The Impact of RMB Exchange Rate Fluctuation on China's Export Commodity Structure

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Abstract:

This paper empirically investigates the RMB exchange rate volatility on the composition of China's export commodities using data from 2002-2022. Real effective exchange rate of RMB, technological progress, trade openness and foreign direct head seeds are used as explanatory variables. Elevated real effective exchange rate of RMB and foreign direct investment are unfavorable to the upgrading in China's export commodity composition; technological progress and increased trade openness are favorable to the structural upgrading of China's export commodities. Finally, suggestions are made to improve the export trade structure further.

Keywords: export, commodity structure, exchange rate, RMB

1. Introduction

Since the beginning of reform and openness, Chinese foreign commerce has flourished, maintaining its position as the world's number-one trading nation for many years. From 2013 to the end of 2022, Chinese total merchandise trade imports and exports ranked first worldwide for nine consecutive years. From 2009 to 2022, Chinese export trade value grew except for two years in 2015 and 2016. But from 2017 onwards, the growth rate of Chinese exports slowed down, and although the total value of exported merchandise is continuing to grow, the global share of the world has only increased in 2020 and 2021. In 2022, Chinese total merchandise export trade as a percentage of total global trade declined by 0.6%.

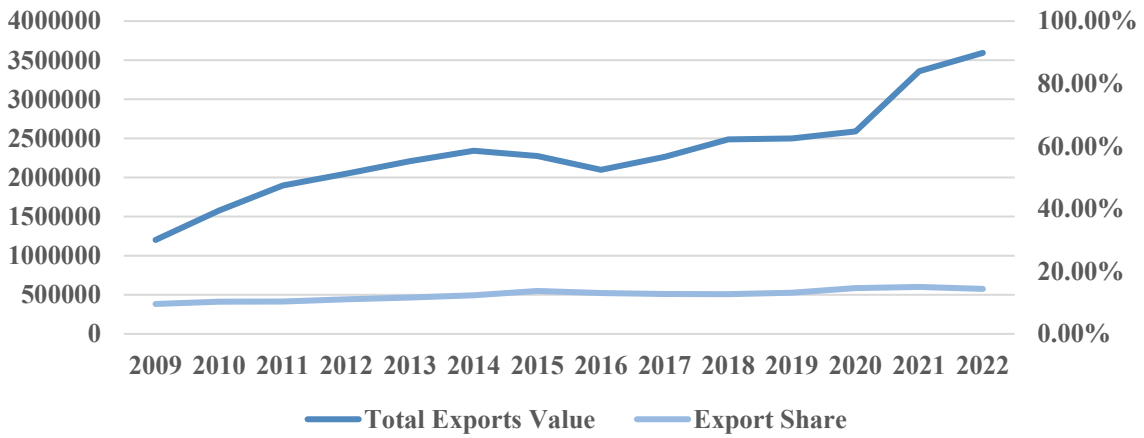

Figure 1. Total Merchandise Export Trade Value of China and Global Share, 2009-2022

In terms of the structure of export trade, before 2003, Chinese export trade in merchandise was dominated by labor-intensive products. Since then, Chinese merchandise exports have shifted from being predominantly labor-intensive to being predominantly capital- and technology-intensive, and the proportion of resource-intensive merchandise exports is gradually decreasing. However, labor-intensive merchandise still occupies a large share. Nevertheless, it can still be said that the structural transformation and promotion of China's merchandise trade exports have achieved moderate success.

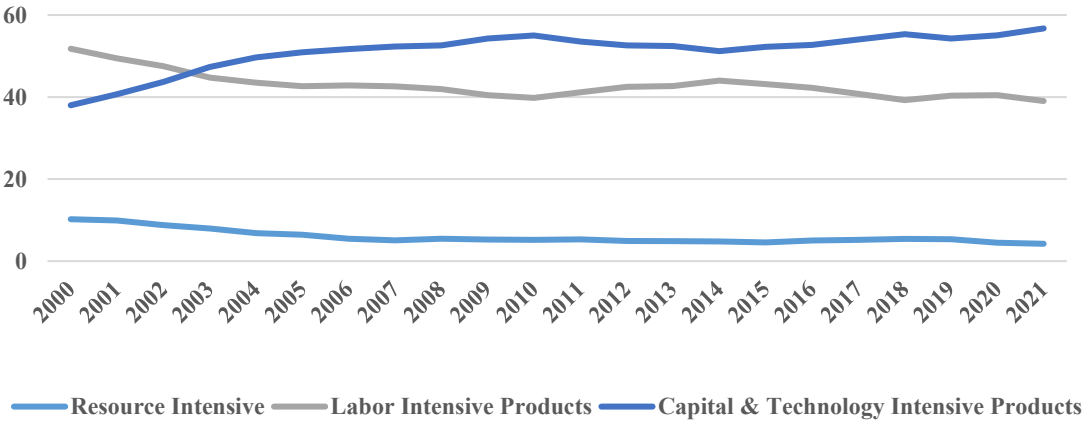

Figure 2. Export of Different Products in China, 2012-2022

According to Figure 2, published by the Bank for International Settlements, the exchange rate of RMB as a whole showed a more pronounced growth trend during the period from 2010 to 2016. Since the period from 2017 to 2022, the rate has shown a two-way fluctuation. In 2022, the exchange rate of RMB experienced two depreciations, and although it still maintained two-way fluctuations, the fluctuation amplitude increased compared to the previous five years. The instability of the international situation and changes in domestic policies have put the RMB exchange rate trend in the spotlight.

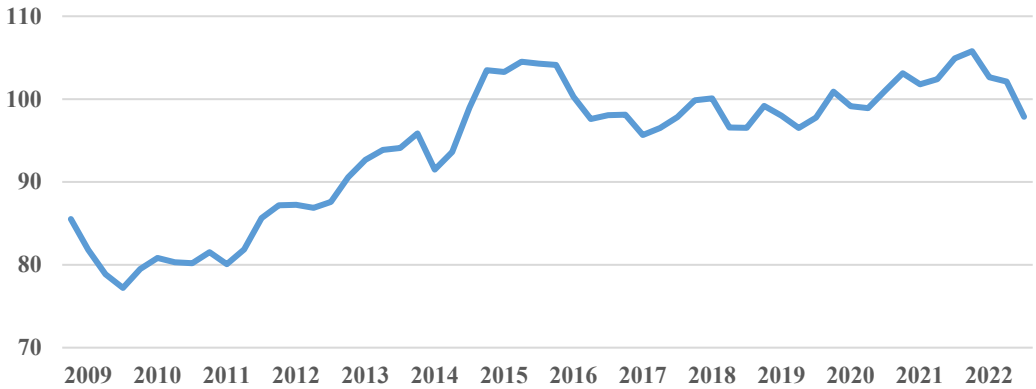

Figure 3. Quarterly Real Effective Exchange of RMB,2009-2022

In the context of the slowdown in global economic and trade recovery and the volatility of the RMB exchange rate, exploring how to upgrade the Chinese export trade structure further to make it more competitive and responsive to international market demand will help China improve its export stability in the face of risky challenges such as exchange rate volatility. This research will provide strong policy support for the government and enterprises to promote Chinese trade upgrading and sustainable development, as well as contribute to a better understanding of the position and role of China in global trade.

2. Research Status

The scholars studies can be categorized into three categories according to the commodity classification criteria:

The first one is categorized according to factor intensity. Zeng Zheng and Zhang Yabin (2007)[] measured the elasticity of China's exports of different items, indirectly showing that the exchange rate appreciation of the RMB is advantageous to the optimization and upgrading with respect to the structure of China's export items. Zheng Ganshu et al. (2019)[] conclude through empirical research that RMB appreciation will reduce the export of primary products and labor-intensive products and increase the export of some capital and technology-intensive products. The second one is based on the classification according to technology intensity. Hu Dongmei et al. (2010)[] studied the exchange rate pass-through effect of products classified according to technology intensity concluded that there is imperfect price pass-through for simple technology exports and excessive for higher technology products. Shen Guobing and Huang Shunjun (2017) []

used the Tobit model regression to conclude that the real exchange rate appreciation of export products increases the share of Chinese exports to the U.S. of general trade high-technology products and labor resource products. Among them, the base of the export share of high-tech products of general trade goods is larger, thus helping to improve the technological structure of Chinese exports of general trade goods to the United States.

The third is based on enterprise-level analysis. Li Hongbin et al. (2011)[] measured the exchange rate elasticity of different industries based on the data of Chinese import and export enterprises from 2000 to 2006, and conclude that RMB appreciation has a greater impact on the imports and exports of high-tech industries and capital-intensive industries. Han Jian et al. (2017)[] concluded that high-quality products are subject to low risk of RMB exchange rate appreciation, while low-quality products experience a sharp contraction in export quantities.

Previous literature has mostly explored the way in which exchange rate fluctuations influence the structure of products under the factor intensity classification. Therefore, on the basis of previous studies, this paper mainly expands on the following aspects: further classifying commodities into five categories according to technical factors, and analyzing the implications of RMB exchange rate changes on different categories under this classification method.

3.Empirical Analysis

3.1 Explained Variables

Based on the commodities classified according to Lall's (2000) classification of technological elements published by UNCTAD[], this essay classifies China's exports into five categories: primary products, resource-based products, low-technology products, medium-technology products, and high-technology products. The proportion of export value of each of these five categories is chosen as the explanatory variables.

3.2 Explanatory Variables

Based on the previous research on the influencing factors of export commodity structure, this paper chooses the real effective exchange rate of RMB, technological progress, foreign trade dependence, and foreign direct investment as the explanatory variables.

3.2.1 Real Effective Exchange Rate of RMB

When the exchange rate changes, the relative price of the same product corresponding to the currencies of the two countries changes accordingly. Comparative cost theory suggests that countries have different opportunity costs for producing a particular good and therefore there are potential complementary trade opportunities. According to David Ricardo, each country should import products with comparative disadvantages, focus on the production and output of products with comparative advantages, and gain benefits by exchanging the advantageous products each produces for the disadvantageous products it produces. In this case, the country with the lower priced product will have a global competitive advantage for this product and thus increase its exports.

3.2.2 Technological Progress

Technology, as one of the factors of production, is an important factor in a country's competitiveness in global trade. Technological progress and high levels of technology can increase a country's exports of high-value-added goods, while also affecting the production of other types of products. By improving production efficiency and quality, it is possible to produce more primary and low-technology manufactured goods with a lower value-added and thus gain a competitive advantage in the global market. Ultimately, by affecting the share of exports of different types of products, China influences the commodity structure of its exports. This paper uses total factor productivity to measure China's technological progress:

$$TFP = \frac{Y}{K^{\alpha} L^{\beta}}$$

Based on the existing research results of previous researchers, this paper sets the output elasticity of capital and labor in China to be 0.6 and 0.4. Using 2002 as the base period, the data are processed applying the consumer price index and the fixed asset price index. However, considering that the fixed asset price index stopped being published after 2019, referring to the methodology in Jiang, Yonghong & Sun, Feng'e et al. (2016)[], this paper adopts the GDP deflator instead of the relevant data for the same period after 2019.

3.2.3 Trade Openness

In this paper, foreign trade dependence is used to indicate the degree of trade openness:

$$ED = \frac{TotalExportsandImports}{GDP}$$

The degree of openness of a country's foreign trade depends on the trade policies and measures it adopts in response to international trade and economic cooperation with other countries and regions. For example, export-oriented policies may promote the export of certain products, while protectionist policies may restrict the export of certain products, ultimately leading to changes in the export structure.

3.2.4 Foreign Direct Investment

Foreign investors may introduce more advanced production technologies, techniques and management practices, which can help improve China's productivity and product quality. At the same time, along with the inflow of capital, the country expands its production, develops new products or increases its production capacity. This not only promotes the export of Chinese goods, but also makes the structure of exported goods change. This paper uses the actual capitalization of foreign direct investment in RMB terms as a share of GDP to express it.

3.3 Econometric model

Relevant data from the National Bureau of Statistics of China and UN Comtrade from 2002-2022 are selected to test the influence of the above explanatory variables and the following regression econometric model is established:

$$lnX_i = C + \beta_1 lnREER_{t-1} + \beta_2 lnTFP_{t-1} + \beta_3 lnED_{t-1} + \beta_4 lnFDI_{t-1} + \delta \quad (1)$$

In which, $X_i(X = 1,2,3,4,5)$ denotes the proportion of exports of five commodities under the previous category, REER denotes the real effective exchange rate of RMB, TFP denotes technological progress, ED denotes the degree of foreign trade dependence, FDI denotes foreign direct investment, and C is constant term, δ is residual term.

3.3.1 Augmented Dickey Fuller Test

To avoid spurious regressions, stationary tests were performed using the ADF unit root test. The results are shown in Table 1:

Table 1. Augmented Dickey Fuller Test

Variable	T-Statistic	P-Value	Form (C,T,K)	Result
DlnREER	-3.555488	0.0176	(C,NT,0)	stationary**
DlnTFP	-4.347713	0.0152	(C,T,1)	stationary**
DlnED	-3.621256	0.0154	(C,NT,0)	stationary**
DlnFDI	-4.439972	0.0128	(C,T,1)	stationary**
lnPP	-4.458370	0.0144	(C,T,4)	stationary**
DlnPP	-3.280006	0.0350	(C,NT,4)	stationary**
DlnRB	-4.026582	0.0323	(C,T,4)	stationary**
DlnLT	-2.751435	0.0841	(C,NT,0)	stationary***
DlnMT	-4.410911	0.0135	(C,T,1)	stationary**
DlnHT	-4.427866	0.0131	(C,T,1)	stationary**

Note: D denotes the first order difference of the variables,**denotes the rejection of the original hypothesis at 5% critical level and ***denotes the rejection of the original hypothesis at 10% critical level.

The results of the Eview 10.0 test indicate that only lnPP is smooth in the original series. After performing one section of differencing on the various time series, the results for each variable show that they are stationary.

3.3.2 Regression Analysis

(1) Impact on Primary Products

Since *lnREER* is not statistically significant, this variable is excluded to build the equation. After the residual test, the results show that it is stationary. Therefore, there is a cointegration relationship between *lnTFP*, *lnED*, *lnFDI* and primary product exports. Equation (2) is obtained with t-statistics in parentheses:

$$lnPP = 3.556426 - 0.467680 lnTFP_{t-1} - 0.542553 lnED_{t-1} + 0.428347 lnFDI_{t-1} + \delta(2)$$

$$(9.545966)(-3.360304)(-6.492153)(5.784263)$$

Equation (2) shows that changes in technological progress and trade openness are negatively correlated with the export share of primary products, while changes in foreign direct investment have positive effects.

(2) Impact on Resource-Based Products

The association among four explanatory variables and exports of manufactured resources is not sufficiently pronounced as none of them are statistically significant in *lnREER*,*lnTFP*,*lnED*and*lnFDI*.

Impact on Low-Technology Products

Since*lnTFP*and*lnED*are not statistically significant, these two variables are not statistically significant and are excluded from creating the equation. After the residual test, the result shows that it is stationary. Therefore, the export of low-techno products and *lnREER*, *lnFDI*have a cointegration relationship. Equation (3) is obtained with t-statistics in parentheses:

$$lnLT = 1.486000 + 0.413357 lnREER_{t-1} + 0.203703 lnFDI_{t-1} + \delta \qquad (3)$$

$$(2.114442)(2.713771)(3.946178)$$

Equation (3) shows that fluctuations in the real effective exchange rate of the RMB and FDI have positive effects.

Impact on Medium-Technology Products

Since *lnREER*,*lnTFP* and *lnED* are not statistically significant, these three variables are excluded to create the equation. After the residual test, the results show that it is stationary. Therefore, *lnFDI* and exports of medium technology products have a cointegration relationship. Equation (4) is obtained with t-statistics in parentheses:

$$lnMT = 3.228907 - 0.117495 lnFDI_{t-1} + \delta \qquad (4)$$

$$(282.4897)(-7.091992)$$

Equation (4) shows that there are negative impacts between changes in FDI and the export share of medium technology products.

(5) Impact on High-Technology Products

Since*lnTFP* and *lnED* are not statistically significant, these two variables are excluded to build the equation. After the residual test, the results show that it is stationary. Therefore, *lnREER*, *ln*FDI and exports of medium technology products have a cointegration relationship. Equation (5) is obtained with t-statistics in parentheses:

$$lnHT = 5.318330 - 0.389361 lnREER_{t-1} - 0.142733 lnFDI_{t-1} + \delta \qquad (5)$$

$$(9.061356)(-3.060847)(-3.310894)$$

Equation (5) shows that fluctuations in the real effective exchange rate of the RMB and changes in FDI have negative effects on the export percentage of high-tech products.

3. Suggestions

Based on the above research, the following suggestions are made:

First, as the RMB appreciates, product prices rise, especially the price fluctuations of high-tech products are more sensitive, so the negative implications for exports of high-tech products are more pronounced. Accordingly, the government should adopt a flexible exchange rate policy, and targeted intervention, in order to prevent excessive exchange rate fluctuations leading to commodity export instability.

Secondly, the state should increase its support for technological innovation, increase R&D investment, and improve the level of technology, so as to promote the export of high-value-added medium and high-tech products.

Third, a higher degree of trade openness usually increases the value of product exports. In this case, the negative impact on the share of exports of primary products is more significant. For this reason, the country should continue to promote trade liberalization policies, strengthen cooperation with international markets, develop diversified product markets, and encourage the export of high-value-added products.

Fourth, the country should guide the flow of FDI to high-technology industries, attract foreign investment from low-technology industries to higher-technology products through incentive policies, and reduce dependence on low-value-added products.

4. Conclusions

First, the real effective exchange rate of RMB is positively correlated with the export ratio of low-tech products and negatively correlated with the export proportion of high-tech products. This trend creates a negative effect on the

structural improvement of China's export commodities.

Secondly, there is a negative correlation between technological progress and the proportion of exports of primary products. With technological progress, countries tend to produce and export more value-added and other products with higher technological levels. For the export of primary products with lower technological levels, the impact is less obvious, which leads to a decline in the export share of primary products. Thus, technological progress has a positive impact on the structural promotion of China's export commodities.

Third, there is a negative correlation between the degree of trade openness and the share of primary product exports. This is because, in this case, the country prefers to export medium and high-tech products, which leads to a decrease in the export share of primary products. Therefore, increased trade openness has a positive impact on the structural promotion of China's export commodities.

Fourth, foreign direct investment has a positive correlation with the export ratio of primary products and low-technology products and a negative correlation with the export proportion of medium-technology products and high-tech products. Most of the FDI is invested in the manufacturing industry, so the increase of foreign investment has a positive impact on the export of primary products and low-tech products, while medium- and high-tech products are mostly subject to the R&D and technology level of the country. In general, the increase in foreign direct investment has a negative impact on the structure of China's export commodities.

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