Economic impact assessment of Beijing-Shanghai high-speed railway on small and medium-sized cities along the economic circle of Yangtze river delta

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Keywords: Beijing-Shanghai High-speed Railway, Yangtze River Delta Economic Circle, DID Model.

Abstract. Up to now, domestic and foreign scholars have not reached a consensus on the impact of high-speed railways on regional economic development. Beijing-Shanghai High-speed Railway is a high-speed railway with great influence in China, so this paper selects the small and medium-sized cities along the Beijing-Shanghai High-speed Railway in the Yangtze River Delta Economic Circle as the research object. Through the quantitative analysis of DID model, it is concluded that the economic impact of Beijing-Shanghai High-speed Railway on the small and medium-sized cities along the Yangtze River Delta Economic Circle is not significant.

1. Introduction

The Beijing-Shanghai High-speed Railway is a high-speed railway with great influence in China. It is 1,318 km long and passes through 21 stations including Beijing, Tianjin, Jinan, Nanjing and Shanghai. It was completed and put into operation in June 2011. High-speed railway has the characteristics of large capacity, fast speed, low energy consumption, safety and reliability, saving land resources, environmental protection and other high-quality characteristics, which plays a huge role in promoting social and economic development. The Beijing-Shanghai high-speed railway has alleviated the transportation bottleneck of the Beijing-Shanghai railway, but it is not clear whether it plays a significant role in promoting regional economic growth and whether it constitutes a driving force for local economic growth. Based on the above considerations, this paper attempts to analyze the regional economic effect of Beijing-Shanghai high-speed railway.

2. Literature Review

Combing the existing literature, we can see that there is no consensus on whether the opening of high-speed railway can promote regional economic growth. Kim K S (2000) thinks that high-speed railway can improve the accessibility between regions and stimulate the regional economic growth after examining the situation of high-speed railway in Japan and Europe [1]. Xu Yuping (2011) from the perspective of expanding domestic demand and increasing employment discusses the construction of high-speed railway to promote regional economic development [2]. In contrast, Vickerman R (1997) argues that the impact of high-speed railways on regional economic growth is unclear [3]. Wang Yao, Nian Meng (2014) draw the conclusion through empirical analysis that high-speed railway has not played a leading role in regional economic growth under the background of the overall slowdown of China's economic growth [4].

3. Research Design

3.1 Model design

How to only examine the impact of Beijing-Shanghai high-speed railway opening on the small and medium-sized cities along the Yangtze River Delta Economic Circle is the key to the choice of method. It is necessary to introduce an econometric method to eliminate all factors except high-speed railway, and to study the impact of high-speed railway opening on regional economic growth

separately. The impact of Beijing-Shanghai high-speed railway on regional economic growth is reflected in the vertical impact and horizontal impact. The vertical impact mainly refers to the impact in time, the horizontal impact refers to the impact along the Beijing-Shanghai railway. Therefore, the paper adopts the Difference in Difference method (DID) to estimate the economic impact of Beijing-Shanghai high-speed railway on the small and medium-sized cities along the Yangtze River Delta Economic Circle. DID method is a very important research method to evaluate the effect of policies, the basic logic is to find samples of the experimental group and the control group. The experimental group is the small and medium-sized cities along the Beijing-Shanghai high-speed rail in the Yangtze River Delta Economic Circle, and the control group is the other small and medium-sized cities in the Yangtze River Delta Economic Circle. Then the cities with high-speed rail and those without high-speed rail are analyzed by the model before and after the opening of the high-speed rail. Establish regression models as follows:

$$\log(GDP) = \beta_0 + \beta_1 w_{it} + \beta_2 t_{it} + \beta_3 w_{it} \times t_{it} + Z_{\mathrm{it}} + \varepsilon_{it} \tag{1}$$

Where i and t respectively represent the i-th city and the t-th year; The explained variable GDP represents the GDP index of small and medium-sized cities (last year=100); t_{it} represents the time dummy variable. The opening time of Beijing-Shanghai Gaotian is June 30, 2011. So the value before 2011 is 0, and after 2011 is 1; The region factor w is the region dummy variable, and the city on the Beijing-Shanghai high-speed railway line is assigned a value of 1, otherwise, the assignment value is 0; The intersection and multiplication terms of the time dummy variable and the region dummy variable $w_{it} \times t_{it}$ represent the opening factors of the Beijing-Shanghai high-speed railway; the cities located along the Shanghai-Nanjing and Shanghai-Hangzhou high-speed railways in 2011 and after are assigned a value of 1, otherwise, the assignment value is 0. For the selection of control variable Z, based on the theory of economic growth and urban-rural income gap, fixed asset investment, fiscal expenditure, urbanization and industrial structure control variables are selected. ε_{it} representing random disturbances.

3.2 Sample selection

The sample interval of this paper is from 2008 to 2014. The cities along the Beijing-Shanghai high-speed railway will be treated as the treatment group, and the other cities will be treated as the control group. This paper mainly studies the economic impact of Beijing-Shanghai high-speed railway on the small and medium-sized cities along the Yangtze River Delta Economic Circle. The cities selected for the treatment group are Zhenjiang, Changzhou, Wuxi and Suzhou. From the Yangtze River Delta Economic Circle, select cities similar to the experimental group. The cities of the control group mainly include Taizhou, Suqian, Huai'an and Lianyungang.

Sample data mainly from the provincial statistical yearbook, the statistical bulletin of each city and "China Urban Statistical Yearbook".

3.3 Statistical results

Considering the stationarity of the data, the dependent and control variables are logarithmically processed. This paper uses Eviews software to give the impact of high-speed railway on GDP index after adding control variables, which include logarithm of industrial structure (Ind), logarithm of urbanization (Urb), logarithm of fixed assets investment (lna) and logarithm of financial expenditure (lnf). Models 1 to 5 give the invariant parameter regression results of all samples of cities in this paper, and Models 6 to 10 give the random effect regression results of all samples of cities in this paper, as listed in Table 1 and Table 2.

Table 1 Regression results of Beijing-Shanghai High-speed Railway on GDP index of small and medium-sized cities in Yangtze River Delta Economic Circle by invariant parameter model

variable	1	2	3	4	5
W	4.7246***	0.0923***	-0.1725***	-0.1346**	-0.1250**
T	4.7193***	-0.1296**	-0.1862***	-0.1064*	-0.1020*
W*T	-4.7375***	-0.1168***	0.0094	0.0448	0.0525
LOG(IND)		1.0943***	0.5525***	0.5756***	0.5981***
LOG(URB)			0.6137***	0.8474***	0.8456***
LOG(INA)				-0.1552***	-0.1992***
LOG(INF)					0.0382

Notes: 1. The values in brackets are standard deviations; 2. ***, *** and * mean significant at the statistical levels of 1%, 5% and 10%.

Table 2 regression results of stochastic effect model of beijing-shanghai high-speed railway on gdp index of small and medium-sized cities in yangtze river delta economic circle

variable	6	7	8	9	10
C	4.7324	4.9534	5.0798	4.9883	4.9879
W	-0.0078	-0.0121	0.0018	0.0003	0.0035
T	-0.0131**	-0.0073**	-0.0005	-0.0005	-0.0007
W*T	-0.0051	-0.0002	-0.0052	-0.0034	-0.0011
LOG(IND)		-0.0512*	-0.0463**	-0.0344**	-0.0252*
LOG(URB)			-0.0386	-0.0168	-0.0239
LOG(INA)				-0.0066*	-0.0213***
LOG(INF)					0.0162**

Model 1-5 shows that the time factor t is significantly positive at 1% level without adding the control variable. After adding the control variable gradually, the time factor changes sign but is still significantly negative at the level of 10%. Model 6-10 is not significant in terms of time factor, and the regional factor W has the same problem. We pay attention to the crossover term W*T only through the significance test of model 1 and 2, model 3-10 is through the significance test, especially after adding control variables, are through the significance test, we can draw a preliminary conclusion that the Beijing-Shanghai high-speed railway along the economic circle of the Yangtze River Delta economic impact on the small and medium-sized cities is not significant.

4. Conclusions and prospects

Through the data regression results, the preliminary conclusion is that the economic impact of Beijing-Shanghai high-speed railway on the small and medium-sized cities along the Yangtze River Delta Economic Circle is not significant. This may be the Beijing-Shanghai high-speed rail not only accelerated the flow of manpower, technology and capital in the Yangtze River Delta Economic Circle, but also produced a lot of negative effects. Due to the large-scale and strong strength of Shanghai, Nanjing and other cities have relatively obvious benefits, resulting in "siphon benefits." In the cities along the high-speed railway, the original idea that small and medium-sized cities use high-speed railway to drive the development of transportation and attract talents can not be realized, but more resources, talents attracted by the big cities along the line, resulting in the small and medium-sized cities more and more lack of vitality. The influence of Beijing-Shanghai high-speed railway on the small and medium-sized cities along the Yangtze River Delta Economic Circle is complicated, which may lead to the insignificant influence of Beijing-Shanghai high-speed railway on the small and medium-sized cities along the Yangtze River Delta Economic Circle.

References

[1] Kim K S. High-speed rail developments and spatial restructuring: A case study of the Capital region in South Korea. *Cities*, vol.17, pp. 251-262, 2000.

[2] Xu Yuping. Research on the Construction of High-speed Railway to Promote Regional Economic Development. *Jiangxi Social Sciences*, vol.12, pp. 62-65, 2011.

[3] Vickerman R. High-speed rail in Europe: experience and issues for future development. *Annals of Regional Science*, vol.31, pp. 21-38, 1997.

[4] Wang Yao, Nian Meng. Does the high-speed railway drive regional economic development? *Shanghai Economic Research*, vol.2, pp. 82-91, 2014.