Impacts of Recent Changes in the Exchange Rate of RMB on China's Economy and Countermeasures

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Abstract: This paper converts the change in the exchange rate of the RMB to the USD into the equivalent of the change in China's export subsidies and import tariffs, and then uses the GTAP model to analyze the impacts of the decreasing of exchange rate of RMB to the USD on China's economy. The results are as follows: From March 2018 to May 2020, the exchange rate fell by 14%, which increased China's GDP, residents' income, terms of trade, exports and foreign trade surplus by 0.95%, 0.94%, 0.51%, 3.32% and 46.299 billion US dollars respectively, but caused the price level increased by 3.34%, and also caused China's social welfare, net return rate of capital return, output, and imports to decline by 22.893 billion US dollars, 1.05%, 0.76% and 3.77%, respectively. The study also found that the positive and negative effects on China's economy will be greater if the exchange rate drops further. The positive and negative effects may be reduced if the exchange rate rebounds.

Keywords: RMB exchange rate fluctuations; economic Impact; Global Trade Analysis Project model

1. Introduction

In March 2008, the RMB/USD exchange rate was around 6.3, and since then, the exchange rate has been falling, breaking through the "1 USD to 7 RMB" barrier in August 2019; on May 28, 2020, the RMB/USD exchange rate once fell to 7.1966, a new low of nearly two years. Some scholars have discussed the impact of the recent changes in the RMB exchange rate on China's foreign trade and domestic prices. Xie and Zhao [1], Li et al [2] and Shi [3] argued that RMB depreciation will help mitigate the impact of China-US trade frictions on China's export trade, but it will trigger price increases of Chinese imports, which will not only curb the development of China's import trade, but also push up the level of Chinese inflation. Cui [4] conducted a regression analysis of the relationship between the RMB exchange rate and China's import trade and found that RMB depreciation leads to a decrease in China's imports. Wang et al [5] used a partial equilibrium model to analyze the impact of exchange rate fluctuations on China's agricultural commodity prices, trade and production, and

found that the depreciation of the RMB led to higher prices of China's imports and consequently lower imports, but caused an increase in both demand for and production of agricultural products, especially on the production of rice, wheat, corn, beef, pork and milk powder.

In addition, early literature examined the effects of a country's currency depreciation on its GDP, output, and import and export trade. Hu [6] used regression methods to analyze the effect of RMB depreciation and found that RMB depreciation has a boosting effect on China's exports but no significant inhibiting effect on China's imports. Chen [7] used regression analysis to analyze the effect of RMB depreciation on China's GDP. Lamb [8] and Chit et al [9] used time series model and panel data model respectively to analyze the impact of currency exchange rate changes on agriculture in emerging market countries in Africa and East Asia, they found that currency depreciation made these regions increased agricultural exports and production.

The main problems with the existing studies are as follows: recent studies on the impact of a lower RMB exchange rate on China's economy are mostly limited to the impact on import and export trade, domestic prices and output, while comprehensive studies on the impact of a lower RMB exchange rate on China's economic growth, social welfare, household income, import and export trade, terms of trade and capital gains are lacking. Early studies of the impact of currency depreciation in one country mainly used time series models and panel data models for regression analysis, but few studies on the multiple economic effects of RMB depreciation in China using multi-country and multi-sector general equilibrium models.

The contribution of this paper is to construct a computational model to translate changes in the RMB/USD exchange rate into the equivalence of changes in China's export subsidies and import tariffs, and then apply a global trade analysis model to analyze the impact of a weaker RMB exchange rate on China's macroeconomic (including GDP, income, social welfare, trade balance, terms of trade, and capital yields) and industrial sector output, import/export trade, and product prices, and make policy recommendations to provide a reference for relevant administrations to effectively apply the exchange rate policy.

2. Theoretical Foundations and Research Methods

2.1. Theoretical Foundation

According to the general equilibrium theory, there is an interaction and mutual influence between the prices, supply and demand of various commodities and factors of production [10]. When the price of a commodity or factor of production changes, it not only causes a change in the supply and demand for that commodity and factor of production, but also causes a change in the supply and demand and prices of its substitutes and complements and their factors of production, and a change in the prices and supply and demand of those substitutes and complements and their factors of production further causes a change in the supply and demand and prices of the respective substitutes and complements and their factors of production. The changes will lead to a chain reaction of various economic and trade activities in the economic system, which will bring the economic system to a new equilibrium state and bring about a new equilibrium value of prices, supply and demand of all commodities and factors of production. International trade closely links the economic activities of all countries in the world, and changes in the exchange rate of a country's currency will not only lead to changes in the prices and quantities of its exports and imports, and in the prices and quantities of commodities and factors of production in various sectors and markets of the country, but will also lead to changes in the prices of various commodities, supply and demand in other trading countries, thus causing an equilibrium between the country and the world market of various commodities and factors of production. Price and quantity changes until all markets are cleared (i.e., all markets are in equilibrium supply and demand) to get a picture of the impact of exchange rate changes on the country's GDP, production, income, consumption, investment, and import and export trade [11].

2.2. Model Selection

Based on general equilibrium theory, Dixon (1977) of the Centre for Policy Studies at the University of Melbourne, Australia, developed the world's first CGE model called ORANI. Since then, the CGE model has been widely used to analyze the effects of economic policies [12-15]. The global CGE model, the Global Trade Analysis Project (GTAP) model, developed by Purdue University is a commonly used tool for policy analysis [16-18]. It is a multi-country (or regional) and multi-sectoral CGE model developed by Professor Thomas W. Hertel of Purdue University, based on the IMPACT program in Australia and the salter program. The model contains functions such as production and demand in multiple countries (regions) around the world, and constructs sub-models of the interactions and interactions between sectors and markets in each country (region) based on the economic and trade linkages between countries (regions) around the world, and these sub-models cover production, consumption, social welfare and trade in each country (region). The

re-modeling can be applied to analyze the impact of export subsidies and import tariff policies on the macroeconomic and industrial sectors of a country (region) or multiple countries (regions) simply by importing the GTAPAgg database of relevant countries (regions) and industrial sectors into the RunGTAP operating software. The latest GTAP databases (GTAP10 model database) released by Purdue University in June 2019 covers data on GDP, production, consumption, savings, investment, import and export trade, export subsidies and tariffs for 141 countries (regions) in the world, and this paper uses this database to conduct the analysis. In order to meet the "closure" condition of the model, merging the 65 product sectors in the GTAP10 model into 33 new product sectors (Table 2).

2.3. RMB Exchange Rate Movement Scenario

In February 2018, the RMB/USD exchange rate was around 6.3, which is used as the benchmark data in this paper to examine the impact of changes in the RMB exchange rate (Scenario 1) on China's economy in the period from February 2018 to May 2020, and also to simulate and predict the impact on China's economy if the exchange rate continues to fall (Scenario 2) and if there is a rebound in the RMB exchange rate (Scenario 3). Specific scenarios are designed as following (Table 1).

As of the end of May 2020, the RMB/USD exchange rate moves around 7.1, which is about a 14% decline in the RMB/USD exchange rate, thus setting up a scenario 1 RMB/USD exchange rate decline of 14%. In the short term, due to international and domestic economic policies, the RMB/USD exchange rate is likely to fall further: assuming the RMB/USD exchange rate falls to 7.56 [The occurrence of the New Crown epidemic had a negative impact on the global economy, and a large number of travelers have been holding USD to hedge against the risk, which has led to the recent global "USD shortage", resulting in a trend decline in the exchange rate of non-US currencies such as the RMB; in addition, the recent continued easing of China's monetary policy and market expectations for the RMB exchange rate may lead to a further decline in the exchange rate of the RMB], that means that the exchange rate between the RMB and the USD decreases by 20%, resulting in Scenario 2. Nonetheless, China's economy has enormous potential for development, and in the long run, the RMB is unlikely to depreciate disorderly and the exchange rate will "basically stabilize at a reasonable equilibrium level" [the monthly government work report in 2020 proposed that sound monetary policy should be more flexible and moderate, and the comprehensive use of lowering interest rates and refinancing and other means to guide the growth rate of broad money supply and social financing scale to be significantly higher than last year, "continue to improve the market-based formation mechanism of the RMB exchange rate, and maintain the basic stability of the exchange rate at a reasonable and equilibrium level." To convey to the world China's confidence in stabilizing its exchange currency and financial markets. Source: http://www.npc.gov.cn/zgrdw/npc/xin

wen/2016-03/15/cont ent_1984655.htm], this hypothesized that the RMB/USD exchange rate rises back to 7, which represents an 11% decline in the RMB/USD exchange rate relative to the benchmark data, creating Scenario 3.

Table 1. Scenarios for changes in the exchange rate of the RMB against the USD

Scenario	Scenario Description	Exchange rate level (benchmark RMB/USD exchange rate is 6.3)
Scenario 1	The RMB declined by 14% against the USD	RMB/USD exchange rate dips to 7.10
Scenario 2	The RMB declined by 20% against the USD	RMB/USD exchange rate dips to 7.56
Scenario 3	The RMB declined by 11% against the USD	RMB/USD exchange rate dips to 7.00

2.4. Methodology for Converting Changes in the RMB Exchange Rate into the Equivalent of Export Subsidies and Import Tariffs

Although the GTAP model includes more than thirty exogenous shock variables such as export subsidies and import tariffs, there are no exchange rate variables. This paper solves the above problem by converting changes in the RMB exchange rate into the equivalent of export subsidies and import tariffs. The US dollar serves as the intermediate currency of China's exchange rate, and a decline in the exchange rate of the RMB against the US dollar means lower prices for Chinese exports denominated in US dollars, which corresponds to a certain subsidy for Chinese exports, but at the same time, results in the RMB price of Chinese imports being raised, which corresponds to China's imposition of tariffs on imports. Based on the above analysis, the following section constructs the formulae for "converting RMB exchange rate changes into export subsidies" and "converting RMB exchange rate changes into import tariff equivalents".

1). Method of converting changes in the RMB exchange rate into the equivalent of export subsidies

The analytical approach of Feenstra [19] and Zhongmin Li et al [20] is used to construct equation (1).

$$P_{CHN}^{cif} = P_{CHN}(1-s) \qquad (1)$$

In equation (1), P_{CHN}^{cif} is the CIF price of Chinese exports denominated in RMB, P_{CHN} is the total cost of Chinese exports including commodity price, freight and insurance, and s is the tax rebate rate (export subsidy rate) of Chinese exports.

According to equation (1), the CIF duty-paid price of foreign imports of Chinese goods (denominated in U.S. dollars) can be expressed by equation (2).

$$P_F = P_{CHN}^{cif} \times (1+m) \times r = P_{CHN} \times (1-s) \times (1+m) \times r \qquad (2)$$

In equation (2), m and r are the foreign import tariff and the exchange rate of RMB to USD, and other symbols are the same as in equation (1).

From equation (2), we can see that a change in export subsidy (s), or a change in the RMB exchange rate (r)

will affect the price (P_F) of imported (Chinese) goods from abroad, given P_{CHN} and m. The effect of a lower RMB exchange rate is equivalent to an increase in China's export subsidy. If we assume that the effect of a lower RMB exchange rate is equivalent to an increase in China's export subsidies, then Equation (2) is given by Equation (3).

$$P_{CHN}(1+m)[1-(s+\Delta s)]r = P_{CHN}(1+m)(1-s)(1-\alpha)r \qquad (3)$$

The equation (4) is derived from equation (3), which converts decline α in the exchange rate of the RMB against the dollar into an export subsidy Δs.

$$\Delta s = \alpha(1+s) \qquad (4)$$

2). Calculation of the conversion of changes in the exchange rate of the RMB into the equivalent of import tariffs

Changes in the RMB exchange rate will affect the prices of Chinese imports, the following constructs a formulation to measure the impact of changes in the RMB exchange rate on the prices of Chinese imports.

Set P_F^{cif} is the CIF price of Chinese imports denominated in US dollars, m' is China's import tariff, and r' is the exchange rate between the US dollar and the Chinese yuan, then the after-tax price of Chinese imports denominated in RMB can be expressed in equation (5).

$$P_{CHN} = P_F^{cif} \times (1+m') \times r' \qquad (5)$$

Assuming that the effect of a decline α in the RMB exchange rate is equivalent to an increase in China's import tariffs Δm, and we obtain equation (6) from equation (5).

$$P_F^{cif} \times (1+m'+\Delta m) \times r' = P_F^{cif} \times (1+m') \times (1+\alpha) \times r' \qquad (6)$$

From equation (6), equation (7) is obtained by converting the change in the exchange rate of RMB to USD α to the change in import tariff Δm.

$$\Delta m = \alpha(1+m) \qquad (7)$$

3. Simulation of the Impact

3.1. Changes in the RMB/USD Exchange Rate under Different Scenarios are Equivalent to Changes in Export Subsidies and Import Tariffs

Apply the 2019 export tax rebate rates for various products in China on the China Export Refund Network to calculate the export tax rebate rates (export subsidy rates) for products in each sector in Table 3, and utilize the 2019 tariff rates for various imported goods in China in the UN Comtrade database to calculate the import tariff rates for products in each sector in Table 2; then use equation (4) and equation (7) to calculate the Table 2 scenario respectively The equivalent effects of export subsidies and import tariffs on various products under scenarios 1 (the decline in the RMB/USD exchange rate by 14%), 2 (the decline in the RMB/USD exchange rate by 20%) and 3 (the decline in the RMB/USD exchange rate by 11%).

Table 2. Equivalent table of export subsidies and import tariffs for RMB exchange rate changes under different scenarios

Department	Export Tax rebate rate(%)	Changes in the RMB exchange rate under different scenarios Changes in export subsidies(%)			Import Tariff rate(%)	Changes in the RMB exchange rate under different scenarios Changes in import tariffs(%)		
		Scene 1	Scene 2	Scene 3		Scene 1	Scene 2	Scene 3
Rice	0.0	15.0	20.0	11.0	61.1	24.1	32.2	17.7
Wheat	0.0	15.0	20.0	11.0	62.9	24.4	32.6	17.9
Edible oil	0.0	15.0	20.0	11.0	15.7	17.4	23.1	12.7
Vegetables, fruits, nuts	0.0	15.0	20.0	11.0	11.5	16.7	22.3	12.3
Other agricultural products	0.0	15.0	20.0	11.0	16.8	17.5	23.4	12.8
Animal products	6.0	15.9	21.2	11.7	7.2	16.1	21.4	11.8
Trees	6.0	15.9	21.2	11.7	12.8	16.9	22.6	12. 4
Aquatic products	9.0	16.4	21.8	12.0	10.5	16.6	22.1	12.2
Sugar	9.0	16.4	21.8	12.0	33.5	20.0	26.7	14.7
Beverages and tobacco products	9.0	16.4	21.8	12.0	26.2	18.9	25.2	13.9
Food	13.0	17.0	22.6	12.4	12.3	16.8	22.5	12.4
Textile	13.0	17.0	22.6	12.4	13.5	17.0	22.7	12.5
Clothing	13.0	17.0	22.6	12.4	14.7	17.2	22.9	12.6
Leather and its products	13.0	17.0	22.6	12.4	14.3	17.1	22.9	12.6
Furniture and other wood products	9.0	16.4	21.8	12.0	11.2	16.7	22.2	12.2
Paper and paper products	13.0	17.0	22.6	12.4	8.6	16.3	21.7	11.9
Transportation vehicles and their parts	13.0	17.0	22.6	12.4	25.2	18.8	25.0	13.8
Petrochemical energy	0.0	15.0	20.0	11.0	0.0	15.0	20.0	11.0
Chemicals	13.0	17.0	22.6	12.4	11.2	16.7	22.2	12.2
Metal and its products and minerals	6.0	15.9	21.2	11.7	6.7	16.0	21.3	11.7
Electronic and electrical equipment	13.0	17.0	22.6	12.4	6.6	16.0	21.3	11.7
Equipment	13.0	17.0	22.6	12.4	6.8	16.0	21.4	11.7
Other devices	13.0	17.0	22.6	12.4	6.8	16.0	21.4	11.7
Electricity	0.0	15.0	20.0	11.0	0.0	15.0	20.0	11.0
Natural gas production and retail	0.0	15.0	20.0	11.0	0.0	15.0	20.0	11.0
Water supply	0.0	15.0	20.0	11.0	0.0	15.0	20.0	11.0
Building	0.0	15.0	20.0	11.0	0.0	15.0	20.0	11.0
Communication	0.0	15.0	20.0	11.0	0.0	15.0	20.0	11.0
Transport	0.0	15.0	20.0	11.0	0.0	15.0	20.0	11.0
Business	0.0	15.0	20.0	11.0	0.0	15.0	20.0	11.0
Financial insurance	0.0	15.0	20.0	11.0	0.0	15.0	20.0	11.0
Entertainment	0.0	15.0	20.0	11.0	0.0	15.0	20.0	11.0
Other service industries	0.0	15.0	20.0	11.0	0.0	15.0	20.0	11.0

Note: The values in the second, third, and fourth columns in the table are the 14%, 20%, and 11% decline in the exchange rate of RMB against the US dollar, which is equivalent to the increase in export subsidies for various commodities. The values in the sixth, seventh, and eighth columns are respectively, the 14%, 20%, and 11% decline in the exchange rate of RMB against the US dollar is equivalent to the increase in import tariffs on various commodities.

3.2. Macroeconomic Implications

The GTAP model was simulated and solved by employing the equivalent values of export subsidies and import tariffs as policy shock variables in Table 3 for a 14% decline in the RMB/USD exchange rate (Scenario 1), 20% decline in the RMB/USD exchange rate (Scenario 2), and 11% decline in the RMB/USD exchange rate (Scenario 3), to obtain the macroeconomic impact of different declines in the RMB exchange rate on China in Table 3.

Table 3 reveals that all three scenarios help to boost China's GDP, income, terms of trade and foreign trade surplus, but lead to a decline in the net return on capital repatriation and social welfare in China. Table 4 also shows that there are differences in the impact of different scenarios on China's macroeconomic welfare. Specifically, Scenario 1 (decrease in the RMB exchange rate by 14%) raises China's GDP, resident income, terms of trade and foreign trade surplus by 0.95%, 0.94%, 0.51% and $46.298 billion, respectively, but causes a decrease in the net return on capital repatriation and

social welfare by 1.05% and $22.892 billion, respectively. Scenario 2 (decrease in RMB exchange rate by 20%) raises China's GDP, income, terms of trade and foreign trade surplus by 1.31%, 1.28%, 0.81% and $67.308 billion, respectively, but causes China's net return on capital repatriation and social welfare to decline by 1.63% and $31.599 billion, respectively. Scenario 3 (decrease in RMB exchange rate by 11%) increases China's GDP, income, terms of trade and foreign trade surplus by 0.55%, 0.53%, 0.44% and $36.205 billion, respectively, but causes China's net return on capital repatriation and social welfare to decrease by 0.92% and $11.922 billion, respectively.

Comparing the macroeconomic impact of these scenarios on China's macroeconomy, it can be seen that the greater the decline in the RMB exchange rate, the greater the effect on China's GDP growth, residents' income, terms of trade, and trade surplus enhancement, but the greater the negative impact on China's net returns on capital repatriation and social welfare.

Table 3. Impact of different scenarios on China's macro economy

Scenes	GDP change (%)	Resident income change (%)	Change in net return of capital return (%)	Changes in terms of trade (%)	Changes in trade balance (millions of dollars)	Changes in social welfare (millions of dollars)
Scene 1	0.95	0.94	-1.05	0.51	46298.96	-22892.76
Scenario 2	1.31	1.28	-1.63	0.81	67308.23	-31599.43
Scenario 3	0.55	0.53	-0.92	0.44	36205.12	-11922.12

Data source: compiled based on the calculation results of the GTAP model.

3.3. Impact on China's Industry

The simulation also derived the effects of three scenarios of changes in the RMB/USD exchange rate on output (production), import-export trade, and product prices in the Chinese industrial sector in Tables 4 to 6, which are analyzed below.

1). Impact on the level of output. The simulation results show that Scenario 1 (decrease of 14% in the RMB/USD exchange rate), Scenario 2 (decrease of 20% in the RMB/USD exchange rate) and Scenario 3 (decrease of 11% in the RMB/USD exchange rate) lead to a decrease of 0.76%, 1.15% and 0.69% in China's total output, respectively. This indicates that a lower RMB exchange rate leads to a reduction in China's output and that the larger the decline in the RMB exchange rate, the larger the reduction in China's total output; this negative impact can be reduced if there is a rebound in the RMB exchange rate.

In terms of the impact on different sectors, the lower RMB exchange rate led to a decrease in the level of output of rice, wheat, livestock products, sugar, other agricultural products, beverages and tobacco products, clothing, textiles, transportation and its parts, natural gas production and retailing, construction, electricity, other services and transportation in China, of which the decline

in the output of textiles, clothing and sugar was greater; however, it caused the level of output in 19 other sectors to rise, of which the output of electronic and electrical equipment rose the most, by about 9%.

2). Impact on export trade. Scenarios 1, 2, and 3 raise China's total exports by 3.31%, 3.6%, and 2.17%, respectively. This indicates that the greater the decline in the RMB exchange rate, the greater the promotion effect on China's total exports; if there is a rebound in the exchange rate, the promotion effect on China's exports will decrease. In terms of the changes in exports in various sectors, the lower RMB has led to different levels of growth in the exports of most industries in China, including wheat, sugar, livestock products, milk and its products, rice and other agricultural products; however, it has led to a reduction in the scale of exports of fossil energy, clothing, textiles, other equipment, transportation, other services, and natural gas production and retailing. Exports of fossil fuels, apparel, and other services have fallen by large or significant amounts.

3). Impacts on import trade. Contrary to the case for exports, these three scenarios reduce China's imports in most sectors, resulting in a reduction in the total size of China's import trade, although there is some variation in the impact of the different scenarios. With specific

reference, Scenario 1, Scenario 2 and Scenario 3 reduce the total size of China's imports by 3.37%, 6.13% and 3.28%, correspondingly.

In terms of the changes in imports by industry, on the one hand, the lower RMB exchange rate led to a significant decrease in imports in 23 industries, including wheat, rice, water supply, furniture and other wood products, electricity, other services, entertainment, finance and insurance, commerce, communications, construction, textiles, paper and paper products, and transportation, with the first four industries experiencing significant decreases; but on the other hand, it made China's sugar, livestock products, and Imports of transportation vehicles and their parts, metals and their products and minerals, beverages and tobacco products, food, machinery and equipment, aquatic products, chemicals, milk and their products expanded.

4). Commodity price impact. The above three scenarios cause the prices of products in various sectors in China to rise to varying degrees, leading to an increase in the overall level of commodity prices in China, but there are significant differences in the impact of different scenarios. Specifically, Scenario 1, Scenario 2, and Scenario 3 increase the overall level of Chinese prices by 3.34%, 4.58%, and 2.84%, respectively. This suggests that the greater the magnitude of a lower RMB exchange rate, the greater the effect on driving up China's price level; if the RMB exchange rate rebounded, the magnitude of China's price level would be reduced. In terms of the price changes of products in various sectors, a lower RMB exchange rate plays a greater role in pushing up the prices of agricultural products such as vegetables, fruits, nuts and livestock products.

In summary, the greater the decline in the exchange rate of the RMB against the USD, the more pronounced it will be in promoting the exports of China's various sectors, but the greater it will be in curbing the output and imports of China's various sectors, and the greater it will be in pushing up China's price level.

Table 4. Scenario 1: The impact of a 14% drop in the exchange rate of RMB against the USD on Chinese industries (unit: %)

Department	Change in Output	Export changes	Import changes	Commodity price changes
Rice	-0.58	17.12	-20.36	3.10
Wheat	-0.19	28.66	-21.9	3.18
Vegetables, fruits, nuts	0.07	9.91	-7.79	3.76
Edible oil	1.99	12.56	-2.95	3.22
Other agricultural products	-2.55	16.75	-7.34	3.01
Animal products	-0.57	23.81	17.63	3.75
Trees	2.43	8.29	-9.33	3.52
Aquatic products	0.33	4.42	2.18	3.42
Petrochemical energy	2.72	-94.59	-8.16	3.37
Milk and its products	0.24	23.73	-1.55	3.14
Sugar	-13.82	24.04	58.88	2.60
Beverages and tobacco products	-0.03	6.86	6.39	3.18
Food	0.59	10.76	3.49	3.21
Textile	-8.91	-9.25	-10.03	3.24
Clothing	-14.72	-37.52	-2.57	3.24
Furniture and other wood products	1.28	0.36	-13.62	3.43
Paper and paper products	1.75	6.33	-10.64	3.38
Transportation vehicles and their parts	-3.67	4.30	18.75	3.21
Metal and its products and minerals	1.24	6.48	9.37	3.40
Chemicals	0.58	3.3	-0.04	3.45
Electronic and electrical equipment	9.31	10.05	-4.92	3.52
Equipment	0.52	4.6	2.58	3.42
Other devices	0.21	-5.57	-6.06	3.72
Building	-0.68	9.42	-11.15	3.43
Electricity	-0.24	6.5	-11.98	3.51
Natural gas production and retail	-0.96	-0.99	-8.31	3.65
Water supply	0.02	16.3	-16.65	3.27
Communication	0.27	11.66	-11.4	3.23
Transportation	-0.24	-4.62	-10.43	3.39
Business	0.83	11.94	-11.46	3.17

Finance and Insurance	0.64	12.46	-11.64	3.17
Entertainment industry	0.27	11.9	-11.75	3.20
Other service	-0.67	-40.31	-11.74	3.19
Overall level	-0.76	3.32	-3.77	3.34

Data source: compiled based on the calculation results of the GTAP model.

Table 5. Scenario 2: The impact of a 20% decline in the exchange rate of RMB against the USD on Chinese industries (unit: %)

Department	Change in Output	Export changes	Import changes	Commodity price changes
Rice	-0.58	16.99	-23.81	4.32
Wheat	-0.15	28.16	-25.51	4.41
Vegetables, fruits, nuts	0.1	9.87	-10.99	5.65
Edible oil	3.26	12.52	-3.80	4.51
Other agricultural products	-1.21	16.73	-15.57	4.31
Animal products	-0.57	23.60	14.86	5.63
Trees	2.85	8.27	-11.25	4.73
Aquatic products	0.32	4.20	0.79	4.58
Petrochemical energy	3.26	-94.09	-9.14	4.44
Milk and its products	0.12	23.32	-1.42	4.35
Sugar	-13.51	23.88	57.41	3.89
Beverages and tobacco products	-0.04	6.67	5.31	4.40
Food	0.55	10.51	1.73	4.44
Textile	-9.18	-9.45	-13.01	4.51
Clothing	-14.95	-40.80	-5.82	4.48
Furniture and other wood products	1.29	0.03	-16.56	4.65
Paper and paper products	2.35	5.91	-12.87	4.61
Transportation vehicles and their parts	-2.86	4.12	16.51	4.46
Metal and its products and minerals	1.17	6.08	6.17	4.64
Chemicals	0.93	2.88	-2.18	4.70
Electronic and electrical equipment	9.26	9.49	-7.65	4.78
Equipment	0.72	4.01	-0.4	4.65
Other devices	0.23	-5.88	-8.24	5.00
Building	-1.06	8.99	-13.26	4.65
Electricity	-0.2	6.17	-13.79	5.14
Natural gas production and retail	-1.51	-1.05	-9.56	5.03
Water supply	0.01	15.58	-19.59	4.44
Communication	0.21	11.15	-13.48	4.39
Transportation	-0.50	-1.62	-12.22	4.60
Business	0.89	11.45	-13.46	4.34
Finance and Insurance	0.67	11.83	-13.8	4.31
Entertainment industry	0.22	11.36	-13.82	4.37
Other service	-0.92	-22.24	-13.85	4.35
Overall level	-1.15	3.60	-6.13	4.58

Data source: compiled based on the calculation results of the GTAP model.

Table 6. Scenario 3: The impact of an 11% drop in the exchange rate of RMB against the USD on Chinese industries (unit: %)

Department	Change in Output	Export changes	Import changes	Commodity price changes
Rice	-0.65	16.41	-19.99	2.45
Wheat	-0.33	27.45	-21.72	2.57
Vegetables, fruits, nuts	0.06	9.45	-7.66	3.45

Edible oil	1.90	10.85	-2.99	2.62
Other agricultural products	-2.74	15.01	-7.57	2.31
Animal products	-0.74	23.04	21.69	3.42
Trees	2.23	7.78	-9.32	3.08
Aquatic products	0.36	4.44	2.51	3.00
Petrochemical energy	2.61	-102.14	-8.16	2.82
Milk and its products	0.05	23.13	2.19	2.51
Sugar	-13.84	22.48	59.05	1.71
Beverages and tobacco products	-0.01	6.64	6.77	2.61
Food	0.61	10.24	3.76	2.64
Textile	-9.52	-10.45	-10.37	2.68
Clothing	-15.96	-38.16	-2.27	2.69
Furniture and other wood products	1.07	-0.23	-13.35	2.97
Paper and paper products	1.68	10.77	-10.31	2.90
Transportation vehicles and their parts	-4.14	9.19	21.43	2.62
Metal and its products and minerals	1.02	5.63	9.59	2.92
Chemicals	0.36	2.04	0.14	2.99
Electronic and electrical equipment	8.86	8.83	-4.87	3.11
Equipment	0.27	3.67	2.86	2.95
Other devices	0.06	-7.29	-5.98	3.40
Building	-0.61	9.19	-10.88	2.98
Electricity	-0.33	4.61	-11.88	2.57
Natural gas production and retail	-0.85	-4.25	-8.14	2.76
Water supply	0.08	16.53	-16.18	2.74
Communication	0.34	11.92	-11.08	2.69
Transportation	-0.01	-7.52	-10.19	2.91
Business	0.83	12.23	-11.17	2.61
Finance and Insurance	0.65	13.02	-11.26	2.61
Entertainment industry	0.42	12.12	-11.32	2.65
Other service	-0.31	-54.91	-11.41	2.65
Overall level	-0.69	2.17	-3.28	2.84

Data source: compiled based on the calculation results of the GTAP model.

4. Conclusions and Recommendations

This paper uses the GTAP model to assess the impact of a lower RMB/USD exchange rate on the Chinese economy from both the macroeconomic and industrial sectors during the period from March 2018 to May 2020, and also simulates and analyzes the impact of a further weakening of the RMB exchange rate and a rebound of the RMB exchange rate on the Chinese economy to obtain the following conclusions and policy recommendations.

4.1. Research Conclusion

Firstly, the recent weakening of the RMB (against the US dollar) has had a double impact on the Chinese economy. On the one hand, it has raised China's GDP, resident income, and also boosted China's export growth and improved China's terms of trade, but on the other hand, it has led to a decline in China's net return on capital, social welfare, and the scale of output and imports, and has also caused China's trade surplus to widen, causing prices to rise significantly.

Secondly, if the exchange rate of the RMB falls further, it will further increase the scale of China's GDP, income and output, and further improve China's terms of trade, but the curbing effect on the scale of China's output and imports will be further enhanced, and may further push up China's foreign trade surplus and price level. These positive and negative impacts on the Chinese economy would be reduced if the exchange rate of the RMB were to rebound.

4.2. Policy Recommendations

China's economy has great potential and vitality, in the long term, the RMB is unlikely to depreciate in the long term, but in the short term, due to the current investors' expectations of the market, domestic and foreign monetary policy and the global economic downturn and other factors, the downward trend of the RMB exchange rate is likely to continue for some time. The research in this paper showed that a lower RMB exchange rate has both positive and negative effects on the Chinese

economy, so effective measures are necessary to avoid disadvantages.

Firstly, emphasis should be placed on the positive effect of a lower RMB exchange rate on the promotion of China's exports and economic growth, yet at the same time, also the negative impact on the domestic capital return aspect. The research shows that a lower RMB exchange rate is conducive to promoting China's GDP and income growth, but it will lead to a decline in the domestic return on capital, and thus deserves our great attention. In response to the negative economic impact of the New Crown epidemic, some developed countries are trying to attract their companies overseas to relocate back to China [on April 11, 2020, the Japanese government announced $2.2 billion to assist Japanese companies to leave China; on April 12, Kudlow, chairman of the White House National Economic Conference, urged all U.S. companies in China to evacuate, and also claimed that for moving costs for U.S. companies moving back from China, the U.S. government gives 100% direct reimbursement. Source: https://news.sina.co m.cn/c/2020-04-14/d   oc-iircuyvh7763427.shtml]. Although the profit-driven nature of capital dictates that there will not be a mass exodus of foreign investors from China (since China has a huge consumer market), this does not mean that we can rest easy. Therefore, the central bank needs to intervene moderately in the foreign exchange market to prevent a sustained and significant decline in the RMB exchange rate, and at the same time, it should strengthen capital market management to prevent massive capital flight [21]; in addition, it should deepen reforms to further reduce various burdens on enterprises, lower their operating costs, create a more favorable development environment for enterprises, and increase the net return on capital.

Secondly, great importance is attached to the negative impact of a lower RMB exchange rate on China's import trade. The research in this paper creating that a lower RMB exchange rate can promote China's export growth, which helps mitigate the impact of the current reduction in foreign demand on China's exports, but at the same time stifles the development of China's import trade, leading to the expansion of China's foreign trade surplus. Therefore, while promoting the development of export trade, it is essential to actively expand imports, which will not only help promote the balanced development of China's import and export trade, but also drive the economic recovery of exporting countries and thus strengthen economic ties with trading partners, which will both improve the external environment for China's economic and trade development and further meet the needs of the domestic market, optimize resource allocation and promote the coordination of China's industrial structure Development. In terms of import expansion, while continuously expanding the import of high-quality daily consumer goods to meet people's expectations for a better life, enterprises are actively encouraged to expand the import of advanced technologies and equipment, etc., so as to raise the technological level and international competitiveness of China's industries and promote the upgrading of Chinese industries.

Thirdly, a strong focus on the impact of a lower RMB exchange rate on domestic prices and social welfare. The research in this paper shows that a lower RMB/USD exchange rate between April 2018 and May 2020 raised China's price level by 3.34%, resulting in a decline in social welfare of US$11.922 billion. The study also shows that a RMB exchange rate that weakened further could further push up the domestic price level, especially by significantly increasing the prices of agricultural products such as vegetables, fruits and livestock products, resulting in a further reduction in social welfare in China. For this reason, it is necessary to plan ahead and increase the market supply of the above-mentioned important agricultural products to stabilize market prices and reduce consumer welfare losses, and at the same time, further improve the livelihood security system for low-income groups to reduce the negative impact of a weaker RMB exchange rate.

Fourthly, support for key industries should be done. The research in this paper shows that the lower RMB exchange rate has caused a significant decline in the production of textiles, clothing and sugar in China. These industries are labor-intensive and absorb a large amount of China's labor force employment. Faced with the possible negative impact of a lower RMB exchange rate on these industries, active measures should be taken. On the one hand, a corresponding early warning mechanism needs to be established expeditiously, and on the other hand, preparatory work such as labor training and re-employment in these industries needs to be done well in order to reduce the negative impact brought about by the significant decline in output in these industries.

Acknowledgment

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