

Research on the Impact of RMB Exchange Rate Changes on China's Export Trade

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Abstract: The RMB exchange rate's fluctuation has become a critical element in China's export trade, due to the country's rapid economic growth and the quickening of global economic globalization. The potential of this exchange rate alteration to affect the cost of exports and the international market's competitiveness renders it one of the most influential regulatory forces in the export trade sector. To explore the impact of RMB exchange rate fluctuations on China's export trade, a linear regression model was constructed, based on panel data from 2001 to 2022 in 31 provinces (regions, cities) of China. A positive relationship between the real effective exchange rate index of RMB and China's total exports is evidenced by the results, and an appreciation of RMB can result in a rise in China's total exports. Therefore, the countermeasures and suggestions to stabilize exchange rate expectation, promote RMB internationalization and improve commodity competitiveness are put forward for reference.

Keywords: Exchange rate movements, Export trade, Real effective exchange rate, Linear regression model.

1. Introduction

The exchange rate is a crucial factor in international trade and financial dealings. As economic globalization advances, international trade is increasingly occurring. Exchange rate serves as a link between the economies of various countries, and its fluctuations have a direct bearing on the export trade of those countries. The alteration of the RMB exchange rate is strongly connected to China's export trade, a factor of great importance to the global economy due to its position as the second largest economy and the world's biggest exporter. This is especially true in the context of economic globalization.

The RMB exchange rate, reformulated with a market-oriented approach, has seen its value fluctuate due to a variety of causes, such as the US-China trade dispute and the novel coronavirus outbreak. The RMB exchange rate's influence on China's export trade is of great significance, and its fluctuations could have a considerable effect. This study seeks to authenticate the correlation between RMB exchange rate fluctuations and China's export trade, by arranging the present state of the RMB exchange rate and employing empirical analysis techniques, thereby furnishing a dependable foundation for pertinent policy formation.

An in-depth study of the impact of RMB exchange rate changes on China's export trade can better grasp the development trend of export trade, stabilize the export market, and provide corresponding theoretical basis for the development of China's export trade. At the same time, it also helps the government and enterprises to better cope with the risk of exchange rate fluctuations, formulate appropriate policies and adopt flexible strategies to promote the development of China's export trade. Theoretically and practically, examining the correlation between RMB exchange rate fluctuations and China's export trade is of great importance for the steady expansion of China's export trade and the answer to alterations in the global trade landscape.

2. Literature Review

2.1. Research status of RMB exchange rate fluctuation on China's export trade

In 2005, China initiated a momentous reform of its exchange rate system, which was based on a pliable floating exchange system that was determined by market supply and demand and swayed by a selection of currencies. Gan Sumei and Cheng Dingping (2019) [1] discovered that this reform had a considerable effect on the value of RMB. As market-oriented reform of RMB exchange rate progressed, the RMB exchange rate fluctuated more and more (Bing Lu, 2020) [2]. On August 11, 2015, the Chinese government's central bank initiated the 811 Exchange Rate Reform to reduce the volatility of the RMB exchange rate, transforming the RMB exchange rate mechanism from a fixed to a floating or free floating system, in order to enhance its adaptability and practicality (Zhang Ming, Chen Yinmo, 1922) [3]. Sun Yike (2018) [4] pointed out that the sharp fall of China's stock market and the upcoming interest rate hike policy of the US Federal Reserve have brought drastic fluctuations to the world economy and led to the rapid appreciation of the RMB.

Confirmed by numerous studies, the fluctuation of RMB exchange rate has a major influence on China's export trade, thus demonstrating its significance in the country's export trade. As the real effective exchange rate rises, the relative value of RMB will also rise. Li LAN (2022) [5] found that when the real effective exchange rate of RMB rises by 1%, China's export volume will increase significantly by 2.17%. Nan (2022) [6], in her research, highlighted that the RMB real exchange rate's ascent would foster the export of capital- and labor-intensive goods. Lu Huanhuan (2023) [7] found through research that when the real effective exchange rate of RMB rises by 1%, the export trade volume of Qinghai Province will correspondingly rise by 0.874%. Wang Fen (2016) [8] pointed out that with the appreciation of RMB, Jiangxi's export would increase significantly. Scholars' research reveals that the export volume will be in a similar direction as the appreciation of RMB. As the yuan appreciates, exports will

increase.

However, some scholars hold the opposite view, arguing that the appreciation of RMB and the export value will move in the opposite direction, and the appreciation of RMB will reduce the export value. Using indirect pricing method, Yu Na (2022) [9] concluded that an increase in the RMB real exchange rate would lead to a decline in China's commodity exports. At the same time, the appreciation of RMB will have an impact on China's trade balance and restrain exports (Hu Xu, 2020) [10]. In addition, Tang Suting and Yuan Xinyu (2023) [11] conducted an in-depth discussion on the impact of RMB exchange rate fluctuations on Yunnan's export volume to Lancang-Mekong countries, and the research showed that in the long run, RMB appreciation would inhibit Yunnan's export trade to Lancang-Mekong countries.

2.2. Literature review

A thorough investigation of both domestic and international literature has exposed that the research findings of numerous academics on the influence of RMB exchange rate fluctuations on export trade are not uniform. There are two pros and cons of the scholars' opinions. Scholars' research has revealed that RMB exchange rate appreciation has a beneficial effect on export trade; conversely, some scholars contend that it has a detrimental effect.

This research, with the main objective of examining the correlation between the real effective exchange rate index of RMB and China's total exports from a macro perspective, employs an empirical analysis approach due to the two distinct perspectives and the absence of new literature research data. Investigating the consequences of RMB exchange rate fluctuations on China's export trade, this study seeks to suggest countermeasures and proposals for the expansion of the country's current export trade.

3. Theoretical analysis and research hypothesis

3.1. RMB exchange rate fluctuations and export trade

The RMB exchange rate's volatility has become a major determinant of China's export trade, due to the country's rapid economic expansion and the quickening of globalization. This fluctuation can have a significant influence on the prices of exported goods and international market competitiveness, making the exchange rate a critical regulatory factor in export trade. The alteration of the RMB exchange rate has a beneficial effect on China's export commerce, through a variety of channels such as product prices, corporate profits, and international balance of payments, for instance, augmenting export competitiveness, fostering the growth of export-oriented industries, augmenting export profits, and reacting to alterations in the global trade climate. Based on this, the following hypothesis is proposed:

Hypothesis 1: It is hypothesized that the RMB real effective exchange rate index has a positive correlation with China's total exports.

3.2. RMB appreciation and total exports

Traditional trade theory holds that when a country's

currency appreciates, its total exports will decrease; When its currency depreciates, total exports increase. However, the impact of RMB appreciation on total exports is complex, involving many aspects such as price competitiveness, terms of trade, export structure adjustment, international market dynamics, exchange rate pass-through effect, contract currency selection, market expectations and speculation. In the actual economic operation, the interaction of these factors may lead to changes in export volume that are different from those analyzed solely from the perspective of exchange rate changes. For example, the appreciation of RMB can enable domestic producers to exchange fewer export products for more foreign products, thereby increasing export profits and improving the terms of trade. In this case, even if the volume of exports decreases, the total volume of exports may still increase due to higher unit prices. The yuan's appreciation could potentially spur businesses to upgrade their products and technologies, thus augmenting the value and competitiveness of their goods in the long run. Such structural adjustment could help maintain or even increase total exports. Based on this, the hypothesis is put forward:

Hypothesis 2: RMB appreciation can promote the increase of China's total export.

4. Research and design

4.1. Model construction

Construct a linear regression model, the specific model is as follows:

$$EX_{it} = \beta_0 + \beta_1 REER_{it} + \beta_2 FDI_{it} + \beta_3 GOV_{it} + \beta_4 TBL_{it} + \beta_5 OL_{it} + \varepsilon \quad (1)$$

Where, i represents region, t represents year, β_0 represents intercept term, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ represents the estimated parameters of each variable respectively; ε represents the random error term.

4.2. Description of variables

4.2.1. Explained variables

The EX of 31 provinces (autonomous regions and municipalities) in China is the explanatory factor in this research, with the total export being expressed as the total export of the business unit's location.

4.2.2. Explanatory variables

The RMB Real Effective Exchange Rate Index (REER) utilized in this research is a signifier of the fluctuation of exchange rates between a nation's currency and a collection of other nations. This index reflects the true purchasing power of the country's currency. When the REER increases, it implies a rise in the domestic currency's worth; conversely, it implies a decrease in the local currency's worth.

4.2.3. Control variables

This study chose four variables, FDI, Government Intervention, Tax Burden, and Openness to the Outside World, as control variables to eliminate their effect on the correlation between RMB exchange rate and China's export trade, thus enabling a more precise evaluation of the effects of RMB exchange rate changes on export trade. See Table 1 for the description of the index system.

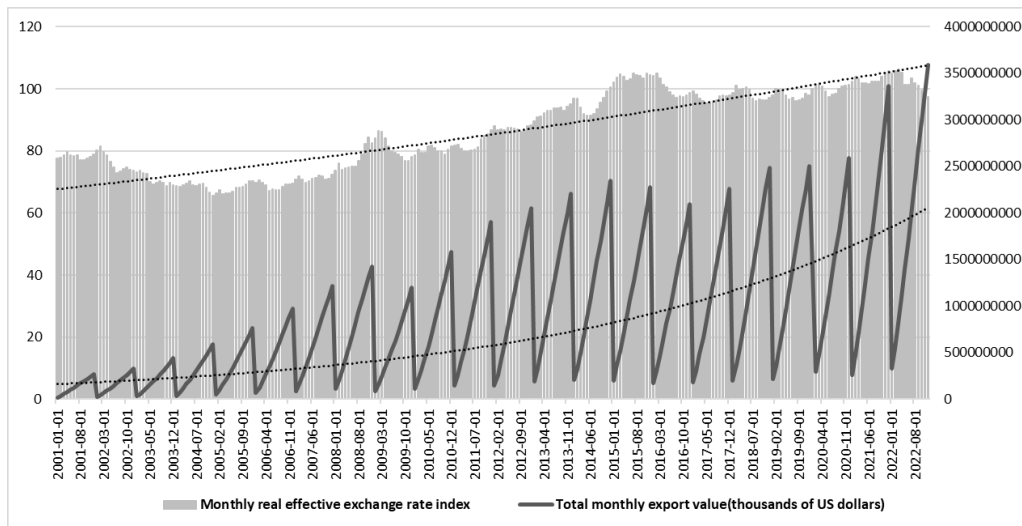
Table 1. Describes the indicator system

Variables	Indicator name	Indicator description
Explained variable	Total exports (EX)	Total exports of the place where the business unit is located
Explanatory variables	Real effective Exchange rate (REER)	Renminbi real effective exchange rate index
Control variables	Foreign Direct Investment (FDI)	(Total exports of foreign-invested enterprises * USD/RMB exchange rate)/Gross regional product
	Level of government intervention (GOV)	General budget expenditure/Gross regional product of local finance
	Tax burden Level (TBL)	Local fiscal tax revenue/gross regional product
	Openness to the outside world (OL)	(Total import and export volume of the location of the business unit * USD/RMB exchange rate)/Gross regional product

4.2.4. Sources of data

The renminbi's real effective exchange rate index and total export value, as seen in Figure 1 after China's entry into the World Trade Organization in 2001, exhibited a steady rise. Consequently, panel data from 31 Chinese provinces (regions, cities) between 2001 and 2022 were chosen as examples. Data on the RMB's effective exchange rate index is sourced from

the Bank for International Settlements, while all other information is sourced from the National Bureau of Statistics' yearly provincial data. Since there is no information on the total export of foreign-invested businesses and local fiscal tax revenue from 2001 to 2005, linear interpolation is employed to supplement the missing information.

**Figure 1.** Relationship between real effective exchange rate index and total export value1

5. Empirical analysis

5.1. Descriptive statistics

Descriptive statistics of all variables, including mean, standard deviation, maximum and minimum values, are revealed in Table 2 it is clear that the total export data of China's 31 provinces (autonomous regions and municipalities) is highly dispersed, with the total export of each province (autonomous regions and municipalities) or at different times being notably disparate, thus leading to an uneven export trade development. The RMB real effective exchange rate

index, as analyzed, has seen a significant transformation in the past 20 years, with its minimum value being 67.84 and its maximum 103.9. Linear interpolation method was employed to supplement the data from 2001 to 2005, thus making foreign direct investment appear negative; the minimum value being -6622, likely due to the influence of China's exchange rate fluctuations, policy alterations, political stability, and other factors on the decision of foreign direct investment in the early 21st century. Foreign investors may worry about the reduction of investment returns, so as to reduce investment or withdraw investment.

Table 2. Descriptive statistics of variables

Variables	Number of observations	Average	Standard Deviation	Minimum	Maximum
EX	682	3798	7568	6.714	53809
REER	682	86.33	12.61	67.84	103.9
FDI	682	1626	3788	- 6622.	22296
GOV	682	0.249	0.184	0.0772	1.354
TBL	682	0.0754	0.0279	0.0198	0.188
OL	682	0.298	0.353	0.00763	1.730

5.2. Correlation analysis

Table 3 reveals the correlation analysis results, which demonstrate a correlation coefficient of 0.212 between RMB real effective exchange rate index and total exports, with a significant positive correlation at the 1% level, thus preliminarily affirming hypothesis 1. From the perspective of selected control variables, the correlation coefficient of

foreign direct investment, tax burden level, opening-up degree and total exports is significantly positive at 1% level, while the correlation coefficient of government intervention degree and total exports is significantly negative at 1% level. The VIF value of each variable being less than 5 implies a VIF value of 1.860, thus indicating that the model does not have any multicollinearity issues.

Table 3. Results of correlation analysis

Variables	EX	REER	FDI	GOV	TBL	OL
EX	1.000					
REER	0.212 ***	1.000				
FDI	0.928 ***	0.138 ***	1.000			
GOV	0.245 ***	0.241 ***	0.221 ***	1.000		
TBL	0.230 ***	0.268 ***	0.264 ***	0.079 **	1.000	
OL	0.515 ***	0.134 ***	0.559 ***	0.284 ***	0.585 ***	1.000

5.3. Baseline regression analysis

By employing step-to-step regression, the influence of RMB real effective exchange rate index on total exports can be further explored. Table 4 R^2 reveals that, as explanatory and control variables are gradually added, the coefficient of determination exhibits a gradual rise in R^2 . The regression model's good fitting effect was evidenced by the benchmark results, which reached 0.875 when the core explanatory variables and all control variables were included. Table 4 displays the outcomes of the RMB real effective exchange rate index's inclusion in column (1) of the table. The regression coefficient for the RMB real effective exchange rate index on total exports is 127.3, which is 1% significant, suggesting a strong positive correlation between the two. Therefore, hypothesis 1 can be verified. Then, control variables such as foreign direct investment, degree of government intervention, level of tax burden and degree of

opening up are gradually added. The regression results in Column (5) demonstrate a positive correlation of 1% between the RMB real effective exchange rate index and total exports, with a coefficient of 80.20. The correlation between foreign direct investment and total exports, 1.752, was found to be significant at a level of 1%. This implies that the appreciation of RMB can lead to an increase in China's exports, thus verifying hypothesis 2 and confirming the regression coefficients of government intervention, the degree of opening to the outside world, and total export, which were -2402.2 and -19716.8 respectively, with a significance level of 1%, suggesting a negative relationship between the two. The coefficient of the degree of opening to the outside world, however, was positive at 1480.4, indicating a positive correlation. The total export is significantly regulated by the degree of openness to the outside world, at 5%, indicating a positive effect.

Table 4. Results of benchmark regression analysis

Variables	(1)	(2)	(3)	(4)	(5)
	EX	EX	EX	EX	EX
REER	127.3***	51.27***	63.33***	67.56***	80.20***
	(5.66)	(6.07)	(7.32)	(7.66)	(8.24)
FDI		1.830***	1.793***	1.809***	1.752***
		(65.10)	(62.55)	(61.30)	(50.08)
GOV			2984.4	2869.7	2402.2
			(4.97)	(4.77)	(3.89)
TBL				9013.3	19716.8
				(2.27)	(3.70)
OL					1480.4**
					(3.00)
_cons	7192.9	3604.6	3840.0	3581.9	4330.5
	(3.67)	(4.93)	(5.33)	(4.92)	(5.66)
N	682	682	682	682	682
R ²	0.045	0.868	0.873	0.874	0.875

5.4. Robustness test

Table 5 reveals the robustness test results when only panel data from 2001 to 2014 and 31 provinces (autonomous regions and municipalities) were used for regression analysis, excluding data from 2015 to 2022- a result of the RMB's appreciation since 2015 due to the alteration of China's exchange rate system, trade disputes between the country and the United States, and the global COVID-19 epidemic. To assess the strength of these results, a sample size was adjusted. Table 5's column (2) reveals no significant alteration in the coefficient symbols or importance of core explanatory and control variables, thus demonstrating the research results are reliable; the data does not alter the conclusions over a given time period and remain consistent.

Table 5. Robustness test results

Variables	(1)	(2)
	EX	EX
REER	80.20*** (8.24)	77.43*** (7.52)
FDI	1.752*** (50.08)	1.439*** (55.69)
GOV	2402.2 (3.89)	1604.1 (3.67)
TBL	19716.8 (3.70)	19459.1 (4.86)
OL	1480.4** (3.00)	2129.3*** (6.90)
_cons	4330.5 (5.66)	4162.2 (5.95)
N	682	434
R ²	0.875	0.940

6. Conclusions and Recommendations

6.1. Conclusion

The impact of RMB exchange rate changes on China's export trade is explored, and the main conclusions are drawn: the RMB real effective exchange rate index is positively correlated with China's total exports, and the appreciation of RMB can promote the increase of China's total exports.

6.2. Suggestions

6.2.1. Stabilize exchange rate expectations

Keeping the RMB exchange rate stable will help reduce exchange rate risks faced by export enterprises and facilitate their long-term planning and market expansion. By intervening promptly in the market and adjusting monetary policy, the central bank can sustain the exchange rate's relative steadiness. Furthermore, export businesses should bolster their foreign exchange risk control, encourage them to utilize forward contracts, options, and other financial instruments to dodge foreign exchange risks, and diminish the adverse effects of exchange rate fluctuations.

6.2.2. Promote the internationalization of the RMB

By promoting the wide application of RMB in international trade, enterprises are encouraged and supported to adopt

RMB for pricing and settlement in international transactions, especially in trade with ASEAN and other regions, which is conducive to taking advantage of the ease of cross-border payment of RMB to increase the scale of trade. At the same time, the payment function of RMB should be enhanced so that its status in international transactions can be promoted, thus promoting the growth of export trade. The internationalization of RMB must be bolstered by a better policy system, a sound legal assurance for its internationalization, enhanced oversight, and the financial market's stability and safety safeguarded.

6.2.3. Improve commodity competitiveness

We will strengthen product quality and standards, continue to raise the quality and technological level of export commodities, and encourage enterprises to raise the added value and competitiveness of their products through innovation and research and development. At the same time, it will cultivate brands with international visibility, enhance brand image and reputation, strengthen overseas marketing and brand promotion work, and use e-commerce platforms and international exhibitions to promote Chinese brands. The government can offer tax incentives, financial subsidies, financing aid, and other steps to lessen the export expenses of businesses. We should strengthen economic and trade ties with major trading partners to jointly address global trade challenges.

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