

The Positive Influence of High-tech Product Export on Economic Growth in Liaoning Province

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Abstract— In recent years, with the change of economic growth mode, the competition of high-tech industry is becoming more and more fierce. Improving the export competitiveness of high-tech products in Liaoning will play an important role in promoting the development of Liaoning's economy. The article first introduces the present situation of high-tech product export in Liaoning. Secondly, it analyzes the positive influence of high-tech product export on economic growth in Liaoning. Then the empirical analysis proves the above. Finally, the countermeasures to promote the export of high-tech products in Liaoning are put forward.

Index Terms—positive influence, high tech product export in Liaoning, economic growth in Liaoning

I. INTRODUCTION

Since Chinese government put forward the strategy of revitalizing the old industrial base in Northeast China, the economic situation in Liaoning has improved, but the foreign economic development is still slow. This requires the support of high-tech exports. The export of high-tech products has led to the continuous adoption of new technological processes by export enterprises, thereby increasing labor productivity and upgrading the industrial structure. At the same time, it needs to depend on the high-tech industry, if the government hopes the traditional industry to develop rapidly. Therefore, the development of high-tech industry has gradually become the focus of economic development in Liaoning. And, it is of practical significance to discuss the impact of the export of high-tech products on the economic growth of Liaoning.

II. HIGH-TECH PRODUCTS EXPORT STATUS IN LIAONING

In the export structure, the key exports of high-tech products are products of computer and communication technology in recent years. In 2014, the exports of these products were \$3.15 billion, accounting for 58% of the province; followed by the field of electronic technology, its exports amounted to \$820 million, accounting for 15.2% of the province. Export enterprises in Liaoning have the characteristics of uneven regional development. There are 833 high-tech enterprises in Dalian and

Shenyang which become the most concentrated areas for high-tech enterprises, accounting for 62.1% of the province. In the distribution of the export market, Japan and the United States are the largest demand countries for high-tech products of Liaoning. In 2014, exports to these countries were \$ 1.22 billion and \$ 1.12 billion respectively, accounted for 25.4% and 20% of exports in the province.

III. THE POSITIVE IMPACT OF HIGH-TECH PRODUCT EXPORT ON ECONOMIC GROWTH IN LIAONING

A. Promoting the Upgrading of Industrial Structure in Liaoning

In general, the development of manufacturing industry in the secondary industry requires the use and transformation of high-tech, and it makes its industrial structure to change from labor-intensive industry to knowledge-intensive industry, thus making the labor force to shift from the secondary industry to the tertiary industry. In addition, due to the development of high-tech industries, the first industry reform was accelerated, and the labor productivity in the first industry was greatly improved. If high-tech industries in Liaoning develop vigorously, it will promote the upgrading of industrial structure for the first, secondary and tertiary industries.

B. Pushing the Growth of Industrial Output Value

With a rapid growth trend of high-tech products export, the export enterprises in Liaoning continue to adopt new technology, new process, new equipment and new methods to improve the level of science and technology, increase labor productivity and reduce production costs, which led to a output value growth in high-tech industry of Liaoning, and stimulating the rapid growth of national economy in Liaoning. And it has a positive role in promoting the cultivation of new trade growth points in Liaoning.

C. Increasing the employment rate in Liaoning

The export of high-tech products is an important means to solve the employment problem. High-tech industry is a knowledge intensive industry, which requires relevant education, research and other industries to provide certain

support. At the same time, it also provides a number of high-quality jobs for technical personnel to have more employment opportunities, and its development has led to the relevant innovation and research for the industry. Data show that since 2010, the number of employees of high-tech enterprises in Liaoning has increased by an average annual rate of 15.4% continuously.

IV. THE EMPIRICAL ANALYSIS OF THE POSITIVE IMPACT OF HIGH-TECH PRODUCT EXPORT ON ECONOMIC GROWTH IN LIAONING

A. Choice of empirical analysis method

The data of high-tech product export and GDP of Liaoning in 1995 - 2015 years are used in this paper, which need to be tested by time series stationarity firstly, then co-integration test, finally, determined by Granger causality test, to find the relationship between high-tech product export and economic growth in Liaoning.

B. Data sources and processing

This paper selects data of Liaoning's high-tech product export volume (X) and Liaoning's GDP (Y) from 1995 to 2015, and GDP units are converted into billions of dollars. In order to further study the stability and elasticity of the relationship between two groups' data of export volume and GDP, Ln values of variables are needed. Data are shown in table I.

TABLE I
LIAONING'S HIGH-TECH PRODUCT EXPORT VOLUME, LIAONING'S GDP AND THE RELATED DATA
UNIT: BILLIONS OF DOLLARS

years	high-tech product export volume (X)	GDP(Y)	LnX	LnY
1995	5.2	374	1.6487	5.9243
1996	4.8	395	1.5686	5.9802
1997	7.2	544	1.9741	6.3000
1998	8.0	590	2.0794	6.3801
1999	11.3	634	2.4248	6.4520
2000	16.43	709	2.7991	6.5639
2001	17.5	765	2.8622	6.6399
2002	21.1	829	3.0493	6.7202
2003	26.5	912	3.2771	6.8156
2004	29.0	1013	3.3673	6.9207
2005	26.1	1222	3.2619	7.1082
2006	31.0	1413	3.4340	7.2535
2007	36.6	1696	3.6000	7.4360
2008	42.1	2076	3.7400	7.6382
2009	37.7	2311	3.6297	7.7454
2010	53.0	2804	3.9703	7.9388
2011	57.7	3376	4.0553	8.1244
2012	50.9	3774	3.9299	8.2359
2013	54.3	4134	3.9945	8.3270
2014	51.2	4348	3.9357	8.3775
2015	46.1	4360	3.8308	8.3802

Source: Liaoning Statistical Office

C. Empirical analysis process

1. ADF test: stationarity test of variables

Since most of the economic data of time series are non-stationary, the most commonly used testing tool is ADF unit root test. The results are as in table II:

TABLE II
RESULTS OF UNIT ROOT TEST

Variables	ADF value	5% Critical value	10% Critical value	Conclusion
LnX	-2.289774	-3.020686	-2.650413	Non-stationary
LnY	-1.140183	-3.029970	-2.655194	Non-stationary
Δ Ln X	-4.195519	-3.029970	-2.655194	Stationary
Δ Ln Y	-3.699289	-3.029970	-2.655194	Stationary

Note: Δ represents the first order difference of variables

It can be seen from table II, in the significant levels of 5% and 10%, the critical values of unit root test of LnX are -3.020686 and -2.650413, and the critical values of unit root test of LnY are -3.029970 and -2.655194, all of which are less than ADF values, so the two series LnX and LnY have unit roots, and they are non-stationary series. Meanwhile, it can be seen that the critical values of the unit root test of Δ LnX and Δ LnY are greater than ADF values, therefore the unit roots do not exist. Δ LnX and Δ LnY are stationary series, therefore LnX and LnY satisfy the condition of first order unit root co-integration, which leads to a next step of the co-integration test.

2. E-G co-integration test

Co-integration test of the relation between LnY and LnX is carried out:

First, the equation results of Equation regression are obtained as follows:

$$LN Y_t = -3.393327 + 0.910292 LN X_t$$

$$t: (-5.663860) (11.01119)$$

$$R^2 = 0.864524 \quad F = 121.2464$$

Then, the unit root test for residual μ_t are carried out, the results are shown in table III.

TABLE III
UNIT ROOT TEST OF RESIDUAL μ_t

Variable	ADF Value	5% Critical value	10% Critical value	Conclusion
μ_t	-2.098633	-1.964418	-1.605603	Stationary

The sequence of residual μ_t passed the stationary test at 5% significance level, therefore it is a stationary sequence. It also shows that there is a co-integration relationship between LnX and LnY, and a long-term equilibrium relationship between the high-tech product export and GDP growth in Liaoning.

3. Granger causality test

Granger causality test is used to analyze the causal relationship between the high-tech product export and

GDP growth in Liaoning, and the results are shown in table IV

TABLE IV
RESULTS OF GRANGER CAUSALITY TEST

Lag stage	Null hypothesis	Statistical value F	Value P of F	Conclusion
2	LNX is not LNY's Granger cause	4.69703	0.0240	Rejected
	LNY is not LNX's Granger cause	1.53202	0.2611	Accepted

It can be seen from table IV, in the level of 5% critical value, one value P of F is 0.0240, less than 0.05, so the assumption of LNX is not LNY's Granger cause is rejected, namely Liaoning high-tech product export becomes an unidirectional Granger cause for Liaoning's GDP growth, showing that high-tech product export plays a certain role in promoting the economic growth of Liaoning.

D. Conclusion

This paper uses the unit root test, co-integration test and Grainger causality test to test the correlation between high-tech product export and economic growth in Liaoning. From the Grainger causality test results, there is a one-way causal relationship between high-tech product export and economic growth in Liaoning, namely high-tech product export has a certain role in promoting economic growth of Liaoning.

V. COUNTERMEASURES TO PROMOTE THE HIGH-TECH PRODUCT EXPORT OF LIAONING

A. increasing financial support for high-tech enterprises

According to the survey, in 2015, the total expenditure of the government of Liaoning in high-tech industries was 11.9 billion yuan, an increase of 17.5% over last year. However, compared with other advanced provinces and cities, the annual growth rate of local financial expenditure is lower. Therefore, the government of Liaoning should increase the financial expenditure on high-tech industries and provide strong financial support for high-tech enterprises in Liaoning.

B. Formulating development strategy for high and new technology

The key to the rapid development of Liaoning's high-tech industry lies in the independent innovation and continuous development of new products by Liaoning's enterprises. These enterprises should develop some key

areas and cultivate new industries. Under the leadership of the policy about "One Belt and One Road", Liaoning government should actively respond to the new policy of the country, improve the added value of high-tech products actively, develop their own proprietary technology, and strive to achieve the change of "made in Liaoning" to "created in Liaoning".

C. Enhancing innovation capability

In order to occupy a comparative advantage in the market competition, it is very important for high-tech enterprises to have core technology and core products to achieve excess revenue. Liaoning high-tech enterprises should strive to develop products with core technology, improve innovation awareness and increase capital input for technological innovation. At the same time, they should pay attention to learning foreign advanced technology for their own use, the introduction of foreign advanced equipment for research, and enhancing their own innovative ability.

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