

An Analysis on the Convergence of Higher Education Fiscal Expenditures in China

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Abstract: Higher education fiscal expenditure is an important factor that affects the quality of higher education development, and it also has a significant role in promoting the balanced development of higher education. The convergence of higher education financial expenditure can intuitively explain the trend of balanced development of higher education. This article is to study the convergence of higher education fiscal expenditure in China and explain the current status and differences in various regions. Finally, provide suggestions for the balanced and coordinated development of fiscal expenditure on higher education.

Keywords: Higher education fiscal expenditure; Balanced development of higher education; Convergence

1. Introduction

In the more than 40 years since the resumption of the college entrance examination, Chinese higher education has undergone changes from weak to strong [1]. The number of colleges and universities increased from 404 in 1977 to 2663 in 2018. Besides, the number of college graduates increased from only 16500 in 1978 to 7533087 in 2018. While how about the trend of higher education fiscal expenditures? Are lower expenditure provinces catching up to the most expenditure provinces, and if so, how quickly?

According to the theory of educational production function, educational funding is one of the key factors affecting the quality of education. Among them, national public financial investment is an important source of educational funding for higher education. Exploring the convergence of fiscal expenditures on higher education, we could find whether Chinese fiscal expenditures on higher education have a stable growth path and go on a balanced development.

2. The Experience Study and Reference of Educational Convergence

2.1. Reference on convergence

Convergence is based on the theory of neoclassical economics, which studies the phenomenon that the economy eventually exhibits the characteristics of convergent development under the condition of diminishing marginal output of capital [2]. As early as 1928, Ramsey found that the relationship between the growth rate of per capita income the level of per capita income in different regions was not positive but negative correlation. In a closed economy with similar preferences, economically back-

ward areas would surpass economically developed regions as a faster growth rate and the convergence of economic levels has been achieved. This condition is called economic convergence [3].

The concept of convergence was originally proposed by Barro and Sala-I-Martin. It was used to explain the convergence across countries about labor productivity using GDP per capita. The convergence methods are mainly divided into five types in existing studies: σ convergence, β convergence, club convergence, γ convergence, and time series convergence. The first three convergence types are widely used in economic research. σ convergence means that the gap between economies gradually narrows over time. β convergence can be divided into absolute β convergence and conditional β convergence [4]. The requirements for absolute β convergence are more stringent, assuming that all economies have the same characteristic elements. Regardless of its initial level, it can converge to the same steady point. Besides, the farther away from the steady point, the growth rate of the economy is faster. Conditional β convergence is to assume that the characteristic elements are different between economies, and that different characteristic elements will affect the growth path of each economy and push economies converge to different stable states [5].

2.2. Experience studies on educational convergence

In recent years, some scholars have begun to apply the convergence theory to the study of education finance. In the field of education and human capital, Smith and Sab selected the enrollment rate and teacher-student ratio of various education stages in multiple countries as the research objects, and used three-stage least squares method to study the convergence of education human capital. Then, they found conditional convergence about the en-

rollment rate and teacher-student ratio [6]. Stamatkis and Petrakis evaluated the convergence of OECD countries' enrollment rate. They found that the human capital within the country has convergence, but there is no cross-border convergence between countries. Afzal studied the convergence of education and welfare in Pakistan. The conclusion shows that the literacy rate in the past 50 years has a significant β convergence, while the degree of gender equality and the level of accommodation have increased. Gu analyzed the convergence of local vocational education development in China and discussed the role of neighborhood structure in the development of local vocational education [7].

With the increasing use of convergence analysis in the field of education, some domestic scholars have also started relevant research. Li and Luo studied the convergence of compulsory education in China and found that per capita education funding, regional per capita GDP and per capita education resources are important factors that affect the convergence of compulsory education [8]. In addition, there is no club convergence in compulsory education regardless of the east, middle or west. convergence. In terms of higher education research, Xia and Cui

believe that there is no σ convergence in higher education expenditures, and that there is a significant absolute β convergence in higher education expenditures in the western region in China. The research results of Tang and Zhou show that there is a trend of absolute β convergence in the budget of higher education and a significant conditional β convergence after joining the central government expenditures, per capita GDP and per capita disposable income.

3. The Empirical Research on the Convergence of Higher Education Financial Expenditures in China

According to the above, this article will measure the σ convergence and absolute β convergence of the fiscal expenditures on higher education in China.

3.1. σ Convergence

This article mainly examines the σ convergence of Chinese higher education fiscal expenditure to illustrate the horizontal trend of it over time in the form of standard deviation. The result is shown below.

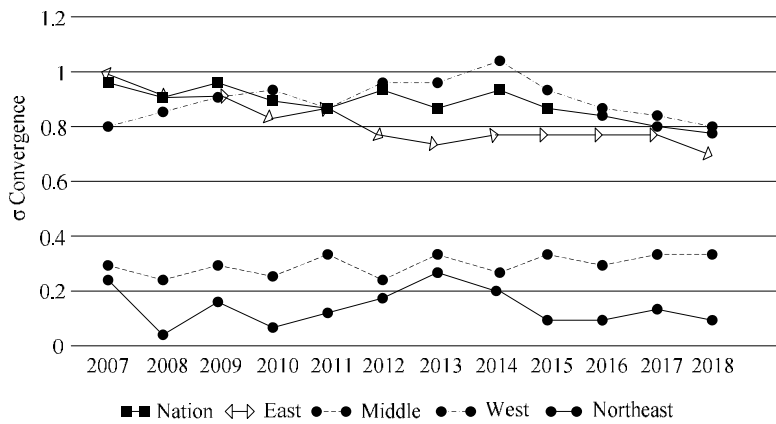


Figure 1. σ Convergence test of higher education fiscal expenditure

Although the national higher education financial expenditure fluctuated slightly, the overall trend was a downward trend and showing the characteristics of σ convergence. The value of the standard deviation decreased from 0.994 in 2007 to 0.783 in 2018. It can be seen by region that only the eastern region shows an obvious σ convergence trend. The western and northeastern regions show an “M”-type shock and a convergence trend from 2014 to 2018. But there is no obvious convergence or divergent trend in the middle region.

3.2. Absolute β convergence

The model based on the ideas of Bernard and Jones (1996) is used to calculate the absolute β convergence. The model is as follows:

$$(\ln y_{iT} - \ln y_{i0}) / T = a + b \ln y_{i0} + e \quad (1)$$

In the above formula, y_{iT} and y_{i0} respectively represent the data value of the i -th unit in the reporting period and the initial period, that is, the higher education fiscal expenditure in i -th province. T represents the time span and e is the random error term. a and b are the parameter to be estimated. According to the relationship between b and 0, whether there is absolute β convergence can be determined. When $b < 0$, it is absolute β convergence. Besides, the convergence rate λ and the convergence time τ can also be calculated from the estimated β value. The specific formula is as follows:

$$b = -(1 - e^{-\lambda T}) / T \quad (2)$$

$$t = \ln(2) / \lambda \quad (3)$$

We conduct a comprehensive test of the absolute β convergence of the whole country and sub-regions in the following time periods: First is the continuous time of all periods in 2007-2018 as the test period (T=12). Then the whole period is divided into 4 parts, that is one period of 3 years (T=6). The average value of every 3 years is used

as the amount of higher education financial expenditure for each period of time to measure convergence. Third, 2012 is used as the cut-off point to conclude the convergence during 2007-2011 (T=5) and 2012-2018 (T=7). The results are shown in the Table 1.

Table 1. Absolute β convergence of higher education financial expenditure

	2007-2018 (T=12)				2007-2018 (T=6)			
	β	R ²	λ	τ	β	R ²	λ	τ
Nation	-0.019***	0.373	0.022	32.143	-0.021***	0.257	0.022	30.882
	(0.004)	[0.352]			(0.007)	[0.231]		
East	-0.026***	0.606	0.031	22.242	-0.043***	0.465	0.050	13.937
	(0.007)	[0.557]			(0.016)	[0.398]		
Middle	-0.001	0.001	0.001	689.127	-0.068	0.380	0.087	7.933
	(0.027)	[-0.249]			(0.043)	[0.224]		
West	-0.001	0.001	0.001	689.127	-0.027***	0.507	0.029	23.531
	(0.006)	[-0.099]			(0.009)	[0.458]		
Northeast	-0.092	0.920	—	—	-0.146	0.893	0.348	1.992
	(0.027)	[0.840]			(0.051)	[0.786]		
	2007-2018 (T=5)				2007-2018 (T=7)			
	β	R ²	λ	τ	β	R ²	λ	τ
Nation	-0.029***	0.281	0.031	22.124	-0.022***	0.270	0.024	29.013
	(0.009)	[0.256]			(0.007)	[0.245]		
East	-0.029**	0.373	0.031	22.124	-0.020	0.141	0.022	32.171
	(0.013)	[0.295]			(0.018)	[0.033]		
Middle	-0.018	0.018	0.019	36.748	0.060	0.451	0.050	13.837
	(0.065)	[-0.227]			(0.033)	[0.314]		
West	0.004	0.007	0.004	175.037	-0.027**	0.387	0.030	23.161
	(0.016)	[-0.092]			(0.011)	[0.326]		
Northeast	-0.189	0.864	0.580	1.195	-0.091	0.756	0.145	4.788
	(0.075)	[0.727]			(0.052)	[0.511]		

Note: The standard deviation is in parentheses, and the adjustment R2 is in square brackets. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. According to the test results, the estimated β values in the four time periods around the whole country are -0.019, -0.021, -0.029, and -0.022, respectively, and all are significant at a 1% significance level. The different convergence speeds in the four period (2.2%, 2.2%, 3.1%, and 2.4% respectively) indicate that the convergence speed to the steady-state equilibrium point is varying. The half-life cycles of the nation are respectively 32.143 years, 30.882 years, 22.124 years, and 29.013 years.

The results of β convergence by region show that only the eastern region has obvious β convergence in continuous time and most of the time-segment estimates. Only in 2007-2018, there is no β convergence, and its continuous time convergence rate (3.1%) is higher than the national continuous time convergence speed. The western region has a significant β convergence trend during 2007-2018

(T=6) and after 2012. There is no trend of β convergence in the central and northeastern regions in all time periods.

4. Conclusion

According to the above research results, it can be seen that the national higher education fiscal expenditures generally show a convergence trend, especially in the whole country and the eastern region, indicating that the regions of lagging fiscal expenditures on higher education has begun to show the “catch-up effect” in recent years. The σ convergence trends in the western, central and northeastern regions are not clear, and there is no significant β convergence, indicating that these regions have not yet found a suitable convergence path for themselves. Through the investigation of the convergence of higher education fiscal expenditure, we can know that the gap in China's higher education fiscal expenditure mainly comes from the gap between regions. While increasing

investment in higher education, we should also consider the balanced and coordinated development between regions to achieve the stable growth of fiscal expenditure on higher education.

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