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Study on the Relationship between Logistics Industry Development and Economic Growth in Mianyang City

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Abstract: *This paper takes the relationship between the development level of logistics industry and economic growth in Mianyang City as the research object. Firstly, the mechanism of the interaction between the logistics industry and economic growth is discussed. Secondly, the data of the logistics industry development level and economic development level in Mianyang City from the year 2005 to 2020 are selected, and after logarithmic processing, single integration and co-integration tests are carried out. The test results show that there is a co-integration relationship between the two. Then, the least square method is used for regression. The results show that the development of logistics industry has strong positive effects on economic development. What's more, in order to further analyze the influence of the logistics industry lag period on the current economic growth, a VAR model is introduced and an impulse response analysis is made. The results indicate that the logistics industry lag period one has a negative impact on the economic development of the current period. No matter which stage of economic growth, it has little impact on the development of the logistics industry. This means that the government should increase the investment and construction in the logistics industry.*

Keywords: *Mianyang City, Economic Growth, Logistics Industry, Relationship*

1. Introduction

Mianyang is the only science and technology city in China approved by the CPC Central Committee and the State Council. It is the second largest economy in Sichuan province, one of the seven regional central cities that have been cultivated and expanded, the regional central city of the Chengdu-Chongqing urban agglomeration, and an important national defense scientific research and electronic industry production base. It is known as the "Land of Happiness, Silicon Valley in the West". In 2021, Mianyang's GDP reached 335.029 billion yuan, with a year-on-year growth of 8.7%, ranking the second in the province. But the gap with Yibin city, which is in third place, is getting smaller and smaller, and Mianyang is also relatively backward compared with the eastern coastal areas [1]. Therefore, it is necessary to further tap the potential of Mianyang's economic development, and it is a good choice to vigorously develop the logistics industry.

2. Current Situation of Logistics Development in Mianyang City

In recent years, the Mianyang municipal government has increased investment and policy support for the logistics industry, and the development of logistics in Mianyang is facing new opportunities. But there exist some problems at the same time. For example, there are still deficiencies in the construction of logistics infrastructure [2]. The overall planning of the modern logistics industry also needs to be further improved. The details are as follows.

2.1 Current Situation of Logistics Parks

Mianyang City is currently speeding up the construction of three modern logistics park base projects: (1) Shitang Newly Built Logistics Park Base Phase I Construction Project; (2) Longmen Agricultural and Sideline Products Logistics Park Construction Project; (3) Shitang Industrial and Commercial Logistics Park Project Phase IV; In addition, this city also vigorously develop various large and medium-sized county-level logistics centers, which can effectively solve the problem of

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insufficient infrastructure construction, but it still cannot meet the needs.

2.2 Current Situation of Logistics Service Enterprises

At present, there are more than 70 logistics enterprises registered in Mianyang City, but many of them are relatively small in scale. They can provide fewer service items, and their service level is not high. Besides that, the urban logistics enterprises in Mianyang are mainly distributed in the urban areas of Mianyang, and county and township logistics still need to continue to develop. Generally speaking, the development of Mianyang's logistics industry temporarily lags behind the requirements of economic development [3].

3. Objective Analysis of the Promoting Effects of Logistics Industry Development on Economic Growth

The promoting effects of logistics industry development on economic growth are mainly manifested in the following aspects.

3.1 Reduce Enterprise Cost

The production of products, especially for manufacturing enterprises, is inseparable from not only the purchases of raw materials, parts and production equipment, but also the transportation of the produced products to the sales market. Enterprises themselves set up special transportation departments to undertake these tasks. On the one hand, both the cost of transportation facility and the maintenance cost are relatively high. On the other hand, the operation of the transportation sector also requires professional management, which is difficult for many enterprises. But professional logistics companies can provide customers with low-cost, multi-variety logistics services due to economies of scale and professional services [4]. This can help other enterprises to effectively reduce the transportation cost.

3.2 Improve Work Efficiency of Enterprises

A well-developed logistics system can improve the work efficiency of enterprises. For example, requiring the logistics department to implement just-in-time supply and just-in-time delivery to itself can enable enterprises to reduce storage costs. In addition, enterprises need to make timely coordination with the just-in-time supply and just-in-time delivery services provided by the logistics department, which forms a pressure from the outside that requires enterprises to improve work efficiency.

3.3 Provide Information Feedback for Enterprises and Promote Win-win between Supply and Demand Sides and Logistics Enterprises

The logistics department communicates with both supply and demand sides and can timely discover new demands of customers and provide information for manufacturers, so that enterprises can produce products that are more suitable for consumers' needs, adjust the contradiction between supply and demand, and enable logistics enterprises to better protect their own business [5].

3.4 Promote Regional and Urban-rural Economic Integration and Narrow the Gap

By developing the logistics industry, we can push the products of some remote and backward areas to a broad market, so that the development of these areas can be accelerated. It will help narrow the economic gap between regions and between urban and rural areas. The development of logistics industry will enhance the stability and durability of China's overall economic development.

4. Empirical Tests of the Relationship between Logistics Industry Development and Economic Growth in Mianyang City

4.1 Indicator Selection

The level of logistics demand intensity and enterprise logistics infrastructure investment intensity will directly contribute to the consumption and investment in the total GDP. Conversely speaking, the rapid development of social economy is also the key factor determining the logistics demand. The

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faster the economic growth, the greater the overall demand for logistics products. The development of logistics industry and economic development is an interdependent unity, which can promote each other. Taking Mianyang as the research object, this paper studies the relationship between logistics industry and economic growth in Mianyang city. The proxy index selected for economic growth is the GDP of Mianyang City, while the proxy index selected for the development level of logistics industry, due to the availability of data, is only the freight traffic of highways of Mianyang City [6]. The data year selected for the two indicators is from 2005 to 2020.

Table 1: Data

Year	GDP (billion yuan)	FT Freight Traffic (10000 tons)	Year	GDP (billion yuan)	FT Freight Traffic (10000 tons)
2005	45.9	147163	2013	147.041	693728
2006	53.788	158557	2014	161.208	674954
2007	65.401	177360	2015	174.300	664241
2008	71.875	327712	2016	195.791	710671
2009	79.960	370069	2017	231.357	771749
2010	93.587	417741	2018	261.330	842133
2011	113.381	522445	2019	287.049	645446
2012	126.476	609244	2020	301.008	686054

4.2 Single Integration and Co-integration Tests

In the above table, GDP is the gross domestic product of Mianyang City, and FT indicates the freight traffic of highways of Mianyang City. In order to eliminate heteroscedasticity, logarithm processing should be performed on the above data. Then a unit root test is carried out, and the test results are shown in Table 2.

Table 2: Unit Root Test Results.

Variables	Differential times	(C,T,K)	DW values	ADF values	10% critical value	Results
lnGDP	1	(C,n,3)	1.902046	-3.4322916	-3.362984	stable
lnHT	1	(C,n,3)	2.106758	-2.482430	-1.604392	stable

It can be seen from Table 2 that lnGDP and lnHT are first-order single integer sequences. There may be a co-integration relationship between the two. Next, the co-integration relationship between the two will be tested.

The Johanson co-integration test is adopted, with no intercept and trend terms. The test results are shown as follows. It can be seen that there is a co-integration relationship between the two.

Table 3: Co-integration Test.

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.481849	14.07600	12.32090	0.0252
At most 1 *	0.293859	4.871172	4.129906	0.0324

4.3 Least Square Method for Regression

Since there is a co-integration relationship between lnGDP and lnHT, the least squares regression method is used to regress them, and there is no pseudo-regression.

The model is set as:

$lnGDP=C+lnHT+\varepsilon$

Among them, GDP is the gross domestic product of Mianyang City, HT is the freight traffic of highways of Mianyang City, ε is the residual term, and ln is the natural logarithmic symbol.

R-squared=0.823460, Adjusted R-squared=0.810850. The table above shows that the intercept term and LNHT have passed the t-test. The determination coefficient of the sample is large, and the

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regression results can be used. Through the analysis of the regression results, it can be found that the development of the logistics industry has a greater contribution to economic development.

Table 4: Least Squares Regression Results.

Variables	Correlation coefficient	t statistics	Prob.
C	-5.080067	-3.351943	0.0047
LNHT	0.938140	8.080970	0.0000

The above analysis is aimed at the impact of the development of the logistics industry on the economic growth in that year, and the impact of the logistics in the lag period on the economic growth can be further analyzed. This requires the use of the VAR model, and at the same time, the role of economic growth on logistics can also be analyzed.

4.4 VAR Model Analysis

To establish a VAR model, it is necessary to determine the lag order of the model, which is generally determined according to the criterion that the lag period minimizes the values of AIC and SC at the same time. If the AIC and SC values do not take the minimum values at the same time, the LR statistic needs to be constructed to judge the lag period. It can be seen from Table 5 that the AIC and SC values take the minimum values at the same time when the lag period is in the first stage. Therefore, the lag period for the establishment of the VAR model is taken as 1.

Table 5: A Comparison of Information Criteria for Determining the Optimal Lag Period.

Lag period / Criteria	Lag period I	Lag period II
AIC	-4.157723	-3.861501
SC	-3.874503	-3.405032

The estimated result of VAR model is as follows. (6 decimal places are reserved):

LNGDP = 0.181321+0.927935*LNGDP(-1) + 0.03499*LNHT(-1)

(20.4402) (0.79150) (0.59308)

Adj.R-squared= 0.995291,F= 1480.665,AIC=--3.503466,SC=-3.361856

LNHT = 2.260939-0.006651*LNGDP(-1) + 0.837807*LNHT(-1)

(1.76673) (-0.03500) (4.52656)

Adj.R-squared= 0.995291,F= 66.72409,AIC=--3.503466,SC=-0.498434

From the above two formulas it can be seen that the economy of Mianyang City was greatly affected by the economy of the previous year, while the impact of logistics of last year on the economy of this year was very weak, but the effect was still positive. However, Mianyang's logistics was negatively affected by the economy of the previous year, which may be because there is an either-or choice for the output of some goods between adjacent two years. Of course, it is to be expected that logistics will have a greater impact on the next year.

4.5 Impulse Response Analysis

Next, the degree of interaction between lnGDP and lnHT should be further analyzed, and this requires the impulse response analysis. In this paper, Multiple Graphs are used to display the impulse response, and Cholesky-dof adjusted is selected as the decomposition method. LnHT and lnGDP are selected as shock variables, and lnHT and lnGDP as response variables. The impact of shock is shown in Table 6.

What is depicted in the above table is the impact of one standard deviation change of variable lnHT on lnGDP. The impact of the change in the variable lnGDP on lnHT starts to be zero, and then increases gradually, reaching the first peak of 0.6 in the ninth period, and then levels off. However, the

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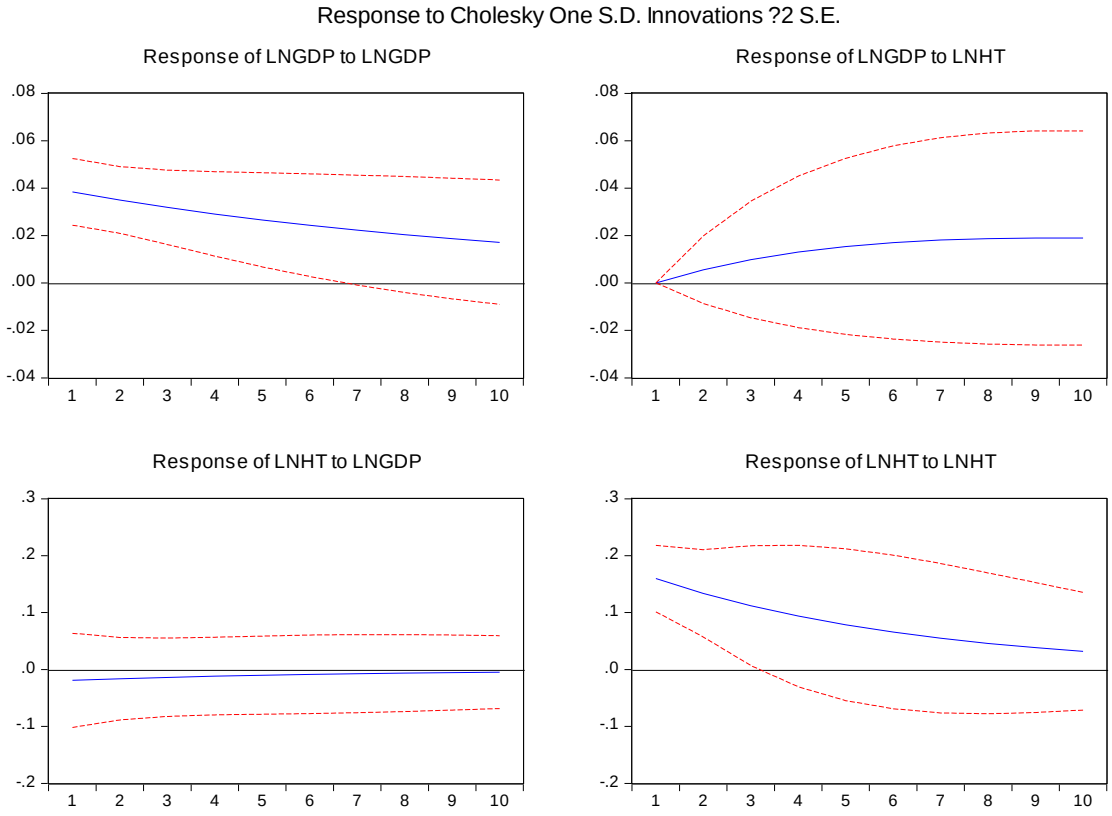
change of one standard deviation of the variable lnGDP described in the table has a weak impact on lnHT in each period.

Table 6: Impulse Response Analysis



5. Conclusions

The above empirical results indicate that the development of logistics industry in Mianyang can play a greater role in economic development. However, economic development has little impact on the development of the logistics industry. Although Mianyang has built some logistics infrastructure, it still needs to continue to increase construction. In addition, it is necessary to strengthen the training of talents in logistics, so that they can play a better role in logistics enterprises, and improve the management level of logistics enterprises. Finally, it is necessary to give full play to the scientific and technological advantages of Mianyang, the "Science and Technology City", and increase investment in research and development of logistics technology.

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