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A Reasonable Estimate of the Return on Human Capital Investment for Migrant Workers in China

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Abstract:

There are structural differences in the returns on human capital investment between migrant workers and urban domiciled labor in China, there because of the urban-rural segmentation of the labor market and extremely high mobility costs. These structural differences vary by marital status, age structure, and migration range, leading to the potential bias of using the traditional Mincer wage equation to estimate returns on human capital investment for migrant workers. An empirical study based on CFPS data supports the theory. This study enables a more reasonable understanding and estimation of the returns on human capital investment of Chinese migrant workers.

Keywords*: Chinese migrant workers, Return on human capital investment, Wage differences, Bias, Reasonable estimation.*

I. INTRODUCTION

Human capital is the capital embodied in workers, such as their knowledge and skills, cultural and technical level and health status. The most important of these is the expenditure on education, which forms educational capital. Education can improve the quality of the labor force, the work capacity and skill level of workers, and thus increase labor productivity [1]. Education is the most commonly used and easily available human capital variable, the level of return to education not only affects households' and individuals' education investment decisions, but is also an important indicator for our understanding of the labor market, and has important implications in both academic research and policy formulation. This paper examines how to more reasonably estimate the return on human capital investment for migrant workers in China's urban labor market by examining the changes in their returns to education.

Although a large body of literature has examined the returns to education of migrant workers, important features such as why the returns to education of migrant workers are significantly lower than those of urban residents and the existence of significant regional differences in the returns to education of migrant workers have not been effectively explained and analyzed:

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First, the return to education of migrant workers is low and significantly lower than that of urban residents and consistently lower than the world average [2-15]. Second, there are significant regional differences in the returns to education of migrant workers. However, for urban residents, the inter-provincial differences in returns to education are not significant [16-19].

The main explanations for these characteristics of the returns to education of migrant workers in China in the current literature are: first, the segmentation of urban and rural labor markets, which prevents migrant workers from allocating their human capital on a larger scale, reduces their returns to education and leads to differences in the returns to education between urban and rural areas [20,21]; second, for regional differences, some studies point out that they should be related to the existence of higher mobility costs for migrant workers. labor force preferences are also important influencing factors, but they are not elaborated [17]. Third, some other studies have argued that the differences in returns to education between urban and rural areas are largely due to differences in investment and quality of education between urban and rural areas [22].

The Mincer wage equation is the basic method used to measure the return to education by measuring the proportional increase in the present value of an individual's lifetime earnings with one additional year of education. But one of the premises of the Mincer wage equation is that wages reflect individual labor productivity differences and that the returns workers receive from their work are primarily reflected in the level of wages. These conditions can be satisfied only when the labor market is more competitive and the cost of labor mobility is low. The literature does not sufficiently consider the actual situation of urban-rural segmentation of China's labor market and extremely high labor mobility costs, and thus cannot effectively explain the characteristics of the returns on human capital investment of Chinese migrant workers.

This paper discusses the structural differences in the returns on human capital investment of migrant workers (varying by marital status, age structure, and migration range) in the context of the urban-rural segmentation of the labor market and high mobility costs, leading to possible problems in using the traditional Mincer wage equation to estimate the returns to education of migrant workers. The empirical study using the China Family Panel Studies (CFPS) database provides a good proof of the theoretical proposition proposed in this paper, and also points out the way to reasonably estimate the return on human capital investment of migrant workers.

II. CHARACTERISTICS OF NON-FARM LABOR SUPPLY OF MIGRANT WORKERS AND ITS IMPACT ON THE RETURN TO HUMAN CAPITAL INVESTMENT

For the estimation of individual educational returns, the Mincer wage equation is usually used for estimation, and the general form is:

$$\ln(Y) = a + bS + cEx + dEx^2 + e_i Z_i + \varepsilon \quad (1)$$

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In equation (1), Y is personal income, which is usually individual wage income, S is years of education, Ex is years of service which is the number of years worked by individual workers, the square of years of service reflects the inverse U relationship between years of service and earnings, and Z is a control variable because the variables affecting earnings are other relevant factors such as region, industry, and workplace in addition to education and years of service. For workers in general, equation (1) is the basic form to estimate their returns to education, but in the case of high mobility costs and still segmented labor market, the direct application of equation (1) to estimate the returns to education of Chinese migrant workers will result in estimation bias, because we must consider the following two factors when estimating the returns to education of migrant workers:

First, some institutional factors such as China's household registration system and land system make it difficult for migrant workers, especially those who move across districts, to move their families, and the workplace and residence of migrant workers cannot be transferred simultaneously.

Second, domestic work, family reunification and child care are of high value to married migrant workers and are important components of family utility, and the mobility costs of moving families are too high.

The implicit assumption of Eq. (1) is that labor is free to move and migrate, and such labor migration is naturally family migration, i.e., the workplace and the place of residence of the labor force are transferred simultaneously; however, when considering the two factors mentioned above, the assumption that labor is free to move and migrate is hardly valid, so we need to adjust Eq. (1) to fit the actual situation:

$$Y = \begin{cases} W_{whole} & cross-district\ non-farm\ employment \\ W_{part} + I & local\ non-farm\ employment \end{cases} \quad (2)$$

In equation (2), when a migrant worker chooses to work across regions, he faces a national labor market and receives a wage income of Wwhole. When a migrant worker chooses to work locally, he faces a regional labor market and receives a wage income of Wpart. However, because he can also take care of his family in local employment, he can also obtain utility I. It is also natural to assume in this paper that The paper also naturally assumes that migrant workers will naturally earn higher wages because they can choose their jobs in a wider range.

$$W_{whole} \geq W_{part} \quad (3)$$

For all migrant workers, there is no restriction on whether to choose inter-regional employment or local employment. Migrant workers are rational economic people who will consider the wage income and the utility of family care, and they choose local employment or inter-regional employment based on the consideration of maximizing family interests rather than maximizing wage income, so we naturally come to the understanding that:

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$$W_{part} + I \geq W_{whole} \quad (4)$$

Based on Eqs. (1) to (4), this paper naturally leads to several theoretical propositions:

(1) There are differences in the returns to education between migrant workers and urban household labor, with migrant workers having lower returns to education than urban household labor. The urban household labor force usually works and has a family in the same area, and there is no decrease in family utility due to participation in non-farm employment. In this case, individual laborers' returns to work are mainly reflected in wages; thus laborers with higher education level and higher labor productivity will choose jobs with higher wages, while those with lower education level and weaker labor productivity will only get jobs with lower wages. But those married migrant workers who are employed across districts are not always like this; laborers with high education level and strong work productivity will choose local non-agricultural employment jobs instead of foreign non-agricultural employment jobs with higher wages because of factors such as family reunion and domestic work, which reduces the return to education of migrant workers to some extent.

(2) Migrant workers' marital status affects their returns to education, and the returns to education for married workers are lower than those for unmarried workers. For an unmarried migrant worker, working outside the home does not reduce his family utility, so he faces a national labor market and can choose the location with the highest wages to improve his return to education; however, for a married migrant worker, considering the utility of family reunion and child care, he is more likely to choose to work locally with lower wages, although this can help higher overall utility, but this choice reduces the return to education.

(3) The return to education obtained by migrant workers in local non-farm employment is lower than that of cross-area employment. In addition, more married migrant workers will choose to work locally, which will also undoubtedly increase the labor supply of migrant workers and thus depress the local wage level. All these factors in general will reduce the return to education of locally employed migrant workers.

(4) Younger migrant workers have a higher return to education. Younger migrant workers have higher returns to education not because they are better educated or more capable, but as a derivative of proposition (2), because marriage and age are related, and the proportion of marriage and children is higher at older ages.

This paper would also like to emphasize that these four propositions mentioned above or these characteristics of migrant workers in terms of returns on human capital investment are different from those of urban domiciled workers.

III. EMPIRICAL EVIDENCE ON THE RETURNS TO HUMAN CAPITAL INVESTMENT OF MIGRANT WORKERS

This paper uses data from the China Family Panel Studies (CFPS), a project implemented by the Institute of Social Science Survey (ISSS) of Peking University, which covers 16,000 households in 25 provinces, municipalities and autonomous regions. The data includes three levels of individuals, families and communities, which can be regarded as a nationally representative sample.

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This paper first estimates the difference in returns to education between migrant workers and urban domiciled labor force based on household registration and marital status using the standard Mincer wage equation; the estimation results are detailed in Table 1.

$$\text{ilnwage}=\beta_0 + \beta_1 \times edu_i + \beta_2 \times exp_i + \beta_2 \times exp_i^2 + \varepsilon_i \quad (5)$$

TABLE I Results of The Mincer Wage Equation (Benchmark Model)

	RURAL HOUSEHOLD REGISTRATION			**URBAN HOUSEHOLD REGISTRATION**		
	FULL SAMPLE	**UNMARRIED**	**MARRIED**	**FULL SAMPLE**	**UNMARRIED**	**MARRIED**
EDUCATION	0.033***	0.047***	0.028***	0.076***	0.074***	0.076***
	(16.88)	(-11.13)	(-12.49)	(-32.84)	(-10.83)	(-30.89)
EXPERIENCE	0.037***	0.086***	0.001	-0.021***	0.040**	-0.035***
	(-7.39)	(-7.37)	(-0.2)	(-3.53)	(-2.53)	(-4.62)
EXPERIENCE SQUARED / 100	-0.052***	-0.120***	-0.01	0.032***	-0.057**	0.050***
	(-7.79)	(-6.90)	(-1.05)	-4.32	(-2.54)	-5.38
CONSTANTS	1.378***	0.456***	2.117***	1.882***	0.926***	2.181***
	-15.32	-2.62	-14.5	-16.33	-3.46	-13.78
R-SQUARED	0.0458	0.1001	0.0390	0.1176	0.0960	0.1250
N	8272	1938	6334	8338	1433	6905

* p<0.1, ** p<0.05 , *** p<0.01

However, in fact, in addition to education and work, gender differences, ownership differences, and regional differences also affect the returns to education [23], so we introduce the above-mentioned control variables in the standard Mincerian wage equation.

$$\text{ilnwage}=\beta_0 + \beta_1 \times edu_i + \beta_2 \times exp_i + \beta_2 \times exp_i^2 + \beta_3 \times X_i + \varepsilon_i \quad (6)$$

Whether rural workers are employed across districts may cause problems in sample selection, which in turn affects the results of Mincer's wage equation, and we consider the problem of sample selection bias based on equation (6). According to existing studies, the decision affecting rural residents' cross-district nonfarm work includes the following factors: individual factors such as age, gender, education, being married and party membership; household factors such as family size and number of children under 6 years old; and other factors such as region and time [24,25].

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$$p_i^* = \alpha_0 + \alpha_1 \times Z_i + \mu_i \quad (7)$$
$$p_i = \begin{cases} 1 \ if \ \ p_i^* > 0 \\ 0 \ if \ \ p_i^* \leq 0 \end{cases}$$

Next we are calculating the inverse Mills ratio which is calculated as

$$\lambda_i = \frac{\varphi(\alpha_0 + \alpha_1 \times Z_i)}{\Phi(\alpha_0 + \alpha_1 \times Z_i)}$$

Then by substituting substitution into the equation equation (2) yields the following wage equation

$$\text{ilnwage}=\beta_0 + \beta_1 \times edu_i + \beta_2 \times exp_i + \beta_2 \times exp_i^2 + \beta_3 \times X_i + \beta_4 \times \lambda_i + \varepsilon_i \quad (8)$$

Combining the estimation results in Table 2 reveals two main features: first, compared with the urban household labor force, the return to education of migrant workers is significantly lower than that of the urban household labor force for both married and unmarried labor force, and the difference between them is larger. For the urban household labor force, in the benchmark model (5), the returns to education for married and unmarried labor force are 7.6% and 7.4%; while in model (6), the returns to education for married and unmarried labor force are 7.3% and 6.1%, respectively. For migrant workers, the baseline model (5) estimates the returns to education for married and unmarried labor force as2.8% and4.7%, respectively, while model (6) estimates the returns to education for married and unmarried labor force as 1.7% and 3.3%. In addition, the return to education decreases after the inclusion of control variables for both urban domiciled labor force and migrant workers, but this is reasonable.

The sample selection model estimates results in returns to education of 1.8% and 3.2% for the married and unmarried labor force, respectively; thus it can be argued that the first theoretical proposition of this paper is confirmed, i.e., there is a difference in the returns to education between migrant workers and urban domiciled labor force, with migrant workers having lower returns to education than urban domiciled labor force. This estimation result is actually also largely consistent with the findings of the established literature; however, we explain the latter reason in comparison with the established literature.

TABLE II Effect of Household Registration and Marriage on the Return To Education in The Labor Force

	RURAL HOUSEHOLD NON-FARM EMPLOYMENT				**URBAN HOUSEHOLD REGISTRATION**	
	UNPROCESSED		**SAMPLE SELECTION**			
	UNMARRIED	**MARRIED**	**UNMARRIED**	**MARRIED**	**UNMARRIED**	**MARRIED**

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EDUCATION	0.033***	0.017***	0.032***	0.018***	0.061***	0.073***
	(8.14)	(8.24)	(7.68)	(8.45)	(9.31)	(30.63)
EXPERIENCE	0.081***	0.027***	0.079***	0.028***	0.042***	-0.003
	(7.44)	(3.97)	(7.16)	(4.15)	(2.83)	(-0.38)
EXPERIENCE SQUARED / 100	-0.120***	-0.048***	-0.120***	-0.046***	-0.059***	0.004
	(-7.45)	(-5.67)	(-7.46)	(-5.47)	(-2.86)	(0.41)
MALE	0.162***	0.424***	0.196***	0.385***	0.085**	0.217***
	(5.60)	(24.77)	(3.81)	(14.39)	(2.35)	(13.64)
SELECTIVITY BIAS			-0.142	0.155*		
			(-0.80)	(1.94)		
CONSTANTS	-0.121	2.097***	-0.317	2.329***	1.640***	1.866***
	(-0.26)	(8.52)	(-0.61)	(8.52)	(5.02)	(11.21)
R-SQUARED	0.2638	0.2492	0.2640	0.2496	0.2786	0.2775
N	1938	6334	1938	6334	1433	6905

* p<0.1, ** p<0.05, *** p<0.01; all models have controls for ownership, province, and year.

Second, for migrant workers, the return to education of married labor force is significantly lower than that of unmarried labor force, such as the sample selection model shows that the return to education of unmarried labor force is 3.2%, while the return to education of married labor force is only 1.8%; however, for urban household labor force, the return to education of married labor force is higher than that of unmarried labor force, the return to education of married labor force is 7.3%, while the return to education of The return rate of education for married labor force is 7.3%, while that for unmarried labor force is 6.1%. This indicates that the education return rate of married migrant workers is significantly lower than that of unmarried migrant workers, which confirms the second theoretical proposition of this paper that the marital status of migrant workers affects their education return rate, and the education return rate of married workers is lower than that of unmarried workers.

At the same time, we also note that both urban domiciles and migrant workers have higher returns to education for men compared to women.

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TABLE III Returns To Education For Local Non-Farm Employment And Cross-District Employment Of Migrant Workers

	SAMPLE SELECTION NOT CONSIDERED		SAMPLE SELECTION	
	LOCAL EMPLOYMENT	CROSS-DISTRICT EMPLOYMENT	LOCAL EMPLOYMENT	CROSS-DISTRICT EMPLOYMENT
EDUCATION	0.021***	0.028***	0.022***	0.028***
	(10.76)	(6.39)	(10.61)	(6.22)
EXPERIENCE	0.039***	0.045***	0.040***	0.045***
	(6.78)	(3.39)	(6.86)	(3.40)
EXPERIENCE SQUARED / 100	-0.062***	-0.062***	-0.061***	-0.061***
	(-8.38)	(-3.43)	(-8.24)	(-3.32)
MALE	0.361***	0.287***	0.340***	0.269***
	(22.37)	(7.73)	(13.32)	(4.50)
MARRIAGE	0.063**	0.032	0.079***	0.043
	(2.54)	(0.69)	(2.74)	(0.78)
SELECTIVITY BIAS			0.086	0.065
			(1.07)	(0.37)
CONSTANTS	1.231***	1.712***	1.352***	1.718***
	(5.47)	(3.02)	(5.38)	(2.68)
R-SQUARED	0.2415	0.2615	0.2416	0.2616
N	6935	1337	6935	1337

* p<0.1, ** p<0.05 , *** p<0.01; all models have controls for ownership, province, and year.

The paper then estimated the return to education of migrant workers based on whether they were employed across districts, and the estimated results are shown in Table 3. From Table 3, it can be seen that there is a significant difference between the return to education of migrant workers who are employed locally and those who are employed across districts. The results estimated based on the OLS method show that the return to education of migrant workers in local employment is 2.1%, while the return to education in cross-district employment is 2.8%; the sample selection model also yields relatively similar results. This confirms the third theoretical proposition proposed in this paper: for migrant workers, the return to education for local nonfarm employment is lower than that for cross-district mobility. Cross-area employment allows for a wider range of job choices, and migrant workers will therefore earn higher wages; in addition, more married migrant workers will choose to work locally for employment, which will also undoubtedly increase the labor supply of migrant workers

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and thus depress wages. All these factors in general depress the return to education of locally employed migrant workers. The estimates also show that married laborers and men receive higher wage levels.

To test the fourth theoretical proposition proposed in this paper: younger migrant workers have a higher return to education. In this paper, we divide the sample into two samples according to the age of the labor force, and we define the labor force of 16~35 years old as the younger sample, while the control group is the labor force between 35 and 60 years old, and the estimation results are shown in Table 4. From Table 4, we can see that for the rural household labor force, the younger labor force receives a higher return to education, as the sample selection model shows that the younger migrant workers have a return to education of 3.1%, while the older migrant workers have a return to education of only 1.1%, and the OLS estimation results are relatively similar. We note, however, that for the urban domiciled labor force, it is the older labor force that receives higher returns to education, e35.g., 6.2% for those between ~60 years old and 7.3% for those between 35~60 years old. This confirms the theoretical proposition made in this paper that younger migrant workers have higher returns to education.

TABLE IV Returns To Education By Age

	RURAL HOUSEHOLD REGISTRATION				**URBAN HOUSEHOLD REGISTRATION**	
	UNPROCESSED		**SAMPLE SELECTION**			
	16-35 YEARS OLD	**36-60 YEARS OLD**	**16-35 YEARS OLD**	**36-60 YEARS OLD**	**16-35 YEARS OLD**	**36-60 YEARS OLD**
EDUCATION	0.031***	0.009***	0.031***	0.011***	0.062***	0.073***
	(11.22)	(3.86)	(10.70)	(4.34)	(14.95)	(27.29)
EXPERIENCE	0.170***	0.044*	0.170***	0.052**	0.046**	-0.034*
	(7.92)	(1.87)	(7.91)	(2.20)	(2.10)	(-1.65)
EXPERIENCE SQUARED / 100	-0.294***	-0.067***	-0.294***	-0.071***	-0.062	0.037*
	(-7.42)	(-2.67)	(-7.42)	(-2.85)	(-1.59)	(1.68)
MALE	0.274***	0.471***	0.277***	0.411***	0.133***	0.221***
	(14.16)	(20.88)	(8.90)	(11.52)	(5.91)	(11.59)
MARRIAGE	-0.006	0.118***	-0.008	0.168***	-0.001	0.072**
	(-0.21)	(2.62)	(-0.24)	(3.32)	(-0.03)	(2.03)
SELECTIVITY BIAS			-0.012	0.236**		
			(-0.12)	(2.20)		
CONSTANTS	-0.466	1.813***	-0.482	1.962***	1.285***	2.597***

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	(-1.23)	(3.05)	(-1.20)	(3.28)	(3.99)	(5.31)
R-SQUARED	0.2577	0.2430	0.2577	0.2439	0.2686	0.2834
N	4281	3991	4281	3991	3176	5162

* p<0.1, ** p<0.05, *** p<0.01; all models have controls for ownership, province, and year.

IV. CONCLUSION

This paper identifies structural differences in returns on human capital investment for migrant workers (varying by marital status, age structure, and migration range) in the context of the existence of an urban-rural segmentation of the labor market and extremely high mobility costs, leading to possible problems in estimating returns to education for migrant workers using the traditional Mincer wage equation which relies on the efficient labor market hypothesis; and examines, based on CFPS data, the returns to education for migrant workers and urban household workers' returns to education, the main findings are:

First, compared with the urban domiciled labor force, the return to education of migrant workers is significantly lower than that of the urban domiciled labor force, whether married or unmarried, and the gap between them is larger. Second, the marital status of migrant workers affects their return to education, and the return to education of married workers is lower than that of unmarried workers. Third, for migrant workers, the return to education for local non-farm employment is lower than that for cross-district mobility. Fourth, the return to education is higher for younger migrant workers.

Based on the empirical results of CFPS data, the theoretical hypothesis proposed in this paper is well supported. The root causes of these educational return characteristics of migrant workers are: due to the urban-rural segmentation of China's labor market and the extremely high mobility costs, migrant workers mainly consider maximizing family utility in their choice of employment location. The unmarried sample of migrant workers is the most representative of the educational return of migrant workers.

This paper has made a useful attempt to estimate the return on human capital investment of migrant workers, and some improvements can be made in the estimation methods in the next step, such as adopting some more advanced estimation methods to conduct an in-depth study on this, and considering other influencing factors other than education, which may lead to better estimation results.

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