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Econometric Analysis on Development of Port Logistics Industry in Zhanjiang

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***Abstract*—In order to study the relationship between Zhanjiang port logistics and economic development, this article uses data from Zhanjiang port logistics and economic development from 2004 to 2014 to establish an econometric model by using regression analysis methods. The regression equation indicates that the container throughput and port throughput have an obvious effect on the total output value of Zhanjiang City. As a result, it is found that the container throughput has a more significant effect on the total output value of Zhanjiang City; Zhanjiang's port logistics and regional economic development have a long-term balanced relationship; the effective use of port logistics development can promote the development of regional economy. The new and original work in this paper is econometric analysis on development of port logistics industry in Zhanjiang using regression analysis methods.**

***Keywords*—port throughput; container shipping; economic development; Zhanjiang**

I. INTRODUCTION

With the globalization of the world economy, trade liberalization and the formation of an international transportation market, especially the development of modern logistics, the port has become an important link and key node in the global supply chain. According to statistics, 90% of world trade (calculated in tons) is completed by sea transportation. As an important part of the trade chain, the growth of throughput is closely related to trade growth. The port is no longer a traditional one with only a single function of loading, unloading, warehousing and transportation, which is detached from the enterprises about production, trade and transportation. It is a catalyst for the development of the economy and trade. The port can produce tremendous impact on the surrounding areas and hinterland, and therefore the radiation function to promote the development of the economy and trade in the region and even the world.

Zhanjiang Port is the first self-designed and constructed modern seaport since the founding of New China. After more than 50 years of development, it has become an important hub for the country. Zhanjiang Port is one of the 20 major coastal hubs in the country, and is positioned as the main port of the southwest coastal area, one of the five largest port groups in the country. It has been open to navigation with 100 countries and regions in the world. In 2008, it became the only port group in the southwest coast of China, that strengthens Zhanjiang Port's dominant position as the main channel for China's large-scale southwest, and indicates that Zhanjiang Port is advancing towards regional shipping centers and logistics centers with a leapfrog development posture.

Zhanjiang Port (Group) Co., Ltd. is the largest public terminal operator in Zhanjiang Port. Currently, there are Tunshu Island, Xiahai, and Xiashan operational harbors, 38 production berths, of which 26 are over 10,000 tons. They have the largest 300,000-ton land-based crude oil terminal in the country, the largest 250,000 tonnage iron ore wharf in southern China, and the deepest 300,000-tonne channel in Asia, who has an annual capacity of 49.54 million tons. The warehouse area of the port area is 227,000 square meters, the yard area is 1.334 million square meters, the volume of oil tanks is 542,000 cubic meters, loading and unloading machines (sets) more than 770, Hong Kong ships 22, oil pipelines 41.5 kilometers, railway lines 107 kilometers that can handle the loading and unloading, storage and packaging of various cargoes such as containers, general cargo, bulk cargoes, heavy parts, dangerous goods, petroleum, and liquid chemical products, transit services, passenger and automobile ro-ro transportation services, as well as cargo agency, ship agency , ship towing, bonded warehousing, export supervision warehousing, and trade processing, distribution, distribution, information and other logistics value-added services.

II. MODEL SETTING AND DATA DESCRIPTION

A. Model Setting

Select "Zhanjiang City GDP" as the explanatory variable, represented by Y, and "port throughput" and "container throughput" as the explanatory variables respectively, represented by X_1, X_2. The model is assumed to be

$$\ln Y_t = \beta_0 + \beta_1 \ln X_{1t} + \beta_2 \ln X_{2t} + \mu_t \tag{1}$$

B. Data Description

From the Zhanjiang Bureau of Statistics website, the time series data of "Port Throughput" and "Container Throughput"

from 2004 to 2014 and the total GDP of Zhanjiang City are selected. See Table 1.

TABLE I. DEVELOPMENT DATA OF LOGISTICS INDUSTRY IN ZHANJIANG PORT

Year	Y	X1	X2
2004	5096	17.00	608.16
2005	6620	18.00	680.97
2006	8173	27.00	805.52
2007	9165	28.00	924.41
2008	10404	28.00	1099.41
2009	11838	23.00	1156.67
2010	13638	32.00	1405.06
2011	15539	37.80	1700.23
2012	17092	41.20	1860.22
2013	18006	45.20	2060.01
2014	20238	58.08	2258.72

Data Sources: Zhanjiang Bureau of Statistics

III. MODEL PARAMETER ESTIMATION AND RESULTS

Using econometric software Eviews, the results are as follows:

View | Proc | Object | Print | Name | Freeze | Estimate | Forecast | Stats | Resids

Dependent Variable: Y
Method: Least Squares
Date: 12/23/16 Time: 17:17
Sample: 2004 2014
Included observations: 11

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-117.3928	56.66656	-2.071642	0.0720
X1	0.098767	0.012244	8.066530	0.0000
X2	6.860149	4.904673	1.398696	0.1995

R-squared	0.989884	Mean dependent var	1323.580
Adjusted R-squared	0.987356	S.D. dependent var	573.0541
S.E. of regression	64.43851	Akaike info criterion	11.39630
Sum squared resid	33218.57	Schwarz criterion	11.50482
Log likelihood	-59.67965	Hannan-Quinn criter.	11.32790
F-statistic	391.4306	Durbin-Watson stat	1.343215
Prob(F-statistic)	0.000000		

FIGURE I. ECONOMETRIC ANALYSIS RESULTS.

The regression result is:

$$\ln \hat{Y}_t = -117.3928 + 0.098767 \ln X_{1t} + 6.860149 \ln X_{2t} \quad (2)$$

IV. MODEL CHECKING

A. Economic Significance Test

Through the econometric analysis of Zhanjiang port logistics industry, the parameter symbols are correct and in line with the significance of economic testing.

B. Statistical Test

1) Goodness of fit test: It can be seen from the regression results that sample determination coefficient is 0.989884 and the adjusted sample determination coefficient is 0.987356. These show that the model has good goodness of fit.

2) The overall significance test of the regression model: The statistic F is 391.4306. Statistically, p is a decreasing indicator of the credibility of the results. The larger the p-value, the less we can consider that the association of variables in the sample is a reliable indicator of the association of variables in the population. In the case where the given significance level is $\alpha = 0.05$, and the degrees of freedom are 1, 11 respectively, the F distribution table is found to be $F_{0.05}(1, 11) = 4.84$. Obviously F=391.4306>4.84, indicating that the effect of all explanatory variables on the interpreted variables is significant at the 95% confidence level.

3) Significance test of regression parameters: The regression parameters are reasonable. Each explanatory variable has a significant influence on the explained variable.

C. Econometric Test

1) Multiple linear test: It can be known from the estimation model that sample determination coefficient is 0.989884 and the adjusted sample determination coefficient is 0.987356. These two values are higher. The F-test value was 391.4306, which was significantly significant. For the model of two explanatory variables, the simple correlation coefficient method is used to find the simple correlation coefficient r=0.48 of X1 and X2. The absolute value of r is not close to 1, indicating that there is no strong multicollinearity between the two variables.

2) Autocorrelation test: The DW is 1.343215, which is in the region without autocorrelation. Therefore, there is no first-order linear autocorrelation for the random error term of the model. For the high-order autocorrelation, the autocorrelation coefficient and the high autocorrelation coefficient are obtained by the partial correlation coefficient test. Within the standard deviation, the correlation is not significant, indicating that there is no high-order autocorrelation, and the model passes the test.

3) Heteroscedasticity test: It is easy to verify that the model does not have heteroscedasticity.

V. INSPIRATION AND SUGGESTIONS

Accelerating the pace of construction of Zhanjiang's coastal ports will help achieve the strategic goal of accelerating the future development of Zhanjiang's economy, and will also raise higher transportation and service requirements for port logistics.

With the adjustment of national industrial policies and the changing market environment, when building the Zhanjiang economy, it is necessary to integrate regional advantages, optimize the allocation of port resources, make overall plans, form a port-oriented industrial cluster, and carry out linkages between multi-region ports. Improve the service contribution of Zhanjiang port logistics, and promote the overall development of Zhanjiang's economy and society.

A. Further Increasing the Port Infrastructure Construction and Providing Supporting Services

It is necessary to use advanced concepts and technologies to manage ports and develop ports, and accelerate the construction of port infrastructure and supporting facilities.

Enhance the ability of independent innovation. Earnestly study, learn from and absorb the management concepts, management experience and advanced technologies of developed ports at home and abroad. Increase investment in technology and talents. Aim at new trends in the development of world ports, and continuously improve and innovate the facilities and comprehensive capabilities of the port. Improve the overall function of the port. Continuously improve the service quality, and further expand the port throughput.

B. Speeding up the Development of the Port Container Transportation Industry

Container transportation, especially in marine transportation, has many advantages:

1) Transportation volume in container transportation being large: The scattered goods to be transported are packed in boxes in advance, which facilitates mechanized loading and unloading. This greatly shortens the time the vessel is parked at the port and the time the goods are stored in the warehouse, speeding up the delivery of the goods and reducing transportation costs.

The specifications of the boxes are uniform, and there are more goods loaded on the same volume of ships, which increases the transportation volume.

2) Container transportation helping to reduce damage to items: Container loading and unloading can ensure the integrity of the shipment, almost completely eliminate the loss of goods, greatly reducing damage and compensation. For example, if the glass plate is transported by usual means, then the damage rate is 15%. But, if the glass plate is transported by container, the damage rate is only 0.2% to 1%.

3) Container transportation saving packaging materials: Packaging materials for bulk shipping and simple packaging are generally used at one time. The container can be used multiple times, and the cost of packing and unpacking can be reduced, and the freight cost can be reduced, which is beneficial to the customer.

C. Accelerating the Construction of the Transportation Industry and Opening the Way for Port Development

In the more than 20 years from the 1980s to 2003, the development of cargo throughput in Zhanjiang port was very unstable. The main reason is that the railway capacity is insufficient, and the “bottleneck” of backward railway transportation restricts the substantial increase in port throughput. Therefore, railway construction should be accelerated and completed as soon as possible to provide services for the port economy.

The modern port economy is dominated by the modern logistics industry. Therefore, in order to develop the port economy and make full use of its agglomeration and radiation functions, it is necessary to vigorously develop logistics, business flow and trade facilities, and actively cultivate port integrated service industries such as modern logistics, shipping transactions, ship repair and logistics value-added services. At the same time, the development of the logistics industry is inseparable from the service function of the port economy.

D. Building Infrastructure Quckly

In order to adapt to the trend of large-scale international container ships and all-weather operation requirements, as well as the economic development of the hinterland and the high efficiency of various types of cargo operations, the port must have a waterway with 15 meters water depth, docks and berths. The reduction of the overall cost level of logistics services in world trade needs to be solved by means of large-scale ships. It is necessary to strengthen the infrastructure construction of railways, highways, waterways, civil aviation, warehousing, etc., to form a three-dimensional modern integrated transportation network and a smooth and convenient collection and distribution system to meet the requirements of the development of international container multimodal transport.

It is necessary to build an efficient, safe and reliable modern communication system.

Vigorously develop container and modern logistics industry. Build regional main hub port and logistics distribution center. Accelerate the construction of professional deepwater berths and related land and sea integrated transportation channels. Promote the integration of logistics and business flow. These are based on a revenue structure optimization design.

E. Cultivating and Introducing Comprehensive Management Personnel for Integrated Logistics Services in Various Ways, especially Those Who have Mastered the Electronic Logistics Information Technology and Means

Modern logistics is a three-stream integration and unification of commodity flow, current information flow and low-cost capital flow. This will create a more scientific, more reasonable and more economical connection between production and consumption.

At the same time, the internal management system of the port must be reformed. According to the integrated logistics management idea, the port's business system and other organizations will be adjusted, and a complete logistics service system and a port industry belt centered on logistics services will be established.

It is necessary to continuously expand the port service field, vigorously develop comprehensive logistics value-added services such as cargo transportation, freight forwarding and cargo packaging, assembly, labeling, express delivery, etc., and improve the economic benefits of port logistics services.

Through the relevant research and understanding of the basic situation and strategy of port logistics, as well as the development of internationally renowned ports, combined with the current development and analysis of Zhanjiang Port, the objectivity and inevitability of Zhanjiang's development of port logistics has been recognized. In the face of opportunities, we must grasp; in the face of disadvantages, we must change the

current situation; in the face of advantages, we must make full use of them; in the face of challenges, we must also propose strategies to respond positively. We firmly believe that Zhanjiang Port will develop faster and further and further in the future.

VI. CONCLUSION

With other factors unchanged, when the port throughput and container throughput increase by 1%, the total GDP of Zhanjiang will increase by 6%.

The above results show that there is a long-term positive correlation between the development of Zhanjiang port logistics and the economic level of Zhanjiang. Port logistics has a tremendous role in promoting economic development in Zhanjiang. The rapid economic development of Zhanjiang is inseparable from the development and support of Zhanjiang port logistics.

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