The Economic and Trade Effects of RCEP Agreement in China and Other Member Countries: An Empirical Study Based on GTAP Model

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Abstract: Based on GTAP model, this paper analyzes the impact of RCEP on the economic effects and trade cooperation in China and other member countries. We build a global trade analysis model (GTAP) to simulate and forecast the economic effects of the tariff and non-tariff barrier reduction measures of the RCEP agreement. We divide the industries into 8 groups according to their roles in the industry chain and predict the future trend of economic cooperation between China and other RCEP member countries. The results show that China will meet a higher increasing status in labor-intensive industries, especially in low and medium-tech manufacturing and livestock. RCEP will donate an increase in global investment by 1.03%, and China shall take the opportunity of the RCEP to expand and enhance its foreign trade and investment cooperation.

1 INTRODUCTION

On January 1, 2022, the Regional Comprehensive Economic Partnership Agreement (RCEP) came into force. It adopted the rules of origin accumulated in the region, which greatly reduced the tariffs on trade in goods, while promoting investment liberalization and facilitation using negative lists. The traditional economic and trade relations between China and RCEP member countries are close (see Fig.1), RCEP member countries are also the main destinations for Chinese enterprises to "go out" for investment. Efficient docking of RCEP agreements will help to continuously inject new momentum into China's dual circulation, and advance China opening-up in the new era.

It has been half a year since the formal implementation of RCEP, can the terms and rules provide support and consolidation for the multilateral trade and investment system of the RCEP region? If it promotes the development of regional economic integration? What strategies should China use to seize the opportunities for regional cooperation and prevent economic shocks from other member countries? In order to answer the above questions, this paper will build a global trade analysis model (GTAP) to simulate and forecast the economic effects of the tariff and non-

tariff barrier reduction measures of the RCEP agreement. We divide the industries into Crop, Husbandry, Forestry and Fishery, Low-Manufacturing, Middle Low-Manufacturing, Middle High-Manufacturing, Service, predicting the future trend of GDP and import, export, investment cooperation between China and RCEP member countries.

2 METHODOLOGY

The signing of the RCEP has received widespread attention from many scholars, who have used a variety of analytical tools to analyze and predict the possible economic impact of the RCEP. The research mainly focuses on two aspects: First, the scholars' prospects for the future development of RCEP, as well as the analysis and deduction of its possible problems. Scholars use the GTAP model to analyze ASEAN, Japan, China, and so on. They discuss the impact of RCEP on its welfare, GDP, import and export and other trade effects (Itakura K, 2014; Ratna R S, 2016; Li, 2018; Wen, 2021). The Second is a comparative analysis of RCEP and TPP and other regional cooperation. They analyze the relationship between RCEP and other regional organizations, and explore whether it is a competitive or complementary relation
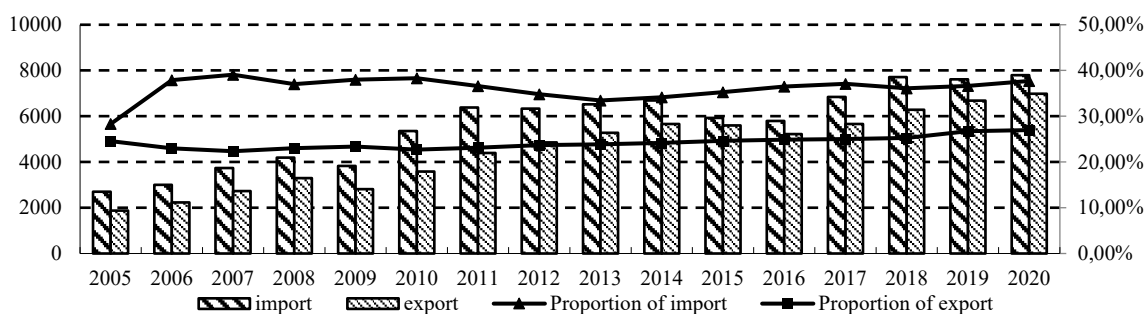
Figure 1: China's imports and exports to RCEP members (Billions of dollars, %).

Table 1: GTAP model industry group division.

code	abbreviations	industries	initial industry numbers of the GTAP model	HS2 code
Cro	crop	Grains, fruits, vegetables, nuts, etc	1~8	7~14, 52, 53
Hus	Husbandry	Cattle, sheep and horses, animal products, etc	9~12	1, 2, 4, 5, 41, 50
Fofi	Forestry and Fishery	Forestry and Fishery	13, 14	3, 6
LM	Low-Manufacturing	Food, tobacco, textiles, furs, wood, paper and other products	19~31, 45	15~24, 42~49, 54~67, 97
MLM	Middle Low-Manufacturing	Rubber and plastic products, mineral products	15~18, 32, 35~39	25~27, 39, 49, 68~83
MHM	Middle High-Manufacturing	Chemical products, essential medicines, electronic machinery and equipment, transportation equipment, etc	33, 34, 40~44	28~38, 84~89, 90~96
Util	Utilities Service	water, electricity, gas	46~48	/
Otse	Other service	Tourism, communications, finance, etc	49~65	/

ship (Ye, 2015; Yamamoto, 2018). However, to our knowledge, there is no systematic quantitative analysis of the effect of RCEP. Our principal objective in this paper is to fill this void by quantifying the economy and trade effect caused by the RCEP, giving predict to the future RCEP cooperation.

To be specific, we use software of RunGTAP 3.75 to run simulations of the RCEP cooperation. GTAP is formulated and solved using GEMPACK, a flexible system for solving AGE models. RunGTAP allows us to run simulations interactively in a Windows environment using the GTAP general equilibrium model. We run the standard GTAP Model with GTAP Data Base 10.0, and use other programs such as AnalyseGE and GTAPView to analyze the economic variables.

2.1 Model Settings

We divide the 141 countries into 11 regional groups based on the GTAP10.0 database, namely China (CHI), Japan (JAP), South Korea (KOR), Australia (AUS), New Zealand (NZL), ASEAN (ASEAN), European Union (EU_27), the United States (USA), Russia (RUS), India (IND), and other countries in the world (rest) (Table 1).

According to the RCEP agreement, the export subsidy measures for agriculture will be completely abolished. The service industry does not involve tariff reduction, and the Utilities Service does not participate in any non-tariff reduction. As a result, we fully consider the key role of manufacturing industry in China's economic development, and refer to Rahman and Rahman (Rahman M M, 2015), dividing the 65 industries of the GTAP model into 8 industrial groups. The codes, abbreviations, industries included, initial industry numbers of the GTAP model and HS2 codes for each industry group are shown in Table 1.

2.2 Simulation Scheme Settings

Since the RCEP agreement was officially implemented in 2022, we set 2021 as the base year for simulation predictions, and refer to the study of Ahmed et al. (Ahmed Y N, 2020) to update the database to 2021. In this paper, the import tariff tax intensity (tms) and the implementation of non-tariff measures (ams) are used as policy shock variables to simulate and predict.

In the setting of tariff shock, this paper uses the weighted average method with the weight of imports to quantify the tariff commitment table with reference to the research of Petri&Plummer (Petri P A, 2019).The first step is to correct the tariff data of the GTAP10.0 database according to the base rate listed in the RCEP tariff commitment table: First, calculate the base rate of the HS8 code by arithmetic average, and then calculate the base rate for HS2 code of China, Japan, South Korea, Australia, New Zealand and ASEAN to other RCEP member countries on the basis of the import volume in 2021. The second step is to calculate the tariff reduction of the member countries after the full implementation of the RCEP agreement according to the tariff rates listed in the tariff commitment table for the first 20 years of the agreement's entry into force. That is to calculate the tariff change rate of HS8-bit coded goods in the 20th year, and then calculate the tariff change rate of HS6-bit coded goods by arithmetic average. The third step is to take the import volume in 2021 as the weight to calculate the tariff reduction rates of China, Japan, South Korea, Australia, New Zealand and ASEAN to other RCEP member countries in the 8 industrial groups as shown in Table 1.

In the setting of non-tariff shock, it is mainly divided into two parts: trade in goods and trade in services. According to the agreement of RCEP, this article sets up that within the RCEP region, export subsidies for agricultural products will be reduced by 100%, quantitative restrictions by 100%, sanitary and phytosanitary measures by 10%, technical barriers to trade by 10%, safeguard measures by 10%, and anti-dumping, countervailing and tariff quotas remain unchanged. Based on the number of non-tariff barrier measures implemented by RCEP member countries in the six major industries of agriculture, animal husbandry, forest fishery, low-tech manufacturing, low-and low-tech manufacturing, medium-and high-tech and high-tech manufacturing in 2020, the reduction degree of non-tariff barriers in the six major goods trade industries is calculated.

As for the reduction of non-tariff barriers to trade in services, after the full implementation of RCEP, the reduction of non-tariff barriers to trade in services among member countries will tend to be consistent. According to the commitment table, the member countries of RCEP do not make any commitment to the field of public services, and there are basically no restrictions on cross-border provision, overseas consumption and commercial existence in other service areas, but there are restrictions on the movement of natural persons. Accordingly, there is no reduction in non-tariff barriers in public services in the RCEP region, and a 30% reduction in other service sectors.

3 EMPIRICAL RESULTS

3.1 Economic Effect

After the RCEP taking effect, the change rates of GDP and import and export-related indicators of countries are shown in Table 2. The simulation results show that, the per GDP of China, Japan, South Korea and Australia will increase, while that of New Zealand and ASEAN will decrease. It indicates that current economies with a higher level of gross national income and a better degree of economic development and foundation have a greater degree of improvement in their income level after enjoying RCEP trade barrier reduction measures. On the contrary, if the economic foundation is worse than others, the smaller the degree of improvement, and may produce trade substitution effect, the GDP will slightly decrease.

3.2 Trade Effect

First, the scale of import and export has increased. After the implementation of RCEP, China, Japan, South Korea, Australia, New Zealand, ASEAN imports and exports and trade dependence have all increased. China's import and export can be greatly increased, and the degree of trade dependence will also increase, but it is lower than that of other member countries.

Table 2: Economic and Trade Effect (%).

Country	GDP	import	export	trade dependence	Country	GDP	import	export	Trade dependence
CHI	0.54	34.40	22.10	0.26	EU_27	-0.14	-3.61	-1.64	0.00
JAP	0.39	38.50	29.50	0.28	USA	-0.06	-8.33	-0.59	-0.03
KOR	0.43	56.30	37.80	0.43	RUS	0.01	-6.50	-3.63	-0.02
AUS	0.34	45.40	28.60	0.37	IND	-0.19	-6.30	-3.03	-0.02
NZL	-0.34	49.50	39.10	0.39	REST	-0.19	-5.87	-2.82	-0.01
ASEAN	-0.10	38.70	29.90	0.34					

Table 3: Rate of change in imports and exports of products (%).

Country	Cro	Hus	Fofi	LM	MLM	MHM	Util	OtseOtse
				import				
CHI	39.24	51.55	31.38	46.79	43.49	32.40	12.33	13.30
JAP	19.98	23.78	16.42	57.78	39.19	29.97	36.07	37.56
KOR	20.16	37.34	33.05	101.20	51.43	60.86	25.94	36.72
AUS	44.38	50.71	23.11	99.58	42.80	43.36	1.49	5.62
NZL	42.43	63.18	35.23	89.70	48.12	41.59	38.60	31.04
ASEAN	47.84	85.79	52.94	72.72	42.81	33.62	12.47	14.97
EU_27	-3.53	-4.31	-3.69	-3.71	-3.96	-3.14	-2.99	-3.99
USA	-5.41	-5.69	-5.14	-9.45	-4.31	-10.58	-5.07	-6.98
RUS	-3.39	-5.34	-4.59	-7.31	-7.34	-6.33	-4.60	-6.24
IND	-8.68	-14.60	-10.08	-10.54	-4.36	-8.80	-5.31	-6.82
REST	-4.96	-6.20	-5.33	-6.70	-6.14	-5.18	-5.15	-6.49
				export				
CHI	93.50	28.40	23.30	26.40	75.60	11.50	-23.80	0.01
JAP	104.00	82.00	70.90	64.10	179.00	3.35	-58.00	-8.63
KOR	184.00	159.00	80.40	137.00	171.00	6.64	-34.20	-9.62
AUS	71.2.0	89.80	143.00	115.00	-0.10	144.00	-5.81	23.90
NZL	156.00	174.00	40.30	28.40	20.40	130.00	-70.40	-8.67
ASEAN	107.00	69.60	86.40	34.90	64.80	25.20	-29.70	-2.57
EU_27	-3.93	-7.01	-4.92	-4.86	-9.76	-0.13	-4.19	2.65
USA	-6.57	-17.90	-8.73	-11.00	-7.37	1.39	3.05	5.40
RUS	-4.97	-14.30	-11.50	-6.95	-5.50	5.32	-0.50	4.80
IND	-4.71	-3.01	-5.46	-9.17	-13.1	0.47	7.15	5.70
REST	-5.11	-6.70	-6.63	-3.30	-10.00	5.30	0.47	5.28

Second, there are differences in products in import and export in different countries, and the scale of China's labor-intensive industries trade is increasing faster. China will increase the import of husbandry, Low-Manufacturing and Middle Low-Manufacturing. Making full use of the advantages of RCEP cooperation can help China to further expand its cooperation in animal husbandry. In addition, imports of Middle Low-Manufacturing and Low-Manufacturing industries have also increased significantly. With the RCEP investment and trade liberalization and facilitation measures, the production links of some labor-intensive industries will be further transferred to countries such as Vietnam, where land and labor costs are lower, and importing Low-Manufacturing from

RCEP member countries is more in line with comparative advantages. Therefore, RCEP may also accelerate the transfer of labor-intensive industries to ASEAN countries with lower land and labor costs, posing new challenges to the value chain status of China's industrial chain. About service industry, China still has a long way to go in service trade. In terms of export products, China's exports of agriculture and Middle Low-Manufacturing industries will be greatly improved. The simulation results show that Southeast Asia will become an important export market for labor-intensive, resource-intensive and simple technology-intensive manufactured goods, and there is increased competition between Southeast Asia and China in labor-intensive and simple technology-

Table 4: The rate change of China's imports and exports (%).

					import					
qxs	JAP	KOR	AUS	NZL	ASEAN	EU_27	USA	RUS	IND	REST
Cro	21.20	25.60	18.30	37.90	38.40	-1.12	-0.62	-1.07	-0.37	-0.79
Hus	41.50	37.70	10.20	38.70	46.90	-2.95	-2.54	-2.93	-2.06	-2.69
Fofi	12.40	20.60	5.61	3.97	21.10	-1.45	-1.18	-1.28	-1.05	-1.20
LM	21.20	24.00	30.00	6.05	23.30	-2.09	-1.42	-1.71	-1.24	-1.47
MLM	48.20	51.00	-2.78	5.30	43.70	-5.38	-4.68	-4.54	-4.84	-4.21
MHM	9.90	2.59	61.10	55.30	10.40	-0.67	0.04	-0.13	-0.18	-0.10
Util	-5.32	-2.93	0.93	-6.63	-1.37	2.01	2.61	2.46	2.60	2.55
Otse	2.34	2.03	8.28	3.65	5.66	0.86	1.30	1.16	1.35	1.29
					export					
qxs	14.90	5.02	22.60	7.06	28.90	-3.19	-3.39	-2.98	-3.41	-3.26
Cro	1.79	15.70	13.00	9.64	28.70	-3.15	-3.45	-2.86	-1.94	-3.11
Hus	1.72	8.14	3.82	3.58	13.40	-2.28	-2.05	-2.25	-1.35	-2.29
Fofi	4.09	20.60	34.60	23.40	30.10	-3.42	-3.12	-3.11	-3.21	-3.35
LM	23.40	28.20	48.00	39.40	41.40	-4.01	-3.85	-3.44	-3.96	-3.95
MLM	-0.93	13.20	11.3	12.60	19.50	-2.77	-2.31	-2.45	-2.07	-2.51
MHM	0.39	-0.51	-3.11	1.05	-1.56	-3.49	-3.82	-3.67	-3.76	-3.74
Util	8.12	7.90	5.10	6.99	6.48	-2.50	-2.58	-2.64	-2.69	-2.73

intensive manufactured goods industries.

Third, in terms of product structure, the cooperation between China and Japan will increase significantly in animal husbandry and Low-Manufacturing, while cooperation with South Korea will increase significantly in forest and fishery, Low-Manufacturing and Middle Low-Manufacturing. Cooperation with Australia in Low-Manufacturing and Middle High-Manufacturing and other services increases, while cooperation with New Zealand is in agriculture and high-tech manufacturing. There are more imports from ASEAN countries in agriculture, animal husbandry, forest fisheries and Middle Low-Manufacturing industries. It can be seen that the industries of China and RCEP member countries complement each other, and further strengthening the cooperation of key industries between China and other countries will help to further enhance the overall international competitiveness of regional industries.

3.3 Investment Effect

From the perspective of global investment, after the implementation of RCEP, the total global investment will rise by 1.03%, and the average price of global investment goods will reduce by 0.294%. It will increase the price of investment goods in China, which will increase investment expenditure, and the growth rate of regional trade and investment, and bring sig-

nificant marginal improvement to the long-term momentum of China's economic growth. RCEP countries are the main destinations for Chinese enterprises to "go out" for investment. Under the role of "tariff concessions" and "rules of origin", China will usher in great opportunities for development and opening up a new situation for enterprises to "go out".

4 CONCLUSIONS

Based on GTAP database variables, this paper explores the impact of RCEP on China, and predicts the impact of economic and trade cooperation between China and RCEP member countries in the future. The study found that: first, the effective implementation of RCEP can bring positive economic and trade effects to member countries, such as general growth in economic indicators such as GDP and import and export volume. Second, China has differences in the changes in import and export products from different countries. Third, the signing of RCEP will increase total global investment by 1.03%, and China shall also make good use of RCEP to expand its foreign investment cooperation.

In order to comprehensively improve the level of bilateral economic and trade cooperation and effectively deal with the negative impact accompanied by integration, this paper puts forward the following

countermeasures and suggestions from the perspective of China: First, we should jointly implemented the RCEP and accelerate connectivity, creating "a highland for development". Second, we should advance China's industrial upgrading and strengthen the status of the supply chain value chain. Third, to build a new open and cooperative platform for high-quality implementation of RCEP.

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