The Analysis of the Export Trade Structure Change and Influence Factors of China to the “One Belt and One Road” Countries: Based on the Technical Added Value Perspective

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Abstract. This article, starting from the technical added value of export products, dividing export products into four technology types, selecting the data of China to 60 countries along “One Belt and One Road” during 2010-2015 to analyze the change of technical structure of export trade and using Seemingly Unrelated Regression Estimation to explore the influence factors of different technology value-added exports. The study found that China’s GDP, partners’ GDP and FTA significantly positive influence on all kinds of products exports, the distance between the two countries significantly hinder the export, partners’ trade openness and the national price effect differently on different technology value-added products.

1. Introduction

In September 2013, President Xi made major strategic vision for One Belt And One Road during his visit to central Asia and ASEAN firstly. With the help of the “silk road” symbol and the existing bilateral and multilateral mechanism between China and relevant countries, “OBOR” strategy actively promotes the along countries’ economic cooperation and bilateral trade cooperation, responds to the desire of the along countries to strengthen mutually beneficial cooperation and shows China’s determination to further open. Since the “One Belt And One Road” proposed three years, Cooperation between China and the One Belt And One Road countries has increased significantly, realizing the common development of participating countries. The “OBOR” strategy’s impact quickly spreads across the globe.

As an impetus of economic growth, the export trade has promoted the development of our economy for a long time. In 2016, the goods trade values of China was 24.33 trillion yuan, of which 13.84 trillion yuan was exported. In terms of exports, China has become the world’s largest exporter, but there is still a gap with the major developed countries in the export trade structure perspective. As a special investment in the process of production elements, the product added value assigned to this technology’s reward is the technology value-added, so the added value provides a new Angle of view for judging countries export structure. By means of technology value-added is more able to reflect the present situation of the export product technology level, objectively guiding countries export and foreign trade policy, effectively promoting the export industry to upgrade.

2. Literature Review

Based on theory of comparative advantage, Zhixiong Guan (2002) [1] presented to evaluate the product value-added initially when he studied the information product of America to Asian countries, which was used to measure the export trade structure. Gang Fan, Zhixiong Guan and Zhizhong Yao (2006) [2] improved the Guan’s method by using Revealed Technology Value-added (RTV) to distinguish high product value-added and low product value-added. Junyan Qi (2009) [3] analyzed China’s RTV and TC, considered that China’s export focused on the low technology
content and labour intensive products in spite of high technology product export was improving. Haiyan Zhang (2013) [4] used the method of TiVa to count the export value-added of China and major countries in 35 industries, found that China was the largest export country but the advantage was letter than traditional method’s counting. Peizhi Wang and Wenwen Liu (2014) [5] found that China exported higher middle technology value-added product by contrasting the export trade structure between China and the world’s major economies. Bin Sheng and Shuai Chen (2016) [6] studied GVC revealed comparative advantage, global value chain and export value-added, considered that lower GVC participation rate developing countries should improve to join the global value chain and increase trade competitiveness.

After the “OBOR” strategy putting forward, a lot of scholars began to study the trade between China and the “OBOR” countries and came up with many valued proposal. Jialing Zou et al. (2015) [7] used HM Index and input-output analysis to research the trade facilitation of “OBOR” countries. Zhonghua Cai Et Al. (2016) [8] researched the export structure of China and the “OBOR” countries by using industry index of similarity, the result showed that the industry similarity index of China India and Vietnam was the highest. Churen Sun et al. (2017) [9] used 1996-2014 panel data verified that the “OBOR” strategy was beneficial to the export of China to the “OBOR” countries.

Above all, the study of export trade technology structure focuses on measuring the export trade measure technology value-added and international comparison. There is less study about the export trade structure change and influence factors of China to the “One Belt and One Road” countries. This article tries to contrast China and the major “OBOR” countries, to reflect the current export trade structure of China to the “OBOR” countries, and find the influence factors of different technology value-added export products by the empirical analysis.

3. Theory Analysis and Model Construction

The absolute advantage and comparative advantage theory in the classical trade theory think that the international trade is based on the international division of labor, and natural resources as the basis of the international division of labor, reasonable use of abundant resources can effectively improve labor productivity, thereby promoting the development of import and export trade. The H-O theory in the new classical trade theory system also reveals the influence of different factors on the production and export products, that is to say countries with abundant technical factors should export technology intensive products. Technology intensive products are the intensive use of technical elements, that is, relatively high value-added products. The technology gap model in new trade theory reveals that technology advantage not only can enhance export advantage, but also can enhance the technical level of export products and embodied technology is increasingly prominent in the international trade structure status. But the above theory cannot clearly analyze the technical structure of a country’s export products. In recent years, scholars generally believe that China’s export product structure tends to low value-added products. However, the strategy of invigorating trade though science and technology is put forward for more than ten years, what happens to the Chinese export product structure, how much the variation, and what is the gap between our country and the trade powers, there is still larger research space.

3.1 Measure method of technology value-added

In recent years, the position of technology in export trade constantly grows, it’s important to know how to measure the Revealed Technology Value-added. As a special investment in the process of production elements, the product added value assigned to this technology’s reward is technology value-added. Based on Zhixiong Guan (2002)’s method [1], the assignment principle of technology value-added is that the more high value-added products, the more from high-income countries, which has more comparative advantage.

When looking at whether there is a comparative advantage in a country’s trade, we always use revealed comparative advantage index, which is RCA. The formula is as follows:
\[ \text{RCA}_{ij} = \frac{X_{ij}}{\sum_{j=1}^{m} X_{ij}} \quad \text{summed over } n \]

\[ w_{ij} = \frac{\text{RCA}_{ij}}{\sum_{i=1}^{n} \text{RCA}_{ij}} \]

\[ \text{RTV}_j = \sum_{i=1}^{n} w_{ij} \ln(Y_i) \]

3.2 Model setting and selection of variables

We selected Chinese total GDP, trading partners’ total GDP and the distance between two countries as explanatory variables, which is an important factor affecting the international trade theory recognized bilateral trade. In addition, the trade dependence degree of trading partners, price and whether or not they are in the same free trade zone with China will also affect the volume of bilateral trade. On these grounds, we set up the panel model as follows:

\[ \ln \text{EX}_{nijt} = \beta_{n0} + \beta_{n1} \ln \text{GDP}_{it} + \beta_{n2} \ln \text{GDP}_{jt} + \beta_{n3} \ln \text{DIS} + \beta_{n4} \ln \text{OPEN}_{jt} + \beta_{n5} \ln P_i + \beta_{n6} \text{FTA} + \epsilon_{nt} \]

Among this model, \( \text{EX}_{nijt} \) shows the different value-added exports of China to the “OBOR” countries \( (n = 1, 2, 3, 4) \), each represent low technology value-added, lower middle technology value-added, higher middle technology value-added and high technology value-added; \( \text{GDP}_{it} \) and \( \text{GDP}_{jt} \) show China’s GDP and the partner’s GDP, the data comes from the world bank database; \( \text{DIS} \) shows the geographical distance between China and its partner capitals, the data comes from the Google Earth; \( \text{OPEN}_{jt} \) shows the partner trade openness, which is the proportion of trade exports in GDP, the data comes from the world bank database; \( P_i \) shows the PPP of partner, which means how many dollars a country needs to buy goods worth a dollar in the United States, the data comes from the world bank database; \( \text{FTA} \) is the dummy variable whether China and the partner belong with the same free trade area or economic organization, when the country and China are in the same free trade area, it assigns 2, when the country belongs to the SCO, the asia-pacific trade agreement, or APEC, it assigns 1, or it assigns 0, the data comes from the China free trade area service network; \( \epsilon_{nt} \) means random interference terms. To reduce the variance of the panel data, we take the logarithm of the variables other than the virtual variables in the equation.
4. Empirical Analysis

4.1 The export technological distribution of China among the “One Belt and One Road” countries

China’s exports of low technology value-added products, lower middle technology value-added products and high technology value-added products were basically flat, which was about $440 billion. However, the exports of higher middle technology value-added products were much less, only 248 billion 699 million dollars. Compared with developed countries, the low technology value-added products accounted for a significantly larger proportion, and the proportion of higher middle technology value-added products and high technology value-added products accounted for were at the bottom. In developed countries, the three countries with the highest proportion of higher middle technology value-added products accounted for Israel, Singapore and Hungary, accounting for the proportion of total exports were 85.9%, 71.7% and 68.1%, respectively. China’s exports of high technology value-added products accounted for 44% of total. Compared with developed countries, disparities still exist.

In emerging economies, the proportion of China’s exports of higher middle technology value-added products was located at third. The higher middle technology value-added products of Philippines exports accounted for the highest, up to 68.6%; two categories of products of India accounted for 46.2% of total exports, 2.2% higher than China; Indonesia, Turkey, Russia and Egypt higher middle technology value-added products exports accounted for 34.5%, 33.9%, 30% and 20.1% respectively. Compared with the technology distribution of developed countries, emerging economies’ exports in the higher middle technology value-added products and high technology value-added products decreased significantly, but China still faces the competitive stress from Philippines, India, Indonesia and other countries.

According to the different geographical location and data availability, the countries along the “OBOR” can be divided into South Asia, ASEAN, Central and Eastern Europe, West Asia, Central Asia and CIS. From a regional perspective, exports of South Asia, ASEAN and the Eastern Europe in the higher middle technology value-added products and high technology value-added products accounted for the proportion of total exports were similar and higher than China, respectively, 58.7%, 58.5% and 58.3%. Chinese higher middle technology value-added export products to South Asia, ASEAN and East European countries will face strong competition, the export oriented enterprises should strengthen the development of heterogeneous products, improve the competitiveness of products.

4.2 The export technological structure of China among the “OBOR” countries

From 2010 to 2014, the four types of technology value-added products exports from China to “B&R” countries are keep growing. Among them, the low technology value-added products exports grow from $712.02 billion in 2010 to $1257.66 billion in 2014, increased by $545.64 billion, about 76.6%; the lower middle technology value-added products exports grow from $703.47 billion in 2010 to $1326.1 billion in 2014, increased by $622.63 billion, about 88.5%; the higher middle technology value-added products exports grow from $1241.02 billion in 2010 to $1987.90 billion in 2014, increased by $746.88 billion, about 60.2%; the high technology value-added products exports grow from $727.59 billion in 2010 to $1089.52 billion in 2014, increased by $361.92 billion, about 49.7%. In these five years, the volume of trade between China and “B&R” countries has increased rapidly, the higher middle technology value-added products exports increased at the highest speed, the lower middle technology value-added products exports had the greatest increase, but the high technology value-added products which have the most value-added had the least increase and speed.

Due to environmental deterioration in the global trade in 2014 to 2015, the exports between China and “B&R” countries appeared different degree of decline. Among them, the low technology value-added products and lower middle technology value-added products exports fell by 7.6% and 7.3%; the higher middle technology value-added products and high technology value-added products exports got a smaller decline about 2.5% and 4.5%. The higher technology value-added can not only bring higher profits, also can improve the products’ anti-risk ability about economic...
and trade. China should explore the high technology value-added products market in “B&R” countries, take active measures to improve the export of the high technology value-added products, enhance the risk resistance capacity of export products.

### 4.3 The empirical analysis of the export structure key factors

To make further explorations about the export trade structure influence factors of China to the “OBOR” countries, we select the data of China to 60 countries along “One Belt and One Road” during 2010-2015. There are four dependent variables, respectively for low technology value-added exports, lower middle technology value-added exports, higher middle technology value-added exports and high technology value-added exports of China to the “OBOR” countries. Accordingly, we can get equation set containing four equations, compared with the single regression, choosing these equations for joint estimate can improve efficiency. So we use the Seemingly Unrelated Regression Estimation (SUR) to estimate the model. The basic assumption of the SUR model is that there is a correlation between the disturbance items in each equation. After testing, the equation of this paper conforms to the SUR model hypothesis, which is suitable to use of the SUR model for estimating.

Table 1 shows the full national test results. lnGDPi is significant influence the four types of exports, the scope of coefficient is [0.426, 0.852]. Among them, the export of low technology value-added products is the most affected by China’s GDP. lnGDPj is significant influence on the four types of exports at the 1% level, the scope of coefficient is [0.910, 1.075], however, with the increase of products’ technology value-added, the elasticity of product to partner’s GDP is larger. In other words, the larger economic development vitality partners have, the more demand for high technology value-added products they are. lnGDPj has a greater coefficient than lnGDPi, which means that the growth of partners’ GDP can accelerate more exports of China to the “OBOR” countries than China’s GDP growing. lnDIS is significant influence the high technology value-added products at the 10% level and another at the 1% level, the scope of coefficient is [-1.538, -0.272]. And with the improvement of export products’ technology value-added, the absolute value of lnDIS coefficient is decreased obviously, the significant of high technology value-added products’ export lower than the former three kinds of products. Both in coefficient and significance show that as technology value-added promotion, the sensitivity of export to the space distance cost is decline, relative to the low technology value-added products, the profit making by high value-added of high technology value-added products can reduce the attention to transport costs, as a result that the high technology value-added products manufacturer can development farther market.

Table 1. All sample test.

<table>
<thead>
<tr>
<th>Variables</th>
<th>lnEX1</th>
<th>lnEX2</th>
<th>lnEX3</th>
<th>lnEX4</th>
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<tr>
<td>lnGDPi</td>
<td>0.59</td>
<td>0.852</td>
<td>0.426</td>
<td>0.622</td>
</tr>
<tr>
<td></td>
<td>0.336</td>
<td>-0.217</td>
<td>-0.194</td>
<td>-0.199</td>
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<tr>
<td>lnGDPj</td>
<td>0.910</td>
<td>0.949</td>
<td>0.977</td>
<td>1.075</td>
</tr>
<tr>
<td></td>
<td>0.044</td>
<td>-0.028</td>
<td>-0.025</td>
<td>-0.026</td>
</tr>
<tr>
<td>lnDIS</td>
<td>-1.538</td>
<td>-1.063</td>
<td>-0.425</td>
<td>-0.272</td>
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<tr>
<td></td>
<td>-0.268</td>
<td>-0.173</td>
<td>-0.155</td>
<td>-0.16</td>
</tr>
<tr>
<td>lnOPENj</td>
<td>-0.291</td>
<td>0.031</td>
<td>0.476</td>
<td>0.442</td>
</tr>
<tr>
<td></td>
<td>-0.163</td>
<td>-0.105</td>
<td>-0.094</td>
<td>-0.097</td>
</tr>
<tr>
<td>lnPj</td>
<td>1.222</td>
<td>0.255</td>
<td>0.121</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>-0.305</td>
<td>-0.197</td>
<td>-0.176</td>
<td>-0.181</td>
</tr>
<tr>
<td>FTA</td>
<td>0.556</td>
<td>0.545</td>
<td>0.401</td>
<td>0.547</td>
</tr>
<tr>
<td>Constant</td>
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<td>-0.083</td>
<td>-0.074</td>
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<tr>
<td></td>
<td>-5.084</td>
<td>-20.08</td>
<td>-15.10</td>
<td>-25.37</td>
</tr>
<tr>
<td></td>
<td>-10.16</td>
<td>-6.566</td>
<td>-5.872</td>
<td>-6.041</td>
</tr>
<tr>
<td>R2</td>
<td>0.662</td>
<td>0.825</td>
<td>0.847</td>
<td>0.867</td>
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<tr>
<td>Wald</td>
<td>696.56</td>
<td>1673.6</td>
<td>1967.14</td>
<td>2319.65</td>
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</table>
InOPEN\(j\) has different influence on different technology value-added products. The scope of coefficient is \([-0.291, 0.476]\). It is significant influence on the exports of higher middle technology value-added products and high technology value-added products at the 1% level and the coefficients are plus. But it’s significant influences on the exports of low technology value-added products at the 10% level and the coefficient is minus. What’s more, InOPEN\(j\) doesn’t have significant influence on the lower middle technology value-added products’ export. InP\(j\) is only significant influence on the low technology value-added products’ export at the 1% level, it has no significant influence on another three types of exports, the scope of coefficient is \([0.030, 1.222]\). With analysis of significant and coefficient, we can find that it has less sensitive about price margin between countries when the export products’ technology value-added is larger. The low technology value-added products market is similar to a perfectly competitive market, when there is price margin, competitive and strong liquidity makes low technology value-added products quickly into the high price areas to get excess returns. FTA is significant influence on the four types of exports at the 1% level, the scope of coefficient is \([0.401, 0.556]\). Because of the free trade area and the establishment of the regional economic cooperation organization, multi-angle affect trade between participating countries, redraw of tariffs, make the change of the degree of market opening, all of which can positive impact on trade between countries, different technology value-added products exports will benefit.

5. Conclusions and Policy Recommendations

China’s exports of higher middle and high technology value-added products accounted for 44%. Compared with developed countries along the “OBOR”, the gap still exists. China should continue to promote industrial transfer, optimize the industrial structure, increase the proportion of capital and knowledge-intensive industries, and increase the value-added of export products. In the emerging economies of “OBOR” countries, the export of higher middle and high technology value-added products of China is the third one. However, China still faces the competitive stress from Philippines, India, Indonesia and other countries. China must accelerate the transformation of its export technology structure so as to make it more robust to export trade and improve the competitiveness of exports. Chinese higher middle technology value-added export products to South Asia, ASEAN and East European countries will face strong competition, the export oriented enterprises should strengthen the development of heterogeneous products, improve the competitiveness of products.

The change about the export trade technology structure of China to the “OBOR” countries shows that China is continuing to promote industrial optimization and upgrading of industrial structure in the process, the added value of the high technology industry got rapid progress, but the growth of high technology value-added industry is facing a bottleneck. In addition, China should strengthen the risk resistance of export product.

The two countries’ GDP are positively correlated with exports, and the distance discourages all types of exports. With the improvement of export products’ technology value-added, the absolute value of InDIS coefficient is decreased obviously, the sensitivity of export to the space distance cost is decline. Partners’ trade openness can significantly inhibit the low technology value-added products export but promote the export of high added value products, causes of the difference influence may be that China exports to low technology value-added products easily replaced by other countries. The increase in the price of partner countries will significantly promote the low technology value-added products exports, and the establishment of the FTA and the regional economic cooperation organization will significantly increase the export of all kinds of products.

5.1 Policies and Suggestions for the government

The government should continue to promote the industrial transfer. On the one hand, the government should transfer the labor-intensive industries, low technology value-added industrial outward using the low labor cost advantage of the “OBOR” countries; on the other hand, the government should provide a favorable system environment to the high technology value-added products production enterprises, strengthen the support of technology research and development,
encourage enterprises to pay attention to technology to improve and innovate, to promote China’s export trade technical structure upgrade.

China should strengthen exchanges and cooperation with the “OBOR” countries and actively promote the development of the FTA and regional economic cooperation organizations, which can significantly promote the export of all kinds of technology value-added products. Under the background of inverse globalization and trade protectionism gradually, China should insist on economic regionalization and globalization.

5.2 Policies and Suggestions for the enterprise

High technology value-added products will not only lead to higher profits, but also improve their ability to withstand economic risks. Enterprises should increase investment in research and development, strengthen cooperation with scientific research institutions, attach importance to technology to improve and innovate, absorb international advanced technology, improve the international competitiveness of the products.

“OBOR” area is a vast market with huge market potential. Chinese enterprises should focus on “OBOR” market, set up enterprise and international sales channels with “OBOR” countries, and strengthen the export to “OBOR” countries relying on high technology value-added and differentiated product strategy, stable international supply and marketing relationship, increase market share of Chinese products.

References


