

Research on the Influence of Foreign Trade on Upgrading of Industrial Structure in Shaanxi Province

—Empirical Analysis Based on New Silk Road Economic Belt

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Abstract

The construction of the “New Silk Road Economic Belt” will inevitably expand the development scale of foreign trade in economic belt relevant area. Based on the data from 1990 to 2013 in Shaanxi Province, this paper analyzes the economic correlation effects of foreign trade on the upgrading of industrial structure in Shaanxi province by using gray relation analysis method. Results show that the foreign trade is highly correlated with GDP and three industrial added values. Moreover, performance of foreign trade and upgrading of industrial structure of Shaanxi Province are also analyzed by using Co-integration and Granger test. It is found that foreign trade has the most promotion to the third industry, the second industry follows, and the first industry least. That is to say, foreign trade of Shaanxi Province is constantly promoting industrial structure shift from “Two • Three • One” model to the “Three • Two • One” model.

Keywords

New Silk Road Economic Belt, Foreign Trade, Upgrading of Industrial Structure, Three Industrial Added Values

1. Introduction

In the background of open global markets, international element has become an important influence factor of industrial structure upgrading in a country. In August 2013, President Xi Jinping has put forward the concept of

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“New Silk Road Economic Belt”. This idea writes a new chapter for China’s opening up. The total population reaches 3 billion along New Silk Road Economic Belt, so market development potential is great. By constructing transportation network and enhancing trade flow, trade between China and the countries in Asia and Europe is expanded, which can promote country’s economy development and upgrading of industrial structure. As the starting of the ancient Silk Road, and also the strongest province of economy and innovation in the Northwest of China, Shaanxi Province is the hub and logistics center of New Silk Road Economic Belt. Studying foreign trade of Shaanxi section along New Silk Road has a great significance for the upgrading of industrial structure.

2. Literature Review

With the development of global economic integration, how to grasp the opportunity of international industrial transfer, and promote the upgrading of industrial structure through foreign trade, has become an important issue for scholars to study. Raymond Vernon (1966) proposes that industry leading countries should combine the evolution of the industrial structure with the development of the international market closely, by participating in the international division of labor to drive industrial structure evolution from labor-intensive to capital technology intensive [1].

Michaely (1997) by using the production function model, it can be found that the export can improve the total factor productivity through the optimization, distribution, full use of resources and technology transfer, and thus promote the adjustment of industrial structure [2]. Mazumda (1996), who combines Solow model with capital accumulation theory to analyze the effect of foreign trade, thinks that a country's imports of capital goods, exports of consumer goods will lead to economic growth, trade structure of industry structure has the pulling effect, on the contrary, it is likely to hinder economic growth [3].

Domestic scholars study the effect of foreign trade on the upgrading of industrial structure mainly from the theoretical and empirical perspective. Shenyu Ji (2001) uses “vent for surplus theory”, international complementary theory which promotes the national production process and the theory of “Goose Model”, and then discusses the effect of foreign trade on China's industrial structure upgrading from the four aspects [4]. Sisi Zhang (2008) elaborates the theoretical relationship between foreign trade and industrial structure upgrading from the aspects of comparative advantage theory and product life cycle theory [5]. Yong Li, Hengxi Qiu (2007) believes that China can stimulate domestic demand growth and import foreign products to increase domestic supply and thus affect its industrial structure through domestic export [6]. Jinhong Wu (2006) points out that the comparative advantage of a country determines its foreign trade structure, the optimization of foreign trade structure can further promote the upgrading of the domestic industry structure [7]. Qingbo Huang, Houming Fan (2010) make a regression analysis based on the data of China, India and the four Asian tigers, It is found that foreign trade significantly promotes economic growth and industrial structure [8]. Xiaohua Sun, Yun Wang (2013) finds that the import and export of manufactured goods are in favor of reducing the proportion of the first industry, enhancing the proportion of the secondary industry; and effect of import and export structure has a significant positive impact on industrial structure upgrading [9].

Shaanxi Province is an important area of the New Silk Road Economic Belt. This paper aims to study the influence mechanism and specific performance of foreign trade on its upgrading of industrial structure by empirical methods. Government should seize the opportunity of building New Silk Road Economic Belt, and change its industrial structure strategically, which can not only promote economic growth but also optimize the industrial structure of the region.

3. General Situation of Foreign Trade and Industry Structure in Shaanxi Province

With the opening of the international market, economic exchanges between Shaanxi and foreign increasingly close, the foreign trade is continuously expanding. As is shown in **Figure 1**, during 1990 to 2013, the total amount of foreign trade increases year by year, increased from RMB 2.471 billion in 1990 to RMB 126.599 billion in 2013, import and export trade has become a driving force of economic growth in Shaanxi Province. Regions of foreign trade in Shaanxi Province are mainly concentrated in the United States, Europe, ASEAN and other regions, and due to regional concentration, it will inevitably weaken the ability of resisting market risk for foreign trade in Shaanxi Province. In 2013, the total GDP amounts to RMB 1.604521 trillion in Shaanxi Province, Three industrial added value is RMB 14.926 billion, RMB 113.828 billion and RMB 65.384 billion respectively, and “Two • Three • One” industrial pattern is presented. As is seen from **Figure 2**, the proportion of the

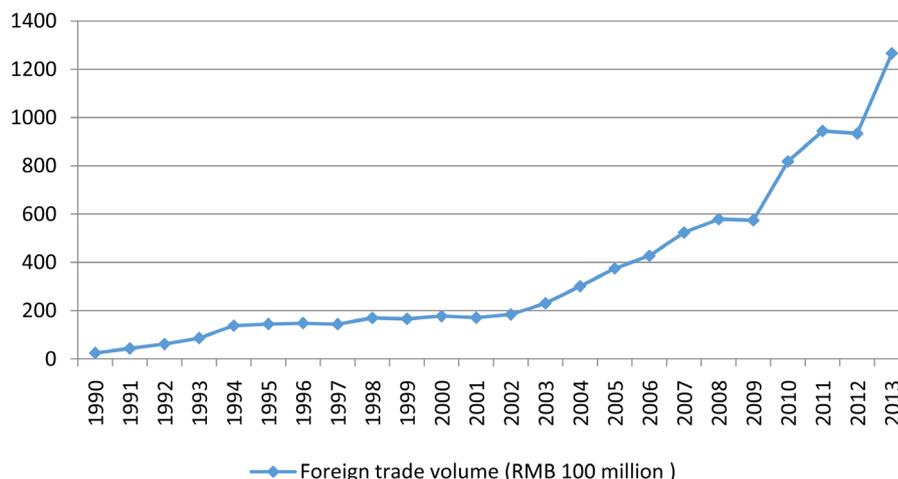


Figure 1. Foreign trade volume in Shaanxi Province in 1990-2013.

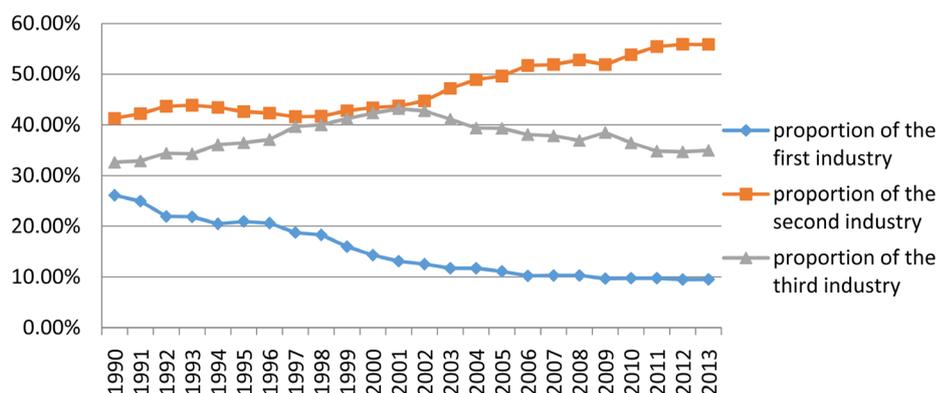


Figure 2. Proportion of three industries.

first industry in Shaanxi province decreases year by year, from 26.11% in the early 1990s down to 9.51% in 2013. The second industry accounted for the proportion of GDP rises roughly, up from 41.29% in 1990 to 55.54% in 2013. Except for individual years, the proportion of the tertiary industry has been increased steadily. According to the classification criteria for the industrial structure based on Sai Erkui measure, in recent years, industrial structure of Shaanxi Province shifts from the middle stage of industrialization to the late stage of industrialization. That is to say, foreign trade of Shaanxi Province not only stimulates the regional economic growth, but also promotes the regional industrial structure optimization to some extent.

4. Empirical Analysis on the Relation between Foreign Trade and Upgrading of Industrial Structure in Shaanxi Province

4.1. Economic Correlation Effects Analysis of Foreign Trade on Upgrading of Industrial Structure

Grey Correlation Analysis is a method of measuring the degree of association among variables by the similarity or dissimilarity of the developing trends of time series variables. If the two trends are consistent or similar, it shows that the correlation between the two is high; otherwise, it is low. This paper selects data of total GDP, three industrial added values and foreign trade from the “Statistical yearbook of Shaanxi province” in 1990-2013, Gray correlation analysis method is used to examine the correlation degree between the variable sequences, which can roughly reflect the impact of foreign trade on upgrading of industrial structure in Shaanxi Province.

Value of foreign trade and GDP of Shaanxi Province from 1990-2013 is shown in Figure 3, as can be seen, trend is rising steadily on the whole.

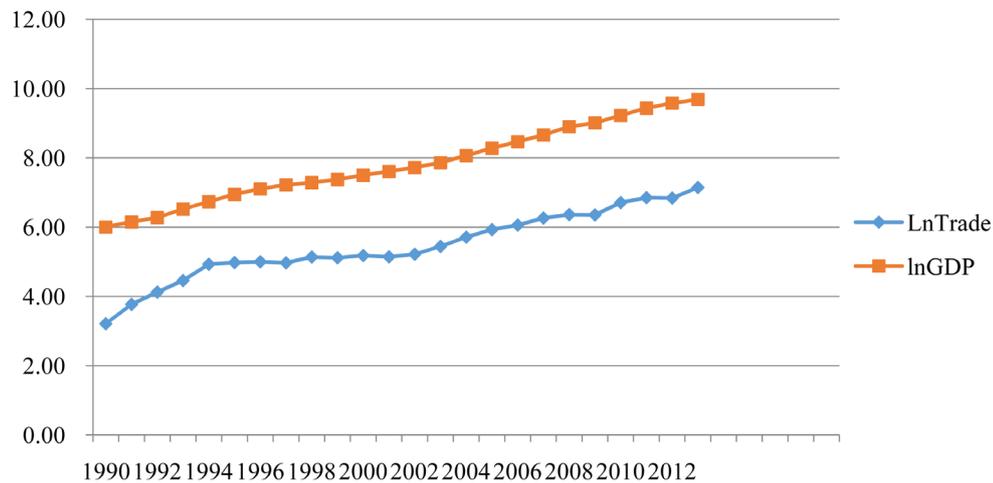


Figure 3. Development trend comparison chart of value of foreign trade and GNP in Shaanxi Province.

Firstly, make the foreign trade volume sequence as a reference sequence $X_0(t)$, and GDP sequence as a comparative sequence $X_1(t)$, to dimensionless initial sequence by the extremum value, primary sequence and mother sequences are referred as $Y_0(t), Y_1(t)$ after normalization. Each of the observed value Y_0 subtract the corresponding observed value Y_1 , then difference sequence $\Delta_{01}(t)$ can be got, the maximum difference and minimum difference is respectively 26.65 and 0. According to the correlation coefficient and correlation calculation formula, the correlation between value of foreign trade and GDP is 0.81. Similarly, the correlation between value of foreign trade and first industry, second industry, third industry is 0.67, 0.85, 0.87 respectively.

Empirical analysis shows that the total import and export is closely related to GDP in Shaanxi Province, foreign trade and economic growth are highly correlated. From the industrial structure, foreign trade has the highest correlation with added value of the third industry in Shanxi Province, followed by the second industry, and the third industry has lowest correlation, which illustrates that foreign trade is constantly pushing the shift of industry structure towards a more advanced stage in Shaanxi Province.

These effects occurred has an important relationship with foreign trade structure in Shaanxi Province. In recent years, trade structure of Shaanxi Province transforms from exports of primary products, imports of manufactured goods to exports of high-end industrial products, imports of raw materials. In 2011, exports of heavy industrial products like aircraft, heavy vehicles are ranking the first in the country, that is to say, the increasing demand of foreign markets for high-end industrial products can stimulate domestic supply increase. To meet market demand, Manufacturers begin technological innovation and adjust the product structure to promote the development of the second industry. On the other hand, the proportion of the emerging information industry, biological medicine, and photovoltaic industry in the import and export market grows rapidly in Shaanxi Province. The introduction of high-new technology and related products not only injects new vitality for the third industry but also promotes the development of the third industry in the region. Therefore, the correlation between foreign trade and added value of the second industry, added value of the third industry is high, but the correlation with added value of the first industry is relatively low.

4.2. Performance Analysis of Foreign Trade on Upgrading of Industrial Structure

The above arguments only analyze the economic relevance effect of foreign trade on industrial structure in Shaanxi, but the analysis is only for their relations between the two variables. It needs more specific analysis on influence of foreign trade on the upgrading of industrial structure in Shaanxi Province.

Balassa, a professor at Johns Hopkins University, proposed the export expansion production function in 1978.

$$Y = f(L, K, X) \quad (1)$$

In the formula, Y, L, K, X , respectively, said total output, labor input, capital input and export volume.

Because this paper is to examine the impact of foreign trade on the industrial structure, the labor and capital in the function of two variables are removed. Also because import trade has a greater impact on the upgrading of

industrial structure, the export volume of the function is extended to the total amount of import and export trade. The following regression model is shown:

$$\text{LnGDP}_{it} = \delta_{it} + \beta_{it} \text{LnTrade}_{it} + \varepsilon_{it} \quad (2)$$

Among $i=1,2,3$ they represent the first, second and third industry respectively. GDP_{it} represents the industrial added value, and Trade_{it} represents the foreign trade volume of the corresponding year in Shaanxi Province. The value of each variable is taken to enhance the stability of time series. All data are from the “Statistical yearbook of Shaanxi province” in 1990-2013.

4.2.1. Unit Root Test

Before the Co-integration test, ADF unit root test is taken firstly for each variable in order to determine the stability of each time series. The results of the test are shown in **Table 1**.

It can be known from the above table: The time series of the total foreign trade and the three industrial added values cannot reject the original hypothesis at the significant level of 10%, which all exist in the unit root and is not stable at the level of the sequence. After the first-order difference, four variables were rejected by the null hypothesis. That is the sequence of first order to maintain stable.

4.2.2. Co-Integration Test

Co-integration relationship can indicate a long term equilibrium relationship between variables. LnTrade, LnGDP1, LnGDP2 and LnGDP3 are all first order single integration, which satisfies the condition of co integration test. And then, EG two step methods were used to explain the variables and the sequence of the explanatory variables in order to test the Co-integration relationship. The results are shown in **Table 2**.

From the coefficients of each variable of the three Co-integration equations in **Table 2** can be known that the fitting degree of the three models is relatively high. Foreign trade volume of Shaanxi Province has every 1% growth, and the first, second and third industry increased value have the growth of 0.749%, 1.183% and 1.207% respectively. It shows that the foreign trade of Shaanxi Province promotes the economic development of the region which has the greatest impact on the third industry, the greater impact on the second industry, while the smallest impact on the first industry growth. This is consistent with the conclusion above that the analysis of the economic correlation effect of foreign trade and upgrading of industrial structure. That foreign trade is driving the industrial structure of Shaanxi Province from the “two • three • one” model to the “three • two • one” model.

The unit root test is performed on the residual sequence e_i . The results are shown in **Table 3**. The test results show that three the residual sequences are all horizontal integration and the ADF test model does not exist a constant and time trend, meeting the residual regression equation to be 0. It is indicated that the LnTrade, LnGDP2, LnGDP3 and LnGDP1 have Co-integration relation. That is to say, there is a long-term stable relationship between the foreign trade volume of Shaanxi Province and the added value of the three industries.

Table 1. Test results table of unit root of each variable.

Variable	ADF Statistics	Critical Value	Verification Model	Conclusion
LnTrade	-2.599	-3.261*	(C, T, 2)	Unstable
LnGDP1	-0.610	-3.255*	(C, T, 1)	Unstable
LnGDP2	-1.302	-3.261*	(C, T, 1)	Unstable
LnGDP3	-3.169	-3.261*	(C, T, 2)	Unstable
Δ LnTrade	-2.868	-2.679***	(0, 0, 2)	Unstable
Δ LnGDP1	-3.207	-3.012**	(C, 0, 2)	Unstable
Δ LnGDP2	-2.991	-2.646*	(C, 0, 2)	Stable
Δ LnGDP3	-2.646	-2.332	(C, 0, 2)	Stable

Notes: *indicates a significant level of 10%, ** indicates a significant level of 5%, *** indicates a significant level of 1%. In the verification model, the first parameter indicates that there is no constant term; the second parameter indicates that there is no time trend term; The third parameter indicates lagged rank (on the basis of AIC and SC principles).

Table 2. Co-integration result of foreign trade volume and three industrial added values.

Variable	C	LnTrade	R ²	S.E.	F
LnGDP1	1.776	0.749	0.941	0.179	351.461
LnGDP2	0.609	1.183	0.949	0.263	409.729
LnGDP3	0.807	1.207	0.953	0.235	450.718

Table 3. Test results of residual series unit root.

Variable	ADF Value	Critical Value	Verification Model	Conclusion
RE ₁	-2.878	-2.674***	(0,0,0)	Stable
RE ₂	-3.209	-3.005**	(0,0,0)	Stable
RE ₃	-3.749	-3.633**	(0,0,0)	Stable

4.2.3. Granger Causality Test

The analysis above shows that the relationship between foreign trade volume and the value added value of the three industries in Shaanxi Province, but the causal relationship between foreign trade volume and the value added of the three industry needs to be further proved, using Grainger causality test to verify the method. Test results are shown in **Table 4**.

As can be seen from **Table 4**, foreign trade is the reason for the variation of the increase of first industry of Shaanxi Province, and foreign trade and the change of value of second and third industry are mutual causes.

The analysis of the reasons for the change of the added value of foreign trade in Shaanxi Province in the first industry: in 2011, the export volume of concentrated apple juice in Shaanxi Province ranked first in the country, and exceeded 1/3 of the world; this has effectively promoted the development of the first industry in Shaanxi Province. In 2014, grain import volume of Shaanxi Province reached 106 million tons. It also introduces a number of genetically modified crops, regulates the wheat varieties, imported Australian dairy cattle and bred new varieties, which could enhance the content of science and technology, improve the output rate and effectively promote the optimization of agricultural structure.

The analysis of the reasons for the mutual influence of foreign trade and its value added of second industry in Shaanxi Province: in recent years, foreign trade structure of Shaanxi Province, which is from the previous import of industrial products and exports of primary products to import raw materials and exports of high value-added industrial product conversion, is continuous adjustment and optimization. The industrial products, such as mechanical and electrical products and aircraft and heavy vehicles and so on, have become the main force in the export market of Shaanxi Province. And the export volume in the country is among the best. These export demands stimulate the development of the second industry on the whole, because of these high value-added industrial products export demanded, which can guide the Province resources and transfer of personnel to the high-end and emerging industries. Simultaneously, advanced technology and management enable manufacturers to produce more advantageous products relative to other countries, in order to promote the development of foreign trade when the second industry has been developed and optimized.

The analysis of the reasons for the change of the added value of foreign trade in Shaanxi Province in the third industry: with the introduction of a series of high-tech companies such as Samsung and the development of high-tech industrial park and the construction of Xi'an port area, these vigorously promote the development of relevant transportation and warehousing logistics. In addition, the software and service outsourcing industry of Shaanxi has also been rapid development, and the total revenue in 2014 amounted to RMB 136 billion. The industry such as Newly-emerged information industry, biological medicine or photovoltaic (PV) in the import and export market of Shaanxi, the proportion of which has rapid growth. Not only is the introduction of high-tech and related products to inject vitality into the third industry of Shaanxi Province, but also Technology Spillovers promotes the development of the third industry in the region. Conversely, it promotes the expansion of foreign trade with the development of the third industry.

Table 4. Results table of Grainger Causality Test for each variable.

Null Hypothesis	F Value	P Value	Test Result
LnTrade is not the cause of Grainger LnGDP1	4.56	0.03	Reject the null hypothesis
LnGDP1 is not the cause of Grainger LnTrade	0.36	0.70	Accept the null hypothesis
LnTrade is not the cause of Grainger LnGDP2	2.91	0.08	Reject the null hypothesis
LnGDP2 is not the cause of Grainger LnTrade	3.73	0.05	Reject the null hypothesis
LnTrade is not the cause of Grainger LnGDP3	3.77	0.05	Reject the null hypothesis
LnGDP3 is not the cause of Grainger LnTrade	2.63	0.10	Reject the null hypothesis

5. Conclusion

Empirical studies above have shown that foreign trade, economic growth and three industrial added value in Shaanxi Province are highly correlated, in ensuring the long-term stable development of its economy, but also continue to promote its industrial structure transforming from the current stage of the two • three • one mode to the three • two • one mode. The construction of new Silk Road economic belt provides a new opportunity for foreign trade in Shaanxi Province.

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