Research on the Contribution of Higher Education to Economic Growth Rate in Jiangsu Province

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Abstract: It is found that the contribution rate of national higher education to economic growth in 1999-2009 is higher than that in Jiangsu Province; 2010-2015, the contribution rate of higher education in Jiangsu Province to economic growth was higher than that of the whole country; the contribution rate of advantageous disciplines and key disciplines to economic growth was much higher than the contribution rate of the scale expandability of China's higher schools to economic growth. Therefore, Jiangsu Province should continue to develop advantageous disciplines and key disciplines, appropriately expand the scale of postgraduate enrollment; create a "soft environment", retain talents, and at the same time increase the attractiveness of talents, especially high-end talents, accelerate the accumulation of talents; form a cluster of advantageous industries. There is necessary to attract talents through industry, adhere to training and introduction, focus on training, and pay attention to the employment quality of graduates, especially high-quality employment.

1. Introduction

From 1996 to 2015, there were mainly two important stages for Jiangsu Province's higher education. The first stage was the expansion of higher education, and the second stage was the construction of preponderant disciplines and key disciplines.

Since 1996, Jiangsu Province has accelerated the pace of enrollment expansion [1]. In 2000, the gross enrollment rate of higher education in Jiangsu Province has reached 15%, entering the stage of popularization of higher education. In the process of expanding enrollment, the quality of higher education has declined and the connotative development has been insufficient. Therefore, in 2012, China's Ministry of Education issued Opinions on Improving the Quality of Higher Education in an All-round Way to cool down the expansion.

In 2010, Jiangsu Provincial Party Committee and Provincial Government promulgated Jiangsu Province Medium and Long-term Education Reform and Development Plan (2010-2020), proposing "Jiangsu University's Advantageous Subject Construction Project". In the same year, Jiangsu Provincial Government Office issued Notice on Printing and Distributing the Implementation Plan of the Superior Discipline Construction Project in Jiangsu Universities, with the goal of cultivating hundreds of thousands of high-level talents [2]. In 2011, Jiangsu Provincial Department of Education issued Notice on Carrying out Selection and Construction of Key Disciplines in the 12th Five-Year Plan.

Schultz believes that the national income continues to grow at a much higher rate than the amount of land used for production income, the amount of actual labor and the amount of reproducible capital [3], rooted in the steady growth of human capital. Under the support of Schultz's human capital theory, there is reason to believe that higher education in different stages of Jiangsu Province contributes to economic growth. As for whether there is a difference and which stage of higher education contributes more to the economic growth rate, it is necessary to further sort out and analyze the literature.

In China Knowledge Network CNKI, researchers found a large number of articles on the contribution of higher education to economic growth, but the papers focusing on Jiangsu Province are still few. For example, Lin Liu et al. concluded that the contribution of higher education to Jiangsu's economic growth rate during the period of 1996-2005 was 1.8%, which was lower than the average growth rate of national higher education (3.350%) in the same period [4]. According to

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Yuping Cui's algorithm from 2001 to 2010, Zhejiang's higher education contribution to economic growth rate (2.1%) was higher than Jiangsu (1.4%) [5]. Qi Fan used the data from 1999 to 2011 and found that after the expansion of colleges and universities in 1999, the development of Jiangsu higher education promoted regional economic growth [6]. Wenyun Yao and Feiyu Chen believed that the contribution of higher education in Jiangsu Province to the annual average growth rate of GDP in 2003-2010 was 3.36% [7]. Shihai Sun and Huaming Song believe that the contribution of higher education to Jiangsu's economic growth rate in 1996-2005 (1.314%) is lower than the national average (1.862%) [8].

From the related research, they use different computing models, using the data from the 1990s to the beginning of the 21st century, to compare the contribution rate of higher education in Jiangsu Province to economic growth with the national average, and the former is lower than the latter. However, the downside is that there is no estimate of the contribution of higher education to economic growth at different stages of Jiangsu Province.

In this study, we use the Cobb-Douglas production function ($Ce=\beta Re/y$, the β value is determined to be 0.73 [9]), and select the "China Labor Statistics Yearbook" and the "China Statistical Yearbook" for the education level of employed persons and the GDP index with estimating the contribution rate of higher education in Jiangsu Province to economic growth in 1999-2009 and in 2010-2015. It is helpful to understand the performance of regional construction projects in promoting economic growth, so as to better implement construction projects and further promote regional economic growth.

2. Analysis of the contribution of higher education in Jiangsu Province to economic growth rate from 1999 to 2009, 2010-2009

2.1 The status of education of employed persons in Jiangsu Province

From 1999 to 2009, the number of junior high school employees in Jiangsu Province increased the fastest, and the number of senior high school and university education employees increased slowly. In terms of controlling the number of illiterate and primary school employees, Jiangsu Province has mainly reduced the proportion of literacy practitioners. The situation of the education level of the employed people in the country has a great similarity with that of Jiangsu Province. The only difference is that the number of employed people in the primary school education level has been greatly reduced.

In 1999, the number of university educated employees in Jiangsu Province was 1.2 percentage points higher than that of the whole country. However, in 2009, the number of university educated employees in Jiangsu Province was 0.16 percentage points lower than the national level (see Table 1).

In a nutshell, the government should attach great importance to the development of secondary education, especially higher education, improve the total amount of high-end talent training, combine cultivation and introduction, optimize the social environment, and enhance the attractiveness of talents.

Table 1 Composition of the education level of employed persons in Jiangsu Province and China (%)

region	1999					2009				
	illiteracy	ps	jhs	shs	cua	illiteracy	ps	jhs	shs	cua
Jiangsu	11.50	29.40	40.10	14.00	5.00	3.90	24.20	50.20	14.50	7.27
China	11.00	33.30	39.90	11.90	3.80	4.80	26.30	48.70	12.80	7.43

Note: ps=primary school, jhs=junior high school, shs=senior high school, cua=college, university and above.

2.2 Estimating the number of years of employment of employees at all levels of education

The number of years of employment of primary, secondary education and university education in Jiangsu Province in 1999 was as follows:

(29.40+40.10+14.00+5.00)×6÷100=5.31
(40.10+14.00+5.00)×3÷100=1.77
(14.00+5.00)×3÷100=0.57
5.00×4÷100=0.20

According to this method, the number of years of education for employed persons in Jiangsu Province and the whole country in 1999 and 2009 can be calculated (see Table 2).

Table 2 The number of years of education for all employed persons in Jiangsu and China

region	1999				2009			
	ps	jhs	shs	cua	ps	jhs	shs	cua
Jiangsu	5.31	1.77	0.57	0.20	5.77	2.16	0.65	0.29
China	5.33	1.67	0.47	0.15	5.71	2.07	0.61	0.30

Note: ps=primary school, jhs=junior high school, shs=senor high school, cua=college, university and above.

Then the average annual growth rate of per capita years of higher education in Jiangsu Province from 1999 to 2009: Rh=(0.29÷0.20)1/10-1=3.79%, and the average annual growth rate of per capita annual higher education in the country is 7.18%.

2.3 Annual average growth rate of the comprehensive education index of employed persons Re

The labor simplification rate of the labor force in elementary school, junior high school, senior high school and university education level is set to 1, 1.2, 1.4 and 2 [10]. According to the relevant data in Table 2 and the labor simplification rate, it can be concluded that the education comprehensive index of the labor force population in Jiangsu Province in 1999 is: 5.31×1+1.77×1.2+0.57×1.4+0.20×2=8.63. In 2009, the education comprehensive index of the provincial labor force is: 5.77 × 1 + 2.16 × 1.2 + 0.65 × 1.4 + 0.29 × 2 = 9.85. By analogy, it can be estimated that the comprehensive index of national education for employees in 1999 and 2009 is 8.29 and 9.65 respectively.

Then, the average annual growth rate of the Jiangsu provincial labor force education comprehensive index from 1999 to 2009 is: Re=(9.85÷8.63) 1/10-1=1.33%. The national labor force education comprehensive index has an average annual growth rate of 1.53%.

The average annual growth rate of the Jiangsu provincial education comprehensive index from 1999 to 2009 was: {[9.85-(2×0.29)]÷[8.63-(2×0.20)]}1/10-1=1.20%. Therefore, the contribution rate of higher education in Jiangsu Province is: 1.33%-1.20%= 0.13%. In the past 10 years, the proportion of higher education in Jiangsu Province in the average annual growth rate of education comprehensive index Eh = 0.13 ÷ 1.33 × 100% = 9.77%. Based on this, it can be calculated that the percentage of national higher education in the average annual growth rate of the comprehensive education index is 18.30%.

2.4 Estimating the average annual growth rate and contribution rate of GDP

According to the data published in the Jiangsu Statistical Yearbook 2017, it is assumed that the GDP index of Jiangsu Province in 1952 was 100, which was 4384.8 in 1999 and 14895.3 in 2009. Therefore, the average annual growth rate of GDP in Jiangsu Province during the past 10 years is: y=(14895.3÷4384.8) 1/10-1=13.01%. Combining the data of Re and Eh, the contribution rate of Jiangsu Province is calculated as: Ce=βRe/y=0.73×1.33÷13.01×100%=7.46%. The contribution of higher education in Jiangsu Province to the average annual growth rate of GDP is: Ch=CeEh =7.46%×9.77%=0.73%. The national average annual growth rate and contribution rate of GDP are estimated based on these, and the results are shown in Table 3.

Table 3 Annual average growth rate of Jiangsu and national GDP in 1999-2009, C_e and C_h

region	Y	C_e	C_h
Jiangsu	13.01	7.46	0.73
China	10.34	10.80	1.98

According to the above algorithm, the average annual growth rate of GDP in Jiangsu Province and China, Ce and Ch, can be obtained from 2010 to 2015. The average annual growth rate of GDP in Jiangsu Province, Ce and Ch were 9.58%, 25.91%, and 12.04%, respectively. The national average annual growth rate of GDP, Ce and Ch were 7.87%, 25.42%, and 10.58%, respectively.

3. Conclusions

3.1 Research conclusions

1) From 1999 to 2009, the contribution rate of higher education to economic growth was higher than that of Jiangsu Province

Since the 1990s, large-scale expansion of colleges and universities in Jiangsu Province has cultivated a large number of talents for local governments, which has effectively promoted the growth of local economy; however, the contribution rate of higher education in Jiangsu Province to economic growth is 1.25 percentage points lower than that of the whole country. Higher education still has a lot of space for improvement in promoting economic growth. This is consistent with the findings of other scholars, and compared with the data of Shihai Sun and Lin Liu, it is found that the contribution rate of higher education in Jiangsu Province to economic growth decreases with time, and compared with the national average. The gap is widening.

The likely reason is that the proportion of highly educated employees in Jiangsu Province was higher than that of the national highly educated people in the 1990s, but by 2009, this advantage no longer existed (see Table 1). In other words, the lack of highly educated personnel in Jiangsu Province has led to limited economic pull, and it is difficult to release the economic vitality of higher education.

2) From 2010 to 2015, the contribution rate of higher education in Jiangsu Province to economic growth was higher than that of the whole country

From 2010 to 2015, the contribution rate of higher education in Jiangsu Province to economic growth was 12.04%, and the contribution rate of higher education to economic growth was 10.58% in China. The former was 1.46 percentage points higher than the latter.

At this stage, Jiangsu Province can reverse the unfavorable situation and surpass the national average, which is related to the increase in the proportion of highly educated personnel in Jiangsu Province. In 2010, the number of employees in colleges, university and above in Jiangsu Province accounted for 11.96% of the total, and the country was 10.09%. The former was 1.87 percentage points higher than the latter; in 2015, the number of employees in colleges, university and above in Jiangsu Province accounted for 25% of the total, and 18.8% in the country. The former is 6.2 percentage points higher than the latter. Over time, the proportion of highly educated employees in Jiangsu Province has been increasing, and far exceeds the national average. This is the key reason why Jiangsu Province can increase the contribution rate of economic growth.

3) The contribution rate of higher education to economic growth in different time periods in Jiangsu Province is significantly different

From 1999 to 2009, the contribution rate of higher education in Jiangsu Province to economic growth was 0.73%; from 2010 to 2015, the contribution rate of higher education in Jiangsu Province to economic growth was 12.04%. Compared the first 10 years with the last 5 years, higher education contributed more to economic growth (11.31 percentage points higher), and the effect was more significant.

The reason for such a large gap is the construction of advantageous disciplines and key disciplines, as well as a series of policies to attract talents in Jiangsu Province. In order to strengthen the construction of high-level innovative and entrepreneurial talents, Jiangsu Provincial Government has set up a special fund for the introduction of high-level innovation and entrepreneurship talents. The Jiangsu Provincial Department of Finance issued Procedures for the Special Funds for the Provincial High-level Innovative and Entrepreneurial Talents Introduction Program in March 2011, stipulates the scope of use of special funds for talent introduction, and clarifies the responsibilities of different departments [11].

Since 2010, Jiangsu Province has formed a pattern of linkage between advantageous disciplines and key disciplines, supporting the introduction of high-level talents in universities, helping to increase the total number of talents, improving the level of innovation and entrepreneurship, and effectively promoting the economic and social development of Jiangsu Province.

3.2 Recommendations

Firstly, in recent years, Jiangsu Province has realized that the lack of high-educated employment personnel has an adverse impact on economic growth. Therefore, it has intensified its training and increased the proportion of highly educated personnel in the employment sector. It has achieved obvious results; but it has not formed a leading position in the country. In 2015, the proportion of postgraduate employment in Jiangsu Province was only 0.2 percentage points higher than the national level, and it also had a large gap with Beijing, Shanghai and Tianjin. In terms of the proportion of employed postgraduates, Beijing 6.1%, Shanghai 4.8%, Tianjin 2.3%, Jiangsu Province 0.9% in 2015, Jiangsu Province high-level talent training is still facing a severe situation. Therefore, Jiangsu Province also needs to appropriately expand the scale of postgraduate enrollment and increase the proportion of postgraduate students in employment. It will surpass Tianjin in a few years and be in line with Beijing and Shanghai.

Secondly, Jiangsu Province still needs to constantly create a “soft environment” to retain talents, while at the same time improving the attractiveness of talents, especially high-end talents, and accelerating talent pooling. For doctors, masters, and undergraduates, the relevant government departments should solve the housing and settlement problems they are most concerned about, and give them rent subsidies, living allowances, and housing subsidies. For top talents or innovative teams at home and abroad, Chengdu has given 3 million yuan or 100 million yuan to fund [12]. Since 2011, the UK has added “excellent talent visas” to the first category of visas, attracting international leaders or potential international leaders in science, humanities, engineering and arts [13], Jiangsu Province can draw on its own research and evidence based on the advanced practices of other countries or other regions, and combine its characteristics with the region to propose its own sweet deal.

Thirdly, Jiangsu Province should form a dominant industrial cluster and attract talents with industry. Jiangsu Province should aim at the development trend of international industry and the development of national strategic emerging industries, “to enlarge and strengthen a number of high-tech enterprises, form a cluster of advantageous industries occupying the front end of the industrial chain, and attract talents through industry development”.

Finally, Jiangsu Province has relied mainly on the expansion of colleges and universities to promote economic growth since the 1990s. However, after 2010, the state has introduced relevant policies, and the dividends from the expansion of enrollment have gradually decreased. Jiangsu Province relies on a series of construction projects to promote scientific research, cultivate first-class talents, promote the high-quality development of higher education, meet the demands of industrial structure transformation and upgrading, and promote economic growth. The contribution rate of the construction of advantageous disciplines and key disciplines to economic growth is much higher than the contribution rate of university scale expansion to economic growth.

There are also many problems in the construction of advantageous disciplines and key disciplines, such as emphasizing the introduction and cultivation of both, and neglecting the high-quality employment of graduates. These problems limit the role of economic growth. In terms of introduction and training, the focus of discipline construction is still to introduce outstanding talents and leading talents. Although the introduction of talents can rapidly increase the total amount of high-level talents, it will also bring many problems. The relevant policy system is not perfect. The policy implementation is not effective, the R&D capital investment is insufficient, the introduction of overseas high-end talents is single, the use and management of high-end overseas talents are not reasonable, and the working and living environment is not very satisfactory [14]. Therefore, Jiangsu Province should adjust its construction thinking, overcome the practice of quick success, persist in training and introduction, and take cultivation as the top priority, and cultivate a

large number of high-end talents to form a competitive advantage in the country. As far as the high-quality employment of graduates is concerned, Jiangsu Province is currently paying attention to the awards of outstanding doctoral and master's dissertation, and the emergence of the outstanding talents at home and abroad. There is no clear indicator of the quality of graduate employment. Regardless of whether the superior disciplines and key disciplines are selected or finalized, the quality of graduate employment, especially the quality of employment is emphasized, so as to better serve the innovative economy.

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