

Does Education Expansion Affect the Returns to Education in Urban China?



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Abstract Educational expansion has become a global trend over the past decades, and its negative impact on the returns to education has been found in developed countries. However, an opposite conclusion is drawn in some developing countries. An analysis of China indicates that different from what has been found in developed countries and some developing countries, education expansion in China has neither a positive impact nor a negative impact on the returns to education. As far as the countries in the period of market transition are concerned, with the maturity of the market and the growth of the economy, the impact of education expansion on the returns to education will pass three periods: the rising period, the period of no significant impact, and the falling period. Compared with developed countries and some developing countries, China is now in the middle period. This indicates that with the maturity of the market economy and the growth of economy, continuous and excessive education expansion in China is likely to result in a decrease in the returns to education.

Keywords Education expansion · Returns to education · Developing country · Urban China

1 Introduction

Since the World War II, educational expansion has become a global trend, the proportion of graduates in the work force has risen dramatically in almost all developed countries over the last 20–40 years (Dolton and Vignoles 2000), and since 1960, the average developing country (gross) primary enrollments have risen from 66 to 100% and (gross) secondary enrollments from 14 to 40% (Pritchett 2001).

With the development and expansion of education, over-education or credential inflation has been the hot topic to study. Some researches in developed countries show that educational expansion alters the structure of supply and demand in labor market

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and then results in a decrease in the returns to education. By contrast, the researches in developing countries (especially those in the period of market transition) show that, with educational expansion, the returns to education still present a lasting and obviously increasing momentum over the past decade. It seems that educational expansion has a rather positive impact on the returns to education than negative one in developing countries.

Educational expansion and obvious increase in the returns to education co-existed in China in the past decades. Therefore, it will be a typical case to discuss the relationship between educational expansion and returns to education in developing countries. The main questions of our study are as follows: Does the educational expansion change the returns to education in urban China?

2 Educational Expansion and the Returns to Education in Developed and Developing Countries

The Human capital theory takes that receiving an education is an investment to human capital (Becker 1994) since education is associated with labor force outcomes, such as occupational status and earning (Bell 1973; Blau and Duncan 1967; Treiman 1970). However, the human capital theory does not well predict how the returns to education will change along with the educational expansion (Bol 2015). The popular view is that educational expansion will result in over-education or credential inflation and a further decrease in the returns to education. One of the perspectives on credential inflation as Štefánik (2014, p. 246) discussed based on Walrasian classical economic theory principle, “If we think of education as a good and of wage as the price of the good, we should be expecting the wage of workers with tertiary education to be declining relative to the average as a consequence of the TE expansion. This relative decline should be a reaction to the situation of increase in the supply of tertiary-educated workers caused by the TE expansion.” Freeman (1976), is nearly the first person who study on over-education and his study indicated that excess supply of graduates resulted in a significant decline of return to education in the US in the 1970s. Recently, decreasing in returns to education caused by education expansion has been found by a large number of empirical studies across many developed countries (Bernardi and Ballarino 2014; Dolton and Vignoles 2000; Fersterer and Winter-Ebmer 2003; Murillo et al. 2012; Wanner 2000). Another view of education inflation is developed from the “positional good” or “screening/signaling theory.” Different from the view that education is able to improve the work capacities of education receivers in the Human capital theory, this view holds that the educational level (credentials) does not necessarily reflect people’s productivity or actual skill; instead, it is a signal to employers to show their potential talents or capacities (Arrow 1973; Spence 1973, 1981). Because of this, employers will tend to hire receivers with a higher level of education under the circumstances of educational expansion and an increasing number of such receivers, and this determines the positions of different

credential holders when entering the labor market. According to this view, with the educational expansion, some credential holders enter into a comparatively lower position in the labor market and the corresponding returns to education are hence decreased. This conclusion is also proved by some recent researches, such as Van de Werfhorst (2009, 2011).

Most of those studies mentioned above concern developed countries. In terms of developing countries and post-socialist countries, there are some different findings. As Pritchett (2001) summarized, several studies from developing countries found that signaling effects of education are small. And the returns to education keep rising in many market transformation countries, which has been found in many market transforming countries, such as Russia (Brainerd 1998), Czech Republic (Chase 1998), Poland (Rutkowski 1996), Hungary (Kertesi and Köllő 2002). One popular explanation is, as Wu and Xie (2003) summarized, the transition of socialism has made the market instead of the state the mechanism to determine social stratification and further made the market competence (such as education) instead of political attribute the important factor to determine income.

Combing the researches in developed countries and some developing countries (in the period of transition), such conclusion can be drawn: In the preliminary stage of economic transition and the initial period of economic takeoff, the transition of a social system and thriving of the market have made the returns to education increase under the backdrop of educational expansion, due to lack of human capital. When the market economy becomes mature, the educational expansion will inevitably change the structure of supply and demand in the labor market as the economy develops, and over-expansion will inevitably result in the decrease of the returns to education. China's economy develops in a period between the above two stages, then what impact does China's educational expansion have on the returns to education?

3 The Changes of Returns to Education in China

As with other countries which went through market transition, China has low returns to education before market transition. In the phase of the planned economy, education levels do not have much influence on earnings; the raise of income is determined by seniority rather than work performance (Zhang et al. 2005). In the 1950s, China's returns to education were ranging from 5 to 6%; at the end of the "cultural revolution" (1966–1976), the returns to education were nearly 0; until 1994, the lower level of the returns to education did not show signs of rising (Fleisher and Wang 2005). Between the 1980s and the 1990s, urban China still adopted the planned economy, therefore, China's marginal returns to education before the 1990s were far below that of the United States, European countries and other developed countries and regions (Fang et al. 2012). For instance, in 1981, each additional year of education produced an increase of 2.5% in people's income in China; in 1987, 2.7% (Meng and Kidd 1997); in 1988, returns to education using the Mincer equation in the rural areas was 4.02% and urban areas 3.29% (Johnson and Chow 1997).

Since the 1990s, with the rapid growth of the market economy, people's earnings have been more affected by the market and the returns to education in China have been on the rise at a rapid rate (Heckman and Li 2004). From 1988 to 1995, net returns to education doubled for man and woman (Hauser and Xie 2005). The returns to education in China increased from 4.0% in 1988 to 10.2% in 2001 (Zhang et al. 2005). A recent research shows that in 1978, each additional year of education produced 2% raise of earnings, while in 1985, the number is 3.5%, 1990, 4.5%, 1995, 5.5%, 2000, 6.6% and 2005, 7.7% (Jansen and Wu 2012). As stated above, in the period of system transition and the initial period of economic development, the increase of returns to education can be viewed as the result of market transition and economic development. A similar conclusion is drawn in many developing countries (in the transition period) as mentioned above. This is because when a market-oriented system was adopted in determining earnings by the state, various potential factors, such as labor market, technological revolution emphasizing skills, an increase of trade, etc. have all resulted in the increasing demand for laborers with a special technique, and further resulted in the increase of the returns to education (Zhang et al. 2005).

In the meantime, China's education has expanded at a fast speed since the 1990s. For instance, in 1991, the gross enrollment rate of elementary schooling is 109.5%, primary schooling is 69.7%, secondary schooling (pre-occupational) is 23.9% and tertiary education is 3.5%; in 2000, the rates are respectively 104.6%, 88.6%, 38.2% and 12.5%; while in 2011, they are respectively 104.6%, 100.1%, 82.5% (full aperture) and 26.5%.¹ In the above discussion about the developed countries and in the mature market, expansion of education will alter the relationship between supply and demand of educated labor force in the labor market, and it, in turn, drives the returns to education in developed countries down. As such, what about China as it has rapid growth and forms a relatively mature market?

Notably, the individual wage, especially the wage of urban employees has increased at a rapid speed as China's economy develops (Fang and Yang 2011; Ge and Yang 2011; Meiyang 2010; Meng et al. 2013; Yang et al. 2010). It could be explained as Xin Meng et al. (2013) mentioned, when an economy shifts from an administratively determined wage system to a market-oriented one, rewards to both observed and unobserved skills increase. However, the increase in income is accompanied by the inequalities of income, which is determined by different systems of ownership, labor sectors and regions (Démurger et al. 2012; Fan et al. 2011; Ge and Yang 2014; Gustafsson and Shi 2002; Li et al. 2013; Shi and Renwei 2011; Yang et al. 2010). And some researchers attribute the uneven growth of income to the difference in access to markets (Kamal et al. 2012). The increase in wages and the differences in sectors and regions will also affect the returns to the skills of laborers. That is to say, the increase in wage and the differences in sectors and regions, as a result of market transition and economic development, can be viewed as the macro factors to affect the returns to education. Therefore, this study will include not only

¹Source of the data: Statistics by the Ministry of Education of the PRC over the years. (<https://old.moe.gov.cn/publicfiles/business/htmlfiles/moe/s8492/list.html>).

the educational expansion but also the increase of wage and its differences in sectors and regions as macro factors to be considered for the returns to education.

Based on the above, the returns to education may be influenced by the educational expansion, the marketization degree and economic development level. The impact of educational expansion on the returns to education is regulated by marketization degree and economic development level. The marketization degree and economic development level of China lies between that of the developed countries and some developing countries. Accordingly, the features of the impact of educational expansion on the returns to education should be different from that of the developed countries as well as that of some developing countries whose economy develops slower than China.

4 Data, Variables and Methods

The expansion of education presents in two ways: The rate of enrollment is improved at all stages, and the educational level of laborers has generally increased. The key of this study is the impact of educational expansion on returns to education, or in other words, the possible impact of educational expansion on the labor market. Therefore, the result of educational expansion can be indicated by laborers' average educational level in different periods. Similar to this, the increase of wages can also be measured by the average wages in different periods. As such, the issue of this study turns to the impact of two macro factors—educational expansion and increase of average wages—on individual earnings. The data in this study comes from five mass social surveys, including China Household Income Project (CHIP 1995, 2002) and China General Social Survey (CGSS 2005, 2008 and 2010).² The urban data of these five surveys are chosen for statistics analysis.

Hierarchical linear modeling (HLM) is a comparatively ideal tool for analysis of macro factors' impact on individual behaviors, for individuals embedded in macrostructures. HLM involves macro and minor factors at the same time. Due to the inadequacy of data in different periods containing both individual and macro information, the macro factors are usually lacking data, therefore, it is hard to observe the impact of macro factors on individual behaviors. As the data in this study only concern five periods of time, it is hard to observe the change of macro factors. But as average education level and average wage can be taken as the measure of change of macro factors, which alter with time as well as labor sectors and regions, we may therefore use time, sector and region to establish "macrostructure." Specifically, the data of these five surveys will be integrated together and each individual is classified

²China Household Income Project (CHIP) is a long-term survey conducted by China Institute for Income Distribution at Beijing Normal University. For its introduction and the data, please refer to: www.ciidbnu.org/chip/index.asp; China General Social Survey (CGSS) is a research project organized and conducted by Renmin University of China. For the introduction, please refer to: <https://www.chinagss.org/>.

through time, labor sector and region. Then we have 69 groups of “region-sector-time.” Though the word “establishing” the structure is used, the macrostructure with these groups is true and real, and the individual laborers are embedded in this “macro structure.” By this way, the average level of education and average income in these groups can reflect the changes at a macro level, so as to solve the inadequacy of observing data at the macro level. This helps to study the impact of macro factors (educational expansion and increase of average income) on individual behaviors (returns to education).

With respect to the analysis method, first, the Mincer equation (Mincer 1958) in linear regression is used to estimate the returns to education in urban China between 1995 and 2010. The model is shown in Eqs. (1) and (2).

$$\text{LNWAGE} = \beta_0 + \beta_1 * \text{EDUY} + \beta_2 * \text{EXP} + \beta_3 * \text{EXP}^2 + \varepsilon \quad (1)$$

$$\text{LNWAGE} = \beta_0 + \beta_1 * \text{EDUY} + \beta_2 * \text{EXP} + \beta_3 * \text{EXP}^2 + \sum \beta_i * X_i + \varepsilon \quad (2)$$

Equation (1) is the basic model of the Mincer Equation. LNWAGE refers to the natural logarithm of respondent’s monthly wages (changing to currency in 2010 by Consumer Price Index, $\text{CPI}_{1978} = 100$); EDUY and EXP refer to education years and working experience of the respondent. Equation (2) is an extended model including control variables. It has 5 dichotomous variables: FEMAL (female = 1, male = 0), ETHNIC (ethnic groups, minorities = 1, others = 0), PARTY (Party members, member of Communist Party of China = 1), FULLTIME (full time job = 1, others = 0), STATEOWN (state-owned sectors = 1, others = 0).

Second, recording the changing average educational level and average wages of laborers in different periods, regions and labor sectors. The labor sectors are classified as party and government bodies and institutions, state-owned enterprises, collective enterprises, private enterprises and self-employed enterprises. The regions are classified as developed regions, moderately-developed regions and less developed regions according to the GDP per capita in each province in 2010. In this study, tertiary education enrollment rate will be taken as an example to show the alter of returns to education. By the way, the tertiary education enrollment rate is obtained from the almanac of statistics on education in China over the years and returns to education is the result calculated by the Mincer equation (results with and without control variables).

Last, Hierarchical Linear Model (HLM) will be used to analyze the impact of macro factors on returns to education. As stated above, the data of the five surveys will be integrated together and be classified in accordance with time, region and labor sector.³ The variables at the individual level and macro-level are shown in Table 1, among which, MEDU refers to the average year of schooling in each group aimed at

³Theoretically, we can have 75 (5 periods \times 5 labor sectors \times 3 regions) groups, but because 6 groups of them do not have enough samples (less than 30), so there are 69 groups analyzed in the model in the end.

Table 1 Data summary for HLM

Variables	N	Mean	SD	Min	Max
Individual level					
FAMLE	25,558	0.45	0.50	0.00	1.00
ETHNIC	25,558	0.05	0.21	0.00	1.00
PATRY	25,558	0.26	0.44	0.00	1.00
FULLTIME	25,558	0.90	0.30	0.00	1.00
EXP	25,558	19.34	9.75	0.00	52.00
EXPSQUAR	25,558	4.69	3.90	0.00	27.04
EDUY	25,558	11.32	3.00	0.00	24.00
LNWAGE	25,558	6.76	0.78		13.12
Group level					
MEDU	69	11.35	1.36	8.48	14.14
MCWAGE	69	1.54	0.90	0.39	5.14
DCWAGE	69	1.95	3.69	0.21	28.15

measure the effect of educational expansion. MCWAGE refers to the average wages in each group (unit: 1,000 yuan) and DCWAGE refers to the standard deviation of average wages in different groups. These two variables are measures for the outcome of economic development and macro-control variables to observe the impact on individual incomes.

5 Analysis and Results

5.1 *The Increase of Returns to Education*

The above literature review reveals that the returns to education in urban China have increased at a rapid rate since the 1990s, and this conclusion is proved by our statistical analysis. The result in Table 2 shows that the returns to education in urban China have a prominent increase. The basic model of the Mincer equation shows that the rate of return to education in urban China is 4.8% in 1995, 8.0% in 2002, 9.6% in 2005, 9.5% in 2008 and 13.2% in 2010. When putting control variables into consideration, as shown in the expanded model in Table 2, the rate of return to education in each year seems to go down, but the overall trend remains the same. The rate of returns to education increases from 3.7% in 1995 to 8.9% in 2010. The expanded model of Table 2 also shows that: The female and the minority groups have comparatively lower wages; party membership had a positive impact on wages in the initial period, but have no significant impact since 2005; the state-owned sector had a positive impact on wages before 2002, but had a negative impact in the model of

Table 2 OLS regressions on LNWAGE^a

	1995		2002		2005		2008		2010		Pooled	
	1	2	3	4	5	6	7	8	9	10	11	12 ^b
(Constant)	5.187*** (0.030)	5.241*** (0.041)	5.500*** (0.037)	5.649*** (0.049)	5.993*** (0.076)	5.880*** (0.078)	6.146*** (0.121)	6.073*** (0.144)	5.674*** (0.099)	5.775*** (0.140)	5.314*** (0.025)	5.392*** (0.028)
EDUY	0.048*** (0.002)	0.037*** (0.002)	0.080*** (0.002)	0.065*** (0.003)	0.096*** (0.005)	0.089*** (0.005)	0.095*** (0.007)	0.092*** (0.008)	0.132*** (0.006)	0.127*** (0.007)	0.095*** (0.002)	0.089*** (0.002)
EXP	0.051*** (0.002)	0.051*** (0.002)	0.030*** (0.003)	0.026*** (0.003)	-0.012** (0.005)	-0.008* (0.005)	0.009 (0.007)	0.011 (0.007)	0.017*** (0.006)	0.016*** (0.006)	0.023*** (0.002)	0.023*** (0.002)
EXP ² /100	-0.071*** (0.005)	-0.079*** (0.005)	-0.023*** (0.006)	-0.030*** (0.008)	0.045*** (0.012)	0.034*** (0.012)	-0.009 (0.019)	-0.019 (0.019)	-0.025* (0.014)	-0.033** (0.015)	-0.014*** (0.004)	-0.020*** (0.004)
FEMALE	-	-0.109*** (0.012)	-	-0.175*** (0.017)	-	-0.182*** (0.027)	-	-0.188*** (0.041)	-	-0.293*** (0.039)	-	-0.160*** (0.028)
ETHNIC	-	-0.061** (0.027)	-	0.033 (0.042)	-	-0.190*** (0.063)	-	-0.212** (0.088)	-	-0.155** (0.072)	-	-0.021 (0.021)
PARTY	-	0.101*** (0.014)	-	0.101*** (0.021)	-	-0.029 (0.039)	-	0.077 (0.053)	-	0.044 (0.048)	-	0.065*** (0.011)
FULLTIME	-	-0.001 (0.033)	-	0.127*** (0.020)	-	0.431*** (0.038)	-	0.263*** (0.089)	-	0.185** (0.091)	-	0.086*** (0.002)
STATEOWN	-	0.155*** (0.015)	-	0.044*** (0.017)	-	-0.166*** (0.028)	-	-0.110** (0.043)	-	-0.038 (0.040)	-	-
N	11,045	10,903	9419	6252	2452	2452	1144	1126	1830	1617	25,890	25,612
Adjusted R ²	0.169	0.191	0.168	0.152	0.147	0.212	0.139	0.171	0.207	0.228	0.149	0.162

Note

*** $P < 0.001$, ** $P < 0.01$, * $P < 0.05$

^bIn order to compare with HLM analysis, "STATEOWN" didn't been put in this model

2005 and 2008, and have no significant impact in the model of 2010; the full-time job has a positive impact on wages since 2002.

The results of OLS regressions can only tell us the changing of returns to education over time, and what we interested is educational expansion and its' impact on the returns to education. In other words, we want to predict the variation of the β coefficient of education in Mincer's equation with factors of macro environment, and take the β coefficient of education as an outcome variable. Before that, a description of the changes of the background in the macro respect from 1995 to 2010 will be conducted.

5.2 Changes in the Macro Context: Educational Expansion and Wage Growth

Since the 1990s, China's education has developed at a rapid speed and tertiary education has significantly expanded after the late 1990s. The gross enrollment rate of tertiary education increased from 7.2% in 1995 to 26.5% in 2010.⁴ Particularly, during 1995 and 2010, as the gross enrollment rate of tertiary education increased rapidly, returns to education present a robust momentum of growth. This is likely to indicate the negative impact on returns to education by extension of education that existed in some developed counties did not appear in China. Instead, the conclusion in some developing countries seems to apply in China, which shows that the extension of education has a positive impact on returns to education. But this remains to be testified (see Fig. 1).

In order to observe the variation of the results of educational expansion and its' impact on the returns to education, theoretically, enough time points and large time-series data sets are needed. In fact, this kind of data sets which contain both individual and macro information lacks in China. One of the results of educational expansion is the increase of average education level in society, and it also can be shown as a difference of average education in a society among times. The difference of laborers' average education among different regions, years and labor sectors make it possible that we can use the variation of average education in different region-sector-year groups (which real exist social units) to simulate the variation of average education in a society among times. The difference in laborers' average education among different regions, years and labor sectors have been testified by many studies, and also testified by our data set.⁵ For instance, the average years of schooling for laborers raised from 10.76 of 1995 to 12.71 of 2010; the average years of schooling for laborers in Party and government bodies raised from 12.16 of 1995 to 13.88 of 2010; that of the

⁴Source of data: the official website of the Ministry of Education (MOE). (<https://www.moe.gov.cn/publicfiles/business/htmlfiles/moe/s8493/201412/181724.html>).

⁵Due to the limit requirement of words, this thesis has omitted the detailed results of the differences of years of schooling, labor sectors and regions, as well as the differences in the periods, sectors and regions on the influence of laborers' income.

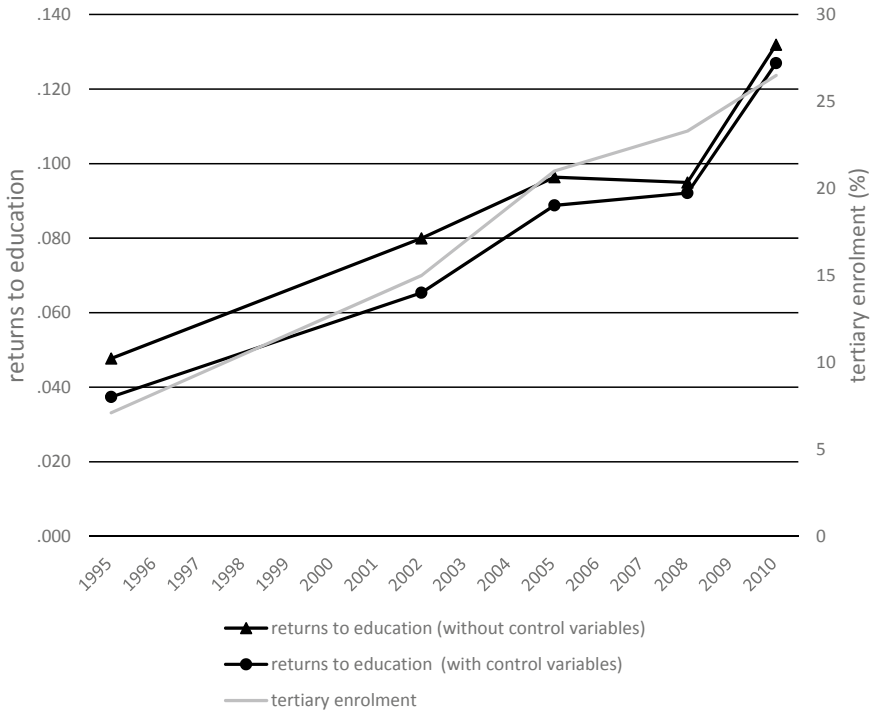


Fig. 1 Enrollment of tertiary education and the returns to education for urban employees. *Note* the data of tertiary enrolment come from the Ministry of Education of the People’s Republic of China (<https://www.moe.gov.cn/publicfiles/business/htmlfiles/moe/s8493/201412/181724.html>); and the rates of returns to education are the results in Table 2

self-employed raised from 10.76 of 1995 to 12.71 of 2010; that of the laborers in developed regions raised from 10.85 of 1995 to 13.19 of 2010; that of the laborers in less developed regions raised from 10.67 of 1995 to 12.42 of 2010.

Another macro factor this study focuses on is the changes (increasing) of average wages of the laborers as a result of economic development. The result of our analysis indicates that the average wage differs at a different time as well as in different regions and sectors. For instance, the result by sample analysis indicates that the average wage increased from 675.39 yuan of 1995 to 3, 011.31 yuan of 2010 (by the currency in 2010; similarly hereinafter); the average wage of laborers in Party and government bodies and institutions increased from 763.64 yuan of 1995 to 2,529.85 of 2010, and the average wage of laborers in private enterprises increased from 876.52 yuan of 1995 to 3,852.36 yuan of 2010; that of laborers in developed regions increased from 844.15 yuan of 1995 to 4,081.49 yuan of 2010 and that of laborers in less developed regions increased from 562.93 yuan of 1995 to 1,887.17 yuan of 2010. Given that the average wage alters with sectors, regions and year, we will, in the hierarchical linear model in the following passage, use the changes of the average wage in each

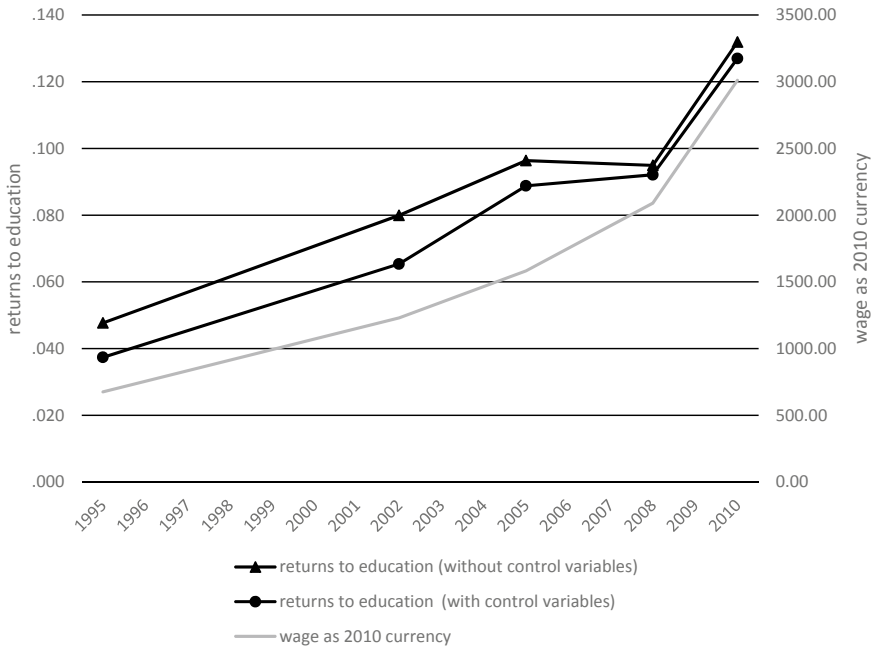


Fig. 2 Average wage and the returns to education for urban employees. *Note* the rates of returns to education is the results in Table 2, and the wage is calculated based on our data set

group classified by “region-sector-year” to simulate the alters of the average wage through time (to overcome the inadequate data of years).

So, what’s the relationship between the alter of the average wage and returns to education? Fig. 2 shows that the increase of average wage is synchronized with the increase of the returns to education. Combining with the result shown in Fig. 1, the increase of the returns to education may be resulted from the expansion of education or resulted from the increase of the average wage of laborers with the economy developing. And this is to be testified in this study.

5.3 The Results of Hierarchical Linear Models

The results in our OLS regressions suggest that the returns to education in urban China since the 1990s represent growth in a rapid speed, which is in line with the conclusions of other similar studies. Descriptive studies also indicate that Chia’s education has greatly expanded with the rapid growth of returns to education. Then, what’s the relationship between the expansion of education and the returns to education? As the expansion of education is a factor in the macro level while the returns to education concern the individual level, this study uses the hierarchical linear model to observe

Table 3 Equations of HLMs

Model	Level-1	Level-2
1	$LNWAGE = \beta_0 + r$	$\beta_0 = \gamma_{00}$
3		$\beta_0 = \gamma_{00} + u_0$
2	$LNWAGE = \beta_0 + \beta_1 FEMALE + \beta_2 ETHNIC + \beta_3 PARTY + \beta_4 FULLTIME + \beta_5 EXP + \beta_6 EXPSQUQRE + \beta_7 EDUY + r$	$\beta_{i0} = \gamma_{i0} (i = 1-7)$
4		$\beta_0 = \gamma_{00} + \mu_0$ $\beta_i = \gamma_{i0} + \mu_i (i = 1-7)$
5		$\beta_0 = \gamma_{00} + \gamma_{01} MCWAGE + \gamma_{02} DCWAGE + \mu_0$ $\beta_i = \gamma_{i0} + \mu_i (i = 1-6)$ $\beta_7 = \gamma_{70} + \gamma_{71} MEDU + \mu_7$
		6
7	$\beta_0 = \gamma_{00} + \gamma_{01} MCWAGE + \gamma_{02} DCWAGE + \mu_0$ $\beta_i = \gamma_{i0} + \mu_i (i = 1 \sim 6)$ $\beta_7 = \gamma_{70} + \gamma_{72} MCWAGE + \mu_7$	

the impact of macro factors on individual behaviors. According to the design of this study, educational expansion has led to the improvement of average years of schooling, therefore it uses the alters of years of schooling by groups to simulate the changes of educational level through time (education expansion); in the meantime, it uses the changes of the average wage, one of the results of economic development, as a controlling factor. The equations of level 1 and level 2 of the hierarchical linear model are shown in Table 3, and the analysis result is shown in Table 4.

To compare with the results of OLS regression, a fixed-effect model (regarding that the regression coefficients in level 1 do not vary with groups) will be applied to analyze the alters of labor wages (refer to Model 1 and 2 in Table 4). From Model 1 to Model 2, we can see that 16.2% $[(0.61248-0.51328)/0.61248 = 0.16196]$ of individual wage can be explained by the predictive variables at the individual level, which is consistent with the result of Model 12 of Table 2 by multiple linear regression (adjusted $R^2 = 0.162$ of Model 12 in Table 2).

Model 3 to Model 7 in Table 4 apply varying coefficient models (regarding that the regression coefficients in level 1 vary with groups). Among them, Model 3 is a null model, which has no predictive variables. It can be drawn from the variance components in Model 3 that 35.92% $[0.22471/(0.40092 + 0.22471) \times 100\% = 35.92\%]$ of the changes of individual wages can be explained by the factor of groups (factor in the macro level), 64.08% $(1-35.92\% = 64.08\%)$ of the changes of individual wages can be explained by the factor of individuals (factor in the micro-level).

Table 4 HLMs for the individual- and Group-level determinants of wage division^a

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Intercept β_0							
Intercept γ_{00}	6.763579*** (0.090926)	5.391369*** (0.138123)	6.967415*** (0.057142)	5.755604*** (0.057889)	5.273881*** (0.071200)	5.581281*** (0.073839)	5.544662*** (0.069491)
MCWAGE γ_{01}	-	-	-	-	0.377169*** (0.04311)	0.180882*** (0.051153)	0.219094*** (0.037669)
DCWAGE γ_{02}	-	-	-	-	0.040229*** (0.005863)	-0.039096*** (0.009405)	-0.050273*** (0.005841)
FEMALE β_1							
Intercept γ_{10}	-	-0.159745*** (0.021464)	-	-0.182424*** (0.014115)	-0.182072*** (0.013905)	-0.184253*** (0.014662)	-0.184067*** (0.014792)
ETHNIC β_2							
Intercept γ_{20}	-	-0.019961 (0.028174)	-	-0.088979*** (0.025082)	-0.093855*** (0.024923)	-0.094254*** (0.025188)	-0.093535*** (0.025162)
PARTY β_3							
Intercept γ_{30}	-	0.065639 (0.040558)	-	0.084605*** (0.016651)	0.079782*** (0.016838)	0.080285*** (0.016812)	0.081417*** (0.017215)
FULLTIME β_4							
Intercept γ_{40}	-	0.084081 (0.082396)	-	0.255119*** (0.033819)	0.247470*** (0.034176)	0.248740*** (0.033920)	0.247865*** (0.034107)
EXP β_5							
Intercept γ_{50}	-	0.022892*** (0.007268)	-	0.022663*** (0.003643)	0.022112*** (0.003579)	0.021834*** (0.003647)	0.021881*** (0.003659)
EXP ² /100 β_6							

(continued)

Table 4 (continued)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Intercept γ_0	-	-0.020993 (0.013975)	-	-0.037823*** (0.008829)	-0.037860*** 0.008638	-0.036773*** (0.008663)	-0.036906*** (0.008729)
EDUY β_7	-	-	-	-	-	-	-
Intercept γ_0	-	0.089003*** (0.010916)	-	0.069468*** (0.004614)	-0.000522 0.017385	0.017617 (0.016226)	0.028320*** (0.003524)
MEDU γ_1	-	-	-	-	0.006101*** 0.001528	0.000800 (0.001691)	-
MCWAGE γ_2	-	-	-	-	-	0.027987*** (0.005654)	0.025835*** (0.002423)
DCWAGE γ_3	-	-	-	-	-	-0.000908 (0.000961)	-
Variance Component ^b	-	-	-	-	-	-	-
Intercept μ_0	-	-	0.22471***	0.15643***	0.10341***	0.12026***	0.11196***
FEMALE μ_1	-	-	-	0.00856***	0.00833***	0.00864***	0.00880***
ETHNIC μ_2	-	-	-	0.01441***	0.01483***	0.01601***	0.01601***
PARTY μ_3	-	-	-	0.00803***	0.00876***	0.00928***	0.00932***
FULLTIME μ_4	-	-	-	0.04928***	0.05273***	0.05330***	0.05373***
EXP μ_5	-	-	-	0.00064***	0.00064***	0.00070***	0.00069***
EXPe ² /100 μ_6	-	-	-	0.00361***	0.00355***	0.00387***	0.00383***
EDUY μ_7	-	-	-	0.00118***	0.00100***	0.00045***	0.00044***
Level-1 r	0.61248	0.51328	0.40092	0.32638	0.32644	0.32642	0.32645
Level-1 obs	25,558						
Level-2 obs	69						

Note The numbers in the brackets are robust standard errors, *** $P < 0.001$, ** $P < 0.01$, * $P < 0.05$

In Model 4, level 1 has included the predictive variables at the individual level, while level 2 has no predictive variables. To lessen the impact of unknown factors, level 2 has divided the variation of slopes of each predictive variable in level 1 into intercept terms and stochastic terms, among which, intercept terms refer to the average slope of predictive variables in level 1 and stochastic terms refer to the variation of the slopes of these predictive variables. The result of the variance test indicates that all predictive variables at the individual level (including educational year “EDUY”) vary in level 2. This result means that, in each group, the predictive variables at the individual level have a different impact on the wages of individual workers (that is the slope is unfixed).

The emphasis of this study is the returns to education, this is the impact of the EDUY on wages. Based on the preliminary analysis in Model 4, it can be drawn that the EDUY’s impact on wages varies in different backgrounds (groups). Then, what factors can affect the impact? How are they working? As stated, this study focuses on the two factors which influence the returns to education, namely the effect of educational expansion (the variation of average educational level) and the increase of average wages brought by economic development. Therefore, in level 2 of Model 5, average MEDU is added to explain the variation of the slope of EDUY in level 1. It turns out that MEDU has a significant role in determining the slope of EDUY (in level 1). This means that the average educational level in each group affects the marginal returns to wages by the length of schooling: The higher the average educational level in one group, the greater marginal returns to wages by the length of schooling of these individuals in this group.

However, when adding average wages in each group which is “MCWAGE” and its difference which is “DCWAGE” as control variables in level 2 (see Model 6), the impact of the average educational level “MEDU” on the returns to education for individuals is not significant in terms of statistics, yet the average wage in each group has a significant impact on the returns to education for individuals. This outcome shows that the marginal utility of an individual’s length of schooling on wages is affected by the average wage of the group that this individual belongs. In other words, when the average wage of the group is high, the length of schooling of the individual in this group will also produce a high marginal utility on wages.

To simplify the results, the predictive variables without a significant role in level 2 are removed in Model 7. The variance components in Model 7 show that 61.71% $[(0.00118-0.00044)/0.00118 = 0.6271]$ of the alters of the individual’s returns to education (the slope of the variable of the length of schooling in level 1) can be explained by the “MCWAGE” in each variable group in level 2. Combining the findings in Model 5 to 7, we can see that what affects the individual’s returns to education in level 2 is the general increase in the average wages of laborers, rather than the general improvement of average educational level.

Based on the analysis result of Model 7, a figure about the impact of average wages on the returns to education is made as below (see Fig. 3).

From Fig. 3, the slopes of the EDUY in different situations are apparently different. The higher the average wages of the laborers, the steeper of the slope of the EDUY.

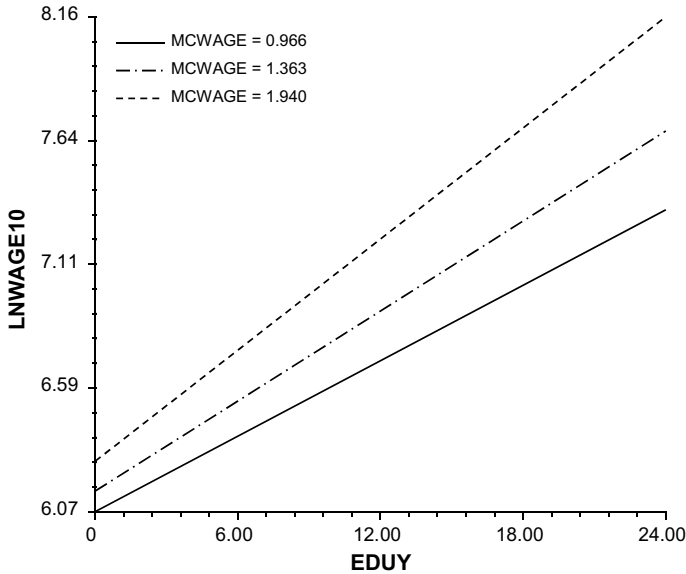


Fig. 3 The impact of average wages on the slope of education

That is to say, when the average wage is comparatively high, the marginal utility of the length of schooling on the wage is great.

6 Conclusions and Discussions

The focus of this study is about the relationship between educational expansion and the returns to education. The outcome of the OLS regression has again proved the conclusions of existing studies, which is the returns to education in urban China have greatly improved since the 1990s. But different from the previous studies which use the expansion of education only as a macro background, this study uses the hierarchical linear model to analyze the relationship between educational expansion and the individual's returns to education. It finds that the expansion of education in China has neither a positive impact nor a negative impact on the returns to education.

As we have reviewed, the expansion of education has a negative impact on the returns to education in developed countries, while in some developing countries (particularly those in market transition), the impact is not negative, but even positive. Regarding these different results, we think that for developing countries, particularly those in the period of market transition, they are in the period of market transition and the initial stage of economic thriving. On one hand, the emerging market system changes the old system of income distribution and makes the performance as the basis for deciding income; on the other hand, the introduction of a market system

has stimulated the development of the economy and boosted the need for a skilled workforce. Due to these two features in the transition period and the initial stage of economic thriving, the expansion of education in developing countries and particularly those in the period of market transition does not have a negative impact on the returns to education, instead, it has helped the increase of the returns to education. While for the developed countries, educational expansion alters the relationship of supply and demand or the signaling or positioning function of education in the labor market in the context of a mature market, so the over-expansion of education can result in the decrease of the returns to education.

As for China, its economy has developed considerably after 40 years' reform and opening up, and the market economy has basically formed. The level of China's economy is between the developed countries and some developing countries (in transition), therefore, the impact of educational expansion in China differs from both. This is testified by this study. The analysis of urban China by the method of the hierarchical linear model shows that, the increase of the average length of education as a result of educational expansion does not have a significant impact on the individual's returns to education from the statistics aspect, while the increase of average wages of laborers as one of the results of economic development, instead, has a great influence on the individual's returns to education. Furthermore, such a conclusion can be drawn: The educational expansion does not have a significant impact on the returns to education and the rising of the individual's returns to education is led by the development of the economy rather than the expansion of education.

If we take the impacts of educational expansion in developed countries and some developing countries as two extremes of a pair of the ideal type, then with the market transition and the maturity of the market, the impact of the educational expansion on individual's returns to education will experience three periods: the rising period, the period of no significant impact, and the falling period. This study indicates that the impact of educational expansion on the individual's returns to education in China lies between those of the developed countries and some developing countries, which is in the middle period. It is still a question to be considered and paid continuous attention to whether this middle period means the continuous and excessive educational expansion will result in the decrease in the returns to education with further maturity of China's market economy and further growth of the economy.

References

- Arrow, K. J. (1973). Higher education as a filter. *Journal of Public Economics*, 2(3), 193–216.
- Becker, G. S. (1994). *Human capital: A theoretical and empirical analysis, with special reference to education*. Chicago: The University of Chicago Press.
- Bell, D. (1973). *The coming of post-industrial society: A venture in social forecasting*. New York: Basic Books.
- Bernardi, F., & Ballarino, G. (2014). Participation, equality of opportunity and returns to tertiary education in contemporary Europe. *European Societies*, 16(3), 422–442. <https://doi.org/10.1080/14616696.2012.750729>.

- Blau, P. M., & Duncan, O. D. (1967). *The American occupational structure*. New York: Wiley.
- Bol, T. (2015). Has education become more positional? Educational expansion and labour market outcomes, 1985–2007. *Acta Sociologica*, 58(2), 1–15.
- Brainerd, E. (1998). Winners and losers in Russia's economic transition. *American Economic Review*, 88(5), 1094–1116.
- Chase, R. S. (1998). Markets for communist human capital: Returns to education and experience in the Czech Republic and Slovakia. *Industrial & Labor Relations Review*, 51(3), 401–423. 10.2307/2525115.
- Démurger, S., Li, S., & Yang, J. (2012). Earnings differentials between the public and private sectors in China: Exploring changes for urban local residents in the 2000s. *China Economic Review*, 23(1), 138–153.
- Dolton, P., & Vignoles, A. (2000). The incidence and effects of overeducation in the UK graduate labour market. *Economics of Education Review*, 19(2), 179–198. [https://doi.org/10.1016/S0272-7757\(97\)00036-8](https://doi.org/10.1016/S0272-7757(97)00036-8).
- Fan, S., Kanbur, R., & Zhang, X. (2011). China's regional disparities: Experience and policy. *Review of Development Finance*, 1(1), 47–56.
- Fang, C., & Yang, D. (2011). Wage increases, wage convergence, and the Lewis turning point in China. *China Economic Review*, 22(4), 601–610.
- Fang, H., Eggleston, K. N., Rizzo, J. A., Rozelle, S., & Zeckhauser, R. J. (2012). *The returns to education in China: Evidence from the 1986 compulsory education law*. National Bureau of Economic Research, Working Paper No. 18189.
- Fersterer, J., & Winter-Ebmer, R. (2003). Are Austrian returns to education falling over time? *Labour Economics*, 10(1), 73–89.
- Fleisher, B. M., & Wang, X. J. (2005). Returns to schooling in China under planning and reform. *Journal of Comparative Economics*, 33(2), 265–277. <https://doi.org/10.1016/j.jce.2005.03.006>.
- Freeman, R. (1976). *The overeducated American*. New York: Academic Press.
- Ge, S., & Yang, D. T. (2014). Changes in China's wage structure. *Journal of the European Economic Association*, 12(2), 300–336.
- Ge, S. Q., & Yang, D. T. (2011). Labor market developments in China: A neoclassical view. *China Economic Review*, 22(4), 611–625. <https://doi.org/10.1016/j.chieco.2011.07.003>.
- Gustafsson, B., & Shi, L. (2002). Income inequality within and across counties in rural China 1988 and 1995. *Journal of Development Economics*, 69(1), 179–204.
- Hauser, S. M., & Xie, Y. (2005). Temporal and regional variation in earnings inequality: urban China in transition between 1988 and 1995. *Social Science Research*, 34(1), 44–79. <https://doi.org/10.1016/j.ssresearch.2003.12.002>.
- Heckman, J. J., & Li, X. (2004). Selection bias, comparative advantage and heterogeneous returns to education: Evidence from China in 2000. *Pacific Economic Review*, 9(3), 155–171.
- Jansen, W., & Wu, X. G. (2012). Income inequality in urban China, 1978–2005. *Chinese Sociological Review*, 45(1), 3–27. <https://doi.org/10.2753/Csa2162-0555450101>.
- Johnson, E. N., & Chow, G. C. (1997). Rates of return to schooling in China. *Pacific Economic Review*, 2(2), 101–113.
- Kamal, F., Lovely, M. E., & Ouyang, P. (2012). Does deeper integration enhance spatial advantages? Market access and wage growth in China. *International Review of Economics & Finance*, 23, 59–74.
- Kertesi, G., & Köllő, J. (2002). Economic transformation and the revaluation of human capital—Hungary, 1986–1999. *Research in Labor Economics*, 21, 235–273.
- Li, S., Sato, H., & Sicular, T. (2013). *Rising inequality in China: Challenges to a harmonious Society*. Cambridge: Cambridge University Press.
- Meiyan, W. (2010). The rise of labor cost and the fall of labor input: Has China reached Lewis turning point? *China Economic Journal*, 3(2), 137–153.
- Meng, X., & Kidd, M. P. (1997). Labor market reform and the changing structure of wage determination in China's state sector during the 1980s. *Journal of Comparative Economics*, 25(3), 403–421. <https://doi.org/10.1006/jcec.1997.1481>.

- Meng, X., Shen, K., & Xue, S. (2013). Economic reform, education expansion, and earnings inequality for urban males in China, 1988–2009. *Journal of Comparative Economics*, 41(1), 227–244.
- Mincer, J. (1958). Investment in human-capital and personal income-distribution. *Journal of Political Economy*, 66(4), 281–302. <https://doi.org/10.1086/258055>.
- Murillo, I. P., Rahona-López, M., & del Mar Salinas-Jiménez, M. (2012). Effects of educational mismatch on private returns to education: An analysis of the Spanish case (1995–2006). *Journal of Policy Modeling*, 34(5), 646–659.
- Pritchett, L. (2001). Where has all the education gone? *The World Bank Economic Review*, 15(3), 367–391.
- Rutkowski, J. (1996). High skills pay off: The changing wage structure during economic transition in Poland. *Economics of Transition*, 4(1), 89–112.
- Shi, L., & Renwei, Z. (2011). Market reform and the widening of the income gap. *Social Sciences in China*, 32(2), 140–158.
- Spence, M. (1973). Job market signaling. *Quarterly Journal of Economics*, 87(3), 355–374. <https://doi.org/10.2307/1882010>.
- Spence, M. (1981). Signaling, screening, and information. In S. Rosen (Ed.), *Studies in labor markets* (pp. 319–358). Chicago: University of Chicago Press.
- Štefánik, M. (2014). European comparison of intergenerational differences in private returns to education in the context of tertiary education expansion. *Sociológia-Slovak Sociological Review*, 46(3), 243–260.
- Treiman, D. J. (1970). Industrialization and social stratification. *Sociological Inquiry*, 40(2), 207–234.
- Van de Werfhorst, H. G. (2009). Credential inflation and educational strategies: A comparison of the United States and the Netherlands. *Research in Social Stratification and Mobility*, 27(4), 269–284.
- Van de Werfhorst, H. G. (2011). Skills, positional good or social closure? The role of education across structural–institutional labour market settings. *Journal of Education and Work*, 24(5), 521–548.
- Wanner, R. A. (2000). A matter of degree (s): Twentieth-century trends in occupational status returns to educational credentials in Canada. *Canadian Review of Sociology/Revue Canadienne De Sociologie*, 37(3), 313–343.
- Wu, X., & Xie, Y. (2003). Does the market pay off? Earnings returns to education in urban China. *American Sociological Review*, 68(3), 425–442.
- Yang, D. T., Chen, V. W., & Monarch, R. (2010). Rising wages: Has China lost its global labor advantage? *Pacific Economic Review*, 15(4), 482–504.
- 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. <https://doi.org/10.1016/j.jce.2005.05.008>.