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ARTICLE

IMPACT OF EDUCATIONAL MISMATCH ON WORKERS' INCOME: EVIDENCE FROM CHINA

Maishou Li[1,2*], Kaixuan Li[1]

[1]School of Economics, Institute of Economics, Henan University, Kaifeng 475004, China
[2]Institute of Rural Revitalization, Henan University, Kaifeng 475004, China
[*]Corresponding Author E-mail: lms@henu.edu.cn

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ABSTRACT

With the continuous expansion of college enrollment, the supply of highly educated talents exceeds the demand in the labor market, and the phenomenon of education mismatch is widespread. Using data from China Family Panel Studies from 2014 to 2018, this paper measures the income-reward and punishment effects of education mismatch based on fixed-effects model and instrumental variable estimation. It shows that overeducated workers will suffer a 4.6% earnings penalty for each year of overeducation, but still earn 11.4% more than well-matched workers for the same position. In contrast, Undereducated workers will receive an 8% earnings bonus for every year of undereducation, but will earn 6.8% less than well-matched workers for the same position.

KEYWORDS

Education mismatch; Overeducation; Undereducation; income

1. INTRODUCTION

In order to meet the need of talents for economic development, China began to expand the enrollment of colleges and universities since 1999, and the scale of higher education has expanded rapidly. However, with the gradual decline of economic growth in recent years, the demand for highly educated talents in the labor market continues to decrease, and more and more college students are facing the problem of difficult employment. In 2020, due to the impact of the epidemic, all walks of life have faced a huge test, and graduates are facing more serious employment difficulties. In order to alleviate the employment problem, colleges and universities have carried out a new round of postgraduate enrollment expansion, which temporarily solved the employment problem of college students in that year, but also produced the problem of education mismatch.

Education mismatch, including overeducation and undereducation, is a matching state between education and work in which labor resources are not fully utilized. Overeducation refers to the fact that the level of education received by the laborer is higher than the level of education needed by the job, while the undereducation refers to the fact that the level of education received by the laborer is lower than the level of education needed by the job. With the increasing influence of education mismatch on society, scholars have carried out a series of studies on the incidence, measurement, cause and influence of educational mismatch, among which the effect of educational mismatch on income has always attracted much attention. Therefore, it is necessary to study the mismatch of education in China's labor market in the context of the current new round of graduate school enrollment expansion. On the other hand, most of the current studies on the income effect of education mismatch are based on the analysis of cross-sectional data, and there are problems such as omitted variables and measurement errors, which makes the estimation results likely to be biased. In this paper, the method of fixed effects model and instrumental variables can effectively solve the problems of missing variables and measurement errors, so that the estimation results are more accurate and reliable.

2. LITERATURE REVIEW

The existing research on educational mismatch is mainly carried out from three aspects: measurement, cause and influence. Next, this paper will review the domestic and foreign literatures from the measurement and influence of educational mismatch.

2.1 Measures of the match between education and work

Education mismatch refers to a mismatch state in which the actual education level of workers is higher or lower than that required by the job. It is easy to measure the actual education level of workers, and the data can be obtained by designing relevant questions in the questionnaire. However, it is difficult to obtain the data of the education level required by work. At present, there are three methods to measure the education level required for work in the literature, which are self-assessment method, job analysis method and actual matching method [1].

The self-assessment method refers to the evaluation of the education level required by the job that the worker is currently engaged in. The data are generally obtained by setting corresponding questions in the questionnaire. According to different evaluation criteria, this method can be divided into two categories. The first one is to ask the employee

the minimum educational background required for the job at the time of application. The second is to ask the employee what level of education they think is required for their current job [2].

Job analysis method is an external objective evaluation method. It evaluates the education level required by a job based on the technical characteristics of different occupations. The advantage is that the evaluation standard has objectivity and certainty, which is in sharp contrast with self-assessment method. Verhaest and Omey used the standard occupational classification of Statistics Netherlands to estimate the number of years of education required for a job when studying the effect of education mismatch on earnings. [3].

The actual matching method is to measure the required education level of an occupation according to the distribution of the actual education level of the employed personnel of the occupation, which can be divided into standard deviation method and mode method [4]. The standard deviation method first calculates the mean and standard deviation of occupational education level. Within the standard deviation range of the mean is education adaptation, above the mean standard deviation range is over-education, and below the mean standard deviation range is education insufficiency. The mode method is to calculate the mode value of the actual education level of all workers in a certain occupation as the required education level.

2.2 The impact of educational mismatch

The endogeneity issue of educational mismatch is the greatest difficulty in identifying how educational mismatch affects income. While studying the effect of overeducation on income, Wu found that due to the segmentation of China's labor market, overeducation is unevenly distributed across industries and regions, and overeducation can lead to a loss of income for individuals [5]. However, the biggest shortcoming of this study is that it did not consider the endogeneity issue of education mismatch, which may lead to biased conclusions. When Yan and Wang studied the penalty effect of overeducation on wages, they first used the fixed effects model to control individual differences, and then used education mismatch indicators measured by two different methods as instrumental variables to solve the measurement error problem [6]. Although this study has solved the problems of measurement error and omitted variables to some extent, due to the adoption of two-period panel data, the educational mismatch has little change in the short term, which will lead to biased estimation results of the fixed effects model.

At present, scholars have ignored the endogeneity problems caused by unobservable variables such as ability and failed to deal with the measurement errors of education mismatch, which may magnify or narrow the impact of education mismatch on income. Even though some scholars use fixed effects model, instrumental variables, proxy variables and other methods to solve the endogeneity problem, there is still room for improvement in the research methods. Compared with the above studies, this paper uses the fixed effect model and the education mismatch index measured by the new measurement method as instrumental variables to solve the endogeneity problem when studying the impact of education mismatch on income, which makes a marginal contribution to identify the causal relationship between education mismatch and income, and is a further extension of the above studies.

3. MODELS, VARIABLES AND DATA

3.1 Model

As for the study of the impact of education mismatch on income, Western economists put forward a model to measure the return rate of overeducation (ORU model). On the basis of ORU model, different model methods are proposed according to the research needs. This paper mainly adopts the following two methods.

Verdugo and Verdugo put the years of education into the wage equation, which is divided into the years of required education, the years of overeducation and the years of undereducation, and referred to as DH model for convenience in this paper [7]. The other is that Duncan and Hoffman incorporate years of education, dummy variables of overeducation and dummy variables of undereducation into the wage equation, which is referred to as VV model in this paper [8].

The decomposition of actual years of schooling in the DH model is formulated as follows:

$$S_{\mathrm{a}} = S_r + S_o - S_u \tag{1}$$

S_a is the actual years of education, Sr refers to the number of years of education required to work, S_o and S_u refer to years of overeducation and years of undereducation, respectively, when $S_a > S_r$, $S_o = S_a - S_r$. Otherwise S_o=0； when $S_a < S_r$, $S_u = S_r - S_a$. Otherwise, S_u=0.The DH model is obtained by incorporating the actual years of education into the classical Mince wage equation:

$$W_{it} = \beta_o + \beta_1 S_{rit} + \beta_2 S_{oit} + \beta_3 S_{uit} + \gamma X_{it} + \varepsilon_{it} \tag{2}$$

W_{it} represents income, X_{it} refers to other explanatory variables affecting income, including ownership, industry, gender, health, marriage, experience and regional characteristics, etc., ε_{it} is the residual term. γ is the corresponding coefficient vector of each control variable. β_1 is the return rate of years of education required by work, and β_2 is the return rate of years of overeducation ($\beta_2 > 0$). β_3 is the rate of return for years of insufficient education ($\beta_2 < 0$). In the DH model, the rate of return on education mismatch is the rate of return on years of overeducation and years of undereducation compared to people in the same position.

In the VV model, the actual years of education, the dummy variable of overeducation and the dummy variable of undereducation are included in the wage equation. In order to better study the impact of education mismatch on income, the dummy variable of overeducation and the dummy variable of undereducation are replaced by the years of overeducation and the years of undereducation in the VV model. The model is as follows:

$$W_{it} = \beta_o + \beta_a S_{ait} + \beta_o S_{oit} + \beta_u S_{uit} + \gamma X_{it} + \varepsilon_{it} \tag{3}$$

β_a is the rate of return on actual years of schooling, β_o is the rate of return on years of overeducation ($\beta_o < 0$). β_u is the rate of return for years of undereducation ($\beta_u > 0$). The VV model studies the rate of return on income from years of overeducation and years of undereducation compared to people with the same number of years of education.

3.2 Data

This paper uses data from the China Family Panel Studies (CFPS) adult database to investigate the relationship between educational mismatch and income. The data include personal characteristics such as age, years of education, income, working hours, occupation, and health status. The CFPS conducted a nationwide sample survey in 2010 and tracks respondents every two years. This enables this paper to use fixed effects model based on panel data to solve the problem of omitted variables. Since the education mismatch status does not change much in the short run, in order to make the estimation results of the fixed effects model more accurate, this paper uses the data of 2014 and 2018 to merge into panel data.

The core explanatory variable in this paper is the matching status of education and job. In order to ensure the accuracy of measuring the education mismatch standard, the original data are processed as follows. (1) Only the samples of non-agricultural jobs were retained. (2) Samples with missing data such as health status, marital status, annual income, occupation, age, years of education and years of education required for work were excluded. (3) Samples with annual income less than 5000 were excluded. (4) Samples with logic errors and abnormal hourly income were excluded. The remaining 5997 samples were collected in 2014 and 1759 samples were collected in 2018. Combining 2014 and 2018 as panel data, the final remaining 848 samples were collected.

3.3 Variables

(1) Education mismatch years. The years of education mismatch can be subdivided into years of overeducation and years of undereducation. The method of measuring educational mismatch in this paper refers to the mode self-evaluation method proposed by Peng. The so-called

Table 1: Description of Variables.

Variable	Symbol	N	Mean	Min	Max
Logarithm of wage	ln(wage)	848	10.26	8.5	13
Years of Attained Education	Edu	848	11.58	0	19
Years of Required Education	Req	848	11.14	6	16
Years of Overeducation	Over	848	1.22	0	10
Years of Undereducation	Under	848	0.78	0	15
Work experience	Exp	848	15.99	0	42
Age in years	Age	848	35.09	18	60
Dummy variable of gender	Gender	848	0.57	0	1
Dummy variable of marriage	Mar	848	0.76	0	1
Health	Heal	848	6.15	3	8

mode self-evaluation method refers to the mode of self-evaluation of the education required by different respondents in the same occupation to obtain the education years required by the job [9]. If the number of years of education of the survey object is more than the number of years of education required by the job, it is overeducated, and the difference is the number of years of overeducated. Similarly, the number of years of undereducation is the number of years of education required for work minus the actual number of years of education. (2) Years of education required for work. The number of years of education required for a job is measured by the CFPS question, "What degree do you think your current job requires?" According to the current education situation in China, this paper sets the years of education for illiterates or semi-illiterates as 0, 6 for primary schools, 9 for junior high schools, 12 for senior high schools, 15 for junior colleges, 16 for undergraduates, 19 for masters and 22 for doctorates. (3) Income. The income of this paper is the annual income including salary, bonus and welfare after deducting personal income tax and five social insurance and housing fund. In the empirical analysis, the logarithm of the annual income is taken. (4) Work experience. CFPS data does not directly provide the variable of work experience. This paper uses working years as a proxy. If the number of years of education is less than 12, working years = age-18; if the number of years of education is higher than 12, working years = age-6 - years of education. (5) Health. Health is an important factor affecting income. In this paper, the values of very unhealthy, relatively unhealthy, unhealthy, average, healthy, relatively healthy, very healthy and very healthy in CFPS are respectively 1-8. The higher the value, the healthier it is. (6) Industry. The data of CFPS divides the industry into 20 categories, and in order to avoid multiple collinearity caused by too many dummy variables in the equation, this paper divides the industry into 8 categories. (7) Region. According to the economic division, China can be divided into four regions, namely the western region, the central region, the eastern region and the northeast region. (8) Dummy variable of marriage: Set marriage as 1, and other states such as unmarried, widowed, divorced and cohabitation as 0. (9) Dummy variable of gender: male is 1, female is 0. (10) Dummy variable of work unit: 1 for state-owned enterprises, public institutions and government agencies, and 0 for others. Luo and Peng found that the nature of enterprise ownership was correlated with overeducation [10]. In order to avoid the endogeneity problem caused by the omission of the property variable of enterprise ownership, the dummy variable of work unit is added here.

Northeast China: Liaoning, Jilin, Heilongjiang; Eastern region: Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan Provinces; Central Region: Shanxi, Anhui, Jiangxi, Henan, Hubei, Hunan; In the western region: Inner Mongolia Autonomous Region, Guangxi Zhuang Autonomous Region, Chongqing Municipality, Sichuan Province, Guizhou Province, Yunnan Province, Tibet Autonomous Region, Shaanxi Province, Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region, Xinjiang Uygur Autonomous Region.

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3.4 Descriptive statistics

Table 1 shows the descriptive statistics of the key variables, from which it can be seen that the average of the actual years of education is larger than the average of the years of education required for work, indicating that overeducation may be widespread. The number of years of over-education is greater than the number of years of under-education, which suggests that overeducation may be worse than undereducation.

4. ECONOMETRIC ANALYSIS

4.1 Baseline regression

Table 2 shows the OLS estimation results of the impact effect of education mismatch on income. The first column in the table is the regression results of DH model that only controls the years of education required for work, years of overeducation and years of undereducation. The rate of return to education is 8.5%. Compared with workers in the same position and in the state of education adaptation, the annual income of over-education increases by 6.4% for each additional year, which is statistically significant. For each additional year of undereducation, earnings were 3.3% lower than those of workers in the same position and were not statistically significant. In the second column, after adding the control variables of work experience, work experience square, gender, industry, marital status, health level, unit nature and region, the return rate of education rises from 8.5% to 10.2%, which is statistically significant. Compared with the workers in the same position and with appropriate education, the income of over-educated workers increases by 7.2% for each additional year. For each additional year of undereducation, they earn 4.7 percent less than workers in the same position. Column (3) and (4) in the table show the estimation results of the VV model. Column (3) only examines the effects of actual years of education, years of overeducation and years of undereducation on

Table 2: Estimation Result.

	DH		VV	
	(1)	(2)	(3)	(4)
Edu	-	-	0.085***	0.102***
	-	-	(9.044)	(10.098)
Req	0.085***	0.102***	-	-
	(9.044)	(10.098)	-	-
Over	0.064***	0.072***	-0.021	-0.030**
	(4.473)	(5.085)	(-1.468)	(-2.128)
Under	-0.033**	-0.047***	0.052***	0.055***
	(-2.145)	(-3.185)	(3.094)	(3.478)
Exp	-	0.042***	-	0.042***
	-	(4.057)	-	(4.057)
Mar	-	0.052	-	0.052
	-	(0.814)	-	(0.814)
Heal	-	-0.007	-	-0.007
	-	(-0.355)	-	(-0.355)
Gender	-	0.361***	-	0.361***
	-	(7.352)	-	(7.352)
Industry	No	Yes	No	Yes
Work unit	No	Yes	No	Yes
Region	No	Yes	No	Yes
N	848	848	848	848
R^2	0.093	0.229	0.093	0.229

Note: the variable description is given in Table 2. ***, **, * mean the significance at 0.01, 0.05, and 0.1 level respectively.

income, without adding other control variables. The estimated return on education is 8.5%, which is the same as the estimated return on education in column 1. Compared with workers with the same number of years of education and appropriate education, each additional year of overeducation earns an insignificant 2.1% less, and each additional year of undereducation earns a significant 5.2% more. After adding a series of other explanatory variables, the estimated result as in column (4) shows that the increase in the return on education is 10.2%. Compared with workers with the same number of years of education and suitable education, the income of over-education is significantly lower by 3% for each additional year, and the income of under-education is significantly higher by 5.5% for each additional year. The coefficients of other explanatory variables are basically consistent with those in column (2).

4.2 Discussion of endogeneity

When studying the effect of education mismatch on income, OLS estimation may be biased due to the endogeneity problem. The first is the omission of unobservable variables such as ability. Ability is related to both educational matching status and income, which leads to the fact that the omitted variables are related to both explanatory variables and explained variables, resulting in the endogeneity problem. The second problem is the measurement error. When measuring the years of education required by a job, the results measured by different measurement methods are different, which indicates that the measurement results are likely to have errors. This paper proposes different solutions for different models.

The fixed effects model is used in the DH model to address endogeneity issues arising from unobservable variables such as ability, and later instrumental variables are used to address measurement errors. In this paper, the educational mismatch index measured by standard deviation self-assessment method is used as an instrumental variable. Self-evaluation of the standard deviation method is put forward by the reference Peng Shuhong self-evaluation of modal method, first of all, the same career all respondents to the current work of the education needed to appraise the average, then the actual level of education in average and a standard deviation within the scope of the situation as a moderate education, higher than the average one standard deviation by the education level of as excessive education, One standard deviation below the average level of education is considered undereducated. The third column of Table 3 shows the estimation results of the two-stage least squares method, in which the F-statistic of the first stage regression is 112.28, far greater than 10, indicating that the selected instrumental variables are not weak instrumental variables.

In the VV model, since the actual years of education of workers almost do not change over time, the fixed effect model cannot be used to solve the endogeneity problem caused by ability. Here, the intelligence level is introduced as the proxy variable of ability. In CFPS, the subjective evaluation of interviewees' intelligence level is from low to high, ranging from 1 to 7. Often people with higher levels of intelligence have higher abilities, so intelligence is a good proxy variable. In order to solve the endogeneity problem caused by measurement errors, the education mismatch index measured by the mode method is used as an instrumental variable to correct the estimation bias caused by measurement errors. Mode method and mode self-evaluation method are both methods to measure the educational mismatch index, and the measurement errors of these two measures are not correlated, so it is appropriate to take the educational mismatch index measured by mode method as an instrumental variable. The sixth column of Table 3 shows the estimation results of the two-stage least squares method. The F-statistic of the first stage is 180.76, indicating that the instrumental variables are not weak instrumental variables.

The first column of Table 3 shows the results of mixed OLS regression estimation, and the return on education is 10.2% and significant. Compared with well-matched workers in the same position, each additional year of overeducation leads to 7.2% higher earnings and each additional year of undereducation leads to 4.7% lower earnings. The coefficient of work experience is positive and the coefficient of work experience square is negative, indicating that the income will increase with the improvement of work experience, but the rate of increase decreases. Mixed OLS regression ignores unobservable variables such as ability, which may have an impact on the education-job match, potentially leading to endogeneity problems. In order to solve the endogeneity problem caused by omitted variables, this paper uses the fixed effect model. The estimation results show that the rate of return to education decreases to 6.6%, and the coefficients of overeducation and undereducation also decrease, which indicates that the omission of unobserved variables such as ability makes the estimation result high. The third column adopts the method of instrumental variables to solve the problem of measurement error. It can be seen that compared with the first column, the return rate of education rises from 10.2% to 10.8%, and the coefficient of overeducation rises from 0.072 to 0.171, which is significant. This is because the impact of education mismatching income is underestimated due to the measurement error. The coefficient of insufficient education is not significant, which may be caused by the endogeneity problem caused by the omitted ability variable. The fourth column in the table presents the estimation results of the IV fixed effects, and after addressing the endogeneity issues caused by omitted variables and measurement errors, the return to education is 7.5% and significant. Overeducated workers earn 11.4% more than well-matched workers in the same position.

The fifth column of Table 3 shows the mixed OLS regression estimation results of the VV model, and the education yield is 10.2%. For the same degree, overeducated workers earn 3% less than well-matched workers, and undereducated workers earn 5.5% more than well-matched workers. The mode method is used as the instrumental variable of

Table 3 The effect of Education Mismatch on income

	DH Model				VV Model	
	Mixed	Fixed	IV	IV-fixed	Mixed	IV
Req	0.102***	0.066	0.108***	0.075***	-	-
	(10.098)	(1.569)	(9.288)	(2.703)	-	-
Edu	-	-	-	-	0.102***	0.114***
	-	-	-	-	(10.098)	(10.059)
Over	0.072***	0.045	0.171***	0.114*	-0.030**	-0.046**
	(5.085)	(1.053)	(5.151)	(1.860)	(-2.128)	(-2.419)
Under	-0.047***	-0.038	-0.036	-0.068	0.055***	0.080***
	(-3.185)	(-0.879)	(-0.878)	(-0.969)	(3.478)	(3.903)
Exp	0.042***	0.121***	0.039***	0.116***	0.042***	0.041***
	(4.057)	(5.500)	(3.787)	(5.166)	(4.057)	(4.022)
Mar	0.052	0.018	0.044	0.022	0.052	0.050
	(0.814)	(0.159)	(0.686)	(0.192)	(0.814)	(0.793)
Heal	-0.007	-0.003	-0.009	-0.007	-0.007	-0.007
	(-0.355)	(-0.124)	(-0.471)	(-0.256)	(-0.355)	(-0.372)
Intelligence	-	-	-	-	-	-0.002
	-	-	-	-	-	(-0.083)
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Work unit	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes	Yes
N	848	848	848	848	848	848
R2	0.228	0.177	0.203	0.163	0.229	0.225
F	-	-	112.28	-	-	180.76

Note: *, **, *** represent significant at the 0.1, 0.05, and 0.01 level respectively, and the F values in the table are the F statistics estimated in the first stage of the two-stage least squares method.

mode self-evaluation method to solve the measurement error problem, and the intelligence level is introduced as the proxy variable of ability. The estimated results are shown in the sixth column of Table 3, and the education yield rises from 10.2% to 11.4%. For the same degree, overeducated workers earn 4.6% less than well-matched workers, and undereducated workers earn 8% more than well-matched workers. It is worth noting that the coefficient of intelligence level is negative, which may be due to the endogeneity problem caused by the omitted variables that the proxy variables cannot fully handle.

4.3 Robustness tests

4.3.1 Replacing years of educational mismatch with educational mismatch dummy variables

Using a dummy variable for education mismatch can alleviate the measurement error problem. Since the education mismatch indicator is a dummy variable, it is no longer appropriate to use the fixed effects model, and the same instrumental variable approach as in Table 3 is used here to deal with the endogeneity problem. Compared with the workers with the same job, overeducated workers earn 26.1% more than well-matched workers, undereducated workers earn14.9% less. Over-educated workers earn 13% less and undereducated workers 27.7% more than their counterparts with the same degree. These results further validate the conclusions in Table 3, which indicates that the conclusions of this paper have good robustness.

4.3.2 Replace annual income with hourly income

In order to further investigate the robustness of the conclusion, annual income is replaced by hourly income as the explained variable. The estimated results are shown in Table 5. Compared with well-matched workers with the same job, each additional year of overeducation leads to a 16.9% higher income, while each additional year of undereducation

Table 4: Estimation Results of Education Mismatch Dummy Variables.

	DH		VV	
	OLS	IV	OLS	IV
Req	0.090***	0.106***	-	-
	(9.371)	(9.013)	-	-
Edu	-	-	0.095***	0.105***
	-	-	(9.620)	(9.318)
Over	0.238***	0.261***	-0.060	-0.130
	(4.156)	(4.529)	(-1.025)	(-1.409)
Under	-0.129**	-0.149**	0.188***	0.277***
	(-2.062)	(-2.380)	(2.885)	(2.679)
Exp	0.037***	0.039***	0.043***	0.043***
	(3.650)	(3.832)	(4.166)	(4.170)
Mar	0.074	0.066	0.051	0.046
	(1.162)	(1.044)	(0.792)	(0.720)
Heal	-0.009	-0.008	-0.005	-0.005
	(-0.455)	(-0.438)	(-0.275)	(-0.264)
Gender	0.370***	0.374***	0.350***	0.355***
	(7.485)	(7.643)	(7.117)	(7.262)
Industry	Yes	Yes	Yes	Yes
Work unit	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
N	848	848	848	848
R^2	0.219	0.217	0.223	0.219

Note: the variable description is given in Table 2. ***, **, * mean the significance at 0.01, 0.05, and 0.1 level respectively.

Table 5: Results of Hourly Earnings Estimates.

	DH		VV	
	OLS	IV-fixed	0LS	IV
Req	0.138***	0.113***	-	-
	(11.774)	(3.595)	-	-
Edu	-	-	0.138***	0.150***
	-	-	(11.774)	(11.449)
Over	0.093***	0.169**	-0.045***	-0.060***
	(5.641)	(2.402)	(-2.780)	(-2.750)
Under	-0.066***	-0.092	0.072***	0.099***
	(-3.859)	(-1.139)	(3.922)	(4.171)
Exp	0.048***	0.093***	0.048***	0.047***
	(4.031)	(3.600)	(4.031)	(4.013)
Mar	0.062	0.034	0.062	0.060
	(0.838)	(0.261)	(0.838)	(0.820)
Heal	-0.013	-0.008	-0.013	-0.013
	(-0.569)	(-0.265)	(-0.569)	(-0.598)
Industry	Yes	Yes	Yes	Yes
Work unit	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
N	841	841	841	841
R^2	0.248	0.125	0.248	0.245

leads to a 9.2% lower income. Compared with well-matched workers with the same educational background, each additional year of overeducation leads to a 6.0% lower income and each additional year of undereducation leads to a 9.9% higher income. Compared with the estimation results in Table 3, the estimation of the impact effect of education mismatch on income maintains the same direction and significance. These results further demonstrate the robustness of the conclusions of this paper.

5. CONCLUSION

Although the new round of graduate school expansion has briefly alleviated the problem of difficult employment for college students, it has not fundamentally solved the problem, but will cause a more serious phenomenon of over-education. It has been shown that overeducation has a negative impact on personal income, job satisfaction and productivity to some extent, so it is necessary to correctly understand the impact of education mismatch. This paper investigates the impact of education mismatch on earnings using CFPS panel data, and further tests the applicability of economic theories related to education mismatch in China based on fixed effects models and instrumental variable estimation to address omitted variable bias and measurement error. The results of the study show that overeducated workers will suffer a 4.6% earnings penalty, but still earn 11.4% more than well-matched workers in the same position. In contrast, undereducated workers will receive an 8% earnings bonus, but will earn 6.8% less than well-matched workers in the same position.

To address the education mismatch problem, this paper puts forward the following suggestions: firstly, we should start from reforming the education system, universities should pay attention to the needs of the current socialist market economy, adjust the training program timely and effectively according to the economic fluctuations and the changes in labor market demand, increase the professional skills training of students, and provide enterprises with talents who adapt to the current economic needs and have superb professional skills. Secondly, enterprises should also establish a more perfect talent identification and reward and punishment mechanism, attach importance to professional skills rather than education for newly recruited workers, and fully release their labor productivity level for over-educated workers. In addition, individuals should also make reasonable investment plans in education. Finally, the government should strengthen the guidance and supervision work, provide guidance and supervision to the reform of universities and enterprises, and pay attention to the balance between the scale of education and the needs of economic development. Only in this way can we fundamentally solve the problem of education mismatch.

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