Education Development and Wage Inequality in Urban China*

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Abstract

Using a representative household survey for 1995, 2002, 2007, and 2013, we show that education plays a pivotal role in shaping wage inequality in urban China. We find that education was a major contributor to increased wage inequality between 1995 and 2013. The returns to education remained high after 2007 despite a large inflow of college-educated workers. Although regional wage inequality declined from 2007–13, regional wage inequality among educated workers did not. Residual wage inequality increased, and the within inequality of educated workers increased faster than that of the less educated. We argue that China's education expansion seems insufficient to narrow the educational wage gap, and a lack of labor mobility for educated workers prevents the decline in returns to education in specific regions.

1. Introduction

Urban wage inequality has become an increasingly important component of China's overall income inequality, which increased dramatically in the last three decades and has

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become a major societal challenge for contemporary China (Li and Sicular 2014). In this paper, we study the evolution of the wage structure in urban China, paying special attention to the education wage differential. Education is a major factor in wage determination, and wage gaps between individuals of different education levels (the "skill differential") change when the institutional settings and the relative demand and supply of educated workers change. In China over the last three decades, the labor force composition and the wage-setting mechanism have changed significantly. It is therefore of interest to see how the role of education in determining wages and wage inequality has changed over time.

In particular, there is considerable interest among scholars in whether the sharply increased supply of college graduates in recent years has reduced the returns to education (or the wage gap between educated and less-educated workers). Also of interest are the recent trends of wage gaps in age, gender, region, and unobservable abilities, which seem to be influenced by education. The answers to these questions have major implications for the behavior of wage structure and for policymaking.

To accomplish this, we use China Household Income Project Survey (CHIPS) data for 1995, 2002, 2007, and 2013, a nationally representative survey that covers nearly two decades in China's transition process. Several patterns are observed in our empirical analysis. First, education has become increasingly important for wage setting as both the increase in education levels and rising returns contribute to wage growth. Second, wage gaps based on education, gender, and age increased significantly since 1995, and it is the education gap that contributes most to the rise in wage inequality. Third, regional inequality increased between 1995 and 2007 and then declined after 2007; since 2002, the regional wage gap for less-educated workers converged but that of the educated did not. Accordingly, we find a sufficiently large regional variation in the returns to education, which strongly signals a lack of mobility for educated workers. Finally, although wage inequality is relatively low within educated groups, it grew faster than that within less-educated groups. We discuss possible reasons for the co-movement of education development and wage inequality and their policy implications.

The paper proceeds as follows. Section 2 briefly discusses the background of the urban labor market in China and related literature. Section 3 introduces and describes the data. Section 4 estimates wage equations and examines the returns to education and residual wage inequalities. Section 5 performs regression-based decomposition to examine the factors that influence wage inequality. Section 6 concludes.

2. Background

The Chinese labor market experienced profound changes since the mid 1990s, including the privatization and ownership restructuring of state-owned enterprises (SOEs) in the

late 1990s and China's entrance into the WTO. The private sector grew rapidly after SOE reform, which increased the demand for labor despite the fact that privatization reduced employment in state sectors. The restructuring in the late 1990s significantly increased urban wage inequality, as it ensured that market forces played a more decisive role in the labor market.

After its entry into the WTO, China experienced a sharp increase in trade activity over a relatively short period, and most of the increase occurred in the coastal region. Along with rapid export growth, China's exports were becoming more sophisticated with resources moving from agriculture and textiles into machinery, electronics, and assembly (Schott 2008; Xing 2014). China's industry structure upgraded as the economy developed, which increased the demand for skilled labor. But its exports declined sharply following the global financial crisis after 2007.

On the supply side, hundreds of millions of migrant workers from rural China entered the urban labor market, helping to keep the unskilled wage at a low level. This was despite the hindrance of the household registration system (or *hukou*), which was established in the 1950s to control migration and had been reformed to be less restrictive since the 1980s, but not abolished. The supply of skilled workers also increased, but the amount was relatively small before the early 2000s. During this period, there was rapid wage growth and a widening wage gap in a number of dimensions, such as in education, gender, region, industry, occupation, and unobservable abilities (Chen, Wang, and Wei 2004; Xing and Li 2012; Meng, Shen, and Xue 2013).

It is of particular interest to investigate the changes in wage structure after 2007. The global financial crisis and the sovereign debt crisis in Europe constituted major negative shocks on the export sector of China. Some also believe that, since this period, China is doomed to experience a trajectory of low growth after more than three decades of high growth. On the supply side, by 2013, the number of newly graduated college students had reached around 7 million annually as a result of a continuous expansion in higher education. Meanwhile, low-skilled workers (mainly rural to urban migrants) have become increasingly reluctant to migrate long distances to coastal China. In this context, it is of particular interest to investigate how the wages of skilled versus unskilled workers evolved in recent years and to investigate this evolution by region. For consideration of unobservable skills, we investigate residual wage inequality.

3. Data and descriptive statistics

We use the urban part of the four waves (in 1995, 2002, 2007, and 2013) of the CHIPS in this study. The first two rounds of the survey were conducted by the Chinese Academy of Social Sciences in cooperation with the National Bureau of Statistics (NBS) and the last two

Table 1. Summary statistics

	1995	2002	2007	2013
Age (%)				
16–25 years	10.85	6.87	5.82	7.85
26–35 years	25.84	22.52	22.05	26.77
36–45 years	40.46	37.56	40.71	34.71
46–55 years	19.43	29.8	27.16	25.64
56–60 years	3.42	3.25	4.26	5.02
Education (%)				
Elementary school or below	5.05	2.23	1.57	3.87
Middle school	29.97	22.74	16.64	22.22
High school	41.52	41.09	36.97	30.55
Professional school	15.68	23.22	27.88	20.78
College	7.78	10.63	16.93	22.58
Region (%)				
Eastern region	37.5	47.87	36.01	48.77
Middle region	34.88	29.96	33.71	32.06
Western region	27.62	22.17	30.28	19.18
Manufacturing industry (%)	41.45	26.02	21.13	17.06
No. of obs.	10,996	9,500	9,732	6,265

Source: *China Household Income Project Survey (CHIPS) for 1995, 2002, 2007, and 2013.*

Note: *The eastern region includes Beijing, Liaoning, Jiangsu, and Guangdong; the central region includes Shanxi, Anhui, Henan, and Hubei; the western region includes Chongqing, Sichuan, Yunnan, and Gansu.*

were conducted by China Institute for Income Distribution (CIID) and NBS. The data used in this paper cover 12 provinces in all waves including Beijing, Shanxi, Liaoning, Jiangsu, Anhui, Henan, Hubei, Guangdong, Chongqing, Sichuan, Yunnan, and Gansu. We include only employed persons (aged 16–60 years) with positive wages in the sample, and consider the total annual wage of workers, which includes basic wages, bonuses, allowances, and social insurance premium paid by individuals. Social insurance payments contributed by employers are deducted from the wage bill. The wages are adjusted to 2013 prices using provincial urban consumer price index.

Table 1 reports the descriptive statistics of the sample. One major feature is the rapidly increasing education level. In 1995, college-educated workers accounted for less than 8 percent of the urban labor force, and in 2013 the share reached 23 percent, suggesting that higher education expansion significantly changed the composition of the labor force in urban China.

Table 2 describes the wage distribution and its changes. Between 1995 and 2013, the mean wage increased by 1.4 in natural log, an average of 7.8 percent annual increase in log wages. The wage increase in the higher percentiles was larger than in the lower percentiles, leading to increased wage inequality between 1995 and 2013.[1] The growth in inequality was the largest between 1995 and 2002 and was the smallest between 2007 and 2013. A

1 The variance of log wages decreased between 2002 and 2007, probably because variance is more sensitive to outliers than percentile difference and the Gini coefficient.

Table 2. Means, deciles, variances, and residual of log wages, 1995–2013

	1995	2002	2007	2013
A				
Mean	8.954	9.478	9.994	10.369
Median	8.996	9.551	10.016	10.437
P50–10	0.714	0.884	0.921	0.961
P90–50	0.580	0.713	0.858	0.862
P90–10	1.293	1.597	1.779	1.823
Variance	0.325	0.523	0.492	0.721
B: Residual				
P50–10	0.548	0.737	0.713	0.781
P90–50	0.495	0.603	0.656	0.679
P90–10	1.043	1.340	1.369	1.460
Variance	0.223	0.394	0.323	0.529

Source: *China Household Income Project Survey (CHIPS) for 1995, 2002, 2007, and 2013.*

Note: *Residual is calculated by running regressions for each year of log of wages on education, experience, experience squared, gender, the interactions between education and experience, between education and experience squared, between education and gender, between gender and experience, and province dummies, and then to predict residuals.*

closer examination reveals that wage inequality was larger at the lower half of the distribution throughout the studied period; wage inequalities in the upper half (p90–p50) increased faster between 1995 and 2002 but changed only slightly between 2007 and 2013. In a detailed description reported in Li, Wu, and Xing (2016), the wage gaps in education, region, age, and gender changed considerably as well between 1995 and 2013.

4. Wage determination, the returns to education, and residual wage inequality

4.1 Wage determination and the returns to education

How did the changes in relative wages in education, age (or experience), region, gender, and other aspects contribute to the evolution of wage inequality? We estimate a Mincerian wage equation to address these questions, assuming that the wages are determined by years of schooling (*Schooling*), experience (*Exp*), experience squared (*Exp2*), gender (*Male*), region, as well as idiosyncratic factors.[2] The model is as follows:

$$\ln wage = \beta_0 + \beta_1 Schooling + \beta_2 Exp + \beta_3 Exp2 + \gamma X + \varepsilon. \quad (1)$$

We estimate the wage equation for each year using ordinary least squares (OLS) regressions. The results reported in Table 3 suggest that the wage gap between men and women has increased significantly. By 2013, female workers earn 30 percent less than male workers

2 It is worth mentioning that we are estimating the private returns to education rather than the social or external returns as in Fan, Ma, and Wang (2015).

Table 3. Wage equations, OLS

	(1) 1995	(2) 2002	(3) 2007	(4) 2013	(5) 1995	(6) 2002	(7) 2007	(8) 2013
	Baseline				More controls			
Schooling	0.049	0.089	0.108	0.106	0.030	0.041	0.072	0.075
	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.004)
Male	0.126	0.208	0.256	0.295	0.096	0.157	0.231	0.250
	(0.009)	(0.014)	(0.012)	(0.019)	(0.010)	(0.013)	(0.012)	(0.020)
Exp	0.048	0.046	0.041	0.067	0.048	0.043	0.039	0.064
	(0.002)	(0.003)	(0.002)	(0.004)	(0.002)	(0.003)	(0.002)	(0.003)
Exp2	−0.072	−0.073	−0.066	−0.128	−0.075	−0.081	−0.070	−0.128
	(0.004)	(0.007)	(0.005)	(0.008)	(0.004)	(0.006)	(0.005)	(0.008)
Obs	10,996	9,500	9,732	6,265	10,372	9,217	9,730	6,116
R^2	0.301	0.213	0.330	0.246	0.344	0.320	0.391	0.302

Source: *China Household Income Project Survey (CHIPS) for 1995, 2002, 2007, and 2013.*

Note: *In the baseline regressions (columns (1–4)), we regress log of wages on years of schooling (Schooling), gender (Male), experience (Exp), experience squared (Exp2), and province dummies. For columns (5–8), we control for more variables including the industry dummies, occupation dummies, and ownership dummies. Standard errors are reported in parentheses.*

annually, compared with a gap of 13 percent in 1995. The regression results confirm our findings in Section 3 that whereas wage growth for younger workers is higher in 2013 than in other years, the wage decline for older workers is also more dramatic.

The return to education increased from 5 percent in 1995 to 9 percent in 2002 and to 11 percent in 2007, largely consistent with previous studies. With an increasing number of college graduates entering the labor market, it may have been expected that the return to education would decline since the late 2000s. This is not supported by empirical evidence: The return to education is high at 11 percent in 2013. The return to education declines after we control for industry, ownership, and occupation, as education is correlated with job characteristics. Nevertheless, the increasing trend and a relatively high return in 2013 are still observed. One may argue that educated workers entering the labor market recently are young, and so will have a larger impact on the returns to education of the younger cohorts. To address this concern, we separate the sample into two age groups (those aged below and above 35 years), and the results do not change much.[3]

Another concern is that the return to education may be nonlinear in years of schooling: A high return to years of schooling may possibly be caused by the high returns to low education levels (middle school relative to primary school, for example). Table 4 reports the returns by education levels. All are estimated by using high school graduates as the reference group, controlling for experience, gender, and region. The returns to college actually increased between 2007 and 2013. It is the professional school graduates that experienced a slight decrease in returns. The relative wage disadvantage of the middle school graduates

3 The results for different age groups are not reported to save space and are available upon request.

Table 4. Relative (log) wages using high school as reference group

	1995	2002	2007	2013	1995	2002	2007	2013
College	0.268	0.570	0.631	0.671	0.191	0.317	0.446	0.508
Professional school	0.152	0.327	0.352	0.333	0.095	0.166	0.239	0.253
Middle school	−0.150	−0.293	−0.213	−0.223	−0.078	−0.143	−0.128	−0.149

Source: *China Household Income Project Survey (CHIPS) for 1995, 2002, 2007, and 2013.*

Note: *The results are obtained by running regressions of log wages on dummies of education levels (college, professional school, middle school, and primary school and below), experience, experience squared, gender, and province dummies. High school is treated as the reference group in the regressions. The numbers reported herein are coefficients on the dummies of college, professional school, and middle school.*

Table 5. The returns to education by province (coefficients on years of schooling)

	Baseline regression				More controls			
Beijing*	0.039	0.077	0.123	0.142	0.021	0.033	0.091	0.106
Shanxi	0.052	0.071	0.079	0.065	0.034	0.020	0.059	0.053
Liaoning*	0.051	0.088	0.100	0.103	0.043	0.056	0.048	0.058
Jiangsu*	0.055	0.099	0.148	0.103	0.037	0.039	0.092	0.052
Anhui	0.045	0.106	0.072	0.098	0.021	0.063	0.044	0.057
Henan	0.064	0.084	0.084	0.093	0.034	0.040	0.050	0.074
Hubei	0.044	0.078	0.085	0.103	0.029	0.038	0.055	0.078
Guangdong*	0.036	0.100	0.140	0.149	0.017	0.059	0.100	0.103
Chongqing	–	0.083	0.090	0.059	–	0.039	0.063	0.022
Sichuan	0.047	0.090	0.120	0.105	0.023	0.040	0.073	0.065
Yunnan	0.043	0.079	0.112	0.136	0.024	0.022	0.078	0.095
Gansu	0.068	0.144	0.112	0.147	0.054	0.049	0.047	0.120

Source: *China Household Income Project Survey (CHIPS) for 1995, 2002, 2007, and 2013.*

Note: *For each province, we run an OLS regression to get the returns to years of schooling. We also control for experience, experience squared and gender. Coastal provinces are marked with an asterisk (*).*

first enlarged between 1995 and 2002 and then reduced afterwards. These patterns hold when we control for job characteristics and separate the samples by age.[4]

Finally, a growing literature emphasizes the need to estimate location specific wage equations (Black, Kolesnikova, and Taylor 2009). We therefore estimate the wage determination for each province, and the results as reported in Table 5 suggest that the returns to education vary significantly across regions. In 2013, for example, the return to education in Beijing is as high as 14.2 percent and it is only 6.5 percent in Shanxi. But there is no consistent evidence suggesting a declined return to education by 2013. This finding is consistent with Whalley and Xing (2014), who show that the returns to education increased significantly in coastal cities after 2002; it also is consistent with the finding that less-educated workers are more responsive to local demand shifts than educated workers (Luo and Xing 2016).

4 The results by age groups are not reported and are available upon request. It is also possible that the average ability of different demographic groups changed. But it is hard to evaluate this possibility.

Table 6. Within group wage inequality (the wage differential between the 90th and 10th percentiles) by age, gender, and education

	Female				Male			
	1995	2002	2007	2013	1995	2002	2007	2013
Aged 16–30 years								
Middle school	1.39	1.52	1.50	1.65	1.26	1.35	1.58	2.20
High school	1.34	1.27	1.29	1.61	1.33	1.47	1.30	1.70
Professional school	1.09	1.32	1.35	1.44	1.11	1.42	1.37	1.52
College	1.02	1.30	1.47	1.40	1.05	1.35	1.37	1.74
Aged 31–45 years								
Middle school	0.97	1.57	1.44	1.29	1.03	1.36	1.39	1.50
High school	1.03	1.36	1.46	1.46	0.93	1.16	1.44	1.41
Professional school	0.89	1.19	1.27	1.44	0.79	1.09	1.24	1.29
College	0.78	1.15	1.00	1.12	0.75	1.13	1.16	1.18
Aged 46–60 years								
Middle school	1.35	1.57	1.51	1.73	1.10	1.37	1.44	1.51
High school	0.99	1.53	1.59	1.84	0.95	1.33	1.37	1.61
Professional school	0.71	1.29	1.45	1.87	0.85	1.27	1.36	1.33
College	0.88	1.63	1.05	1.31	0.83	1.04	1.19	0.97

Source: *China Household Income Project Survey (CHIPS) for 1995, 2002, 2007, and 2013.*

Note: *We run regressions for each year of log of wages on education, experience, experience squared, gender, the interactions between education and experience, between education and experience squared, between education and gender, between gender and experience, province dummies, and the interactions between province dummies and education dummies, gender, and experience to get the residuals. The residuals are used to calculated the within-group inequality.*

4.2 Residual wage inequality

To examine residual wage inequality, that is, inequality that cannot be explained by the between group gaps or the group inequality within the observably identical groups (within-group inequality), we first run OLS regressions of log wages on education levels, gender, experience, experience squared, their interactions, and region dummies, and then predict the residuals, the distribution of which is presented in panel (B) in Table 2.[5] The results show that, after partialling out the cross-group gaps, inequality remained high and increasing between 1995 and 2013. The variances of the residuals were around two-thirds of the total variances. The wage differentials between different percentiles also remain large.

The residual wage inequality in Table 2 is for the whole sample of each year, which is the weighted sum of the within group wage inequality of various groups. We next report the within group wage inequality, which is measured using the differential between the 90th and 10th percentiles of the wage distribution for different groups defined by gender, age, and education (see Table 6). As the share of observations with primary school degrees is low, we omit this group. Several important points emerge. First, residual wage inequality increased in most groups between 1995 and 2013. Second, within-group inequalities in the low education groups are generally higher than those in the high education groups. This is in strong contrast with the pattern in United States, where within group inequality is higher for high-education groups than for the low education groups. The Chinese pattern

5 Although the regional difference in the returns to education is significant, adding the interactions between education and regional dummies do not change the residual wage inequality much.

Table 7. Regression-based inequality decompositions, Murdoch and Sicular (2002)

	1995	2002	2007	2013
Gini coefficient	0.2904	0.3309	0.3672	0.378
Contribution by (%)				
Education	**4.9**	**7.44**	**10.81**	**13.97**
Male	1.71	1.97	3.26	3.48
Experience	11.09	2.68	1.34	2.02
Province	17.12	10.01	17.48	7.83
Ownership	2.25	2.64	3.15	6.49
Industry	1.03	5.97	2.89	2.83
Occupation	0.84	8.93	3.83	4.48
Residual	61.07	60.36	57.24	58.91

Source: *China Household Income Project Survey (CHIPS) for 1995, 2002, 2007, and 2013.*

Note: *The decomposition is performed after we run regressions of wages on years of schooling, gender dummy, experience and experience squared, province dummies, industry dummies, and occupation dummies.*

has been changing, however. The evidence here suggests that within-group inequalities in the high education groups grow faster than those in the low education groups, which is most obvious for the middle aged (31–45) individuals with below college degrees.

5. Education and wage inequality

How do education and other factors contribute to wage inequality, which has increased from a Gini coefficient of 0.29 in 1995 to 0.38 in 2013? As the distribution of education among the sample also matters, the returns to education alone is insufficient to answer this question. We therefore use the regression-based decomposition proposed by Morduch and Sicular (2002) to assess the relative importance of different factors in shaping the wage inequality. Morduch and Sicular propose that the regression results can be used to calculate the income flows attributed to personal characteristics (education, for example), and their contributions to wage inequality can then be calculated using methods of decomposition by income sources.

As reported in Table 7, education plays an increasingly important role in shaping wage inequality. In 1995, education alone explains less than 5 percent of the total wage inequality; by 2013, it explains nearly 14 percent of the Gini coefficient. The regional factor is an important contributor as well, but its importance varies considerably. Between 2002 and 2007, its contribution to wage inequality increased significantly; but in the following period, its contribution declined sharply. Industry also plays an increasingly important role in determining wage inequality. Our results show that gender and ownership have become increasingly important in determining wage inequality, but their contributions are still relatively small. It is also obvious that unobserved factors (captured in the residual) contribute significantly to wage inequality.

Although both the between-group wage gaps (the price effect) and the changes in the relative shares of different groups (the composition effect) can contribute to the rise in wage inequality, Li, Wu, and Xing (2016) show that the increase in wage inequality is mainly due to the price effect. This conclusion is consistent with earlier studies, which show that the increased skill price is the main reason for the increase in wage inequality in urban China since the mid 1990s. But why did the returns to education remain high in recent years despite the large-scaled expansion in higher education? We provide two possible explanations.

First, although higher education expanded and the share of college graduates in the urban workforce increased significantly, the share of workers with tertiary degrees in China's total working age population is still low. According to the population census data for 2010, the share of college graduates in the population aged 22–60 years was only 11 percent. The share of college graduates or college students was 28 percent for those aged 20 in 2010, the highest among all ages. This share will probably increase for the younger cohorts, which will definitely increase the human capital level of China's workforce. But, for China to improve its human capital level through education expansion, it must overcome the effects of its family planning policy. The younger population has witnessed the greatest effect of this policy. The increase in the human capital level of the labor force through education expansion will thus be slower than in a society with a larger young population.

To assess the extent of higher education expansion and its association with wage inequality, it is of particular interest to compare contemporary China in the last two decades with South Korea in the 1970–80s. South Korea grew rapidly between 1971 and 1988, with annual growth of GDP per capita of 7.4 percent. Unlike China, however, South Korea's wage inequality decreased dramatically during that period. The wage ratio between the 90th and 10th percentiles for working age men decreased from 5.4 in 1971 to 3.4 in 1989. Kim and Topel (1992) show that the decline in wage inequality was mainly caused by the increasing relative supply of skilled workers. In less than two decades, the share of college graduates in the labor force increased by around 10 percent, and that of the high school graduates increased by over 20 percent—the change being more dramatic than what has happened in China. Compared with South Korea, China's higher education expansion today is not extraordinary. It may just take longer for education expansion to reduce wage inequality.

Second, given the labor force composition, how workers of different education levels are allocated is also important. In Section 4.1, we showed that the returns to education remained high particularly in coastal provinces, suggesting that the labor mobility of skilled workers is insufficient to meet the demand for skilled workers in those regions. Luo and Xing (2016) show that skilled workers are less responsive to the demand shocks than unskilled workers, which limits the decline in returns to education in coastal regions. We

argue that the educated workers who are more likely to have a non-agricultural *hukou* status are less responsive to demand shocks than less-educated workers because their migration costs are usually high. For educated workers who do not have a local *hukou* at the destination city, they not only need to give up decent and secure jobs in their origin cities, but often sacrifice social benefits bonded with an official *hukou* registration. In contrast, for less-educated rural workers who migrate for better paying jobs without obtaining local *hukou* status, they would have engaged in farming jobs with low incomes had they not migrated.

6. Conclusions

The Chinese economy has experienced tremendous structural change since the late 1990s, which has had a significant impact on the labor market and wage structure. In this paper, we use CHIP data from 1995 to 2013 to show that the wage gap between individuals of different education levels increased significantly since the mid 1990s, and education played an increasingly larger role in shaping wage inequality in urban China and especially in coastal regions. The inflow of college educated workers seems insufficient to reduce the educational wage gap, and the mobility of the educated has been insufficient to reduce the high returns in specific regions.

These results have several policy implications. First, China's higher education should be further expanded. In 2010, only 10 percent of the working age population had degrees of tertiary education. Thus the human capital level should be greatly improved through expansion not only in higher education but in high schools. One challenge for further education expansion is the rising unemployment rate among young college graduates. As their unemployment duration is generally short, however, the expected return to college would not be reduced substantially. Second, because a large share of the population already in the workforce (that is, the old cohorts) are of low education levels, the government should provide training to upgrade their skills.

Third, to equalize the gap in the educational wage gap across regions, restrictions on the mobility of educated workers should be removed. Making social welfare (like medical insurance and pension) portable is the right direction for reform. Such reforms often require complementary reform of China's *hukou* system.

Finally, an increased inequality within the educated group could be a reflection of many forces, such as heterogeneity of individual abilities, rising skill prices, the inequality in value-added provided by higher education institutions of different tiers, a larger role of luck, and variation in employer–employee matching quality. Further studies on this aspect are needed for clear policy implications.

References

Black, Dan, Natalia Kolesnikova, and Lowell Taylor. 2009. Earnings Functions When Wages and Prices Vary by Location. *Journal of Labor Economics 27*(1):21–47.

Chen, Yuyu, Zhigang Wang, and Zhong Wei. 2004. Earnings Inequality and its Evolution in the 1990s in Urban China [in Chinese]. *Economic Science (JingjiKexue) 2004*(4):16–25.

Fan, Wen, Yuanyuan Ma, and Liming Wang. 2015. Do We Need More Public Investment in Higher Education? Estimating the External Returns to Higher Education in China. *Asian Economic Papers 14*(3):88–104.

Kim, Dae-Il, and Robert Topel. 1992. Labor Markets and Economic Growth: Lessons from Korea's Industrialization, 1970–1990. In: *Differences and Changes in Wage Structures*, edited by R. B. Freeman and L. F. Katz, pp. 227–264. Chicago: University of Chicago Press.

Li, Shi, and Terry Sicular. 2014. The Distribution of Household Income in China: Inequality, Poverty and Policies. *The China Quarterly 217*:1–41.

Li, Shi, Shanshan Wu, and Chunbing Xing. 2016. Wage Growth, Wage Inequality, and Structural Change. CIID Working Paper No. 51. Beijing: China Institute of Income Distribution.

Luo, Dongdong, and Chunbing Xing. 2016. Population Adjustments in Response to Local Demand Shifts in China. *Journal of Housing Economics 33*(2016):101–114.

Meng, Xin, Kailing Shen, and Sen Xue. 2013. Economic Reform, Education Expansion, and Earnings Inequality for Urban Males in China, 1988–2009. *Journal of Comparative Economics 41*(1):227–244.

Morduch, Jonathan, and Terry Sicular, 2002. Rethinking Inequality Decomposition, with Evidence from Rural China. *The Economic Journal 112*(476):93–106.

Schott, Peter. 2008. The Relative Sophistication of Chinese Exports. *Economic Policy 23*(53):6–49.

Whalley, John, and Chunbing Xing. 2014. The Regional Distribution of Skill Premia in Urban China: Implications for Growth and Inequality. *International Labour Review 153*(3):395–419.

Xing, Chunbing, and Shi Li. 2012. Residual Wage Inequality in Urban China, 1995–2007. *China Economic Review 23*(2):205–222.

Xing, Yuqing. 2014. China's High-Tech Exports: The Myth and Reality. *Asian Economic Papers 13*(1):109–123.