



Research on the Relationship between Education Financial Investment and Higher Education Gross Enrollment Ratio

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Abstract. For China today, the higher education business can be considered pivotal to achieving further development. Therefore, this study focuses on data from nine Chinese provinces and ministries and analyzes data collected through the National Bureau of Statistics for the past 10 years. First, the contribution of education financial investment to the gross enrollment rate of higher education is discussed from an overall perspective. Second, indicators of the impact of local education financial investment on higher education gross enrollment rate are introduced to further analyze the mechanism of the above impact. From a practical perspective, a panel data model is used for analysis to explore the relationship between higher education and education financial investment. It is found that education financial investment has a significant positive effect on higher education enrollment. However, it is also verified in the quantile regression to obtain that education investment is not higher or lower, but rather, it is divided into horizontal stages of enrollment rate.

Keywords: Education Financial Investment, Higher Education Gross Enrollment Rate, Panel Data Analysis.

1 Introduction

Financial orientation towards higher education is reflected in the allocation of funding and resources. The optimal allocation of financial resources is thus of great importance for the construction of a high-quality higher education system. It is only by building a high-quality higher education system and putting the development of higher education in the first place of the people that the major problems facing society in the new era can be fundamentally solved. Encouraging them to better cater to the aspirations of the people. And ultimately achieve an effective improvement in the higher education penetration rate of relevant proposals and reflections. Domestic and foreign theories are based on the important position of higher education in the development of the country to the

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popularity and development of higher education and educational imbalance as the entry point for research.

Since the founding of our country, this report has made remarkable research results in several areas such as research on the principles of higher education, research on higher education management, research on higher education economics, research on comparative higher education, and research on the history of higher education. And a large number of excellent papers and monographs have been published. As China's higher education has entered the stage of popularization, the issue of higher education development and popularization has started to attract much attention and attention from domestic economics and education circles. It has become a hot spot of attention for many scholars, and more research results have been achieved. Li Ran pointed out in "A Study on the Equilibrium of Basic Educational Resources Allocation and Spatial Layout in Xi'an City" that the efficiency and fairness of educational resources allocation are not contradictory^[1]. Yang Hongmin studied the causes of regional differences in education in China^[2]. Wu Daguang and Wang Yuxiang through their research in "Analysis of the process of higher education expansion and influencing factors in China--Based on the examination of the gross enrollment rate of higher education in each province and region" proposed that the development and changes of the gross enrollment rate of higher education in China show three obvious characteristics: first, the rapid growth rate in the short term, second, the unbalanced regional development, and third, the national The third is the dominant role of national planning targets. Driven by the national gross enrollment rate target, it is relatively easy to achieve the gross enrollment rate target at the provincial and regional levels^[3].

The tertiary gross enrolment ratio (GER) is an important indicator used internationally to measure the level of higher education development. This indicator can not only illustrate the higher education opportunities provided by a country to young people of appropriate age, but also reflect the relative proportion of high-level talent training in the country^[4]. Driven by the national target of gross enrollment rate in higher education, it is relatively easy to achieve the target of gross enrollment rate at the provincial and regional levels. At the new historical time point, it is necessary to summarize and reflect on the history of regional higher education expansion in China and explore new development paths in the future. On the other hand, the unreasonable investment mechanism in education in China and the relative lack of education investment have exacerbated the regional differences in education development.

This study uses statistical and analytical methods to prepare the construction of panel data and structural models. The aim is to study the impact of total financial investment in education on higher education enrollment and analyze the possible transmission mechanisms and the epochal changes of the impact. Multivariate analysis is beneficial to reveal the space and time between the two is intrinsically linked to the country's promotion of educational equity and is integrated from a spatial and temporal perspective. Allocating limited educational resources and improving the external governance structure of higher education and formulation of economic development policies have an important impact^[5].

2 Method

2.1 Data Source

Based on the rigor and reliability of the data, this paper focuses on the data of nine provinces and ministries and analyzes them to achieve the ultimate research purpose, and selects the statistical data of the National Bureau of Statistics in the past 10 years, such as the proportion of central financial expenditure, national financial education expenditure, local financial education expenditure, price level, and education statistics yearbook for analysis.

2.2 Research Hypothesis

Based on the purpose of this paper and related studies, this paper intends to make the following two hypotheses.

H1: Local fiscal spending on education significantly affects the gross enrollment rate in higher education.

H2: With fiscal changes, financial investment in education is contributing more and more to higher education enrollment.

This section discusses the validity of two research hypotheses in turn. First, it discusses the overall effect of financial investment in education on the gross enrollment rate of higher education. Second, indicators of the effect of local education financial investment on higher education gross enrollment rate are introduced to further analyze the mechanism of the above effect; finally, the relationship between financial investment and higher education gross enrollment rate is analyzed using panel data.

2.3 Statistics and Analytical Methods

This paper uses statistical and econometric analysis to construct panel data and structural models, aiming to study the impact of total financial investment in education on higher education enrollment, analyze the possible transmission mechanisms and the epochal changes of the impact.

3 Results

3.1 Local Financial Investment Can Significantly Affect the Gross Enrolment Ratio of Tertiary Education

In this paper, a fixed-effect regression model was used to test the hypothesis, and the study found that financial investment in education has a significant positive impact on the enrollment rate, and hypothesis 1 was valid. There are relatively many indicators to measure the fairness of the process.

For better data analysis, this report set the higher education gross enrollment rate as y and the education financial input as X . The environmental factors of the development

of higher education can be divided into domestic environmental factors and international environmental factors. Among them, domestic environmental impact factors such as political stability, economic and social development level, market demand for higher education, social and legal system, and social and cultural environment. International environmental impact factors include international relations, academic exchanges, international trade and investment in higher education, etc...^[6]. In addition, this report added three additional control variables to demonstrate the effectiveness of the effect of education financial input on the higher education gross enrollment rate. The specific variable choices are shown in the following table 1.

Table 1. List of variables

Variable Type	Variable Name	Variable Symbols	Variable Definition
Explained variables	Gross Enrollment Rate in Higher Education	y	Gross Enrollment Rate in Higher Education
Explanatory variables	Financial investment in education	x	Financial expenditure on education/total financial expenditure
	Urbanization	urban	Urban population/total population
Control variables	Price level	lncpi	Natural logarithm of CPI
	Teacher-student ratio in general higher education	rss	Ratio of teachers to students in general higher education institutions

The purpose of the optimal model identification test in this paper is to find the best model in the static panel regression model. The data structure constructed in this paper is panel data, and panel data contains both individual and time characteristics, which cannot be estimated by simply using OLS models in regression analysis, otherwise, it will generate a larger problem of omitted variables. In this paper, three tests are introduced, which are F-test, BP test for random effects, and Hausman test total of three tests. For the panel regression, there are three models, the first is a mixed-effects model, the second is a fixed-effects model, and the third is a random-effects model, and the results of the three tests are needed to identify the optimal model. First, the F-test and BP-test are used to identify the optimality of the mixed-effects model with the fixed-effects model and the random-effects model, respectively. In the premise that both the fixed-effects model and the random-effects model are better than the mixed-effects model, the Hausman test is conducted between them to obtain the optimal model, which is the final model of this paper. The results of the collation test are as follows table 2.

Table 2. Optimal model test results

Inspection	Results
F-test	18.88***
BP test	54.88***
Hausman test	159.77***

Note: The data sources in the table are compiled by the authors based on the output of stata15 software; * p<0.1 ** p<0.05 *** p<0.01

From the analysis of the above table, it can be seen that the original hypothesis is rejected in all three tests, and the optimal model can be identified as a fixed-effect model. Based on the results of the optimal model test above, this paper establishes a regression model for verifying whether the hypothesis is valid, and establishes a model of the effect of education financial input on enrollment, with education financial input as the explanatory variable and enrollment as the explanatory variable, and establishes the regression model as follows.

$$Y_{i,t} = \beta_0 + \beta_1 X_{i,t} + \beta_2 URBAN_{i,t} + \beta_3 LNCPI_{i,t} + \beta_4 RSS_{i,t} + \sum_{j=1}^J year_j + \epsilon_{i,t} \quad (1)$$

In the above model, the β_0 are the constant terms, the β_1 are the regression coefficients of the core explanatory variables, and $\sum_{j=1}^J year_j$ is the year control, and $\epsilon_{i,t}$ is the residual term of the model.

There must be a definite relationship or probability between the components of the correlation before correlation analysis can be carried out. Correlation analysis is the examination of two or more parts of variables with correlation in order to gauge how closely two factors correlate. In this study, correlation analysis is used to determine whether the core variables are strongly correlated, that is, whether the correlation coefficient is neither excessively high nor low; secondly, correlation analysis serves as the foundation for regression analysis, and if the primary variables are strongly correlated, the corresponding regression analysis can be established for testing the validity of the hypothesis at a lower level. There are mainly pearson correlation coefficient and spearman correlation coefficient statistically, comprehensive statistical measurement, and the description of realistic application for the correlation coefficient, the correlation analysis of this paper adopts pearson correlation coefficient and collates the correlation results as table 3.

Table 3. Results of pearson correlation analysis

	y	x	urban	lncpi	rss
y	1				
x	0.0920	1			
urban	0.897***	-0.0740	1		
lncpi	-0.349***	-0.122	-0.201*	1	
rss	-0.299***	-0.107	-0.515***	-0.205*	1

Note: The data sources in the table are compiled by the authors from the output of stata15. * p<0.1 **p<0.05 *** p<0.01

Specifically, the correlation coefficient between y and urban, lncpi, and rss shows a significant value. The correlation coefficient between y and lncpi is -0.349 and shows a 0.01 level of significance, thus indicating a negative correlation between y and lncpi. y and rss have a correlation coefficient value of -0.299 and show a 0.01 level of significance, thus indicating a negative correlation between y and rss. In addition, the correlation between y and x co1 term does not show a significant value ($p>0.05$), implying that there is no correlation between y and x co1 term.

Correlations among the explanatory variables, moderator variables, and control variables indicate that the correlation coefficients among all variables are at reasonable levels, and levels of relative independence amongst the vast majority of variables are high; in order to account for the possible existence of serious multicollinearity problems, the VIF value test is subsequently performed to identify them. Although the direction and significance of the correlation does not identify the causal relationship among the variables, a correlation analysis is the mutual relation between variables and does not satisfy the causal relation, and correlation analysis cannot control for individual differences as well as for differences between time points, therefore, the existence of correlation is investigated in this paper to determine if the correlation results obtained are good. The presence of a correlation analysis therefore does not indicate the significance of the regression analysis, and the lack of a correlation analysis does not suggest the exact existence of causality.

Based on the set model equation, this paper performs a panel regression and collates the regression results as table.

Table 4. Panel analysis results

Models Explained variables	Fixed effects model y
x	0.7614*** (3.2990)
urban	0.9108*** (14.3603)
lncpi	1.5806 (1.3531)
rss	0.6978 (1.4595)
_cons	-7.6626 (-1.4121)
N	92
Provincial Control	Yes
Year Control	Yes
r2	0.9172
r2_a	0.9009
F	116.3053***

Note: Data sources in the table are compiled by the authors from stata15 output. Values in parentheses are t-statistics; * $p<0.1$ ** $p<0.05$ *** $p<0.01$

As can be seen from the table 4, the R-squared value of the model is 0.9127, implying that it explains 91.72% of the causes of variation in y. The F-test of the model was found to pass the F-test ($F=116.3053$, $p<0.01$), which means that the model is valid, and the specific analysis shows that: the regression coefficient value of x is 0.761 ($t=3.299$, $p=0.001<0.01$), implying that x will have a significant positive relationship on y. The regression coefficient value of urban is 0.911 ($t=14.360$, $p=0.000<0.01$), implying that the Level of urbanization has a significant positive effect relationship on y. The regression coefficient value of $\ln\text{cpi}$ is 1.581 ($t=1.353$, $p=0.180>0.05$), implying that $\ln\text{cpi}$ does not have an effective relationship on y. The regression coefficient value of rss is 0.698 ($t=1.460$, $p=0.149>0.05$), implying that rss does not have an influential relationship with y.

3.2 With Fiscal Changes, Financial Investment in Education has An Increasing Role in Promoting Higher Education Enrollment.

Based on the analysis of hypothesis 2, this paper introduces quantile regression based on the above table and sorts out the changes of the regression coefficient of the core explanatory variable education financial investment as follows.

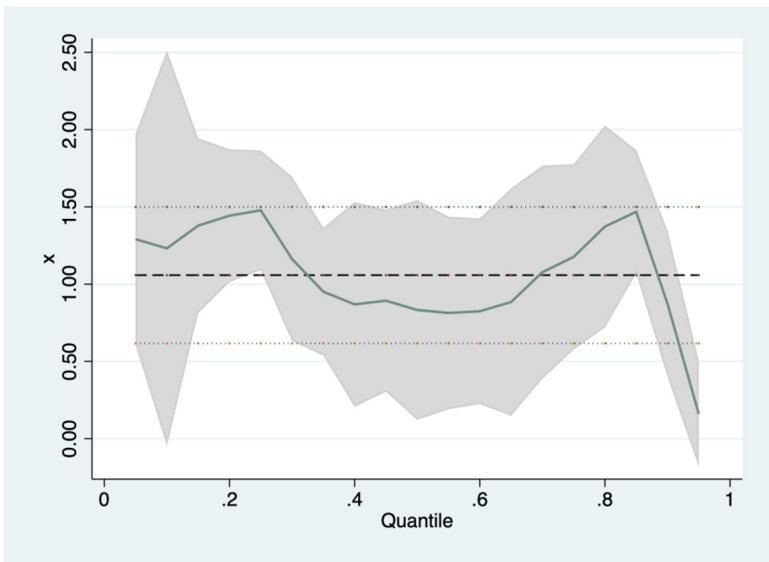


Fig. 1. Regression coefficient of quantile of financial education investment (Photo credit :Original)

In Fig. 1, the horizontal coordinates are the quantile levels of enrollment, which increase from left to right levels, and the vertical coordinates are the regression coefficients of financial education investment. From the results, the regression coefficients corresponding to all quantile points are greater than 0, indicating that the effect of financial investment in education on enrollment shows a continuous positive effect, and

in terms of the strength of the effect, the results show that the regression coefficients fluctuate. The analysis of the results there suggests that the higher the financial investment in education is not better, and that attention should be paid to the level of investment at the appropriate stage of enrollment level in order to better play a positive role in enrollment.

Overall, the direction of influence is in line with the previous article, indicating that the model is more robust.

3.3 Summary of Results

This study focuses on data from nine provinces and ministries in China, discusses the impact of education finance on the gross enrolment ratio of higher education, and tests the hypothesis by establishing an econometric model.

The empirical results of this paper can be summarized in the light of the above discussion as follows.

First, this paper uses a fixed-effect regression model to test the hypothesis, and the study shows that the financial investment in education has a significant positive impact on the enrollment rate, and hypothesis 1 is true.

However, at the same time, in quantile regression, it is verified that the higher the better, nor the lower the better, but the horizontal stage of the enrollment rate, and the hypothesis 2 is overturned.

4 Discussion

Two hypotheses are proposed in this paper. The first hypothesis is that local financial expenditure on education will significantly affect the gross enrollment rate of higher education. The second hypothesis is that with the change of finance, the promotion effect of educational financial investment on the enrollment rate of higher education is increasing.

4.1 Promoting Higher Educational Development with Economic Development

We first hypothesize that local financial spending on education will have a significant impact on the gross higher education enrollment rate, which is valid. In general, the more developed an area is, the higher its educational attainment should be. This is in line with common sense, such as in Jiangsu and Zhejiang regions.

As the ancients said, when granaries are full, etiquette is known. Marx and Engels also believed that the economic base determines the superstructure. Education needs money just as crops need rain and fertilizer. Without adequate education funds, higher education cannot develop sustainably [7].

For some developed regions, economic development and educational development have initially formed a positive interaction and coordinated development^[8]. In modern society, scientific and technological innovation ability is necessary for a region to achieve sustainable economic growth. Scientific and technological innovation is

closely related to education. Higher education can provide a steady flow of intellectual support and talent guarantee for regional innovation. For the development of economy, more talents are needed^[9]. So, while the economy helps education, education promotes economic growth.

4.2 Optimize Higher Education Investment

The second hypothesis is that with financial changes, educational financial input plays an increasing role in promoting the enrollment rate of higher education. This hypothesis is not valid. First of all, the government's financial input is needed to ensure the normal operation of all work, including construction, roads, education, health care and many other aspects. Therefore, the government's financial input should be based on the corresponding demand. If the emphasis on a certain aspect or ignoring a certain aspect, obviously is not appropriate. Generally speaking, if the government is going to focus on education, of course, it will invest more in education. But what needs to be considered is whether the government is investing enough in education. If a district spends relatively little money on education, it would be good for us to increase spending appropriately. On the contrary, if a region's educational financial input is saturated, this report continues to increase investment, and the benefit may be little, more likely to backfire. Lao Tzu said in the *Dao De Jing*: too strong must be weak, this is what the report means. Basically, the money needed to increase the financial input in education comes from other sources. If you overinvest in education, other areas will suffer and become weak. As a result, people's normal standard of living will decline. When people's living standard declines, they may pay less attention to education, which indirectly leads to the decline of education.

In this era when the public attaches more and more importance to education, the government should reasonably plan the financial input in education and keep it at a relatively normal range. Generally speaking, national planning objectives play a dominant role^[3,10]. That is to say, the government should not increase the financial investment in education unscientifically for the purpose of indicators, which will not give full play to the reasonable value of the funds, and may make the results counterproductive. For families, if they want their children's academic success, they must also need all-round training. First of all, students' mental health and physical health are both important. If a student's body and mind are not good, he can hardly do well in his study. Therefore, parents can't always teach children to study things, can't only care about children's academic performance. As a parent, the first thing to do is to turn the child into a person with a sound personality, rather than a learning machine. After school, parents can take their children to do more meaningful things, such as going to museums and forest parks, instead of using cram schools instead. For the school, it must not just increase the school's teaching efforts, but really do let the all-round development of students. Schools can't eliminate music and physical education classes that help students relax. Also, teachers can't occupy students' class time often or assign a lot of homework. An interpersonal relationship is also very important in school life. If students often have conflicts with their classmates or teachers, it will also have bad effects. For individual students, the study is certainly an important thing in their school days,

but it is not the most important thing. A good body, can let a person lifetime benefit. A sound state of mind, can let people experience setbacks.

It should be noted that there are limitations in the operation of some variables in this study. First of all, the variables used only involve the gross enrollment rate of higher education, educational financial input, the level of urbanization, the price level and the teacher-student ratio of regular institutions of higher learning. In fact, there are many more variables that can be described, such as consumption levels. Secondly, the data in this paper is not rich enough, with only the data of the last ten years and only nine provinces. In addition. The model established in this paper also has room for optimization.

5 Conclusion

The results of this study show that local financial expenditure on education has a significant impact on the gross enrolment rate of higher education, but with the change of finance, the promotion effect of educational financial investment on the enrollment rate of higher education is not increasing, and even has an inhibitory effect. First of all, education is definitely related to the corresponding financial input. It is right to value investment in education. But everything has a degree. It is not that the more financial investment in education, the more it promotes the enrollment rate of higher education. Therefore, the government should reasonably allocate all kinds of financial input, so that they get the corresponding balanced development. The government can neither favour nor ignore one side.

This study is to discuss the influence of educational financial input on the gross enrollment rate of higher education, which is a supplement to education research. The main contribution of this paper is to focus on higher education, which is of The Times and in line with the current social needs. However, the selection of variables in this paper is still limited, and the year span is not enough. Future studies can select more perfect control variables according to the actual situation, and carry out more detailed operations on the variables, so as to optimize the model. This is conducive to the in-depth study of the problem.

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