The Influence of Regional Higher Education Level on Local Economic Development

Qianwei Hu[1,*]

[1] School of Economics, Shandong University, Jinan City, Shandong Province, P.R. China
[*] Corresponding author. Email: qianwei_hu@mail.sdu.edu.cn

ABSTRACT
The impact of higher education on China's growth in the economy is the subject of this research. The level of higher education is proxied by the number of students, teachers, and colleges, and the research uses gross domestic product to measure economic growth. This research uses the linear regression model, in an effort to explore the magnitude of the effect. This paper intends to add to the current literature by bringing together evidence from a Chinese regional annual data set from the period 2003 to 2018 acquired from the National Bureau of Statistics and Ministry of Education of the People's Republic of China. The result reveals that higher education has a substantial and favorable impact on China's economic development, and the number of college teachers is also suitable for evaluating higher education levels, which is the main innovation of the research. It suggests that the government should invest more in tertiary education to foster economic growth.

Keywords: *Higher education, Economic growth, Linear regression model*

1. INTRODUCTION

1.1 Research Background

The Chinese government proclaims several achievements in higher education in each budget, with major government expenditures dedicated to the sector. The belief that higher education for children in developing countries is vital for future economic success, resulting in greater stability and living conditions, is driving this increase. For a long time, tertiary education was seen as an important factor in economic success.

The theoretical literature on growth points to at least three ways in which education could influence economic growth. First, as the theories of endogenous growth [1] propose, education may help the economy become more inventive by providing new information about new technology, items, and processes. Second, education can improve the human capital inherent in the workforce, boost labor productivity, and so move to a more balanced level of output, as in augmented neoclassical growth models [2]. Third, education can help with the distribution and transfer of knowledge needed for the absorption and processing of new information and the successful utilization of new technologies generated by someone else, thus fostering economic advancement [3].

1.2 Research Significance

In recent years, the significance of human capital in economic growth has piqued economists' interest. Previous research has looked at the impact of education on economic growth, using education as a simple measure of human capital. While the link between education and economic growth is well established, current research has focused on higher education and its economic growth consequences. As a result, higher education is widely regarded as one of the most important components of a country's economic development and competitiveness. For the creation of simple goods and services and the use of technology in the workplace, basic education (at both the primary and secondary levels) may be sufficient. Higher education, on the other hand, is more likely to generate graduates who can help the country move to a knowledge-based economy by developing new technology. Higher education fosters economic growth through giving technology and innovation, as well as delivering highly skilled workers to the job market.

Previous studies have looked into the impact of higher education on research and development, according to the literature. This study, on the other hand, re-examines the association between higher education and economic

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growth. Using panel data from the National Bureau of Statistics and the Ministry of Education of the People's Republic of China from 2003 to 2018, this study addresses a gap in the literature by using the number of students, professors, and colleges as proxies for higher education levels. The impact of tertiary education on economic development is then studied through a linear regression model.

1.3 Paper Organization

The organization of this paper is as follows: The study begins with an overview of the research on the impact of higher education on economic growth. The econometric methodology is then explained. Empirical results and discussion are shown in the following section, based on which the paper offers policy recommendations. Finally, the conclusions are drawn.

2. LITERATURE REVIEW

There has been extensive research on the relation between higher education and economic growth. However, the majority of these studies have been cross-sectional, with minimal studies on single-country techniques. Growth accounting methodologies were utilized by Jorgenson and Fraumeni (1992) to show that investing in both physical and human capital accounted for a considerable share of the growth in both the educational and industrial sectors of the US economy. They discovered that increases in labor input accounted for almost 60% of total economic growth. Improvements in labor quality accounted for another 42% of the labor contribution. In addition to a unique viewpoint on indirect feedbacks on economic growth and externalities, Appiah and McMahon (2002) studied the net impacts of education on other important developmental parameters in Africa. Infant mortality is reduced, life expectancy is increased, civic institutions and democratization are strengthened, political stability is improved, and physical capital investment is increased, all of which have a positive delayed feedback effect on economic growth. Fertility rates and population growth rates were both reduced as a result of the effects. They also discovered that education has a net influence on poverty, inequality, and crime reduction. Lin (2005) examined the impact of higher education programs on the labor force and, as a result, economic growth in Taiwan between 1965 and 2000. The finding was that higher education has a large and favorable impact on Taiwan's economic development, with engineering and natural science majors playing a key role. Farrell, Harmon, Laffan, and O'Carroll (2006) presented a large body of evidence from around the world that showed that investment in tertiary education makes measurable positive effects on the economy and society, plus investing in university-based research and development has real economic benefits. They discovered that a strong research-and innovation-oriented higher education system had the potential for mutually beneficial engagement with the business sector and that universities' economic effect was in teaching students to generate new ideas. To tackle his challenge, Osipian (2007) employed a system of linear and logarithmic equations and an endogenous growth model. He examined the importance of various degrees of education in helping Russia and Ukraine achieve significant economic growth. His research found that the educational advancement has a minimal impact on economic growth. He did establish, however, that university education had long-term benefits for income per capita growth. According to Kruss, Mcgrath, Petersen, and Gastrow (2015), international education and development thinking on the link between education, technological innovation, production, and development can benefit from evolutionary economics and the national innovation systems approach. From 1970 to 2010, Dufrechou (2016) investigated the impact of postsecondary learning on economic development and per capita income in a group of high and upper-middle income nations. The study used system GMM regressions and hierarchical linear models to deal with endogeneity issues and account for parameter variability. When compared to other skill profiles, a larger percentage of enrolment in scientific and technological employment was found to be a significant influencer of economic development and per capita GDP for a given share of tertiary educated. The share of the tertiary educated is measured as the share of people who entered universities, teacher's colleges, and higher professional schools, representing the most productive or skilled labor endowment, the only part of total human capital that enters the production function.

The modeling issue is also addressed in this research. The majority of studies on the effects of higher education on economic growth have found that linear models, which are a decent approximation and follow many theoretical methodologies, are used. As a result, in this investigation, the linear option was chosen. From 1959 to 2008, the impact of education expenditure on Sri Lanka's economic growth was studied by Ganegodage and Rambaldi (2011). The model employed was the Auto-regressive Distributed Lag (ARDL). When compared to other emerging countries, they discovered that education returns have a weak positive effect on economic growth. Mercan and Sezer (2014) examined the influence of education spending on Turkey's economic growth using the same methods and discovered that education spending has a favorable and significant impact on economic growth. In 36 high-income nations, Jin and Jin (2014) investigated the effects of Internet education on economic growth by application of a linear regression model. They argue that a broad online education could boost the economy.

This research could add to the existing literature in a variety of ways. First, the effects of postsecondary education on local income and economic growth in China are discussed. based on data from 31 Chinese provinces and municipalities from 2003 to 2018. Second, in contrast to prior studies, this one includes the number of teachers in measuring higher education levels.

3. METHODOLOGY

3.1 Variable Selection

To examine the impact of regional higher education on local economic development, the first thing to do is to find some specific measures for the variable in the model. Before starting the research, here is a review of a lot of articles all around the world studying this topic. Surprisingly, there are very few articles talking about China. And among those who study China, most of them only care about one or some specific provinces. This research wants to make a more general description of the impact of increased education levels in China on local economic growth to make a supplement for domestic study in this aspect, so it will use the annual data of all the 31 provinces and municipalities in China covered from 2003-2018, including Xinjiang, Ningxia, Qinghai, Gansu, Shaanxi, Tibet, Yunnan, Guizhou, Sichuan, Chongqing, Hainan, Guangxi, Guangdong, Hunan, Hubei, Henan, Shandong, Jiangxi, Fujian, Anhui, Zhejiang, Jiangsu, Shanghai, Heilongjiang, Jilin, Liaoning, Neimenggu, Shanxi, Tianjin, Beijing.

For the local economic development level, within the expectations, almost all of the articles that have been reviewed choose the GDP (gross domestic product) to measure the economic level. Since this paper studies the dimension of region, it is necessary to transform gross domestic product into gross regional product. The paper first suggests the number of universities and colleges should be a key determinant in measuring higher education levels, and most of the articles that have been reviewed confirm this guessing. As a result, the study uses this as one way of measurement for the labeled NofU. Also, it has been noticed that some papers use the number of students as a measurement, so the research uses this as another way to label NofS. Besides, the study makes a guess that the number of teachers in higher education institutions may also be a good way to measure higher education level, although there isn't any article that takes this into consideration. Thus the paper puts it in the NofT and tries to find out whether the guessing is right. Table 1 has a description of all the variables.

Table 1. Description of variables

Variable	Variable	Description	Source
Dependent variable	GDP	Gross regional product (unit:100 million yuan)	National Bureau of Statistics
Independent variable	NofU	Regional number of universities and colleges	National Bureau of Statistics
	NofS	Regional number of college students (unit:10 thousand people)	
	NofT	Regional number of teachers in universities and colleges (unit:10 thousand people)	
Control variable	RD	Regional research and development expenditure of industrial enterprises, which is used to measure regional technology level (unit: 100 million yuan)	National Bureau of Statistics
	FAI	Regional fixed asset investment, which have already subtracted the education part and is used to measure regional capital investment level (unit: 100 million yuan)	
	NEU	Number of employment in urban areas, which is used to measure regional labor input (unit:10 thousand people)	

3.2 Model

The basic regression model is specified in the following equation:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 RD_{it} + \beta_3 FAI_{it} + \beta_4 NEU_{it} + u_{it} \quad (1)$$

In model (1), the dependent variable is Y_{it}, the local economic development level of province or municipality i in year t. The independent variable in year t is the regional higher education level of province or municipality i, X_{it}. RD_{it}, FAI_{it}, and NEU_{it} are controlled variables. RD_{it} represents the regional research and experimental development expenditure of province or municipality i in year t, which is used to measure the regional science and technology development level here. FAI_{it} is the regional fixed asset investment of province or municipality i at year t, selected to measure physical capital investment here. NEU_{it} stands for the number of jobs in urban areas of province or municipality i at year t, which is chosen to measure labor investment here.

The idea of the model is based on a very classical model: the Cobb-Douglas production function. The expression of the C-D function is as follows:

$$Y = AK^{\alpha}L^{\beta} \quad (2)$$

In this formula, Y represents the production level, A represents the technical level, K represents the capital input level, L represents the labor input level, α is the capital output elasticity coefficient, and β is the labor output elasticity coefficient.

In order to reflect the role of education, the labor input level (L) is replaced by the product of the labor input (L) and education input (E). Taking logarithm on both sides of the formula, we get the following equation:

$$y = a + \alpha k + \beta l + \beta e \quad (3)$$

In this formula, y is the output level, a, k, l, e are the levels of technology, capital input, labor input, and education input, respectively, which corresponds to the idea model and helps to determine the control variables.

As for technology level, according to a lot of articles that have been reviewed, they mainly choose R & D expenditure for measurement. So this research also does this, with some adjustments here. Since the control variable and the independent variable are assumed to be uncorrelated, the paper uses the regional R&D expenditure of industrial enterprises instead of the total, given that the total will include research funds for universities. As for the level of capital investment, previous researchers mainly used capital stock for measurement. But this study suggests new investment in one year should be a better one when considering its contribution to this year's economic development, so the research changes this to fixed asset investment. Also, to meet the condition, the paper subtracts the education part from the total investment. As for labor input level, to be honest, this study only notices a few taking this into consideration. Among those who do so, they mainly use the labor force in one year for measurement. But this may not be very precise because the labor force includes the unemployed, which will not contribute to the economy, so the research changes this into the number of employment in urban areas.

4. EMPIRICAL RESULTS AND DISCUSSION

Section 4.1 shows the statistical description of all the variables, followed by the results of Pearson correlation tests and Hausman specification tests, which are presented in Sections 4.2 and 4.3, respectively. In the model, the number of local universities is used to evaluate the regional higher educational level. Because it is not the only factor that can be used as a measure, the research selects two more regressors to conduct robustness tests, with the goal of determining whether the results obtained would still hold if the measure was changed. Section 4.4 presents and discusses the regression results of the model, followed by Section 4.5, which contains the results of two robustness tests.

4.1 Statistical Description

The variables' statistical descriptions are listed below. Table 2 shows that the paper can have a intuitional impression on the average level of all the regions in China from 2003 to 2018. The average regional GDP is 1519.56 billion yuan. The average NofU is 73. The average NofS and average NofT are 698.52 thousand and 68.08 thousand respectively. Diagram 1 below shows the developing trend of the average GDP and the number of universities across all regions. It can be seen that from 2003 to 2018, with the increase of NofU, regional GDP also increased, which depicts a positive relationship between these two. The study also notices that the former growth rate is slower than the latter in recent years. This is reasonable since after the early rapid expansion, there are not many resources for a region to establish new universities like before, so growth speed slows a bit.

Also, the paper can make some comparisons from the standpoint of China's geographical split. Table 3 shows the basic statistical description of the seven partitions of China. Northwest China shows the lowest NofU (38), RD (4.14B), FAI (442.132B) and NEU (2208.47T), and the lowest GDP (511.77B), which is within expectations. East China has the highest GDP (2557.513B) and second NofU (98), which may result from its highest RD (51.88B), FAI (1501.52B) and NEU (7406.49T). Central China possesses the highest NofU (110), but its other factors are a little bit weaker than in East China, so it has the second highest GDP (2107.036B).

From the analysis, it can be seen that all of these four factors can contribute to economic growth, so local government needs to balance the development of these key factors to boost the economy.

Table 2. Descriptive statistics for all regions

Variable	Mean	Std.Dev.	Min	Max
GDP	15195.790	12435.820	677.300	51604.050
NofU	72.776	35.949	5.813	142.438
NofS	69.852	43.396	2.866	157.298
NofT	6.808	4.012	0.311	14.990
RD	238.420	303.020	0.375	1128.654
FAI	9736.517	6450.521	675.295	26474.770
NEU	507.033	349.765	28.245	1593.336

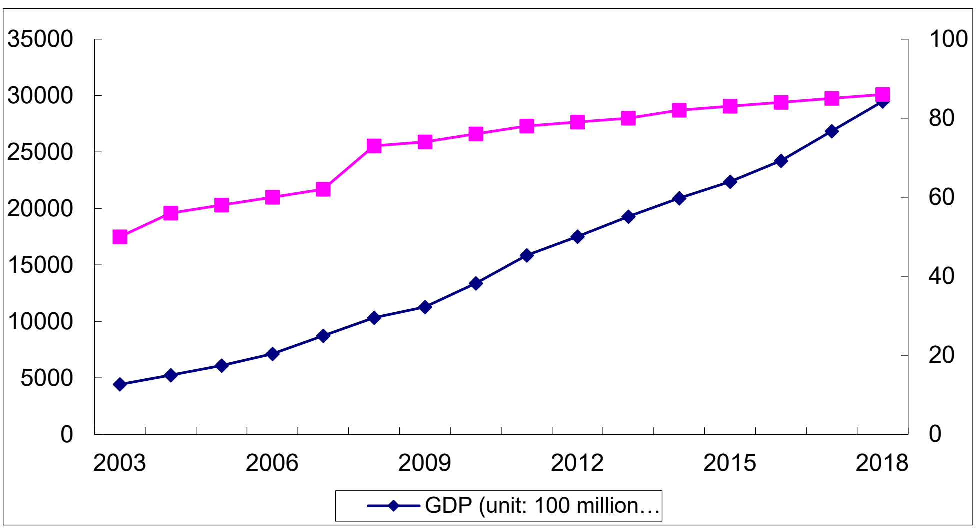

Figure 1 The trend of the average GDP and number of universities for all regions

Table 3. Descriptive Statistics for seven partitions of China (panel data)

Statistic	GDP	NofU	RD	FAI	NEU
North China					
Mean	12277.200	71	157.551	8523.571	446.788
Std.Dev	5324.026	25	68.123	4344.796	194.017
Northeast China					
Mean	10136.130	76	122.704	8454.125	440.071

Std.Dev	4129.936	24	99.933	3100.791	134.194
East China					
Mean	25575.130	98	518.790	15015.190	740.649
Std.Dev	13054.400	28	378.661	8203.191	315.277
Central China					
Mean	21070.360	110	269.283	14795.940	706.885
Std.Dev	3765.542	2	14.436	3428.056	215.611
South China					
Mean	21298.450	69	398.853	9106.850	671.309
Std.Dev	26507.580	55	632.621	7839.313	801.249
Southwest China					
Mean	9510.875	52	78.407	6931.494	345.966
Std.Dev	7197.021	31	72.163	4842.739	243.512
Northwest China					
Mean	5117.703	38	41.434	4421.320	220.847
Std.Dev	4196.625	29	47.167	3328.550	159.660

4.2 Pearson Correlation Tests

The model only contains one independent variable, the higher education variable, and the study uses the data from three dimensions to measure it, but this research doesn't put them all in the model as three standalone independent variables. It considers that these three are highly correlated and, if so, this will generate the problem of multicollinearity. Then the study runs the Pearson correlation test for these three, and the result (as shown in Table 4) confirms the consideration. So instead, the paper chooses the number of universities and colleges to be the main regression variable since most studies use this as the determinant. And for the other two, they are used to doing the robustness test.

To be rigorous, the research uses the Pearson correlation test for the three control variables and the main regression variable. The result in Table 5 shows that the correlation coefficients are mostly smaller than 0.8 or approximately 0.8. This means they have a weak correlation, which basically meets the conditions for the choice of control variables.

Table 4. Pairwise correlations for three IVs

Variable	(1)	(2)	(3)
(1) NofU	1.000		
(2) NofT	0.932*	1.000	
(3) NofS	0.950*	0.914*	1.000
Note: **** p<0.01, ** p<0.05, * p<0.1*			

Table 5. Pairwise correlations for CVs and main IV

Variable	(1)	(2)	(3)	(4)
(1) NofU	1.000			
(2) RD	0.675*	1.000		
(3) FAI	0.759*	0.792*	1.000	
(4) NEU	0.832*	0.875*	0.771*	1.000
Note: *** p<0.01, ** p<0.05, * p<0.1				

4.3 Hausman Specification Tests

Since the data type is panel data, it is needed to figure out whether a fixed effect or a random effect model should be used. The results of three Hausman tests show that the regressions for these three higher education variables all use the fixed effect model.

4.4 Regression Based on the Model

As the "Model" section explains, the fixed effect model is chosen in the regression analysis. The model's regression results are summarized in Table 6. It presents the estimates for the impact of the number of universities in the province (NofU) on local GDP. Three control variables are also included: R & D expenditure (RD), fixed-assets investment (FAI), and the number of employment in urban areas (NEU). Based on the coefficient in row 2, having one additional college or university in one region in China will lead to an additional GDP growth of 162.280 (unit: 100 million yuan). That is, the number of universities has a favorable effect on local economic development. In addition, note that the p-value for the number of universities (NofU) is 0, implying that the coefficient of the number of universities is statistically significant. It can also be seen that R-squared is 0.953, really close to 1, so the regression line "fits" or explains the data well.

The study can roughly draw the conclusion that higher education will have a favorable impact on the economic development in China.

Table 6. Regression result of NofU

GDP	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
NofU	162.280	21.625	7.50	0	119.716	204.844	***
RD	22.613	1.309	17.27	0	20.036	25.19	***
FAI	.317	.03	10.42	0	.257	.376	***
NEU	5.216	1.441	3.62	0	2.38	8.052	***
Constant	-6948.879	1446.95	-4.80	0	-9796.9	-4100.858	***
Mean dependent var	17756.966	SD dependent var	16031.717				
R-squared	0.953	Number of obs	321				
F-test	1464.858	Prob > F	0.000				
Akaike crit. (AIC)	5647.084	Bayesian crit. (BIC)	5665.941				
Note: *** p<.01, ** p<.05, * p<.1							

4.5 Robustness Tests

First, this research replaces the number of universities by the number of college students and chooses the fixed effect model. In other words, the independent variable is the number of college students (NofS). The dependent variable and control variables are the same as before. As presented in Table 7, the coefficient in row 2 equals 114.662, which implies having 10 thousand more students in colleges or universities in China will increase GDP by 114.662 (unit: 100 million yuan), still a positive influence. The p-value for the number of college students (NofS) is 0, thus the coefficient of 114.662 is statistically significant. R-squared is the same value (0.953) as in the last regression.

Next, the paper selects the number of teachers working in local universities (NofT) as the new independent variable and imports the data into the fixed effect model with the other variables staying unchanged. From Table 8, it can be seen that the coefficient is 2260.915 in this case, meaning that 10 thousand additional university teachers in China will bring about a rise of 2260.915 (unit: 100 million yuan) in GDP, which is a positive impact again. What's more, the p-value in row 2 is 0 and the R-squared is 0.959, indicating that the coefficient of the number of teachers working in local universities is statistically significant and the regression line explains the data well.

The results of the two robustness tests confirm the conclusion that higher education will influence economic growth in China, and this impact is positive. It can be compared to [14], in which the finding is that higher education led to the expansion of the economy in China.

Table 7. Regression result for NofS

GDP	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
NofS	114.662	15.284	7.50	0	84.578	144.746	***
RD	22.524	1.307	17.23	0	19.951	25.097	***
FAI	.281	.033	8.44	0	.216	.347	***
NEU	5.359	1.436	3.73	0	2.532	8.186	***
Constant	-2608.848	930.104	-2.80	.005	-4439.566	-778.13	***

Mean dependent var	17756.966	SD dependent var	16031.717
R-squared	0.953	Number of obs	321
F-test	1464.704	Prob > F	0.000
Akaike crit. (AIC)	5647.116	Bayesian crit. (BIC)	5665.973
Note: *** *p*<.01, ** *p*<.05, * *p*<.1			

Table 8. Regression result of NofT

GDP	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
NofT	2260.915	221.879	10.19	0	1824.192	2697.638	***
RD	22.522	1.218	18.49	0	20.124	24.92	***
FAI	.282	.028	9.91	0	.226	.338	***
NEU	3.955	1.364	2.90	.004	1.27	6.64	***
Constant	-9436.842	1330.697	-7.09	0	-12056.043	-6817.641	***

Mean dependent var	17756.966	SD dependent var	16031.717
R-squared	0.959	Number of obs	321
F-test	1678.127	Prob > F	0.000
Akaike crit. (AIC)	5605.357	Bayesian crit. (BIC)	5624.215
Note: **** p<.01, ** p<.05, * p<.1*			

5. POLICY RECOMMENDATIONS

The following recommendations might be made based on the empirical findings in order to further promote economic growth. Because it has been determined that higher education will benefit China's economic growth, it is suggested that the Chinese government should push the expansion of higher education by building more colleges and universities. According to [15], university education yields higher returns on investment. Unlike abilities obtained through basic education, technology and information acquired via higher education never stop evolving as a result of ongoing research and development. Higher education investment can lead to increased productivity, innovation, and creativity, all of which are essential in a knowledge-based economy. Thus, it is highly recommended that the government should give priority to higher education. With abundant resources and money put into the higher education field, more universities can be constructed and economic growth will accelerate.

What's more, in order to push the progress of tertiary education, the government could use some of its revenue to help improve the facilities in universities and to provide more welfare to workers in higher education institutions. With better experience studying or working in universities and colleges, an increasing number of people would like to receive education or have jobs in higher education institutions. In the long run, human capital will accumulate, which is beneficial to the economy.

Last but not least, the government could invest more in the scientific and technological research conducted in institutions of higher education. Science and technology are the key production forces and innovation is the key to the competitiveness of a country on the world stage. More funds for the conduction of studies in universities will encourage technological innovation, thereby leading to great development in the economy.

6. CONCLUSIONS

6.1 Key Findings

This article studies the impact of higher education on economic growth in China. Education has long been thought to be a key factor in achieving economic success. Higher education institutions are crucial in the production of knowledge and human capital, as well as driving capital accumulation and technical innovation in an area. Thus, they will have a persistent influence on the development of the economy. In addition, higher education has a positive externality in the economy, meaning that the benefit to society is greater than the benefit to the individuals who receive higher education themselves, which may increase the positive effects on the economy.

This research looks on the link between tertiary education and economic growth. Tertiary education will have a beneficial impact on economic growth in China, which is supported by the results of robustness tests. This conclusion can be supported by some literature.

Based on the empirical results, it is strongly recommended that the Chinese government should build more universities to push the expansion of tertiary education. The government could also use some of its revenue to help improve the facilities in universities and to provide more welfare to workers in institutions of tertiary education. The scientific and technological research conducted in institutions of tertiary education needs more funds as well.

The main innovation of the research is the application of the number of college teachers as the measure of higher education level, which is rarely found in other articles. The regression results show that the number of college teachers is also suitable for evaluating higher education levels, and the coefficient in this case is much larger than the one for the number of universities and college students.

6.2 Limitations

It has to be admitted that there are some limitations in the research. First, the measures of higher education level are not perfect. The study chooses the number of universities, college students, and college teachers as proxies, but school quality is ignored, so that very different universities are treated the same. Actually, the quality of universities is of great significance to the evaluation of higher education levels and should be taken into consideration. However, it is difficult to measure. Similarly, the quality of university teachers' teaching and research is also out of consideration. Besides, university teachers may include workers who don't give lectures or do research but offer services on campus instead, such as the technicians who are responsible for the daily failure-free operation of multimedia equipment in universities. If there is a large proportion of teachers doing such work in some colleges, the number of university teachers may fail to be a good measure of higher education level. Why? The reasons why higher education is significant to economic prosperity include that tertiary education may help the economy become more inventive by providing new information about new technology, items, and processes; as well as that tertiary education can help with the distribution and transfer of knowledge needed for the absorption and processing of new information and the successful utilization of new technologies generated by someone else. Provision of new information needs to be supported by research. Transfer of knowledge is the main goal of university courses. In this way, the number of workers giving lectures or doing research in higher education institutions is a more accurate measure of the level of higher education than the number of all university teachers. In short, there is still improvement space for the evaluation of higher education levels.

Second, due to the fact that there is limited data available and suitable for the research, the study only includes three control variables---R&D expenditure, fixed-assets investment, and the number of employment in urban areas in the model. However, there are many other factors affecting GDP, such as residents' consumption levels and the trade openness of the region. They are out of the model because of the difficulties in measuring or acquiring the relevant data.

Because of the limitations mentioned above, the quantitative empirical results obtained in the research might not be so accurate. However, these problems don't affect the qualitative analysis, and the conclusion is significant and valid.

6.3 Future Studies

Further studies are needed due to the existence of limitations mentioned above. To improve the evaluation of higher education levels, it is essential to find better proxies. Good measures of school quality and the quality of university teachers' teaching and research could be added. The number of university teachers could exclude workers who don't give lectures or do research. What's more, additional accessible data is needed to enable future studies to take more factors into account and construct more complete and more sophisticated models.

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