Study on the Ternary Margin of China's Export Growth of Agricultural Products to RCEP Member Countries

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ABSTRACT

On November 15, 2020, the "Regional Comprehensive Economic Partnership" (RCEP) was officially signed, which meant the birth of the world's largest free trade zone. RCEP is intended to create a comprehensive and inclusive free trade agreement, which provides new opportunities for the development of China's agricultural product trade under the current uncertainties of economic globalization, growing trade protectionism, the impact of the pandemic, and the slowdown of world economic development. China and RCEP member countries have close trade contacts as well as a long history of cooperation, and the two parties are highly complementary with great potential. The article selects RCEP member countries as the research object and uses a ternary margin analysis framework to decompose China's export growth of agricultural products to RCEP into expansion margin, quantity margin, and price margin, more intuitively showing the growth pattern of China's agricultural exports to RCEP member countries from three dimensions. The research results show that China's agricultural exports to RCEP member countries are mainly based on a growth model with quantity increase as the mainstay and price increase as the supplement; China's agricultural exports to Australia and New Zealand are mainly affected by the expansion margin and quantity margin, and its agricultural exports to Japan, South Korea, and ASEAN mainly rely on the price margin.

Keywords: Ternary margin, Agricultural products, RCEP.

1. INTRODUCTION

The "Regional Comprehensive Economic Partnership" mainly includes 10 ASEAN countries, namely, Japan, South Korea, Australia, New Zealand and China, covering a population of 2.27 billion, a GDP of 26 trillion US dollars, and a total export of 520 million. RCEP negotiations began in November 2012 and lasted for eight years with 31 formal negotiations. The "Regional Comprehensive Economic Partnership" was formally signed on November 15, 2020, and the world's largest free trade agreement was born thereout.

Among the RCEP member countries are the world's major agricultural product importers Japan and South Korea, as well as Thailand, Australia and other major agricultural product exporters in the world. From 2000 to 2019, China's agricultural exports to RCEP member countries increased from 9.698 billion US dollars to 38.714 billion US dollars, an increase of 299.21%, with an average annual growth rate of 26.94%, showing that the agricultural product trade relations between China and RCEP member countries are getting closer. The conclusion of RCEP will further strengthen the agricultural exchanges between member countries and promote the development of agricultural product trade.

China is a big agricultural product trading country. Therefore, grasping the opportunity of signing the "Regional Comprehensive Economic Partnership" and exploring the ternary marginal factors influencing the growth of agricultural exports to RCEP member countries can not only find out the characteristics of China's agricultural export growth to RCEP member countries, but also make targeted suggestions to improve agricultural exports, integrate agricultural product resources, ensure the reasonable flow of resources, realize the healthy development of

agricultural product trade, and promote the upgrading of agricultural export structure.

Most of the current literature on China's agricultural product trade with RCEP member countries focuses mainly on trade potential, export competitiveness and complementarity. Fewer studies have examined the growth pattern of China's agricultural exports to RCEP member countries. Xue Kun and Zhang Jiguo (2016) [1] explored the scale and structure of agricultural product trade between China and RCEP member countries. And the empirical results showed that some agricultural products between China and RCEP member countries were highly complementary. Sun Lifang (2017) [2] explored China's export competitiveness of RCEP agricultural products and its influencing factors, and the results showed that China's agricultural exports to RCEP countries have a lot of room for improvement. Liao Chengsheng (2017) [3] studied the impact of green trade barriers on the RCEP member countries of China's agricultural exports, and through empirical quantitative analysis, he explained that the green trade barriers would increase the cost of China's agricultural products trade and hinder China's agricultural exports. Lu Yanlin (2018) [4] conducted a quantitative analysis of the current situation and development potential of agricultural product trade between China and RCEP countries. The research results showed that China and RCEP countries have great potential for agricultural product trade development. Lin Qingquan, Zheng Yi, Yu Jianhui (2021) [5] studied the competitiveness and complementarity of agricultural products between China and RCEP member countries, and the results of the study showed that the international competitiveness of Chinese agricultural products was relatively weak, but they were highly complementary to the agricultural products of RCEP member countries. Zhang Lichen, Wang Yanqing, and Guo Liping (2020) [6] analyzed the impact of RCEP on the development of agriculture in China, and also analyzed the impact of RCEP on the development of agricultural industry in Heilongjiang Province. Liu Yizhuo, Kong Weisheng, and Wang Dan (2021) [7] discussed the current status of agricultural trade cooperation between China and RCEP members, believing that the signing of RCEP would enhance the export competitiveness of China's agricultural products, expand China's agricultural trade development space, and improve the investment environment to promote China's agricultural "going global".

Based on his research, Shi Bingzhan [8] split the intensive margin into price margin and quantity margin, and proposed that a country's export growth could be divided into three models, which were mainly divided according to the elasticity of substitution between products. With the continuous deepening of research, the development of the ternary margin analysis framework has become more mature, and scholars have applied it to the study of export growth in different industries. With regard to different time points and differences in research objects, expansion margin, price margin, and quantity margin all play different roles in export growth. At present, there is no relevant conclusion on the growth model of China's agricultural exports to RCEP. Based on the research foundation of Hummels & Klenow [9], this article uses Shi Bingzhan's ternary margin analysis framework to explore the ternary margin of agricultural exports from China to RCEP member countries.

2. CURRENT DEVELOPMENT OF CHINA'S AGRICULTURAL PRODUCT TRADE WITH RCEP MEMBER COUNTRIES

Agricultural products refer to all animal and plant products produced by various agricultural productions. Perishability, short shelf life and difficult to storage and transport are characteristics of most agricultural products. The agricultural products of WTO trade statistics are mainly classified according to the part 0, part 1, part 2 (excluding the 27th and 28th group) and part 4 of the SITC classification.

2.1 Trade Scale

After the rapid growth of China's agricultural export trade to RCEP member countries at an average growth rate of 10.86% from 2000 to 2011, the average growth rate from 2012 to 2019 was 3.73%, and the growth rate slowed down significantly. The average annual growth rate of China's agricultural imports from RCEP member countries in 2000-2011 was 28.10%, while the average growth rate in 2012-2019 was only 3.36%. A deficit began to appear after 2002 and reached its maximum value of 105.252 billion U.S. dollars in 2019. It could be seen that China's dependence on the trade of agricultural products of RCEP member countries was growing.

The proportion of China's agricultural exports to RCEP member countries in China's total agricultural exports was growing steadily, reflecting from the side that RCEP member countries had a stable trade status in China's agricultural export market. However, the

proportion of China's agricultural imports from RCEP member countries in China's agricultural imports has been stable at around 30%, with an upward trend in recent two years, indicating that

China's dependence on agricultural products from RCEP member countries has increased. As shown in "Figure 1".
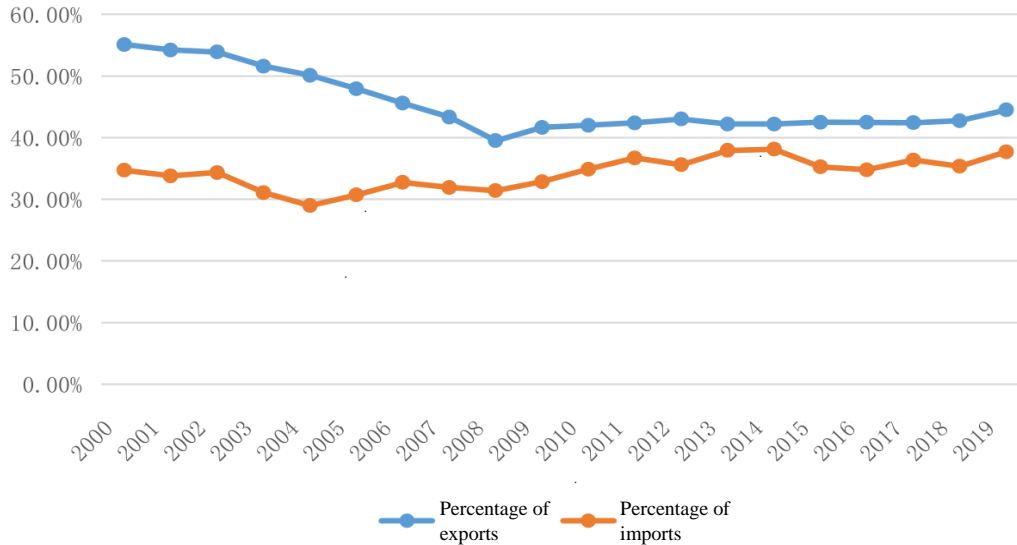

Figure 1 The proportion of China's agricultural products import and export to RCEP member countries in China's agricultural products import and export from 2000 to 2019.

2.2 *Export Market and Import Market*

It can be seen from "Table 1" that the structure of China's agricultural exports to RCEP member countries is relatively concentrated and relatively stable. Japan, a traditional exporter of agricultural products to China, has been occupying the largest export market; South Korea was the second largest export market from 2000 to 2018, and its proportion of export share showed a trend of decline with fluctuation. In 2019, Vietnam overtook South Korea to become the second largest export market. During the period 2000-2019, although the proportion of trade volume of various countries fluctuated, it was

mainly concentrated in several countries such as Japan, South Korea, Malaysia, Indonesia, Vietnam, and Thailand, and the export market structure was relatively stable.

The structure of the import market was similar to the structure of the export market, with a relatively stable structure and a high degree of concentration. Over 80% of the amount of imports was concentrated in the top five importing countries, with the main countries being Australia, Indonesia, Malaysia, Thailand and Japan.

Table 1. China's main import and export markets of agricultural products to RCEP member countries and their proportion in 2019

Ranking / Import and export	First place	Second place	Third place	Fourth place	Fifth place	Cumulative proportion (%)
Export	Japan 31.84%	Vietnam 14.97%	South Korea 14.64%	Thailand 9.98%	Malaysia 8.12%	79.56%
Import	Australia 57.22%	Indonesia 8.98%	Thailand 7.96%	New Zealand 7.95%	Malaysia 4.28%	86.40%

2.3 Product Trade Structure

According to the standard of WTO trade, agricultural product calibers are classified into four categories: 0, 1, 2, and 4 according to the SITC classification. Among the four major categories of agricultural products China exports to RCEP member countries, Category 0, food and live poultry, accounts for the largest share. During the inspection period, the annual exports accounted for about 80% of China's total agricultural exports to RCEP member countries.

China's imports from RCEP member countries accounting for the highest proportion of the four categories belonged to Category 2: non-edible raw materials other than fuel, which accounted for about 73.18% in 2019; followed by Category 0: food and live poultry, which accounted for 21.21% in 2019. It can be seen that China's agricultural trade with RCEP member countries is highly complementary.

3. CHARACTERISTICS OF THE MARGINAL GROWTH OF CHINA'S AGRICULTURAL EXPORTS TO RCEP MEMBER COUNTRIES

3.1 Thoughts on the Ternary Margin Analysis of China's Agricultural Exports to RCEP Member Countries

From 2000 to 2019, the number of agricultural products exported by China to RCEP member countries showed an upward trend, and the number of exports declined in 2019. The average export value tripled from 2000 to 2019. At the same time, the value quantity of different agricultural products was expanding, and the variance in 2019 increased by more than three times compared with 2000, showing that with the development of social economy, the added value of China's agricultural exports to RCEP increased. There was basically no change in the minimum value. The maximum value reached its

peak in 2018, which was more than 13 times that of 2000. On the whole, except for the minimum value that basically remained unchanged, the other values showed a rapid upward trend, indicating that China's export market to RCEP member countries was expanding, the value quantity of agricultural products was increasing, and the market of RCEP member countries had a greater development potential. Therefore, it is necessary to further study which of the expansion margin, quantity margin, and price margin the export growth mainly depends on.

This paper decomposes China's agricultural exports to RCEP member countries in a ternary manner using Hummels & Kleno's approach and Bing-Zhan Shih's ternary marginal analysis framework, drawing on relevant studies by scholars [10-16]. At the same time, it decomposes the agricultural export trade into expansion margin, quantity margin and price margin. According to the decomposition results, the three different dimensions of China's agricultural exports to RCEP member countries are multiplied and aggregated according to their proportions in the total agricultural exports of other countries in the world to RCEP member countries. The results of the overall export performance of agricultural products of RCEP member countries can be obtained.

3.2 The Results of the Ternary Margin Measurement of China's Agricultural Exports to RCEP Member Countries

According to the ternary margin analysis framework and the corresponding data in the CEPII-BACI database, the ternary margin of China to RCEP member countries is calculated. At the same time, it calculates the average annual growth rate of each margin from 2000 to 2019, and the results are shown in "Table 2":

Table 2. Ternary marginal decomposition of China's agricultural export growth to RCEP member countries from 2000 to 2019

Year (t)	Extension margin	Intensive margin (depth/Im)		
	(Breadth/Em)	Depth (Im)	Price margin (P)	Quantity margin (Q)
2000	0.8788	0.3824	0.9687	0.3947
2001	0.9001	0.3749	0.9578	0.3915
2002	0.8876	0.3997	0.9836	0.4064
2003	0.8761	0.4298	0.9839	0.4369
2004	0.9051	0.4074	0.9840	0.4140
2005	0.9080	0.4316	0.9945	0.4340

Year (t)	Extension margin	Intensive margin (depth/Im)		
	(Breadth/Em)	Depth (Im)	Price margin (P)	Quantity margin (Q)
2006	0.8974	0.4524	1.0075	0.4490
2007	0.9203	0.4509	0.9909	0.4551
2008	0.9091	0.4547	1.0039	0.4529
2009	0.8925	0.4585	1.0148	0.4518
2010	0.8867	0.4519	1.0184	0.4438
2011	0.8753	0.4470	1.0179	0.4391
2012	0.8580	0.4588	1.0304	0.4453
2013	0.8910	0.4478	1.0344	0.4329
2014	0.8701	0.4555	1.0279	0.4432
2015	0.8674	0.4705	1.0535	0.4466
2016	0.8753	0.4645	1.0454	0.4444
2017	0.8639	0.4692	1.0415	0.4505
2018	0.8774	0.4650	1.0502	0.4428
2019	0.8871	0.4567	1.0454	0.4368
Average annual growth rate	0.0005	0.0099	0.0042	0.0056
Contribution rate	4.85%	95.15%	40.79%	54.37%

a   Data source: Calculated according to CEPII database

Through the overall observation of the data, China's agricultural exports to RCEP member countries are showing an increasing trend, and the expansion margin maintained a relatively high level from 2000 to 2019, with an average of 0.8864. In terms of absolute figure, the closer the expansion margin value was to 1, the more types of products China exported, which was consistent with China itself as a major exporter of agricultural products. At the same time, it also showed that the types of agricultural products that China exported to RCEP member countries had a certain overlap with the types of agricultural products exported to RCEP member countries in the world. Observed by dividing the time period, it was found that the expansion margin was at the highest value from 2005 to 2008, which may be due to the positive effects of the establishment of the China-ASEAN Free Trade Area in 2006, promoting the increase in the types of agricultural exports from China to RCEP member countries. From 2008 to 2012, it experienced a short-term decline with a decrease of 5.62%, indicating that the impact of the global economic crisis had a negative effect on the growth of China's agricultural exports to RCEP member countries.

Compared with breadth, China's depth growth in RCEP member countries from 2000 to 2019 was relatively fast. After the depth was subdivided further, the two margins of quantity and price could be obtained. It could be seen that the growth rate of

the price margin was relatively slow, and at the same time, it was relatively volatile and unstable. It was preliminarily speculated that this was related to the changes in the world economic environment, leading to a trend of wavelike rise of it. From 2011 to 2013, the price margin increased steadily, with an average annual growth rate of 1.62%. This was related to China's economic policy of stabilizing the RMB exchange rate and promoting the steady growth of the domestic economy. However, the average annual growth rate of margin price from 2000 to 2019 was much lower than the annual average growth rate of quantity margin. Since 2008, the price index has fluctuated slightly above 1. This may be due to the impact of the economic crisis, foreign exchange rate fluctuations, and the continuous emergence of trade barriers, which affected the export prices of agricultural products, but the price level of China's agricultural exports to RCEP member countries was relatively high. The price margin was second only to the quantity margin in terms of contribution rate among the three indexes, indicating that China needed to increase export prices to increase export trade volume.

It could be seen from "Table 2" that the average annual growth rate of the quantity margin was higher than the price margin, indicating that the quantity of agricultural exports rose relatively rapidly in recent years, and there was a relatively large decline from 2008 to 2011. It could be inferred that the impact of

the economic crisis had a negative effect on the marginal growth of China's agricultural exports to RCEP member countries. The quantity margin had the largest contribution rate to the growth of export trade, which could initially reflect that China's growth pattern of agricultural exports to RCEP member countries was "quantity increase as the mainstay and price increase as the supplement".

3.3 The Ternary Margin Analysis of Different Regions

Due to the differences in the level of economic development of RCEP member countries and the different needs of different countries and regions, in order to further explore the characteristics of China's export growth to different countries and regions of RCEP member countries, a ternary marginal decomposition will be carried out for the five regions of Australia, New Zealand, Japan, South Korea, and ASEAN. After calculation, the following "Table 3" is obtained:

Table 3. Analysis of China's agricultural exports to different regions of RCEP

Year	Dimension	Australia	New Zealand	Japan	South Korea	ASEAN
	Breadth Em	0.6579	0.6078	0.8282	0.7169	0.96
2000	Price Pjm	1.094	1.0202	0.9439	0.8604	0.9983
	Quantity Qjm	0.0456	0.0215	0.1486	0.2776	0.7767
	Breadth Em	0.8282	0.7719	0.7163	0.7124	0.9407
2019	Price Pjm	1.0797	1.237	1.1509	1.0141	1.0265
	Quantity Qjm	0.0654	0.0439	0.1418	0.1562	0.6292
	Breadth Em	0.0122	0.0127	-0.0076	-0.0003	-0.0011
Growth rate	Price Pjm	-0.0007	0.0102	0.0105	0.0087	0.0015
	Quantity Qjm	0.0192	0.0383	-0.0025	-0.0298	-0.0110

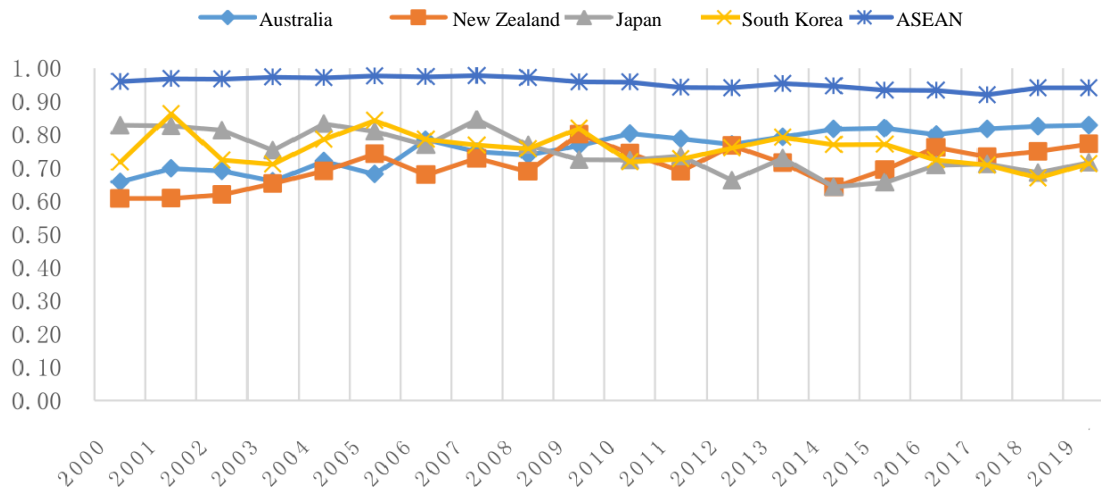a   Data source: Calculated according to CEPII database

Figure 2 Expansion margin of China's agricultural exports to RCEP member countries (sub regions) from 2000 to 2019

a   Data source: Calculated according to CEPII database

It could be seen from "Figure 2" that the expansion margins of each region were quite different. On the whole, the expansion margin of ASEAN was higher than that of other regions, and was at a relatively high level; the expansion margins of Australia and New Zealand showed a trend of wavelike rise; the expansion margins of Japan and South Korea showed a trend of decline with fluctuation. According to relevant statistics, China has been ASEAN's largest trading partner since 2009, and its exports of agricultural products to ASEAN are at a relatively high level. Except for the period from

2000 to 2003, which was slightly lower than 1, the expansion margins of the other years during the inspection period were all above 1, which was higher than China's average expansion margin of 0.8863 for the RCEP member countries as a whole. The 2008 economic crisis had a relatively small impact on ASEAN's expansion margin, and there was no significant fluctuation, indicating that ASEAN was China's stable agricultural export trade market. The expansion margins of Australia and New Zealand showed an overall trend of wavelike rise. Australia's expansion margin had the largest increase, from 0.6579 in 2000 to 0.8282 in 2019, an increase of 20.55%. New Zealand's expansion margin declined from 2009 to 2014. Except for a rebound in 2012, the rest of the year showed a downward trend, from 0.8015 in 2009 to 0.6423 in 2014, a decrease of 19.86%. As the traditional markets for China's agricultural exports, Japan and South Korea showed a slight decline in their overall expansion margins.
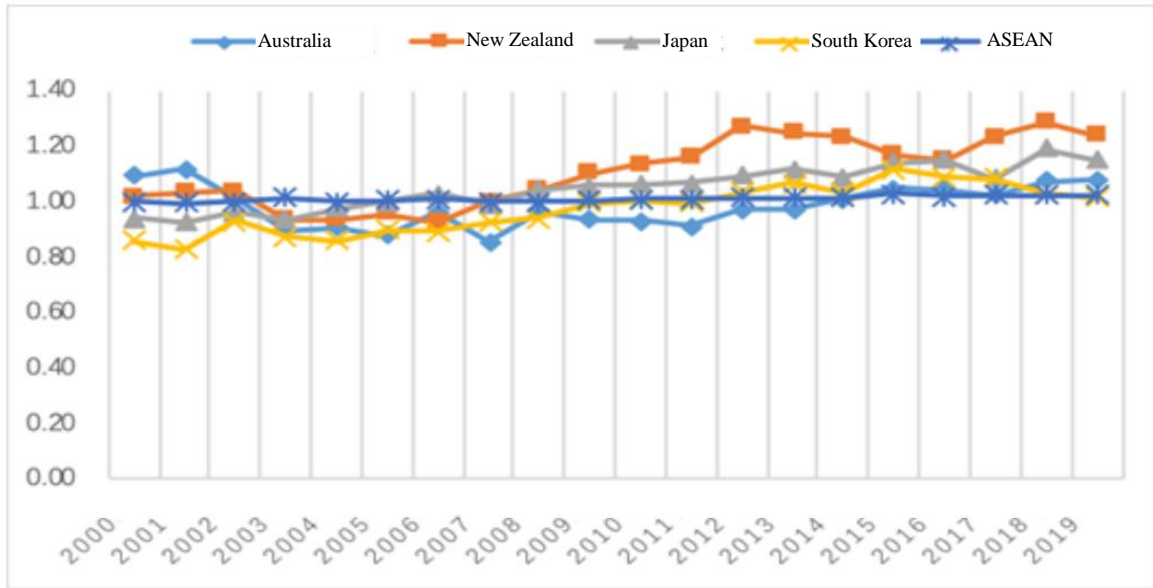

Figure 3 Price margins of China's agricultural exports to RCEP member countries (sub regions) from 2000 to 2019.

a Data source: Calculated according to CEPII database

It can be seen from "Figure 3" that the price margin of China's agricultural exports to ASEAN was relatively stable, with slight fluctuations at the value of 1 from 2000 to 2019. New Zealand was the country with the largest price margin fluctuation, rising by 0.0224, reaching the highest value of 1.2898 in 2018. The growth trends of price margin in Australia and New Zealand were roughly similar, with a decline from 2000 to 2002, and a trend of wavelike rise in other time periods. Japan and South Korea had similar changing trends in terms of price margin. The increase in price margins in 2008 may be due to the impact of the economic crisis and the increase in the export prices of agricultural products from China to Japan and South Korea. At the same time, Japan was also the country with the highest average annual growth rate of price margin. On the whole, the price margins of all regions increased to a certain extent.
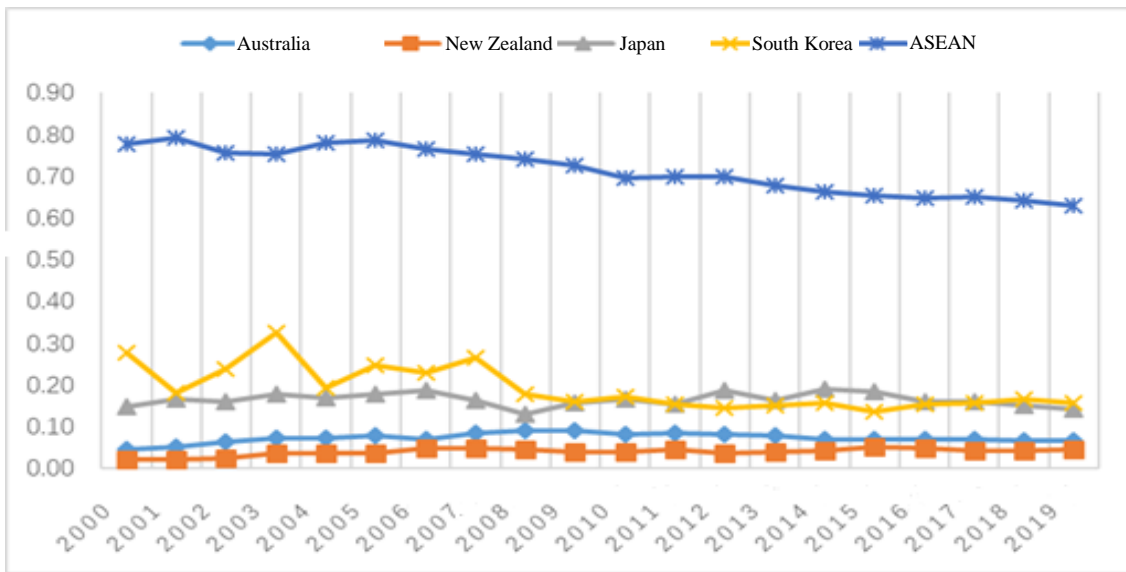
Figure 4 Quantity margin of China's agricultural products to RCEP member countries (sub regions) from 2000 to 2019.

It can be seen from "Figure 4" that China's accession to the WTO in 2001 had a positive impact on most regional intensive margins, except for South Korea's quantitative margin, which declined in 2001. The 2008 economic crisis had different impacts on different regions, among which the impact on New Zealand, Australia, South Korea, and ASEAN was negative, and the impact on South Korea was positive.

4. CONCLUSION AND ENLIGHTENMENT

4.1 Conclusion

Based on the overall development of agricultural product trade between China and RCEP member countries, this article uses the ternary margin analysis framework to explore the growth characteristics of Chinese agricultural exports to RCEP member countries and draws the following conclusions:

- The agricultural product trade between China and RCEP member countries has developed rapidly, is complementary and has great potential for development. Among the RCEP countries, the status of China's agricultural product trade has steadily increased. Since 2000, the trade volume of agricultural products between China and RCEP countries has increased significantly, and both import and export trade have achieved great development. At the same time, the increasing trade deficit shows that China's

dependence on RCEP member countries is deepening. Regarding the import and export market of agricultural products, the import and export markets of agricultural products in China and RCEP member countries are relatively stable and concentrated, of which the export markets are concentrated in Japan, South Korea, Malaysia, and Indonesia, and the import markets are concentrated in Australia, Indonesia, Malaysia, and Thailand. In addition, the agricultural products of China and RCEP member countries have a certain degree of complementarity. China's exports of agricultural products are mainly concentrated in Category 0, and the main imported agricultural products are concentrated in Category 4.

- China's agricultural exports to RCEP member countries are mainly based on a growth model with quantity increase as the mainstay and price increase as the supplement. With the development of China's economy and technological upgrading, the added value of agricultural products exported to foreign countries has continued to increase.

- China is mainly influenced by the expansion margin and the quantity margin for Australia and New Zealand, while Japan, South Korea and ASEAN rely mainly on the price margin.

4.2 Enlightenment

As a major exporter of agricultural products, China has great potential in the markets of RCEP member countries. There are different growth models for different countries. In order to effectively improve the growth model of China's agricultural exports to RCEP member countries, so that the expansion margin, quantity margin and price margin develop in a balanced manner, the specific recommendations are as follows.

4.2.1 Paying Close Attention to the Agricultural Product Consumer Market of RCEP Countries and Deepening Cooperation

RCEP member countries and China's import and export of agricultural products are highly complementary. Therefore, it is necessary to pay attention to the market demand of RCEP member countries' agricultural products and to export agricultural products in a more targeted manner. With the signing of the agreement, cooperation between countries will deepen, and the obstacles to China's export of high value-added agricultural products will be reduced. Timely attention to the latest information and trends in the agricultural product market will help increase China's agricultural export earnings.

4.2.2 Optimizing the Export Structure of China's Agricultural Products

The main countries that Chinese agricultural products export to RCEP are Japan, South Korea, Malaysia, Indonesia, and Thailand, and the share of five countries accounts for more than 80%. Therefore, it's needed to continue to expand other markets. The government can increase the export preference of agricultural products to RCEP member countries, formulate preferential policies, exploit potential markets, spread the risks of agricultural export trade, avoid the phenomenon of a single market, and optimize the export structure of agricultural products, so as to not only limit the benefits to these countries.

4.2.3 Increasing the Diversity of Exported Agricultural Products

From the perspective of the overall ternary margin analysis, there is still room for improvement in the expansion margin of China's agricultural exports to RCEP member countries. The development of new types of agricultural products is an important measure to promote China's agricultural product trade. The continuous development of agricultural product processing technology provides strong support for the addition of new varieties. Chinese agricultural product processing enterprises must adjust their product structure according to the needs of the agricultural product market, promote the development of new products, and meet the diversified needs of consumers.

4.2.4 Increasing the Added Value of Agricultural Products

It is necessary to increase research input and improve the processing level of agricultural products. China's agricultural exports have long been in a stage of winning by quantity, and agricultural products with lower market prices are exported to various target markets. This also reflects the low level of competitiveness of China's agricultural products and the need to improve this extensive growth model. Australia and New Zealand among the RCEP member countries mainly rely on expansion margin and quantity margin. For countries with this type of growth model, China needs to stimulate the growth of its agricultural exports from the quality of agricultural products, and turn price advantages into product advantages to increase the value of agricultural products. Deep processing is a key link in the increase of the added value of agricultural products. The Chinese government and enterprises should all increase investment in scientific research to extend the agricultural product industry chain.

AUTHORS' CONTRIBUTIONS

Jiayi Wang is responsible for experimental design, data analysis, thesis writing, and Xuemei Wang is responsible for thesis writing guidance and thesis revision.

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