Degrees of Contribution to China's Economic Development Made by Different Factors of the Logistics Industry and Their Correlation

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Abstract. Based on the previous research, this paper points to the correlation between different inner factors of the logistics industry and local economic development and presents relative countermeasures. On account of the statistics from 27 provinces of China from 2005 to 2015, it analyzes the influence of different factors of the logistics industry on regional economy and explores aspects and degrees of their impact by exemplifying and modeling. The research results show: (1) logistics industry has promoted regional economy in recent years; (2) construction of grade highway plays an important role in economic development; (3) governments' construction of three modes of transport: water freight, airlifts and railway freight has negative effects on the growth of GDP(Gross Domestic Product).

Keywords: Logistics industry; transportation; economic construction.

1. Introduction

An improved logistics industry can attract abundant investments, and capitals stand for the holistic economic strength of a country. The increase of investments conduces to national economic development. Either first-tier cities in China like Shenzhen and Shanghai, or New York and Los Angeles in America are good examples of attracting abundant investments by their excellent logistics industry to improve national economy. Modern logistics dominates current market operations. With an increasing demand of domestic consumers, an advanced logistics system plays an important role in macroeconomic control. But there exist problems in China's logistics industry such as poor transportation infrastructure, lack of professionalism, disordered competition in market and weak stress tolerance, which have been a barrier to economic growth. In recent years, new logistics sectors have sprung up in China which respond to market demand with continuous innovation, alleviate domestic transport problems and promote national economic development.

This paper discusses how logistics industry improves national economic development, and its functions and practical significance. It uses statistics of the whole country and 27 provinces from 2005 to 2017 to analyze the influence of logistics industry to China's economic development in different periods and different areas and to explore the contribution of different factors in logistics industry to China's economic development and their correlation.

2. Literature Review

Current literature of correlation between domestic logistics industry and economic development is mainly based on empirical analysis. It works by taking a specific area or city as the research object to analyze correlation between various factors of logistics industry and regional economic development through collecting data and modeling. To investigate the correlation between variables of logistics industry and regional GPA, Jiang Kairui, Lu Xinwen and Hong Aihua(2012) establish a function model of freight turnover volume and GDP of Shandong province and did regression analysis. It is concluded that 1-unit increase of logistics volume will drive 1.26 units of economic growth in Shandong Province .[1] Wang Xiaodong, Deng Danxuan and Zhao Zhongxiu(2014) also indicate that transportation infrastructure has a positive spillover effect on economic growth as a whole, but strength of effect varies from place to place.[2] Lan Ting and Dong Huiqing(2016) find that an increase of the gross product value of transportation, warehousing and postal services in logistics

industry of Guangdong Province directly leads to the economic growth there.[3] And in the conclusion of Cao Jianxin and Huang Erni(2009), every 1% increase of cargo freight volume in Guangdong province compared with the previous period can bring an increase of 0.0634333% to the regional economy; the elasticity of GDP relative to regional personal public transport(PTT) is about 9.255425, and every 1% increase of regional passenger transport volume can bring about regional economic growth of 9.255425%.[4] Guozhen(2015) analyzes transportation infrastructure in different regions of China to discuss the different capital investment of that in the East, West and Middle of China. It shows that the output elasticity of capital investment in transportation of the West (0.0737) is the highest among these regions.[5]

In a short term, there will be fluctuations between the logistics industry and economic development. But in the long run, there is stable equilibrium between them. Logistics industry already has shown its leading role in promoting regional economy, and in the context of economic globalization, efficient logistics systems have become the core competitiveness of various enterprises and even different countries. In order to develop regional transportation infrastructure reasonably, the influence of different factors in logistics industry such as quantity of employment in logistics industry, freight turnover volume, lengths of transport routes and the number of berths of major coastal ports on bolstering up regional economy requires integrated and systematic analysis.

3. Econometric Models and Data Analysis

3.1 Econometric Models

This paper utilizes panel data in terms of logistics of 27 provinces in China(Xin Jiang, Xi Zang are excluded for the lack and quality problems of data) from 2005 to 2017, explores the correlation between some key factors and GDP, and analyses the importance and contribution of different factors to GDP.

Thus, this paper designs three econometric models as follows to obtain results. First, it takes OLS as the criterion.

$$y_{it} = x'_{it}\boldsymbol{\beta} + z'_i\boldsymbol{\delta} + u_i + \varepsilon_{it} \quad (i = 1, \cdots, n; t = 1, \cdots, T)$$

In this formula, y_{it} represents place i's GDP in year t. x_{it} are a group of controlled variables that accounts for the economic growth of place i. Freight turnover(ton) is multiplied by freight volume(ton) and load distance(km); third industry added value(billion Yuan) is the annual added value of output; express volume(10,000 pieces) is counted annually; the volume(10,000 tons) of water freight, railway freight, highway freight and the mileage(10,000 km) of railway, grade highway and highway are expressed annually; the level of annual air logistics takes employment(person) in the air transport industry as standard. z_{it} is a characterized unit that doesn't vary with time. u_{it} and ε_{it} are constant terms. u_{it} is a intercept term of unit difference, and ε_{it} is a time-varying disturbance term. $\boldsymbol{\beta}$ is a parameter vector to be estimated, and the correlation between it and **y** can be judged according to the plus sign or the minus sign.

As for the fixed-effect model:

$$\tilde{y}_{it} = \tilde{x}'_{it}\boldsymbol{\beta} + \tilde{\varepsilon}_{it}$$

u_{it} has been concealed in this formula, so $\boldsymbol{\beta}$ can be estimated by OLS in conformity as long as ε_{it} and x_{it} are uncorrelated.

$$\text{Cov}(u_i + \varepsilon_{it}, u_i + \varepsilon_{is}) = \begin{cases} \sigma_u^2, & t \neq s \\ \sigma_u^2 + \sigma_\varepsilon^2, & t = s \end{cases}$$

In the random effect model, auto-correlation among disturbance terms of one unit in different periods should be considered because of the existence of u_{it}. In this formula, σ_u^2 is the variance of u_i, and doesn't differ with changes of i; $\sigma\varepsilon^2$ is the variance of ε_{it}, and doesn't differ with changes of i and r.

3.2 Data Source and Empirical Results

Data of variables in models are referred from State Statistical Bureau, covering 10 groups of variable including 27 provinces and municipalities from 2005 to 2017. Timeliness and quality of data can be ensured. There are three main groups of variables which manifest contribution to economy of different transportation units: (1) the volume(10,000 tons) of water freight, railway freight, highway freight; (2) the mileage(10,000 km) of railway, grade highway and highway; (3) employment(person) in the air transportation industry.

Whereas data of different units get different regression equations, mixed OLS can not get accurate results. Therefore, the fixed effect model or the random effect model selected by Hausmann test can be used to deduce results. If the value of p is 0, the original hypothesis "H_0: u_{it} is not related to $\mathbf{x}_{it}$, ε_{it}" is strongly rejected, and the fixed effect model should be used instead of the random effect model; otherwise, the random effect model should be used for analysis in order to determine the accuracy of the model. According to the results obtained by Hausmann test, the value of p is 0.5048, so the intercept term of unit difference should be considered in modeling to make the results obtained by random effect model more accurate.

Table 1. Results of the three models

Form(1).Results of the three models

VARIABLES	mixed effects model	fixed effects model	random effects model
Third industry added value(100 million yuan)	1.914***	1.712***	1.789***
	-0.0879	-0.0542	-0.0522
Transportation postal category added value (100 million yuan)	0.898**	1.446***	0.952***
	-0.391	-0.251	-0.176
Freight turnover (100 million tons/kilometer)	0.0507	0.0779	0.0789
	-0.122	-0.0637	-0.0803
Express volume (10,000 pieces)	-0.0160***	-0.00931***	-0.0112***
	-0.00329	-0.00176	-0.00202
Cargo transportation volume (10,000 tons)	-0.454	0.811***	0.415**
	-0.442	-0.272	-0.2
Water freight volume (10,000 tons)	0.467	-0.772**	-0.379*
	-0.451	-0.285	-0.211
Railway freight volume (10,000 tons)	0.465	-0.661**	-0.326
	-0.443	-0.314	-0.222
Road freight volume (10,000 tons)	0.484	-0.790***	-0.392*
	-0.442	-0.269	-0.2
Railway mileage (10,000 kilometers)	-7,101*	-8,709***	-12,250***
	-3,588	-2,200	-1,800
Grade highway mileage (10,000 kilometers)	5,281	2,940**	4,887***
	-3,348	-1,328	-1,684
Highway mileage (10,000 kilometers)	71	107.9**	43.45
	-50.67	-44.12	-47.93
Employment in the air transport industry (person)	-0.0810**	-0.0439**	-0.0520**
	-0.0322	-0.0184	-0.0211
Constant	64.07	-2,863	1,665***
	-786.1	-1,749	-374.3
Observations	363	363	363
R-squared	0.999	0.999	
Number of regions		28	28

3.3 Explanation of Measurement Results

Among the regression results of Table 1, the estimated coefficient of "third industry added value" is 1.789, and it passes the significant test at the level of 1%, which shows that domestic economic growth is significantly affected by third industry. Specifically, for every 1% increase in third industry added value, local economic growth will increase by 1.789%. As a leading force of third industry, the growth of logistics industry will play an important role in economic construction.

As for the role played by inner factors of logistics industry on economic growth, it can be seen that while transportation postal category added value, express volume and freight volume pass the significant test at the level of 1% or 5% in the model, freight turnover does not pass that at the level of 10%. It is proved that changes of transportation postal category added volume, express volume and freight volume will have an impact on domestic economy, but freight turnover can not be used as a measure of domestic economic growth. To be specific, the coefficients of transportation postal category added value and cargo traffic volume are 0.952 and 0.415 respectively. It is basically confirmed that for every 1% increase in transportation postal category added value, the local economic growth will increase by 0.952%, and the local economic growth will increase by 0.415%

for every 1% increase in freight volume. The express volume coefficient is -0.0112, which indicates that the more express volume, the more negative effect on the local economy, but the degree of influence is not so significant.

As for the use of three modes of transport including shipments, airlifts and land carriage, variables in the model pass the significant test all except highway mileage and railway freight volume. Among related variables, mileage of grade highway has a positive effect on the local economy, but volume of water freight, highway freight, railway mileage and employment in the air transport industry are contrary to that. In details, under this general trend, construction of waterway, railway and air transport industry can barely promote local economic growth. The higher the construction degree of grade highway, however, the more local economy can be promoted. This result enlightens an important policy: At present, the core of development in China's logistics industry is to promote construction of grade highway so as to improve local economy.

4. Conclusion and Policy Alternatives

Based on the data of 27 provinces in China, this paper studies the importance of different factors in logistics industry to promote China's economic development and their correlation. The results show that, first, logistics industry, as the core of third industry, plays a significant role in promoting local economic growth in China. Second, in recent years, the growth of China's economy is under the positive influence of transportation postal category and freight volume. Express volume, however, has little impact on the development of national economy. Third, among various modes of transport in China, grade highway construction contributes the most to economic growth.

Based on the results of empirical analysis above, this paper offers following proposals for the future development of domestic logistics industry:

First, in order to promote domestic economic growth, government should increase the productive expenditure of logistics and transportation industry, and optimize the investment structure. In an era of big data, O2O has been rapidly developing and has increased the frequency of information transmission since 2013. An increasing number of commercial activities has driven the productivity of logistics industry. Correspondingly, traffic construction helps to reduce time lag of logistics and to enhance timeliness and effectiveness of business transactions. On top of that, an increase of freight turnover will promote local economic growth and improve gross domestic economy.

Then, to achieve coordinated development, government should pay attention to the proportion of internal capital investment in logistics industry. In recent years, the level of domestic express industry has been improved, and the volume of that has an impact on local economic growth—overall negative trend, that is, prevalence of express delivery industry is negative to local economy, but foreign trade and domestic freight play a role in promoting local economy in general. Thus, vicious impact of logistics industry will even emerge as the market becomes saturated if governments or companies do not proceed from integral interests in capital planning.

At last, government should expand the construction of domestic grade highway, particularly in northwest China. As one of the most effective modes of transport at present, highway is most commonly used by many domestic enterprises with advantages of low cost and timeliness. The government's investment in grade highway will further improve its efficiency. The higher delivery rates of freight, the more positive effect on local economic growth. At the same time, the results of this study also show that railway freight has the most negative effect on domestic economic growth. Therefore, government should reasonably adjust proportions of capital investment to ensure the maximized interests of economic development and construction.

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