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The Long-term Trend of Educational Returns in China

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Abstract

This paper utilizes data from the China General Social Survey (CGSS) conducted in 2005, 2010, 2015, 2017, 2018, and 2021. Referring to the Mincer equation, we construct an econometric model and employ Ordinary Least Squares (OLS) regression for estimation. The regression results reveal that the rate of return to education for individuals with a bachelor's degree or above, as well as those with junior college, vocational high school, and senior high school qualifications, relative to those with junior high school or below, experienced a significant decline between 2005 and 2015, and has remained relatively stable between 2015 and 2021. Additionally, we find that the rate of return for higher education exceeds that of other educational levels. Furthermore, subgroup regression analysis indicates that the returns to higher education in eastern regions are higher than in other areas. This may be attributed to the more developed economy and higher wage levels in eastern regions, as well as their greater demand for highly educated talent.

Keywords

Educational return; CGSS; higher education

1. Introduction

The question of whether pursuing higher education is worthwhile continues to be a recurring topic of discussion. Generally, higher education refers to education at the junior college, undergraduate, and postgraduate levels, and this paper adopts the same definition. This paper finds that there is a phenomenon of educational upgrading among China's labor force based on data from the China Labor Statistical Yearbook. The data show that the proportion of men with associate degrees increased from 3.4% in 1996 to 10.7% in 2018, while the proportion with bachelor's degrees rose to 8% in 2018, and those with postgraduate degrees increased to 0.8% in 2018. In contrast, for women, the proportion with associate degrees rose from 2.2% in 1996 to 11.1% in 2018, surpassing men, while the proportion with bachelor's degrees reached 9% in 2018, also higher than men, and those with postgraduate degrees increased to 0.9% in 2018, still exceeding men. Regarding high school education, the proportion of men increased from 12.7% in 1996 to 19.7% in 2018, whereas for women, it rose from 9.7% in 1996 to 15.7% in 2018. These findings indicate that women outperform men in terms of accessing higher education. However, in terms of family support for education, women may be at a disadvantage compared to men.

In the context of a continuously improving level of educational attainment in the labor force, it is crucial to determine whether the returns to higher education for individuals are high or low. This not only influences household decisions regarding educational investment but also affects national policies on funding higher education. Drawing on the Mincer earnings equation, this paper estimates the returns to high school, vocational high school, junior college, and bachelor's degree or above education using data from the Chinese General Social Survey (CGSS) conducted in 2005, 2010, 2015, 2017, 2018, and 2021. The aim is to contribute to the understanding of the returns to higher education and provide insights into issues such as the substitutability between workers with different levels of education.

The structure of the paper is as follows: Section 1 provides an introduction, Section 2 reviews the relevant literature, and Section 3 discusses the data, variables, and descriptive statistics, including a brief explanation of the data selection process, data cleaning methods, and variable selection criteria, followed by descriptive statistics for the main variables. Section 4 presents the empirical analysis, where we extend the Mincer earnings equation to construct an econometric model. Ordinary Least Squares (OLS) regression and subgroup regressions are performed, and the results are analyzed. Finally, Section 5 concludes the paper by summarizing the key findings, discussing the limitations of the study, and suggesting directions for future research.

2. Literature review

The author reviews many works of literature on estimating the rate of return on education and finds the following characteristics:

(1) The measurement models for estimating the rate of return on education are constructed with reference to the Mincer equation;

(2) When estimating the return on education, unobservable variables such as sample self-selection and omission ability will be considered. The instrumental variable method and heckit two-stage estimation method are the main methods to overcome OLS bias in many literatures;

(3) Different measurement models and data lead to no unified standard for the rate of return on education, and the results of different literature are not comparable. Here's a brief review of some of the literature.

Angrist and Krueger constructed a natural experiment based on population census data from 1960, 1970, and 1980, using the difference between birth quarters as an instrumental variable of education level, and using wage income to measure educational returns. They found that 25% of potential dropouts were still in school because of the Compulsory Education Act. The final conclusion of the article was that among the group who dropped out of school after reaching the legal age, individuals who were later in the birth quarter (receiving more education in the compulsory education stage) had higher wage income, while for the group with a college degree, the individual's birth quarter had no difference from future wages, and the article also found that there was no significant difference between the results of the 2SLS method and the OLS method (Angrist, J. D. & Krueger, A. B., 1991). Ashenfelter and Krueger estimated the impact of education time on income based on 149 adult twin questionnaire data, found that wages increased by 16% for each year of education time, and showed that OLS ignoring ability did not lead to overestimation of educational returns (Ashenfelter, O. & Krueger, A., 1994). Xing et al. used the classical Mincer wage equation to estimate the rate of return on education. The explanatory variable is the logarithm of hourly wage. The main explanatory variable is the number of years of education, work experience, and its square and gender converted according to the degree of education. The data are from the 1% population sampling survey in 2005 and the mobile population dynamic monitoring survey in 2011. The article found that there are obvious regional differences in the rate of return on education of migrant workers. The rate of return on education in the eastern region and developed cities is significantly higher than that in the central and western regions. The main measurement method is OLS, and the correction of sample selection bias as a robustness test shows that the conclusion is still valid, The paper holds that the sample selection bias is determined by the correlation between unobservable income determinants and unobservable income determinants and unobservable regional preferences of migrant workers, which is corrected by the binomial form of individual migration probability, and the migration probability is estimated by the proportion of all people with the same characteristics who migrate to a certain region. The same characteristics refer to the same group of 28 characteristic groups that the author divides all samples into by region, age, and education level (Xing Chunbing et al., 2013). Jian and Ning estimated the return on high school and college education by using PSM according to the data of chns1997 and 2006 and found that the average return on education increased significantly in 10 years, and the annual return on high school was higher than that on college (Jian Bixi & Ning Guangjie, 2013). Chen and Feng are also based on the Mincer equation. The explanatory variable is the logarithm of the monthly wage. The main explanatory variables are the virtual variables of junior high school, high school, junior college, and above, and the interaction between a virtual variable of high school education and whether it is a virtual variable of vocational education. The data are based on the survey data of Chip from 1995 to 2013, OLS results show that the income of urban residents increases with the improvement of educational background. From 1995 to 2013, the income of graduates with different degrees of urban residents experienced a change of first rising and then declining. In 2002, the income was the highest, and the income of secondary vocational education was higher than that of general high school. The gap increased first and then decreased. Then Heckman's two steps were used to eliminate the sample selection bias that may be biased by using only individuals who participate in the labor market and have income. The results are similar to OLS. Considering that the choice of individuals to receive secondary vocational education and general high school education is not random, the PSM method was used to generate paired samples, and the results of paired samples were still similar to OLS. The article also regressed the survey data of each year by education cohort. Combined, the year of graduation is calculated according to the number of years of education and the year of birth, The graduation years are divided into 1978-1988, 1989-1998, and 1999. It is found that the secondary vocational income in 1978-1988 is higher than that in Pugao, the income difference in 1989-1998 is narrowed, and the secondary vocational income advantage is lost after 1999 (Chen Jiwei & Feng Shuaizhang, 2022). Zheng et al. constructed an econometrical model based on the extended Mincer income equation to estimate the return on education of general high school, secondary vocational school, and University relative to junior high school. The explanatory variable is the logarithm of individual wage income in the past year. The core explanatory variable is three binary variables indicating education level. The data used six rounds of surveys in chip 1995, 1999, 2002, 2007, 2013, and 2018. The article found that the return on the education of ordinary high schools is lower than that of secondary vocational education at any time, but there are periodic differences in the expected return of the two. In the 1990s, the expected return of ordinary high school is lower than that of secondary vocational education. In the 21st century, the expected return of ordinary high school is lower than that of secondary vocational education. The rate gradually exceeds that of secondary vocational education, and the gap between the two is widening, the measurement method of the article combines instrumental variables and the Heckman sample selection model. The ratio of the number of people with the highest education level in the same district (or county) who are in general high school and junior high school, the ratio of the number of people in secondary vocational school and junior high school, and the ratio of the number of people in university and junior high school are regarded as the possibility of local individuals entering general high school, secondary vocational school and university respectively. Heckman's sample chooses three identifying variables, namely, the proportion of people aged 0 to 5, 6 to 17, and over 60 in the total family population, and the binary variable of whether wage information can be observed, which are calculated by the probit model. The inverse mills ratio is added to the regression equation (Zheng Xiaoting et al., 2023). Tan used the CFPS 2020 data to examine gender differences in educational returns among Chinese residents and conducted a comparison between urban and rural areas. The study found that the rate of return on education for females is higher than that for males, the return in urban areas is greater than in rural areas, the net rate of return for urban females is lower than for urban males, and the net rate of return for rural females is higher than for rural males. Based on these findings, Tan suggested the continuous development of a networked, digitized, personalized, and lifelong education system to improve women's access to education, thereby narrowing the gender income gap in the labor market (Tan Qinyi, 2024). Xing et al. utilized variations in workers' educational levels in panel data to identify the returns to adult higher education. They employed a two-way fixed-effects model and a more robust staggered difference-in-differences approach for estimation, finding that the wage return to adult higher education credentials in China is approximately 15%-19% (Xing Chunbing et al., 2024). Li Yifei et al. found that attending a key university significantly increases individuals' long-term labor market income and has an intergenerational transmission effect. This significant positive effect is more pronounced for individuals from rural areas and western regions (Li Yifei et al., 2024).

Compared with previous studies, the possible innovation of this paper is to use the CGSS database from 2005-2021 to dynamically compare the changes in the return on education of high school, secondary vocational school, junior college, and bachelor's degree or above relative to that of junior high school and below.

3. Data and variables

The Chinese General Social Survey (CGSS) is China's earliest nationwide, comprehensive, and continuous academic survey project. It is conducted by the National Data Center for Chinese Surveys at the Renmin University of China and employs multi-stage stratified PPS (Probability Proportional to Size) random sampling, effectively representing various aspects of Chinese society. From 2003 to 2022, the CGSS carried out 15 annual surveys, successfully collecting questionnaire data from 162,036 respondents across the country. This paper utilizes the survey data from six selected years: 2005, 2010, 2015, 2017, 2018, and 2021.

3.1 Variable selection and description

This paper selects the response to the question "What was your total annual income in XXXX?" from the questionnaire as the dependent variable. Zheng Xiaoting et al. chose wage income over the past year as the dependent variable, arguing that it should not include agricultural operating income, self-employment income, property income, or transfer payments, as these are not directly determined by educational attainment. However, the author of this paper believes that these sources of income are still somewhat related to educational level. Moreover, limiting the dependent variable to wage income would significantly reduce the sample size of individuals with low education levels who are primarily engaged in agricultural activities, which could hinder a more objective reflection of the benefits derived from education. Since the 2005 questionnaire does not include wage income, selecting total income over the past year as the dependent variable allows for extending the time horizon of our study, making it more conducive to reflecting the long-term trends in the returns to higher education.

The core explanatory variables in this paper are four binary variables: whether the highest educational attainment is general high school education, whether it is vocational high school education, whether it is junior college education, and whether it is a bachelor's degree or above. These will be referred to as general high school, vocational high school, junior college, and bachelor's degree or above in subsequent discussions.

Control variables. The control variables mainly include gender (1 for male, 0 for female), political affiliation (1 for members of the Communist Party of China, 0 for non-members), hukou status (1 for urban residence, 0 for non-urban residence), employment sector (1 for public sector, 0 for private sector), work experience, squared work experience, and province of residence. These variables help account for potential confounding factors that may influence the relationship between educational attainment and income.

3.2 Data cleaning

All questionnaire samples were processed as follows: delete samples with missing total income, abnormal and 0 in the past year, delete samples with age (survey year birth year - 1) greater than 70, and delete samples with missing highest education level.

2005 questionnaire data processing: delete samples that responded to "A7. Major employment in the past three months" as retired (not working) and never worked/studied and not working. According to the answer to the question "B3b. What is the highest level of education you will eventually complete", this paper divides education into five categories. The first category is "junior high school and below", including 1-11; The second category is "high school", including 12-14; The third category is "Secondary Vocational", including 15-16; The fourth category is "junior college", including 17-18; The fifth category is "Bachelor's degree or above", including 19-22. Hukou nature the answer to "A5. Hukou nature" is that permanent Hukou in cities and towns is considered urban hukou, and the other answers are non-urban hukou. In this paper, the party and government organs, state-owned enterprises, and state-owned enterprises are divided into units within the system, while the other categories and missing values are divided into units outside the system. Due to the lack of working years in the data, the working experience of this paper is calculated by subtracting the number of years of education from the age of the sample and subtracting 6. The data of years of education is obtained from the highest level of education. Junior high school and below are counted as 9 years, high school and secondary vocational school are counted as 12 years, junior college is counted as 15 years, undergraduate is counted as 16 years, and graduate students and above are counted as 19 years.

2010 questionnaire data processing: delete samples that answered "What is your work experience and status?" to question a58 as "refuse to answer missing values" and "never worked". Education level, the sample answering the question "a7a. Your current highest education level is (including current reading)" is divided into "junior middle school and below", the sample of 06 ordinary high school is divided into "senior high school", the sample of 05 vocational high schools, 07 technical secondary school, and 08 technical schools are divided into "secondary vocational school", the sample of 09-10 is divided into "junior college", and the sample of 11-13 is divided into "undergraduate and above". Hukou will be "A18. Your current Hukou registration status is" answered as non-agricultural Hukou as urban hukou and other answers as non-urban hukou. As for the nature of the work unit, there are two questions in the 2010 questionnaire, one is a59j, the type of unit or company where you currently work, and the other is a59k, the nature of ownership of the unit or company where you currently work is, in order to be consistent with 2005, the samples that answered party and government organs in a59j and state-owned or state-controlled in a59k are considered to be within the system, while the others are outside the system.

The questions in the questionnaires in 2015 and after are similar to those in 2010, except that the answers to the questions about household registration are slightly different. The answers to A18 "your current household registration status is" in the questionnaires in these years are non-agricultural household registration and resident household registration (formerly non-agricultural household registration), which are considered urban household registration, and others are considered non-urban household registration.

3.3 Descriptive statistics

The unit of annual income is yuan, gender represents the proportion of men in the sample, political status represents the proportion of Party members in the sample, Hukou represents the proportion of urban hukou in the sample, work unit represents the proportion of civil servants in the sample, and exp represents the number of years of work.

Apart from the sample size of 8,148 in 2021, the sample sizes for other years are all over ten thousand. The sample sizes displayed in the table above reflect the remaining observations after the data-cleaning process. The distribution of different educational levels is consistent with the educational structure of employed personnel presented in the China Labor Statistical Yearbook. This indicates that the data used in this paper are highly representative.

Table 1. Descriptive Statistics of Main Variables

Year	2005	2010	2015	2017	2018	2021
Annual income	9204	22237	41652	50522	53376	68308
Junior high school and below	66.99	64.27	63.2	58.85	59.67	56.16
High school	15.52	11.44	13.06	12.68	13.43	13.54
Secondary vocational school	7.06	8.38	6.71	6.76	6.75	7.59
Junior college	6.84	8.51	8.01	9.58	8.93	9.25
Bachelor's degree or above	3.59	7.41	9.03	12.14	11.21	13.46
Gender	50.63	53.15	51.45	51.5	51.44	51.03
Political status	8.96	13.31	10.69	11.64	11.7	13.04
Hukou	43.22	42.86	37.87	38.73	38.78	33.92
Work unit	23.8	14.2	11.95	11.94	11.07	11.3
Exp	23.66	27.86	29.95	30.07	30.75	30.93
Sample size	7298	8124	7467	8437	8518	4770

4. Empirical analysis

4.1 Model specification

Following the econometric model established by Zheng Xiaoting et al. (2023), the following model is specified:

$$lninco_i = \alpha + \beta edu_i + \delta exp_i + \sigma exp_i^2 + \gamma X_i + \varepsilon_i$$

where, $lninco_i$ represents the natural logarithm of individual i's annual income over the past year, α is the constant term, β denotes the core estimated parameter of interest in this paper, interpreted as the educational returns of different levels of education relative to junior high school or below. edu_i is a set of dummy variables indicating the highest educational attainment of individual i. exp_i and exp_i^2 represent individual i's work experience and its squared term, respectively. X_i is a vector of control variables, including dummy variables for gender, political affiliation, hukou status, employment sector, and province. ε_i is the random error term.

4.2 Empirical results and analysis

Table 2. Empirical results

	2005	2010	2015	2017	2018	2021
High school	0.351***	0.219***	0.177***	0.248***	0.195***	0.243***
Secondary vocational	0.504***	0.355***	0.329***	0.353***	0.346***	0.373***
Junior college	0.775***	0.513***	0.432***	0.459***	0.410***	0.471***
Bachelor or above	1.047***	0.781***	0.550***	0.672***	0.556***	0.635***
Man	0.400***	0.422***	0.430***	0.354***	0.412***	0.395***
Gender	0.098***	0.227***	0.186***	0.236***	0.217***	0.205***
Hukou	0.613***	0.458***	0.455***	0.448***	0.511***	0.378***
Work unit	0.084***	0.071**	0.037	0.031	0.006	0.103**

The regression results show that, apart from the dummy variable for public-sector employment being insignificant in some years, all other variables are significant at the 1% level. We observe that males have an income advantage over females, Communist Party members have higher incomes compared to non-members, and urban hukou (or non-agricultural household registration) has a positive impact on income. Although the results for public-sector employment are not significant in some years, its effect on income remains positive. To more clearly illustrate the long-term changes in educational returns relative to junior high school or below, this paper presents the corresponding line chart in Figure 1. From the chart, we can draw the following conclusions: the ranking of educational returns is consistent with the descriptive statistics of grouped average income presented earlier: the return to education for individuals with a bachelor's degree or above is greater than that for junior college graduates, which in turn is greater than that for vocational high school graduates. The return for vocational high school is greater than that for general high school, and the return for general high school is greater than that for junior high school or below (as evidenced by the positive coefficient for high school education). The trends in educational returns for high school, vocational high school, junior college, and bachelor's degree or above, relative to junior high school or below, move in the same direction. That is, these returns either increase or decrease simultaneously across years, though the magnitudes of change may differ.

During the periods 2005-2010 and 2010-2015, all four educational returns declined, with the decline being more pronounced during 2005-2010 compared to 2010-2015. Moreover, the decline was greater for junior college and bachelor's degree or above compared to the other two levels, with the latter experiencing the largest drop. This suggests that the returns to higher education significantly decreased during the 2005-2015 period. Between 2015 and 2021, the four educational returns remained relatively stable, without exhibiting any dramatic fluctuations.

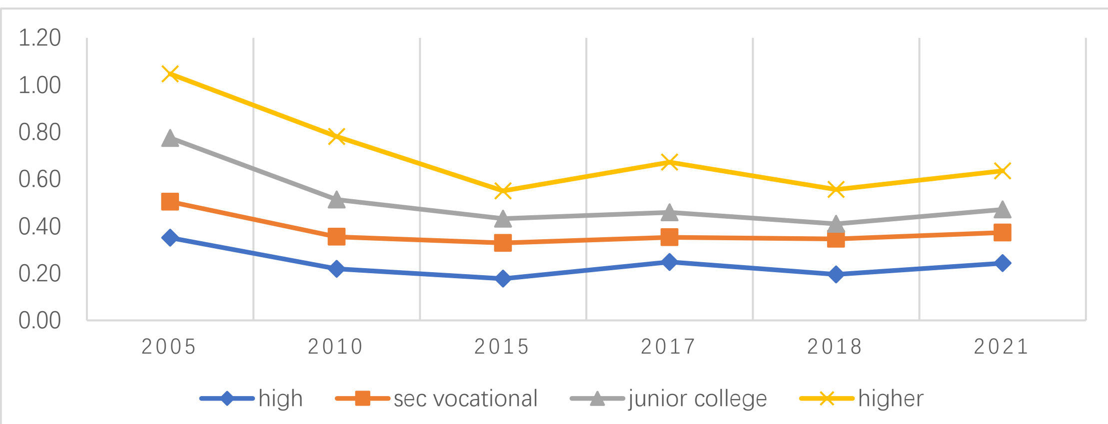

Figure 1. Long-term trends in returns to education.

4.3 Subgroup regression

Table 3. Regression results for the eastern region

	2005	2010	2015	2017
High school	0.440***	0.330***	0.206***	0.260***
Secondary vocational	0.523***	0.460***	0.411***	0.344***
Junior college	0.810***	0.758***	0.592***	0.532***
Bachelor or above	1.203***	1.175***	0.859***	0.911***

Table 4. Regression results for the central and northeast regions

	2005	2010	2015	2017
High school	0.297***	0.197***	0.115**	0.260***
Secondary vocational	0.452***	0.357***	0.185**	0.370***
Junior college	0.686***	0.398***	0.277***	0.413***
Bachelor or above	1.054***	0.666***	0.354***	0.561***

Table 5. Regression results for the Western region

	2005	2010	2015	2017
High school	0.417***	0.314***	0.480***	0.493***
Secondary vocational	0.547***	0.322***	0.562***	0.603***
Junior college	0.909***	0.509***	0.755***	0.712***
Bachelor or above	0.953***	0.616***	0.564***	0.765***

The eastern region includes Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan. The central region includes Shanxi, Anhui, Jiangxi, Henan, Hubei, and Hunan, while the northeastern region includes Liaoning, Jilin, and Heilongjiang. The western region includes Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang. Since the educational returns in 2018 and 2021 did not change significantly compared to those in 2017, subgroup regressions only considered the years 2005, 2010, 2015, and 2017. This paper groups regions according to the classification used by the National Bureau of Statistics, which divides China's economic zones into four major regions: eastern, central, western, and northeastern. Due to sample size considerations, the central and northeastern regions were combined into one group for regression analysis. The subgroup regression results also indicate a noticeable decline in the returns to higher education between 2005 and 2015. Simultaneously, the returns to education at the bachelor's degree level and above in the eastern region are significantly higher than those in the central, northeastern, and western regions. Moreover, the decline in the rate of return to education in the eastern region is smaller than in other regions and also less than the results from ungrouped regressions. This may be attributed to the fact that the eastern region has a more developed economy, higher wage levels, and a relatively higher demand for highly educated talent.

5. Conclusion

Based on CGSS data from six survey years between 2005 and 2021, this paper employs OLS and region-specific OLS regressions to analyze the returns to education. The findings indicate that the returns to higher education exceed those of high school, vocational high school, and junior high school or lower educational levels. Within higher education, individuals with a bachelor's degree or above exhibit higher returns compared to those with junior college degrees. Furthermore, the educational returns for bachelor's degree or above, junior college, vocational high school, and high school relative to junior high school or below experienced a significant decline between 2005 and 2015. In terms of regional differences, the returns to education for individuals with a bachelor's degree or above in the eastern region are higher than those in the western and central regions as well as the northeastern region, and no significant decline was observed between 2005 and 2010.

Despite these findings, the returns to higher education remained the highest between 2005 and 2021. However, societal skepticism regarding higher education may arise due to the strong and high expectations formed by historically high returns, which now conflict with reality as the returns to higher education have significantly declined.

This paper has many shortcomings, but the author's temporary ability is limited, and can only wait for the future to continue to explore: (1) The conclusion of this paper may not be stable. First of all, this paper only uses OLS regression, does not consider the problem of missing ability variables and sample self-selection, and the mainstream instrumental variable method and heckit two-stage estimation method have not been able to used; Secondly, whether the micro database used in this paper can show the real situation of the whole country is also worrying. The author believes that there is a better census and sampling microdata to better reflect the situation of the whole country, but unfortunately, these data need special applications. (2) Different literature has different data and different measurement model settings, and the resulting return on education is not comparable, which makes the estimated return on education meaningless, and the results estimated in this paper are less comparable with those in other literature. To this problem, the author believes that the literature on estimating the rate of return on education is generally limited to the comparison of internal results of their own articles, such as the increase or decrease in time span, and the comparison of different levels of education or years, so as to get a more macro result divorced from the value of the rate of return on education itself. In this way, the significance of the article is limited to this macro result, lacking broader significance, and the guiding significance for family or individual education investment decisions is not very strong. Therefore, we might as well use the estimated model to predict the average income of typical individuals with certain characteristics, so as to improve the comparability of different literature and enhance the practical guiding significance of literature results. (3) The factors affecting the rate of return on education, the rate of return on education, and economic development are all topics worth exploring in the future.

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