

Empirical Research on the Effects of Logistics Industry on Economic

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ABSTRACT

Logistics Industry is regarded as the artery and basal industry of country economic development. Its degree of the development is one of the symbols of modernization and comprehensive national strength, and is described as the accelerator on promoting economic development. By using economic analytical method, the article takes the gross domestic product (GDP) as the explained variable and the value of cargo circular flow as the explaining variable, and sets up the economic model between gross domestic product and cargo circular flow; the interdependence between the logistics industry and the economic development can be revealed, and some corresponding suggestions about Dalian for the future development of logistics industry can be put forward.

Keywords: Dalian Economic, Logistics Industry, Econometric Analysis

1. Introduction

At the 1960s, America scholar Drucker brought forward the doctrine that Logistics is the gloomy mainland of economic field and more scholars start to study Logistics theory. In the hard environment, reducing cost has the limit with improving technological content and management level, so compressing the furthest current time and cutting down current charge are the most important thing to reduce the total cost. At the same time, Logistics industry has powerful correlative effect and promotes the development of Transportation industry, Finance industry, Information industry, Travel industry, and so on. It not only enhances third industry's absolute quantity, but also advance the proportion high value-added industry and optimizes industry's structure from different orientations; brings along further converge about commodity flow, capital flow, information flow, technology flow and is an important ligament in country economy's circulation; besides, accelerates the formation of enterprise' competitive advantages.

On the effects of Logistics Industry on Economic, domestic has a lot of research. Such as, by using qualitative research studying the relation between economic development and modern Logistics industry with the example of Taizhou in Jiangsu province, ZHANG Chunfa gets that they have strong relativity; at quantitative research, by using cointegration test and from the angle of cointegration theory setting up model of Logistics industry and

economic development, LUO Hui tests the effect on Logistics industry on Jiangxi economic development; at the article of empirical research on effect of china Logistics industry on economic development, author adopts regress analysis, study them and bring forwards some advices developing Logistics industry; at the article of the effect of territorial logistics on territorial economic growth, author use the theory of economic growth, analyses their effect mechanism, at the same time, and study their econometric model. Besides, WANG Huiping, ZHANG Min, and so on, by using quantitative method research effect of other provinces on economic growth, for example, Henan province, Anhui province, but research between Dalian Logistics industry and economic growth has not been found.

Dalian has the predominant area and be on core ground on the northeast. 85%-90% of Northeast's trade bargain in the Dalian port. Dalian is also the centre of northeast Asia and has the important effect of promoting Logistics cooperation about China, Japan, Korea; as one of the important economic developmental center and port in our country, Dalian has favorable base on developing Logistics industry. After the reform and opening-up policy, Dalian has got outstanding achievement on the economy and social development, but Logistics industry set the pace. From high standard of establishing district's Logistics center, Dalian still has some problems, such as industry convergence not enough, logistics service shortage, modern Logistics personnel pinch. The article

carry through qualitative analysis on relation between Dalian Logistics industry and economic development; and then, by using econometric analytical method and setting up the econometric model, analyzes quantitative relation and determines Logistics industry contribution to economic development to offer necessary basis for establishing logistics industry's status and setting down Dalian Logistics industry's development layout.

2. Quantitative Analysis on Relation Between Logistics Industry and Economic Development

2.1 Interrelation between Logistics Industry and Economic Development

It is the interrelation between Logistics industry and economic development. On the one hand, by developing Logistics industry brings Logistics system's reformation; on the other hand, by adding Logistics demand economic development accelerates Logistics industry. In a word, logistics shortage that disparity lies in logistics supply and logistics demand can be described and explained relation between Logistics industry and economic development.

2.2 Analysis on the Effect of Economic Growth on Logistics Industry Development

The effect of economic growth on Logistics industry development represents that economic growth brings up the increase of logistics demand and the increase of logistics demand can prompt Logistics industry's development; on the one hand, the level of economic development decides development speed of Logistics industry.

As one of core city in the northeast, after entering into new century, Dalian economy continues to develop, economic strength enhances and microscopic economy benefit improves constantly. At the 2008 year, GDP reach RMB 385.2 billions. Economic fast development ask logistics demand change from quantity to quality; industry structural adjustability that Dalian develops new technology industry, accelerates modern service industry and advances industry all-around competition upgrade the quality of Logistics demand, and railway transportation descends, but highway transportation and navigate transportation ascends; Dalian modern commerce's development also has lots of demand to city distribution.

2.3 Analysis on the Effect of Logistics Industry on Economic Development

That Logistics industry has the effect on promoting economy has two sides: if Logistics could adapt the need of economic development, it will sustain economic development; Logistics stimulates and promotes economic development. Logistics industry's development may-

boost new industry configuration, optimizes industry structure and speeds industry upgrade.

The development of modern Logistics industry, advances Dalian investment environment, attracts more china and foreign investment and fosters new economic growth point. As we know, if Dalian Logistics cost fall one percent, it could create RMB2.5 billions at profit. At one time, modern Logistics industry promotes gross growth on third industry and service level, and accelerates Dalian course of industry superlative. Modern Logistics industry makes the best of Dalian distribution and radicalization function in the northeast economic area and northeast Asia, and also comes true effect of Dalian's shipping center, commerce center, finance center and information center.

3. Empirical Analysis on the Effect of Dalian Logistics Industry on Economic Growth

3.1 Selection about Measurement and Model

To reveal interdependence between Dalian logistics industry and economic development, the article uses econometric analytical method, taking the Dalian gross domestic product (GDP) as the explained variable (Y) to show the level of economic development; taking the value of cargo circular flow as the explaining variable show the development level of Logistics industry. In term of Logistics industry, it should include storage, kinds of distribution center and so on. Because our country's industry system don't carve up Logistics industry and has not integrated statistical index system, we can take transportation and storage as faint production value of Logistics industry. But up to now it is hard to gather all data, so we have to fail slice.

According to Dalian actuality of Logistics industry, cargo transportation (including railway, highway, waterway) is the main in the Logistics industry, so taking the value of cargo circular flow as the main economic index to describing the development of Logistics industry accords with fact. At the same time, the value of cargo circular flow is a practicality index and not influenced by price fluctuate, so this way is reasonable. According to Dalian Statistical Annual from 1998 to 2007, we clear statistical index up about the Dalian gross domestic product and the value of cargo circular flow (**Table 1**).

We use Eviews software to work out scatter figure about the explained variable (Y) and the explaining variable (X), as shown in **Figure 1**.

From the scatter figure we can see: first, Dalian product of Logistics industry ascends gradually (excluding 1998), according with growth trend of gross domestic product; at last, it shows nonlinear relation between Y and X (because of stylebook capacity being not enough, nonlinear relation is unconscious but it don't influence

Table 1. The dalian gross domestic product and the value of cargo circular flow

Year	The value of cargo circular flow (a hundred millions ton kilometres)	Gross domestic product (RMB a hundred millions)
1997	475.95	820.60
1998	462.72	926.27
1999	601.75	1003.08
2000	731.97	1110.77
2001	771.25	1235.64
2002	802.21	1406.10
2003	1265.94	1632.59
2004	1622.27	1961.76
2005	1923.33	2152.23
2006	2503.22	2569.67

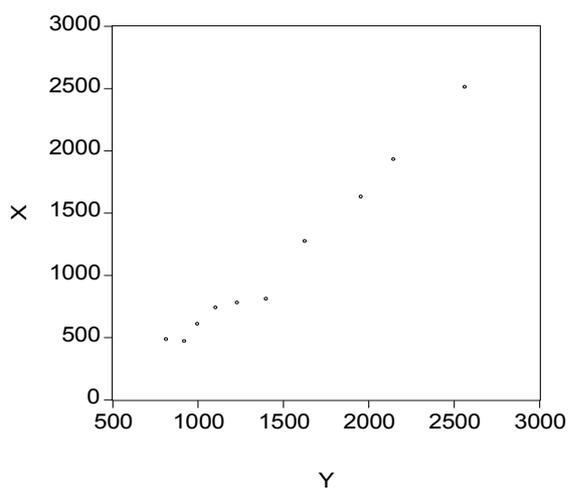


Figure 1. The scatter chart about X and Y

our judgment). From the form of scatter chart, the article adopts model:

$$y_t = \frac{1}{\left(\frac{1}{u} + b_0 b_1^{x_t}\right)} \quad t=1,2,3,\dots,n \quad (1)$$

In fact, u , b_0 and b_1 are estimated parameter, and the way of estimating parameter in linear model cannot be used direct, so the article adopts linear way, namely transforming Model 1:

$$\begin{aligned} \frac{1}{y_t} &= \frac{1}{u} + b_0 (b_1)^{x_t}, \\ \frac{1}{y_t} - \frac{1}{u} &= b_0 (b_1)^{x_t}, \\ \ln\left(\frac{1}{y_t} - \frac{1}{u}\right) &= \ln(b_0) + (\ln b_1)x_t, \end{aligned}$$

Assuming u is known, and $y_t^* = \ln\left(\frac{1}{y_t} - \frac{1}{u}\right)$,

$b_0^* = \ln(b_0)$, $b_1^* = \ln(b_1)$, we can get:

$$y_t^* = b_0^* + b_1^* x_t$$

So we can make the best of linear model to estimate model parameter.

From theory Model (1) we know, b_1 lies in the scope of zero and one. When x inclines to infinity, y would incline to u , namely u is saturation about y . But y represents GDP, so y has not saturation; in fact, x (the value of cargo circular) don't incline to infinity. The model is mainly used to analysis relation between logistics industry and economic development, so it is not necessary to take x as infinity. If we define GDP growth ratio every year as 10%, about seven years later, namely 2013, Dalian GDP will be RMB 500.8 billions, so u would be equal to 5008.

3.2 Model's Parameter Estimation and Test

By way of OLS (Ordinary Least Square) estimating parameter b_0, b_1 , we get the next result:

$$\hat{y} = \frac{1}{\frac{1}{5008} + 0.001(0.999^x)} \quad (2)$$

$$R^2 = 0.952491, \quad \bar{R}^2 = 0.946552, \quad F = 160.3885$$

From the angle of statistical test, simulation extent is high, and salient level of the equation is more than 0.05; from the angle of economic sense, that b_0 belongs to area from zero to infinity and b_1 belongs to area from zero to one are right, namely assuring that GDP grow as the value of cargo circular grow.

3.3 Analysis on the Effect of Dalian Logistics Industry on GDP Growth

According to Model (2), by way of marginal analysis and flexibility analysis, the article makes quantitative analysis on the effect of Dalian Logistics industry on GDP growth.

3.3.1 Marginal Analysis on the Effect of Dalian Logistics Industry on GDP

From Model (2) we can have Marginal effect:

$$\frac{d_y}{d_x} = -b_0 (\ln b_1) \frac{b_1^x}{(b_0 b_1^x + \frac{1}{u})^2} \quad (3)$$

b_1 belongs to area from zero to one and $\ln b_1$ is less than zero, but b_1^x is more than zero and $(\frac{1}{u} + b_0 b_1^x)^2$ is more than zero, so this shows that GDP grows when Logistics industry grows simultaneity. According to statistical data of Dalian Logistics industry (the value of cargo circular flow), when x is equal to 2503.22, we put it to Formula (3):

$$\frac{d_y}{d_x} \Big|_{x=2503.22} = 1.030 \text{ (RMB 0.103 billions),}$$

Namely, when the value of cargo circular flow adds one unit (a hundred millions ton kilometers), GDP adds 1.03 units (RMB 100 millions) accordingly. Marginal effect $\frac{d_y}{d_x}$ is more than zero all along, but

$$\frac{d^2y}{d^2x} = -b_0(Lnb_1) \frac{b_1^x}{\frac{1}{u} + b_0b_1^x} * \left[\frac{Lnb_1}{\frac{1}{u} + b_0b_1^x} - \frac{2b_0b_1^x Lnb_1}{(\frac{1}{u} + b_0b_1^x)^2} \right] \tag{4}$$

From the equation $\frac{d^2y}{d^2x} = 0$ we know that x is equal to

1611. When x is less than 1611, $\frac{d^2y}{d^2x}$ is more than zero;

when x is more than 1611, $\frac{d^2y}{d^2x}$ is less than zero.

Marginal effect can be divided to two phases: when x is less than 1611, Logistics industry has positive effect; when x is more than 1611, Logistics industry has negative effect; when Logistics industry reach considerable scale, marginal effect is unconscious. When x is equal to 1611, marginal effect is the best.

3.3.2 Flexibility Analysis on the Effect of Dalian Logistics Industry on GDP

At the basis of economy and flexibility concept, according to Model (1), flexibility coefficient

$$\in = \frac{dy}{dx} * \frac{x}{y} = -b_0(Lnb_1) \frac{ux}{b_1^{-x} + ub_0} \tag{5}$$

That equation describes contrastive relation between growth ratio of logistics industry and GDP. Because b_1 belongs to area from zero to one, Lnb_1 is less than zero, and u, x, b_0 and b_1^{-x} are all more than zero, flexibility coefficient (\in) is more than zero. That means they keep growth at one direction.

$$\frac{d \in}{dx} = -ub_0(Lnb_1) \frac{b_1^{-x}(1 + xLnb_1) + ub_0}{(b_1^{-x} + ub_0)^2}$$

Assuming the above equation is equal to zero, namely

$$ub_0b_1^x + xLnb_1 + 1 = 0 \tag{6}$$

this equation is a surmountable equation, and by the way of numerical value analysis we can get that x is equal to 1815.

At the moment, that \in is 17.58 is the biggest. Namely, when the scale of Logistics industry grows 1%, GDP may grow 17.58%. When $\frac{d\in}{dx}$ is more than zero,

Logistics industry and GDP change at the same direction; when $\frac{d\in}{dx}$ is less than zero, Logistics industry and GDP change at the adverse direction. Especially when Logistics industry reach considerable scale, its effect is limited to GDP growth. Of course, this analysis is the basis of Model (2). In the model, about GDP growth, the article only think about a factor promoting GDP growth—the value of cargo circular. It is possible that other promoting effects are attributed to Logistics industry, and this is localization about Model (2).

3.3.3 Brief Summary

Carrying through qualitative analysis and empirical analysis on the interdependence of Dalian logistics industry on economic growth, and setting up regress model. From marginal analysis we know: if the value of cargo circular added one unit, 1.03 units of GDP would grow accordingly; from flexibility analysis we know: if economic scale of Dalian Logistics industry adds 1%, GDP could grow 17.58%.

Relying on good district, Dalian logistics industry develops early and forms definite scale, so using Dalian date to test is representative and believable, and it can reflect level to some extent that Logistics industry's development influences economy.

Having strong relativity between Dalian development of logistics industry and the level of economic development, so developing Logistics activity has obvious effect for drawing economy. Especially in recent years, the Logistics industry has boundless beneficence on high growth of Dalian GDP.

4. Conclusions and Suggestions

Dalian logistics industry has some extent development, but it is not enough to exert strong industry converge function. Therefore, first government should mend to open up, build and consummate Logistics district, logistics base and integrative Logistics center, and make it become some extent specialization district, enhance competition and comes true scale effect of Logistics industry. Second, Logistics enterprises should make own great efforts to increase technology input, strengthen to research and develop new service, and improve technology level continually. At last, strengthen Logistics build of information and network specialization.

When the trend of society division and enterprise management's segmented will be obvious, talents demand of Logistics subsection field enlarge increasingly. So Dalian should innovate training pattern, expand channel and strengthen training, not train multiple Logistics talents; consummate talents' training and absorbing mechanism, build loose mechanism to employ persons, create the environment of talent showing itself for standout, and also adopt flexible policy, for example,

holding stocks, using technology to become a shareholder or improving salary, to attract professional talents.

Increasing to opening to the outside world and strengthen to cooperate with international Logistics organization in the field of Logistics and distribution technology, logistics management and consultation, and so on; fetching in positively domestic excellent Logistics enterprises and strengthen territorial Logistics cooperation and multinational entrance; strengthening layout and build of Logistics basal establishment, mending distribution development of Dalian city, going along of intercity and interprovincial and push international development of Logistics industry would become Dalian the most important logistics hinge.

In a word, Dalian Logistics industry has strong effect on promoting economic development, but in fact, comparing fast development of Dalian economic with the development level of Logistics industry, its development pace still improves. Quickening development of Dalian Logis-

tics industry, enhancing its' supply ability and translating huge Logistics demand into effective demand still are emphases in the future of Dalian Logistics industry.

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