Research on the Relationship between Transportation and Regional Economic Development in Inner Mongolia——An Empirical Analysis Based on Panel Data of Various Cities

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Keywords: Regional Difference, Transportation, Regional Economy, Inner Mongolia.

Abstract. This paper focuses on the economic connection between transportation and regional economic development in the east, central and west of Inner Mongolia. By constructing the econometric model with panel data from 2007 to 2017 in 12 cities of Inner Mongolia, the interactive evolutionary relationship is empirically tested. The conclusion is as follows: transportation plays an overall role in promoting the regional economic development of Inner Mongolia. In central Mongolia, the freight transportation plays a significant role in boosting regional economy. As for the eastern Mongolia, the contribution of passenger transportation to the economy is the most obvious. The economy of western region has been relatively backward and the current transportation infrastructure is not large enough to promote economic production. Based on this, the paper puts forward the following Suggestions: Inner Mongolia should speed up the construction of transportation network, so as to highlight its role as a hub. At the same time, achieve efficient use of transportation infrastructure and promote the sharing of resources. Finally, promote the integration of transportation and other emerging industries.

1. Introduction

As a leading and basic industry of the national economy, transportation is an important part and necessary support carrier of economic modernization, which closely cooperates with and depends on other industries. Investment in transportation infrastructure seems to have become a magic bullet to pull the economy out of trouble. When discussing the causes of the "Chinese miracle", many scholars take advanced infrastructure, especially transportation infrastructure, as an important factor.

However, the spatial development of China's transportation industry is extremely unbalanced, the eastern coast region is significantly ahead of the central and western regions. According to the data, the transportation infrastructure in the eastern region of China accounts for 54% of the country's total, and the central region accounts for 30%, while only 16% is distributed in the vast western region. Focusing on the central and western regions, transportation infrastructure is difficult to meet the objective needs of regional economic development, which has become a bottleneck restricting regional economic development. This paper takes Inner Mongolia as an example to illustrate. As an important energy province in China, the potential value of mineral resources reserves in Inner Mongolia ranks the top in China. However, in the past few decades, the development of energy and related industries has not brought substantial and revolutionary progress to the regional economic growth of Inner Mongolia. One of the most important reasons is that the limited transportation capacity of Inner Mongolia's resources can only be absorbed in local areas in the long run.

Therefore, this paper focus on the relationship between transportation and regional economic growth, in order to provide some theoretical reference for the traffic construction in Inner Mongolia.

2. Literature review and setting the scene

Research on the correlation between transportation and regional economic development can be traced back to the early 19th century. Based on the perspective of revitalizing capitalist industry and

commerce, German economist Friedrich List put forward the theory of national productivity focusing on transportation, and advocated to boost economic development by developing transportation.

Currently, there are three different views on the impact of transportation on regional economic development. The idea that the traffic infrastructure construction had positive effect on growth of regional economy (Wang Yong, 2011; Huaxing Wang, 2017; Changyou Ye, 2013) and to improve the transportation system, promoting circulation, industrial structure adjustment and evolution of urban agglomeration economy agglomeration has significant influence (LuoLing, 2013; Feng Bing, 2014; Peng Wang, 2018).

Another view holds that the construction of transportation has even inhibited the development of regional economy. Garciamila (1996) conducted a quantitative analysis of interstate data from 1970 to 1983 in the United States and showed that public investment, including highways, had no significant effect on economic development regardless of regional differences. Liu Qihong (2017) studies show that the improvement of transportation infrastructure accelerates the concentration of labor force to economically developed regions, but harms the economic growth of underdeveloped regions.

In addition, some scholars believe that the impact of transportation development on regional economy should be analyzed from multiple perspectives. Vickerman(2018) shows that the transport infrastructure alone cannot have a fundamental effect on economic development and needs to be strongly coordinated with relevant policy measures. Zhao Ying (2018) used time series data from Beijing-Tianjin-Hebei region from 2001 to 2016 to build an interactive mechanism model of transportation and regional economy. The research shows that only when the development of both sides is in a balanced and coordinated state can the development of both sides be positively promoted.

As for whether transportation can promote regional economic development, most existing literatures take provincial cities as research objects, and there is little analysis on Inner Mongolia, and the heterogeneous influence of transportation on different regions in Inner Mongolia is not considered. This paper takes Inner Mongolia as the main research object, and respectively, in view of the eastern, central and western Inner Mongolia to establish dynamic panel regression, and puts forward the corresponding suggestions to support.

3. Methodology and data

3.1 Research method

Based on the method of liu qing (2017), this paper uses four indexes of road, railway and inland waterway routes, total mileage, passenger volume, freight and number of transportation workers to measure the development level of transportation infrastructure in various regions and selects per capita *GDP* as the measure index of regional economic .This paper includes human capital (hr) into the control variable and measured it by the number of students in ordinary colleges and universities. In addition, by referring to Zhai wei's (2018) research method, this paper incorporates the total number of employed people, government financial expenditure and fixed asset investment into the control variables to minimize model errors.

This paper selects panel data from 2007 to 2017 from 12 cities in Inner Mongolia as the research object, and establishes the model after logarithmic processing of various variables as follows:

$$Lngdp_{it}=\alpha i+\beta_1 Lnmileage_{it}+\beta_2 Lnpassenger_{it}+\beta_3 Lnfreight_{it}+\beta_4 Lnworker_{it}+\beta_5 Lnhr_{it}+$$

$$\beta_6 Lnemploy_{it}+\beta_7 Lnfinance_{it}+\beta_8 Lninvest_{it}+\varepsilon_{it}$$

$$i=1,2,\ldots,12 \qquad t=2007,2001,\ldots,2017 \tag{1}$$

3.2 Data

The above data are from Inner Mongolia statistical yearbook, statistics bureau of each league city and people's government of Inner Mongolia autonomous region.

4. Empirical results

4.1 basic estimation results

In this paper, fisher-ADF unit root test is adopted, and the results show that all variables are of the first order single integral *I(1)*, subject to the first order difference is stable. Furthermore, on this basis, Kao co-integration test is carried out for each variable. The results significantly reject the null hypothesis that there is no co-integration relationship, so there is a long-term stable equilibrium relationship between variables.

In this paper, F test, BP-LM test and Hausman test are carried out respectively. The results show that the individual time-point double-fixed effect model is superior to the mixed model and the random effect model.

Table 4.1 estimation of regression parameters and test results of relevant statistics

Variable	OLS	Two-way FE	RE	System-GMM
C	4.3987*** (0.7073)	-0.0500 (3.1248)	3.5189** (1.6509)	-0.1987 (2.3199)
Lnmileage	-0.1231 (0.0729)	0.6437*** (0.1685)	-0.3031*** (0.0939)	0.3822* (0.3062)
Lnpassenger	-0.0087 (0.0528)	0.0343* (0.0176)	0.0192 (0.0148)	0.0194** (0.0142)
Lnfreight	0.1030 (0.1019)	0.0176* (0.0203)	0.0001 (0.0195)	0.0113* (0.0194)
Lnworker	-0.0057 (0.0760)	0.0063* (0.0164)	0.0299 (0.0230)	-0.0258 (0.0141)
Lnhr	0.0444 (0.0684)	-0.1345*** (0.0381)	-0.1353*** (0.0337)	-0.0735 (0.0352)
Lnemploy	-0.9856*** (0.1791)	0.2397 (0.1979)	-0.2453* (0.2713)	0.1660* (0.2146)
Lnfinance	0.2931** (0.1144)	0.3366* (0.1758)	0.8716*** (0.0867)	0.2859** (0.1191)
Lninvest	0.7141*** (0.1194)	-0.0932 (0.0798)	0.0506 (0.0680)	0.0599* (0.0444)
Lnmileage(-1)				0.4526*** (0.1175)
Cross-section F		94.93		
BP-LM			61.44 (0.0000)	
Hausman			44.60 (0.0000)	

4.2 Heterogeneity test results of eastern, western and central Mongolia

Considering the unique geographical characteristics of Inner Mongolia, dynamic panel estimation and differentiation analysis were conducted of eastern, western and central Mongolia respectively.

Table 4.2 dynamic estimation results of GMM model in eastern, western and central regions

Variable	Eastern-GMM	Central-GMM	Western-GMM
C	-9.6039*** (2.3479)	4.3397 (1.1969)	2.7122 (0.6925)
Lngdp(-1)	0.4307*** (0.0764)	0.5607 (0.1184)	0.47494*** (0.1855)
Lnmileage	0.8464*** (0.2574)	-0.1502 (0.2438)	-0.0312 (0.0995)
Lnpassenger	0.0203*	-0.0258	0.0326

	(0.0119)	(0.0222)	(0.0442)
Lnfreight	-0.0177	0.1165**	-0.0237*
	(0.0146)	(0.0628)	(0.0475)
Lnworker	0.0075	0.0016*	-0.1143***
	(0.0109)	(0.0280)	(0.0358)
Lnhr	-0.0826	0.0286	-0.0868
	(0.0810)	(0.0362)	(0.0770)
Lnemploy	-0.2216**	-06633	-0.3327
	(0.1080)	(0.4238)	(0.2346)
Lnfinance	0.2228***	0.1209***	0.2951**
	(0.0808)	(0.1177)	(0.2179)
Lninvest	0.1481***	0.0549**	0.0581*
	(0.0297)	(0.0777)	(0.0962)

4.3 Analysis of empirical results

Table 4.1 shows that the total mileage, total freight volume and total passenger volume of Inner Mongolia transportation all have significant positive effects on the per capita *GDP* level to different degrees, while the number of transportation employees does not show a significant promoting effect on the economy. This may be related to the objective reality that Inner Mongolia is dominated by mineral resources exploitation and tourism and animal husbandry, and the manufacturing and service industries are weak. Overall, the transportation development in Inner Mongolia has a positive effect on economic growth. Further, according to the coefficient analysis of each explanatory variable, the total mileage of transportation, total passenger volume and total freight volume have little impact on the per capita *GDP*. In terms of control variables, except the human capital level measured by the number of students in ordinary institutions of higher learning, all other variables have passed the positive significance test, indicating that the above control variables do have a positive impact on economic development, and the selection of variables is basically appropriate.

On this basis, the empirical results of eastern, central and western are further analyzed. The total mileage of transportation in eastern Mongolia has a significant positive effect on the per capita *GDP*, the total passenger volume has a significant positive effect on the per capita *GDP*, and the total freight volume is negatively correlated with the per capita *GDP*, but fails the significance test. This further shows that compared with freight transport, passenger transport in the eastern region of Mongolia has a more obvious effect on the regional economy. The economic relationship between indicators and per capita *GDP* in central Mongolia is significantly different from that in eastern Mongolia. The regional total freight volume and the number of transportation staff are significantly positively correlated with the per capita *GDP*, but the relationship between the total passenger volume and per capita *GDP* is not significant. This shows that the transportation infrastructure plays a certain role in promoting the economic development of Mongolia region. The economic relationship between total passenger volume and per capita *GDP* in western region is not significant, and there is a significant negative correlation between total mileage of transportation, total freight volume and the number of transportation staff and per capita *GDP*. This indicates that the transportation has no positive impact on the economic development of western region.

5. Conclusions and recommendations

This paper makes the empirical analysis on the regional economic differences in Inner Mongolia and puts forward the following Suggestions for each region of Inner Mongolia:

First, focus on developing the central region, so as to highlight the role of the hub. With rich industrial foundation, rich mineral resources and advantageous geographical location, central region plays an important role in regional economic activities. Increasing the development of transportation industry in central Mongolia can further reduce the spatial distance within the region, promote the circulation of production factors with eastern and western Mongolia, reduce the transportation cost and accelerate the formation of Inner Mongolia economic center.

Second, speed up the construction of transportation network and promote regional resource sharing. It is necessary to speed up the construction of Inner transportation network, expand the scale of logistics, and speed up the flow of production factors in the region. On the other hand, strengthen the transportation link between the central region and the eastern and western regions, may give full play to the regional advantages of connecting the eastern region to the western region and accelerate the industrial spatial agglomeration.

Thirdly, improve the efficiency of transportation and realize the efficient utilization of transportation infrastructure. At the same time, speed up the construction of well-developed transportation infrastructure, promote the flow of factors and economic exchanges between different regions based on the existing scale, reduce regional differences as soon as possible, and achieve coordinated development within the region.

Fourth, optimize the industrial structure. While increasing the investment and construction of infrastructure, efforts should be made to optimize the investment environment and industrial structure, and realize the intensive use of land, so as to give full play to the spatial spillover effect of transportation infrastructure and further promote the economic development of eastern and western.

Fifth, encourage industry innovation and promote extensive integration of transportation and emerging industries. We will make overall plans to promote the construction of transportation network and highlight the leading role of innovation-driven development, promote the integration of the Internet, cloud computing, big data and other high technologies with the traditional transportation industry.

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