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The Impact of OFID on China's High-tech Product Exports—Empirical Evidence from RCEP Member Countries

Xinying Qu[1,*], Yuqing Wang[2], Junkang Fu[3]

[1]Beibu Gulf Ocean Development Research Center, Beibu Gulf University, Qinzhou, China
[2]School of Marxism, Guangxi Normal University, Guilin, China
[3]School of Economics, Guangxi University for Nationalities, Nanning, China
[*]Corresponding author

Abstract: *This article uses country panel data from the Chinese Ministry of Commerce from 2006 to 2019 to construct a fixed effects model and study the impact of OFID on China's high-tech product exports to Japan, South Korea, Thailand, Singapore, and Indonesia. The conclusion drawn from this article is: (1) The increase in China's OFID stock can promote the export of high-tech products; (2) The increase in China's OFID stock can optimize the structure of export products. Based on the above conclusions, this article proposes relevant countermeasures and suggestions from the aspects of leveraging resource endowment advantages, strengthening international cooperation and negotiations, and optimizing export product markets.*

Keywords: *OFID, High-tech products Exports, Export Product structure*

1. Introduction

63.7% of China's outward foreign direct investment (OFDI) stock is in Asia, with a total OFDI stock in Japan, South Korea, Thailand, Singapore, and Indonesia amounting to 90.4 billion USD, accounting for 5.2% of the entire Asian stock. China's export trade is mainly concentrated in Asia. From 2011 to 2021, China's average export trade in Asia accounted for 48.9% of its total export trade. Many scholars believe that OFDI can promote China's exports. However, as the Chinese economy has entered a stage of high-quality development, can OFDI promote the export of high-tech products from China? Can OFDI optimize export structures? This article explores these questions using data from RCEP member countries.

2. Theory and research hypotheses

Research on the impact of OFDI on trade can generally be categorized into studies on trade volume or trade structure. In terms of trade volume, most countries' OFDI can generate exports. Recent literature has mostly concluded that OFDI has a positive effect on export trade. In terms of trade structure, OFDI can generally improve the exporting country's export structure. China's OFDI aimed at natural resources or production factors can promote the export of machinery or electronic products. Additionally, OFDI aimed at research and development, or market purposes can also improve export structure by learning overseas technologies.

In the research on the impact of direct investment on trade volume, Mundell (1957) argued that when commodity and factor prices are balanced, the global supply of commodities remains unchanged, implying a substitution relationship between OFDI and export trade if firms invest to bypass trade barriers[1]. Kojima (1978) proposed the theory of marginal industry transfer, finding that Japan prefers to invest in resources and labor-intensive industries abroad[2]. This theory suggests that transferring industries that lack comparative advantages domestically but possess them in other developing countries to other countries can not only conserve domestic resources and promote the growth of new industries but also facilitate the integration of industries in developing countries. Swedenborg, B. (1979), found that Swedish firms' foreign investments can create exports[3]. Goldberg, L.S., & Klein, M.W. (1997), studied U.S. investment and trade relations with Thailand, Indonesia, and Malaysia, concluding a substitution effect[4].

In terms of research on the impact of direct investment on trade structure, Kojima (1978) studied U.S.

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OFDI, finding that U.S. investments were production-oriented, which could not only fully utilize the host country's cheap resources but also improve the U.S. trade structure[2]. Blonigen (2001) argued that U.S. firms' import of intermediate products from Japan was due to increased Japanese investment in the U.S. automobile industry[5]. Helpman (1984) and Krugman (1985) proposed economies of scale and product differentiation, based on the premise of imperfectly competitive markets[6][7]. External economies of scale refer to the mutual learning of knowledge and innovation among enterprises due to their aggregation, thereby improving economic efficiency. Enterprise aggregation also reduces the cost of information exchange and transportation, thereby improving economic efficiency. If enterprises pursue economies of scale, they must reduce the variety of products. However, consumers want to increase welfare and demand a greater variety of products. OFDI can effectively address this contradiction for enterprises.

Based on the literature review above, this article proposes the following research hypotheses:

H1: An increase in China's OFDI stock can promote the export volume of high-tech products.

H2: An increase in China's OFDI stock can optimize export structures.

3. Research design and data description

3.1 Model Construction

Tinbergen (1962) proposed the gravity model of trade[8], with the main variables being the export trade volume from country i to country j($export_j^i$)gross national product (GNP), and the distance between the two countries (distance). Here, m and v are constants, while c, p and q are parameters. Some scholars researching international trade and investment have modified certain variables in this model to study different trade issues. The basic form of this model is as follows:

$$\mathrm{export}_{\mathrm{j}}^{\mathrm{i}} = \mathrm{m} * \frac{(\mathrm{GNP_i})^{q} * (\mathrm{GNP_j})^{\mathrm{p}}}{(1+\mathrm{w} * \mathrm{distance})^{\mathrm{c}}} \quad (1)$$

Take the logarithm of both sides (where constant represents a constant):

$$lnexport_j^i = constant + \alpha_1 lngnp_i + \alpha_2 lngnp_j + \alpha_3 lndistance \quad (2)$$

Based on the modified model as described above, Model 1 for this paper is as follows ($\alpha_1, \alpha_2$and$\alpha_3$are the coefficients to be determined, and ε_{iy}represents the error term):

$$\log_{10} import_{iy} = \alpha_1 \log_{10} gdp_{iy} + \alpha_2 \log_{10} fdi.st_{iy} + \alpha_3 \sigma_i + \varepsilon_{iy} \quad (3)$$

Model 2, suitable for this paper, is as follows (β_1, β_2andβ_3 are the coefficients to be determined, andδ_{iy}represents the error term):

$$importp_{iy} = \beta_1 \log_{10} gdp_{iy} + \beta_2 popp_{iy} + \beta_3 \sigma_i \log_{10} fdi.st_{iy} + \delta_{iy} \quad (4)$$

For the coefficients in the two models mentioned above, the null hypothesis is set to be 0. In this paper, the t-test method is used. If the t-value is sufficiently large (the p-value of the t-statistic is sufficiently small), the author has confidence to reject the null hypothesis, considering the explanatory variable to be significant with strong explanatory power. Although the author strives to make each coefficient sufficiently significant, it is also necessary to consider the adjusted R^2, as long as the p-value of the t-statistic for the coefficients in the equation is less than 0.05, this paper will not excessively pursue smaller p-values. Hence, in cases where the significance is similar, this paper prioritizes selecting the best explanatory model based on the adjusted R^2.

3.2 Description of Variables

This study selects five Asian countries, namely Japan, Singapore, South Korea, Indonesia, and Thailand. Firstly, the author conducted a regression analysis of China's export trade total on China's OFDI and the GDP of the five countries. In this model, the author found that using the stock of foreign direct investment (FDI) to represent OFDI is better than using the flow of FDI, and GDP is significantly positively correlated with export trade volume. Therefore, when studying the issue of trade structure, the author prioritizes the selection of investment stock and GDP as explanatory variables.

The data for this study primarily come from the country-by-country data provided by the Chinese Ministry of Commerce (trade volume from China to each country classified by HS code), China

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Statistical Yearbook (China's OFDI amount), World Bank population data, and International Monetary Fund GDP data. After intersecting multiple datasets, the time span of the data used in this study ranges from 2006 to 2019. However, Japan lacks data for the year 2019, and Thailand only has data from 2011 to 2016, as well as for the years 2018 and 2019. The introduction of variables is shown in Table 1.

Table 1: Introduction to Variables Used in Models 1 and 2.

Variables	Meaning of variables
i	Country name
y	Year (2006-2019)
$\log_{10} import_{iy}$	The import value of 16 to 22 categories of high-tech products (classified by HS) imported from China by the above 5 countries (billions of US dollars)
$importp_{iy}$	The proportion of the import value of 16 to 22 categories of high-tech products (classified by HS) imported from China by the above 5 countries to the total import value of each country from China (%)
$\log_{10} gdp_{iy}$	Gross Domestic Product (GDP) of the above 5 countries (billions of US dollars)
$\log_{10} fdi.st_{iy}$	China's direct investment stock in the above five countries (billions of US dollars)
$popp_{iy}$	The year-on-year growth rate of the population in the above five countries (%)
σ_i	Variables classified by the level of development of a country have a value of 1 for developed countries and 0 for developing countries

Data sources: Calculated and organized based on country data from the Ministry of Commerce of China, direct investment data from the China Statistical Yearbook, population growth rate data from various countries of the World Bank, and GDP data from various countries of the International Monetary Fund

4. Regression analysis

$$\log_{10} \widehat{import}_{iy} = 0.42215 \log_{10} gdp_{iy} + 0.08627 \log_{10} fdi.st_{iy} + 0.25226\sigma_i + 0.54923 \quad (5)$$

$$\widehat{importp}_{iy} = -7.53 \log_{10} gdp_{iy} + 1.3733 popp_{iy} + 4.169\, \sigma_i \log_{10} fdi.st_{iy} + 81.9226 \quad (6)$$

Based on the following information of Table 2, this paper chooses model (1.1) as the optimal model. Model (5) suggests that an increase in China's OFDI stock can promote the export volume of high-tech products. Specifically, for every 1% increase in China's OFDI stock, there is an increase of 0.08627% in the export volume of high-tech products. Moreover, if the GDP of the host country increases by 1%, it can lead to a 0.42215% increase in China's export volume of products classified between 16 and 22 categories. Furthermore, when classified according to the level of development, the model indicates significant differences between countries. If Chinese companies choose to export such products to developed countries, it can increase the export volume by 0.25226 compared to developing countries.

Table 2: Model (3) with China's export volume as the dependent variable

Observations	63			
Model Name	(1.1)	(1.2)	(1.3)	(1.4)
Intercept term	0.54923^{***} (0.12862)	0.27051 (0.18535)	2.17049^{***} (0.06866)	0.49157^{***} (0.11338)
$\log_{10} gdp_{iy}$	0.42215^{***} (0.03024)	0.52096^{***} (0.04165)		0.47484^{***} (0.02844)
$\log_{10} fdi.st_{iy}$	0.08627^{***} (0.02400)	0.12211^{***} (0.03520)	0.02236 (0.03868)	
$\sigma_i\, log_{10}\, gdp_{iy}$			0.11426^{***} (0.01098)	
$\sigma_i \log_{10} fdi.st_{iy}$				0.14431^{***} (0.01564)
σ_i	0.25226^{***} (0.02932)			
Adjusted R^2	0.8709	0.7137	0.6317	0.8580
F-statistics	140.4	78.29	54.17	188.2
P-value of F-statistics	0.0000	0.0000	0.0000	0.0000

Note: * * * represents the P-value of the t-statistic ($P \leq 0.001$ *** $P \leq 0.01$** $P \leq 0.05$ *)

In comparison to the models in Table 3, this paper chooses model (2.4) as the optimal model.

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According to model (6), it indicates that an increase in China's investment stock in developed countries is beneficial for improving the export structure. Specifically, the absolute value of China's export volume of high-tech products (categories 16 to 22) is positively correlated with the GDP of the host country, while the proportion of high-tech products in China's total exports is negatively correlated with the host country's GDP. This model suggests that for every 1% increase in the host country's GDP, the proportion of China's export of high-tech products decreases by 7.53%, while a 1% increase in the host country's population growth rate promotes an increase of 1.37% in China's export proportion of high-tech products. In developed countries, for every 1% growth in investment stock, the proportion of high-tech product exports increases by 4.169%.

Table 3: Model (4) with the proportion of China's high-tech product exports as the dependent variable

Observations	63				
Model Name	(2.1)	(2.2)	(2.3)	(2.4)	(2.5)
Intercept term	68.5440*** (7.6499)	81.9380*** (7.4729)	46.0730*** (2.0767)	81.9226*** (5.8278)	66.4205*** (6.2068)
$\log_{10} gdp_{iy}$	-4.8719** (1.7058)	-8.6540*** (1.7556)		-7.5300*** (1.3966)	-4.2878** (1.3997)
$\log_{10} fdi.st_{iy}$	4.2632*** (1.1303)	3.4779** (1.0158)	4.8873*** (1.1677)		4.2323*** (1.0136)
$popp_{iy}$	2.1943** (0.7856)	1.0173 (0.7484)	3.6865*** (0.6529)	1.3733* (0.6593)	
σ_i		5.6057*** (1.3356)			
$\sigma_i \log_{10} gdp_{iy}$			0.4212 (0.3296)		
$\sigma_i \log_{10} fdi.st_{iy}$				4.1690*** (0.5982)	
$\sigma_i popp_{iy}$					2.9939*** (0.6102)
Adjusted R^2	0.5247	0.6291	0.4735	0.6764	0.6178
F-statistics	23.81	27.29	19.59	44.20	34.4
P-value of F-statistics	0.0000	0.0000	0.0000	0.0000	0.0000

Note: * * * represents the P-value of the t-statistic ($P \leq 0.001$ *** $P \leq 0.01$** $P \leq 0.05$ *)

5. Conclusions and Recommendations

5.1 Conclusions

The dependent variables studied in this paper are based on China's export volume of high-tech products (SITC: categories 5 to 9, HS: categories 16 to 22) to five Asian countries (Model 1), and the proportion of China's export of high-tech products to these five Asian countries in China's total export volume (Model 2). The investment stock is positive in both models, while the GDP of each country is positive in Model 1 and negative in Model 2, and there are significant differences among countries (classified by level of development).

The significant differences among countries may be due to several reasons. Firstly, consumers in developed countries have higher standards for goods, resulting in greater demand for high-tech products, and they also possess stronger purchasing power. Secondly, there are more high-tech enterprises in developed countries, with larger production scales and export volumes in international markets, leading to significantly higher demand for related products compared to developing countries. Thirdly, developed countries have more advanced infrastructure, resulting in higher efficiency in logistics and information transmission. According to other literature, China's investment in developing countries mainly focuses on infrastructure (such as hydroelectricity and transportation), which can also promote the export of related products, but a country's GDP remains the main factor driving the consumption of high-tech products. Fourthly, this model also indicates that China's OFDI can promote the export of related products, and China's OFDI structure is also being improved and optimized.

An increase in GDP in other countries will lead to a decrease in the proportion of China's high-tech product exports. The author believes that this is because there is strong competition among high-tech products, and their market belongs to monopolistic competition, where products can be substitutes for each other but cannot be completely substituted. Moreover, the rapid pace of innovation in high-tech products provides many opportunities for companies to excel in competition. Therefore, the proportion

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of China's high-tech product exports will not increase as rapidly as the absolute value of its export amount.

5.2 Recommendations

5.2.1 Exploit Resource Endowment Advantages

As the importance of certain resource endowment advantages emphasized in classical trade theory has decreased when factors can move freely, the ability of enterprises to integrate resources will be a crucial factor influencing whether an industry can achieve high-quality development in the future. Therefore, enterprises should strive to enhance their ability to integrate global resources in international competition to gain competitive advantages and seize the commanding heights of development in future international competition and cooperation.

5.2.2 Strengthen International Cooperation and Negotiation

China should continue to strengthen international cooperation and negotiation to create a favorable market environment for Chinese enterprises. At the same time, corresponding research on domestic laws and regulations should be conducted to strike a balance between encouraging and restricting competition, and to grasp the relationship between leveraging economies of scale and antitrust measures.

Compared with other continents, China has signed more free trade agreements with Asian countries, and most Asian countries are developing countries with high future development potential. Currently, the economies of East Asian countries are developing well, providing an excellent trade environment for China. Conversely, European, and North American countries have more new trade barriers, and cultural differences are also significant. Therefore, for some of China's newly established international companies, investing in surrounding countries centered on China is a more stable approach. By doing so, they can accumulate overseas investment experience, reduce the opportunity cost of mistakes, and avoid direct competition with some large international companies, thereby preserving strength.

5.2.3 Optimize Export Product Markets

Due to the fast pace of innovation in high-tech products and intense competition in the international market, China's largest proportion of exports is in electromechanical products. Although the proportion of electromechanical products is fluctuating upward overall, there is still pressure for the overall proportion of high-tech product exports to decline. Therefore, China should support the development of other high-tech industries while maintaining its existing export advantages, achieving balanced development in various industries to mitigate the risk of sudden declines in the proportion or prices of products in a single industry due to unforeseen events in the international market.

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