

Research on the Coupling and Coordination Effect of Higher Education and Scientific and Technological Innovation in Helping Port Economic Growth

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Abstract: Higher education and scientific and technological innovation are important contents to promote the high-quality and high-level development of technology and talent training, and in the specific activities, higher education and science and technology innovation cities play a role in promoting economic growth from different perspectives or levels. Especially under China's "The Belt and Road" policy, the relationship between higher education, scientific and technological innovation and economic growth in 18 provinces and cities along the route can stimulate the ability of higher education talent training, scientific and technological research and social service, help promote the high-quality development of the region, and further improve the domestic and international cultural soft power. Therefore, by using the coupling and coordination effect analysis, this paper analyzes the content of higher education and scientific and technological innovation to help port economic growth, and puts forward relevant questions and suggestions, so that this study can provide reference value for the economic development of port cities and the application of higher education and scientific and technological innovation.

Keywords: higher education, scientific and technological innovation, port economic growth, coupling coordination effect

Introduction

This year marks the 10th anniversary of the Belt and Road Initiative, which has become a popular international public good and marks a new height of international economic cooperation. It can be seen that China attaches great importance to higher education and scientific and technological innovation, and regards it as an important way and content of the "The Belt and Road", which leads to stimulating the ability of higher education talent training, scientific and technological research, and social service in the context of such policies and social development, helping to promote high-quality regional development and meeting the development requirements of the "The Belt and Road" policy^[1]. It can be seen that in this social context, studying the coupling and coordination effect of higher education and scientific and technological innovation in helping port economic growth not only conforms to the development needs of the times, but also provides some guidance for higher education and scientific and technological innovation.

1. The effect between higher education, scientific and technological innovation, and economic growth

The effects between higher education, scientific and technological innovation and economic growth are mainly divided into three types, namely, the promotion effect of higher education and scientific and technological innovation, the promotion effect of higher education on economic growth, and the effect of scientific and technological innovation and economic growth.

The first is the promotion effect of higher education and scientific and technological innovation, through summarizing and sorting out the relevant literature, it can be seen that higher education is an important internal driving force in regional economic and social development, and it makes a significant contribution to economic performance through scientific and technological innovation of higher education and other institutions, and points out that higher education investment has a very obvious supporting role in regional innovation and development, and higher education investment is an important force to promote regional scientific and technological innovation, so from the perspective of the quantity and quality of higher education, and the promotion effect of scientific and technological innovation, Presented as strong saliency^[2].

The second is the promoting effect of higher education on economic growth, because education plays a very important role in the formation of human capital and thus in promoting economic growth, so the research on the role of economic growth reflects high research value and research significance. Through the investigation and research, it is found that the promoting effect of higher education on economic growth is mainly reflected in the role of regional and international economic development, especially for the high-quality development of regional economy^[3].

Finally, the effect of scientific and technological innovation and economic growth, innovation is the driving force and source of economic growth, scientific and technological innovation as the core of the innovation system is the main engine driving economic growth, the implementation of innovation-driven strategy shows that China's future development depends on scientific and technological innovation driven, so the research on scientific and technological innovation and economic growth is relatively rich, by summarizing the relevant research content, the effect of scientific and technological innovation and economic growth is positive, which is reflected in the content and mechanism of scientific and technological innovation to optimize economic growth, and consolidate the foundation of economic growth^[4].

In addition, in the relationship between higher education, scientific and technological innovation and economic growth, higher education, as the source of talent training and scientific and technological innovation, plays an important role in regional economic development. At the same time, from the qualitative and quantitative perspectives, the interaction mechanism between higher education, scientific and technological innovation capacity and regional economic development is analyzed, and it is pointed out that higher education and scientific and technological innovation capacity have a significant role in promoting regional economic development, and there is heterogeneity among different regions^[5].

2. The coupling and coordination effect of higher education and scientific and technological innovation in helping port economic growth

2.1 Coupling coordination, QR regression and σ convergence models

The first is the coupling coordination degree model, since the index system formulated in this study is a positive index, then the data can be directly normalized, and the entropy method can be used to calculate the de-that of each index, and then the coupling coordination degree model is used to analyze the coordination degree, and the model formula is expressed as:

$$\begin{aligned} D &= \sqrt{C'T} \\ T &= aU_1 + bU_2 + gU_3 \end{aligned} \quad (1)$$

In the formula, D is the degree of coupling and coordination, C is the degree of coupling of the three items, T is the comprehensive evaluation index, U is the comprehensive index, serial numbers 1, 2 and 3 represent higher education, scientific and technological innovation and economic growth, and a, b and g are specific coefficients with amplitudes of 0.28, 0.25 and 0.46 respectively.

Secondly, QR regression and σ convergence model are used to further understand the differences in the coupling coordination degree of port cities, the convergence test criteria are selected σ to judge the discrete degree of coupling coordination, and the influencing factors of coupling coordination differences of the research object are analyzed by QR regression, and the regression coefficients of different variables are calculated. At the same time, it is expressed as:

$$Qy_{it}(\delta / \ln tea_{it}, \ln peo_{it}, \ln exp_{it}, \ln fin_{it}, \ln ear_{it}, \ln con_{it}) \\ = \beta_0 + \beta_1(\delta) \ln tea_{it} + \beta_2(\delta) \ln peo_{it} + \beta_3(\delta) \ln exp_{it} + \beta_4(\delta) \ln fin_{it} \quad (2) \\ + \beta_5(\delta) \ln ear_{it} + \beta_6(\delta) \ln con_{it}$$

where Qy_{it} is the equinox, β is the fractional coefficient estimate, i is the city, and t is the year

2.2 Result analysis

Taking the Yangtze River Delta urban agglomeration as an example, according to the above contents, the comprehensive development level of higher education, scientific and technological innovation and economic growth is obtained, as shown in Table 2. Coupling coordination degree, as shown in Table 3; The influencing variables were divided into number regression results, as shown in Table 4. In this way, it can be used to summarize the current problems of higher education and scientific and technological innovation to help the economic growth of ports, and point out the direction for the next step.

Table 1 Comprehensive development level of the Yangtze River Delta urban agglomeration

Port city	project	2018	2019	2020	2021	2022
Yangtze River Delta Urban Agglomerations	higher education	0.112	0.117	0.123	0.130	0.138
	Scientific and technological innovation	0.170	0.178	0.181	0.205	0.221
	economic growth	0.055	0.061	0.068	0.075	0.079

It can be seen from Table 1 that the comprehensive development level of the Yangtze River Delta urban agglomeration is relatively high, which further indicates that under the influence of regional economic differences, the closer to the inland port cities, the coupling and coordination of higher education, scientific and technological innovation and economic growth are decreasing, and even long-term imbalance.

Table 2 Coupling coordination degree of the Yangtze River Delta urban agglomeration

Port city	City	2018	2019	2020	2021	2022
Yangtze River	Shanghai	0.741	0.759	0.731	0.817	0.862
Delta Urban	Nanjing	0.808	0.827	0.875	0.923	0.935
Agglomerations	Zhejiang	0.634	0.667	0.699	0.735	0.763

As can be seen from Table 2, the coupling coordination degree of the Yangtze River Delta urban agglomeration is dominated by the growth of scientific and technological innovation, and there are small differences among different cities, indicating that the more inland the port city, the lower the coupling coordination degree of the urban agglomeration within the region is at the level of comprehensive development of scientific and technological innovation.

Table 3 The influencing factors are divided into numerical regression result statistics

%	A2	D1	C2	D2	F3	H3
10	0.049** 3.41	0.045** 4.61	0.066** 3.59	-0.003 -0.52	0.008** 7.19	0.143** 10.27
20	0.055** 3.29	0.047** 4.20	0.061** 2.76	-0.003 -0.31	0.008** 5.05	0.150** 10.36
...
90	0.158** 5.72	0.075** 4.75	-0.066* -2.37	-0.022 -1.55	0.007 1.93	0.263** 13.08
OLS	0.085**	0.044**	0.020	0.002	0.008**	0.173**
regression	4.39	3.22	1.01	0.27	5.13	10.22

It can be seen from Table 3 that the influence of the first- and second-level indicators such as A2, D1, E, and H3 on the economic coupling coordination degree of port cities is constantly strengthened, while the impact of indicators C2 and D2 is weakened.

2.3 Optimization suggestions

Firstly, by improving the factor flow mechanism of port cities, and promoting the growth of port economy in accordance with the regional characteristics of higher education and scientific and technological innovation, such as innovating the mode of higher education and improving the introduction mechanism of technical talents, the deficiencies in higher education and scientific and technological innovation in inland port cities will be gradually solved.^[6]

secondly, strengthen the connection and integration between urban higher education and scientific and technological innovation, so as to comprehensively improve the ability of transformation of scientific and technological innovation achievements, so that scientific and technological innovation can be efficiently applied to real production activities;

Finally, it is necessary to estimate the impact of correlation factors on the coupling and coordination of port cities, and the government units not only need to increase the investment in scientific and technological innovation and research and development, but also need to eliminate the proportion of inefficient and ineffective funds, so as to provide development impetus for higher education and scientific and technological innovation, give full play to the role of government leadership and overall planning, and solve the problem of insufficient scientific and technological output and educational investment.

3. Conclusion

To sum up, the research on the coupling and coordination effect of higher education and scientific and technological innovation to help port economic growth takes the effect between higher education, scientific and technological innovation and economic growth as the theoretical basis, analyzes the coupling and coordination effect of higher education and scientific and technological innovation in helping port economic growth from the data, and then puts forward research problems and optimization suggestions, which makes this study have certain reference value and reference significance.

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

References

- [1] Zhao Ke. The spatiotemporal evolution and spillover effects of the coordination between border port tourism industry and county (city) economy: based on the empirical study of Heilongjiang [J]. *Business Economics*. 2021; (9): 43-48104.
- [2] Kong Wei, Liu Yan, Zhi Dandan et al. Empirical Study on Measuring the Coordinated Development of Regional Higher Education and Technological Innovation in China [J]. *Technology Management Research*. 2020; 40 (9): 74-79.
- [3] Li Zilian. Higher Education Quality and Technological Innovation: Mechanisms and Evidence [J]. *Macro Quality Research*. 2023; 11 (3): 116-128.

[4] Zhang Tonggong, Meng Lantao. Research on Investment in Higher Education, Technological Innovation, and High Quality Development of Manufacturing Industry in China [J]. Journal of Qingdao University of Science and Technology (Social Sciences Edition). 2023; 39 (2): 47-55.

[5] Cai Wenbo, Huang Lutao. The coupling and coordination effect of higher education, human capital, and technological innovation in ethnic regions [J]. Research on Ethnic Higher Education. 2022; 10 (3): 46-56.

[6] Jing Hui, Zhang Lin, Sun Yongquan. A study on the coupling relationship between higher education, technological innovation, and economic development [J]. Chinese University Science and Technology. 2023; (8): 52-60.

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