, construction and utility

sectors have added 21.6 million jobs which accounts for 63% of all job growth. While manufacturing was already the largest economic sector in terms of employment in 2003 and continued to be in the top place throughout the period, the construction sector has replaced the education sector and the publication administration sector as the second largest sector by 2011. In contrast, the high value-added for-profit tertiary industry,⁷ which caters more towards highly skilled labor, was much muted with addition of less than eight million workers over the same period. In fact the share of these sectors as total employment in the labor force remained stagnant or even declined during the period (see Fig. 7). Although we only observe labor demand in the equilibrium of the labor market, it nonetheless points to the fact that breakneck economic growth in China has not translated into huge relative demand for high skilled labor. Rather, the economic growth was primarily fueled by the expansion of low-valued added sectors and demanded more unskilled or semi-skilled labor.

Fig. 7 Employment in China's Urban Labor Market by Sectors

Source: National Bureau of Statistics of China. (2012). 2012 中国统计年鉴 [China Statistical Yearbook 2012]. 北京, 中国: 中国统计出版社 [Beijing, China: China Statistics Press].

⁷ The high value-added for-profit tertiary industry includes transport, storage, and post sector, information transmission, computer service and software sector, financial intermediation sector, real estate sector, scientific research, technical services, and geological prospecting sector, management of water conservancy, environment and public facilities sector, culture, sports and entertainment sector. Non-profits sectors such as education sector, health, social securities and social welfare sector and public management and social organization sector are excluded.

In the meantime, China has greatly expanded its education sector in two phases since the economic reforms (Guo, 2011). In the mid-1980s, the government enshrined the goal of nine years of compulsory education (up to the end of junior middle school) for all children. Primary school enrollment rate reached 97.8% in 1990 and junior middle school enrollment rate progressed slowly in the late 1980s but has caught up in the 1990s. By 2000, the junior middle school enrollment rate hit 88.6% and junior middle schools produced 16 million graduates in 2000, five million more than the 1990 figure (Liao, 2008). The second phase was marked by the great expansion of senior middle schools and tertiary education since the late 1990s as a result of the government policy to cushion the impact of the 1997/98 East Asian financial crisis through increased education expenditure (Guo, 2011; Peking University, 1999). The annual supply of fresh college graduates has increased almost six-fold from less than one million in 2000 to 5.8 million in 2010.

The continuous expansion of the education system throughout this period has brought about fundamental changes in the education profile of the labor force since mid-1990s in particular in urban cities.⁸ As Table 4 shows, 43.6% of the urban labor force in 2000 boasted junior middle school credentials, a 11.5% rise from ten years ago, whereas workers with less than primary school education dropped from 21% to around 7%. While urban workers with at least some college education had been rising since the 1980s, there is no doubt that the “great leap forward” occurred in the 21st century. In a matter of a decade, the share of urban workers with some college or above credentials has more than quintupled. Senior middle school graduates also doubled in the urban labor force. For the first time, workers with more than senior middle school education have become the majority of the urban labor force whereas urban workers with primary school education or less, which accounted for more than half of the

Table 4 Education Profiles of the Labor Force in Urban China, Selected Years 1982–2010 (%)

	1982	1990	2000	2005	2010
<Primary school	20.63	21.84	6.76	2.23	0.61
Primary school	33.87	30.16	31.74	13.68	8.24
Junior middle school	30.59	32.13	43.59	40.97	39.62
Senior middle school	13.41	13.13	13.02	24.20	25.26
Some college and above	1.5	2.73	4.9	18.92	26.26

Note. Authors’ own tabulation of census data from 1982, 1990 and 2000. 2005 and 2010 data come from the tabulation by National Bureau of Statistics using the Mini-Census of 2005 and the Census of 2010.

⁸ Other factors that also facilitated this change include the gradual exit of older cohorts who had much lower education attainment from the labor market and the relative size of the different cohorts.

urban labor force until the mid-1990s, dropped to below single digits. A quiet revolution has taken place in urban China in terms of the education profile of the labor force.

Piecing the information together on marketization, labor demand and labor supply, a plausible explanation has emerged. In the 1980s and 1990s, market-oriented economic reform unleashed relative demand for skills and productivity when the relative supply of the skilled was by and large stable and therefore drove up their wage premium and MRRs. However, the “great leap forward” of senior secondary and tertiary education since the late 1990s has produced a huge number of graduates by the mid-2000s which have outpaced the growth of relative demand for the skilled due to the economy’s overdependence on low value-added industries such as manufacturing and construction. Therefore it has put a downward pressure on the MRRs. The seeming slowdown in the deepening of marketization since the mid-2000s may have also fueled this downward trends.

Conclusion and Discussions

Since the early 1990s, the MRR to education has experienced a steady robust rise among China’s urban residents but it has stagnated after the mid-2000s and even has shown some weak signs of a subtle decrease. To the best of the authors’ knowledge, this is the first time that empirical evidence of stagnant or declining MRRs is reported using two comprehensive household datasets of urban residents in China.

This study also attempts to offer some suggestive explanations of the trend using the conceptual framework of labor supply, labor demand and institutions in labor economics. The evidence presented here suggests that market-oriented economic reforms in the 1980s and 1990s unleashed relative demand for skills and productivity when relative supply of the skilled was by and large stable and therefore drove up their wage premium and MRRs. However, the “great leap forward” of senior secondary and tertiary education since the late 1990s has produced a huge number of graduates by the mid-2000s which has outpaced the growth of relative demand for the skilled due to the economy’s overdependence on low value-added industries such as manufacturing and construction. The seeming slowdown in the deepening of marketization since the mid-2000s may have also contributed to the stagnation or slight decline in MRRs.

Future research could take advantage of provincial or sector level variations in rates of return to education to examine the driving force behind such trends. A similar study by Yang (2005) used the city-level variation in CHIPs data to link rate of return to other variables. His sample was very small with only 29 cities

observed twice in the sample. One could build a panel data of 28 provinces and municipalities with at least five data points using the CUHS data or construct a panel data of nine provinces and municipalities with nine data points using the CHNS data. However, the data needed for this type of analysis mean that it will take significant amount of time to collect province-level explanatory variables. This will be the topic of another paper.

Last but not least, while the meteoric growth of higher education in China may have led to an oversupply of college graduates or a deterioration in quality of the graduates and suppressed their wage premium in the short term, it has produced the human capital that China can draw on to move up the value chain in the global economy in the medium to long term. It at least calls for two sets of major policy interventions. First, policies need to be put in place urgently to break the negative feedback loop of declines in return to education and dampened demand for senior middle school and higher education. Second, it requires forceful and well-coordinated policies in the medium to long term to harness the rich human capital through industrial upgrading and technological innovation. Fortunately, some of these policies have already been incorporated into China's 12th Five-Year Development Plan. Only history can tell whether or not these will be implemented successfully.

References

- Arias, O., & McMahon, W. (2001). Dynamic rates of return to education in the U.S. *Economics of Education Review*, 20(2), 121–138. doi: 10.1016/S0272-7757(99)00067-9
- Becker, G. S. (1993). Nobel lecture: The economic way of looking at behavior. *Journal of Political Economics*, 101(3), 385–409.
- Cai, F., Park, A., & Zhao, Y. H. (2008). The Chinese labor market in the reform era. In L. Brandt & T. G. Rawski (Eds.), *China's great economic transformation* (pp. 167–214). New York, NY: Cambridge University Press.
- Chen, X. Y., Chen, L. K., & Xia, C. (2003). 20 世纪 90 年代中国城镇教育收益率的变化与启示 [Rates of return to schooling in urban China: Changes in the 1990s]. *北京大学教育评论* [*Peking University Education Review*], 1(2), 65–72.
- Ding, X. H., Yu, H. X., & Yu, Q. M. (2012). 中国城镇居民各级教育收益率及其变化研究 (2002–2009 年) [Private returns to different education levels in urban China: 2002–2009]. *北京大学教育评论* [*Peking University Education Review*], 10(3), 73–84. doi: 10.3969/j.issn.1671-9468.2012.03.007
- Ding, X. H., Yu, Q. M., & Yu, H. X. (2012). 本世纪以来中国城镇居民教育收益率及其变化研究 [Research on rates of return to education of Chinese urban residents and its changes in this century]. *教育发展研究* [*Exploring Education Development*], (11), 1–6.
- Dong, X. Y., & Hao, L. Y. (2010). 中国市场化进程的定量研究: 改革开放 30 年市场化指数的测度 [A quantitative study of China's marketization process: The marketization index of last 30 years]. *当代经济管理* [*Contemporary Economy & Management*], 32(6), 8–13.
- Fan, G., Wang, X. L., & Ma, G. R. (2011). 中国市场化进程对经济增长的贡献

- [Contribution of marketization to China's economic growth]. 经济研究 [Economic Research Journal], (9), 4–16.
- Freeman, R. (1976). *The overeducated American*. New York, NY: Academic Press.
- Freeman, R. B., & Katz, L. F. (1995). *Differences and changes in wage structures*. Chicago, IL: University of Chicago Press.
- Guo, M. C. (2011). The consequences of educational expansion in reforming China. *Newsletter of the Weatherhead Center for International Affairs, Harvard University*, 26(1), 10–12.
- He, Y. M. (2009). 教育扩张下教育收益率变化的实证分析 [The changes of the rates of return to education: An empirical study based on the data of CHNS]. 中国人口科学 [Chinese Journal of Population Science], (2), 44–54.
- Heckman, J. J., Lochner, L. J., & Todd, P. E. (2006). Earnings functions, rates of return and treatment effects: The Mincer equation and beyond. In E. Hanushek & F. Welch (Eds.), *Handbook of the economics of education* (Vol. I, pp. 307–458). Amsterdam, The Netherlands: Elsevier B.V.
- Hung, F. S. (2008). Returns to education and economic transition: An international comparison. *Compare: A Journal of Comparative and International Education*, 38(2), 155–171. doi: 10.1080/03057920701420957
- Lemieux, T. (2008). The changing nature of wage inequality. *Journal of Population Economics*, 21(1), 21–48. doi: 10.1007/s00148-007-0169-0
- Li, S., & Ding, S. (2003). 中国城镇教育收益率的长期变动趋势 [Long-term change in private returns to education in urban China]. 中国社会科学 [Social Sciences in China], (6), 58–72.
- Liao, Q. F. (2008). 改革开放以来我国普及义务教育的回眸 [Review on our popularization of compulsory education since the reform]. 西南大学学报 (社会科学版) [Journal of Southwest University (Social Sciences Edition)], 34(5), 14–21.
- Liu, J. M. (2006). 市场化与国家规制: 转型期城镇劳动力市场中的收入分配 [Marketization and state regulation: Income distribution in the urban labor market during the period of transition]. 中国社会科学 [Social Sciences in China], (5), 110–124.
- Mincer, J. (1962). Labor force participation of married women: A study of labor supply. In National Bureau of Economic Research (Ed.), *Aspects of labor economics* (pp.63–106). Princeton, NJ: Princeton University Press.
- Peking University. (Ed.). (1999). 关于扩大高等教育规模对短期经济增长作用的研究报告 [The report on the role of higher education expansion on the short-term economic growth]. Retrieved May 10, 2013, from http://www.edu.cn/zong_he_311/20060323/t20060323_12479_4.shtml
- Peng, T., & Zhan, B. (2010). 关于“国进民退”问题的研究综述 [A research review on the development of state-owned enterprises and the decline of private enterprises]. 云南财经大学学报 [Journal of Yunnan University of Finance and Economics], (4), 13–19.
- Psacharopoulos, G. (1989). Time trends of the returns to education: Cross-national evidence. *Economics of Education Review*, 8(3), 225–231.
- Psacharopoulos, G., & Patrinos, H. A. (2004). Returns to investment in education: A further update. *Education Economics*, 12(2), 111–134. doi: 10.1596/1813-9450-2881
- Qi, L. S. (2005). 国有部门劳动工资制度改革对教育收益率的影响: 对 1988–1999 年中国城市教育收益率的实证研究 [The impact of wage and labor reform of state: Owned sector on returns to schooling in urban China]. 教育与经济 [Education & Economy], (4), 19–25. doi: 10.3969/j.issn.1003-4870.2005.04.005

- School of Economics and Resource Management, Beijing Normal University. (2010). 中国市场经济发展报告 [A report on the development of China's market economy]. 北京, 中国: 北京师范大学出版社 [Beijing, China: Beijing Normal University Publishing Group].
- Silles, M. A. (2007). The returns to education for the United Kingdom. *Journal of Applied Economics*, 10(2), 391–413.
- Spence, M. (1973). Job market signaling. *The Quarterly Journal of Economics*, 87(3), 355–374.
- Tinbergen, J. (1975). *Income distribution: Analysis and policies*. Amsterdam, The Netherlands: North-Holland.
- Trostel, P., Walker, I. & Woolley, P. (2002). Estimates of the economic returns to schooling for 28 countries. *Labour Economics*, 9(1), 1–16. doi: 10.1016/S0927-5371(01)00052-5
- Wang, M. J., & Yue, C. J. (2009). 个人教育收益率的估计与比较: 一个半参数方法 [Estimation and comparison on individual returns to schooling: A semiparametric approach]. 统计研究 [Statistical Research], 26(6), 51–59. doi: 10.3969/j.issn.1002-4565.2009.06.007
- World Bank. (2012). China 2030: Building a modern, harmonious, and creative high-income society. Retrieved May 8, 2013, from http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/03/27/000350881_20130327163105/Rendered/PDF/762990PUB0china0Box374372B00PUBLIC0.pdf
- Yang, D. T. (2005). Determinants of schooling returns during transition: Evidence from Chinese cities. *Journal of Comparative Economics*, 33(3), 244–264. doi:10.1016/j.jce.2005.03.010
- Zeng, X. W., Shi, F. Q., Zhao, S. Q., & Dong, X. Y. (2010). 中国市场化指数的测度与评价: 1978–2008 [Measurement and evaluation of China's marketization Indices: 1978–2008]. 中国延安干部学院学报 [Journal of Executive Leadership Academy Yan'An], (4), 47–60.
- Zhang, X. N. (2008). 国有企业工资决定机制研究 [Research on the wage setting mechanism of state-owned enterprises in China]. Retrieved May 8, 2013, from <http://www.doc88.com/p-31878473503.html>
- Zhang, J. S., Zhao, Y. H., Park, A., & Song, X. Q. (2005). Economic returns to schooling in urban China, 1988 to 2001. *Journal of Comparative Economics*, 33(4), 730–752. doi:10.1016/j.jce.2005.05.008
- Zhang, W. K. (2011). “十二五”期间国有企业改革的方向和任务 [Direction and tasks for the reform of state-owned enterprises during the Twelfth Five-Year Plan Period]. Retrieved May 15, 2013, from http://www.fgw.gov.cn/fgwjsp/shzj_content.jsp?docid=468320&channelid=385
- Zhou, J. Y., & Zhong, Y. P. (2010). 教育对中国收入不平等变迁的作用: 1991–2006 [The effects of schooling on the income inequality change in China: 1991–2006]. 北京大学教育评论 [Peking University Education Review], 8(4), 106–119. doi: 10.3969/j.issn.1671-9468.2010.04.009