

The Dynamic Growth of China's Aquatic Product Export to Thailand: Based on the CMS (Constant Market Share) Model

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ABSTRACT

Based on the aquatic product trade data from 2002 to 2018, this paper uses the Constant Market Share (CMS) model to analyze the influencing factors of China's aquatic product export growth to Thailand in stages and at different levels. The results show that the increase in the scale of Thailand aquatic product import demand is the most important factor in promoting the expansion of China-Thailand aquatic product export. The enhancement of China's export competitiveness of aquatic products has little effect on bilateral trade. The interactive effect of export competitiveness and the scale of demand indirectly promote the growth of trade. Therefore, it is believed that China should gradually innovate the production methods of aquatic products, optimize product production and trade structure, and realize the stable and sustainable growth of China-Thailand aquatic product export.

Keywords: aquatic product trade, CMS model, competitiveness

I. INTRODUCTION

China has always been the world's most important producing country of aquatic product. Since 1989, China's aquatic product output has accounted for more than 40% of the world's total output, ranking first in the world for 30 consecutive years. Aquatic products are one of the most internationally competitive agricultural products in China. Since the establishment of the China-ASEAN Free Trade Area in 2010, China and Thailand have ushered in a golden period of economic and trade cooperation. China's aquatic product export trade with Thailand has developed rapidly. According to statistics from the United Nations Commodity Trade Database, from 2010 to 2018, China's exports of aquatic products to Thailand increased from US\$45 million to US\$447 million, with an average annual increase of 33.24%. Thailand has become China's most important aquatic product export market in the ASEAN region, and it is vital to the sustainable development of China's aquaculture. So, does the continuous growth of

China-Thailand export trade stem from the growth of domestic competitiveness? Or is it due to the increase in Thailand's import demand? This paper uses the Constant Market Share (CMS) model to analyze the data of China's aquatic product exports to Thailand from 2002 to 2018 in stages and at different levels, so as to explore the driving factors for the growing export of China-Thailand aquatic products, and quantify the contribution rate of export competitiveness and import market size. On this basis, policy recommendations for the stable development of China-Thailand aquatic product trade are put forward.

II. THE CURRENT STATUS OF CHINA'S AQUATIC PRODUCT EXPORT TO THAILAND

With the continuous advancement of the China-ASEAN Free Trade Area Agreement, the scale and market share of China's aquatic product export to Thailand have increased rapidly. According to the United Nations Commodity Trade Database, in 2002, China's exports of aquatic products to Thailand were US\$45 million, accounting for 0.9% of China's total aquatic product exports. From 2008 to 2010, the average export value remained at about US\$110 million, with an increase of about 45%. Since 2010, the China-ASEAN Free Trade Area has officially landed and started construction in full swing. China's aquatic product exports to Thailand have also ushered in a golden period of development. China's export sales of

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aquatic products to Thailand increased to US\$211 million in 2011, accounting for 1.49% of China's total aquatic product exports. By 2018, China's aquatic product exports to Thailand increased to US\$447, accounting for 2.79% of China's total aquatic product exports, and the overall trend is gradually increasing.

During the same period, Thailand's imports of aquatic products from the world increased significantly, from US\$979 million in 2002 to US\$3.919 billion in

2018, with an average annual growth rate of 9.06%. The proportion of China's aquatic products exported to Thailand in the total import of Thailand aquatic products increased from 4.55% to 11.42%. In terms of time periods, the year of 2010 was a relatively important turning point for China-Thailand aquatic product exports. From 2002 to 2010, China's exports of aquatic products to Thailand were in a slow growth stage. The period of 2010-2018 ushered in a stage of sustained and rapid growth. ("Fig. 1")

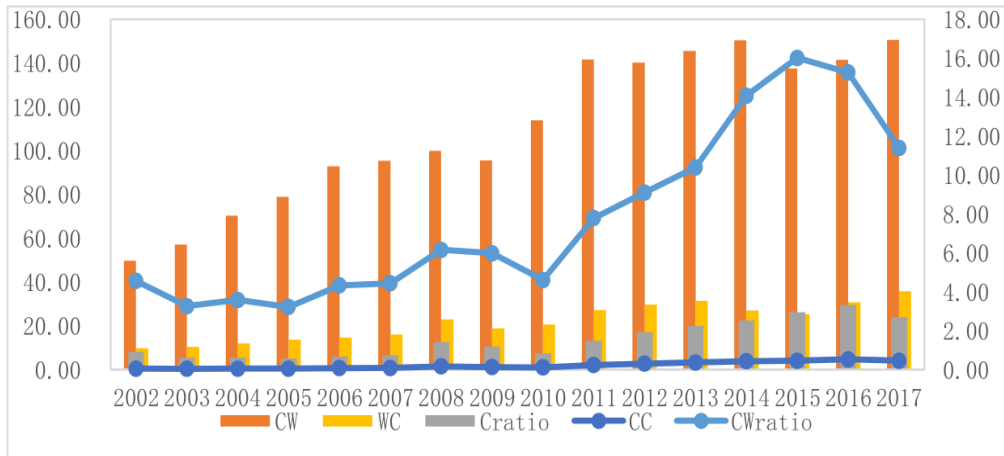


Fig. 1. China's export trade trends of aquatic products to Thailand.

^a Note: The abscissa represents the year, the left ordinate represents the trade volume, using scientific notation, unit: 100 million US dollars; the right ordinate represents share, unit: %. CC represents China's export trade volume of aquatic products to Thailand, CW represents the total export volume of China's aquatic products, WC represents Thailand's imports of aquatic products from the world, Cratio=CC/CW*100%, CWratio=CC/WC*100%.

^b Data source: UN comtrade database.

III. ANALYSIS OF THE DYNAMIC GROWTH OF CHINA'S AQUATIC PRODUCT EXPORTS TO THAILAND

A. Introduction to the CMS model

The Constant Market Share (CMS) model is one of the important models for studying the motives of trade growth. It was first proposed by Tyszynski in 1951 and

$$\frac{\Delta EX}{DEX} = \underbrace{\sum_i \sum_j S_{ij}^0 \Delta Q_{ij}}_{IME} + \underbrace{\sum_i \sum_j \Delta S_{ij} Q_{ij}^0}_{EXE} + \underbrace{\sum_i \sum_j \Delta S_{ij} \Delta Q_{ij}}_{EIE} \quad (1)$$

In the above formula, *i* represents a specific product and *j* represents a single country. *EX* represents China's export value to the industry *I* in region *J*, *Q_{ij}* represents the total import value of forest products *i* in country *j* from the world; *S_{ij}* represents the proportion of China's export to country *j*'s product *i* in the total import value of country *j*'s product *i*; the superscript 0 represents the base period index, and Δ represents the amount of change between the observation period and the base period.

was revised and perfected many times by scholars such as Jepma and Milana. The model decomposes a country's product export change amount (DEX) for a certain region into three parts: the import market scale effect (IME), the export competitiveness effect (EXE), and the supply-demand structure interaction effect (EIE). The first-level decomposition formula is as follows:

It further decomposes the import market scale effect (IME) into two parts: the overall scale effect (GIM) and the product market structure effect (PIM); it decomposes the export competitiveness effect (EXE) into two parts: the overall competitiveness effect (GEX) and the product structure competitiveness effect (SEX); it decomposes the supply-demand structure interaction effect (EIE) into two parts: the pure second-order effect (PIE) and the dynamic structure effect (DIE) ("Table I"), and the second-level decomposition formula of the model is obtained:

$$\underbrace{\sum_i \sum_j S_{ij}^0 \Delta Q_{ij}}_{IME} = \underbrace{S^0 \Delta Q}_{GIM} + \underbrace{(\sum_i \sum_j S_{ij}^0 \Delta Q_{ij} - \sum_j S_j^0 \Delta Q_j)}_{PIM} \quad (2)$$

$$\underbrace{\sum_i \sum_j \Delta S_{ij} Q_{ij}^0}_{EXE} = \underbrace{\Delta S Q^0}_{GEX} + \underbrace{(\sum_i \sum_j \Delta S_{ij} Q_{ij}^0 - \Delta S Q^0)}_{SEX} \quad (3)$$

$$\begin{aligned} &\underbrace{\sum_i \sum_j \Delta S_{ij} \Delta Q_{ij}}_{EIE} = \\ &\underbrace{\left(\frac{Q^1}{Q^0} - 1\right) \sum_i \sum_j \Delta S_{ij} Q_{ij}^0}_{PIE} + \\ &\underbrace{\left[\sum_i \sum_j \Delta S_{ij} \Delta Q_{ij} - \left(\frac{Q^1}{Q^0} - 1\right) \sum_i \sum_j \Delta S_{ij} Q_{ij}^0\right]}_{DIE} \end{aligned} \quad (4)$$

TABLE I. CMS MODEL INDICATORS AND THEIR MEANINGS

Code	Index	Meaning
DEX	export change amount	Changes in the export value of one country to other countries and products
IME	import market scale effect	Export changes caused by changes in the size of the import market
EXE	export competitiveness effect	Changes in exports caused by changes in export competitiveness
EIE	supply-demand structure interaction effect	The interactive effect of import market size and export competitiveness
GIM	the overall scale effect	Changes in exports caused by overall changes in the size of the import market
PIM	the product market structure effect	Export changes caused by changes in the size and structure of the imported product market
GEX	the overall competitiveness effect	Export changes caused by overall changes in export market share
SEX	the product structure competitiveness effect	Export changes caused by the adjustment of the competitiveness of export products
PIE	the product structure competitiveness effect	The interactive effect of changes in overall import scale and changes in export competitiveness
DIE	the dynamic structure effect	The interactive effect of the structural adjustment of import market and the change of export competitiveness

a. Data source: the author decomposes the indicator meaning design according to the formula.

B. Data selection description

The definition of aquatic products in this paper is: the contents of Chapter 3 of the HS code, which specifically include freshwater and marine fishes, crustaceans, molluscs and other aquatic invertebrates, etc. The data used are all from the United Nations Comtrade database (UN Comtrade). Taking into account the availability and comparability of data, as well as the establishment of the China-ASEAN Free Trade Area in 2010, a major international trade event, this paper selects data of 2002-2018 as the research object, and divides it into two periods of 2002-2010 and 2010-2018 for comparative analysis.

C. Empirical results and analysis

1) The first-level decomposition of the CMS model:

As shown in "Table II", among the total effects, from 2002 to 2018, the import market scale effect

contributed the most, with an average value of 80.91%, reflecting that the growth of China's aquatic product exports to Thailand is mainly due to the expansion of Thailand's import market, and the product structure of China's aquatic product exports has better adapted to the growth of Thailand's aquatic product import demand. However, the scale of Thailand's import market also varies significantly in different periods. The contribution value of the scale effect from 2002 to 2010 reached US\$61 million, with a contribution rate of 122.36%; in 2010-2018, the contribution value of the scale effect rose to US\$196 million, but the contribution rate fell to 55.57%.

The contribution of the interaction effect of the supply-demand structure ranked second. From 2002 to 2018, the contribution of the interaction effect of the supply-demand structure was 13.46%. In terms of time periods, from 2002 to 2010, the contribution value and contribution rate of the interaction between the scale of

import demand and export competitiveness were negative, which partially offset the shrinking effect of the import market and the effect of competitiveness expansion; the positive value of 2010-2018 partially corrected the expansion effect of the import market size and at the same time made up for the shrinking effect of insufficient competitiveness.

From 2002 to 2018, the contribution value and contribution rate of the export competitiveness effect were both at a low level, at US\$23 million and 5.63%, respectively. In general, the competitiveness effect had

a weaker impact on China's export growth of aquatic products, but its significance varied greatly at different stages. From 2002 to 2010, the contribution value of China's aquatic product competitiveness effect was -0.03 billion US dollars, and the contribution rate was -5.77%; by 2010-2018, the contribution value of the competitiveness effect rose to US\$66 million, and the contribution rate rose sharply to 18.80%, reflecting that the competitiveness of Chinese aquatic products in the Thailand market increased, the market share expanded, and it also played a positive role in promoting export growth.

TABLE II. THE FIRST-LEVEL DECOMPOSITION RESULTS OF CMS OF CHINA'S AQUATIC PRODUCT EXPORT TO THAILAND

Category	2002-2018		2002-2010		2010-2018	
	Difference	Contribution rate	Difference	Contribution rate	Difference	Contribution rate
<i>DEX</i>	4.03	100.00	0.50	100.00	3.53	100.00
<i>IME</i>	3.26	80.91	0.61	122.36	1.96	55.57
<i>EXE</i>	0.23	5.63	-0.03	-5.77	0.66	18.80
<i>EIE</i>	0.54	13.46	-0.08	-16.59	0.91	25.64

^a Note: difference unit: 100 million US dollars; contribution rate unit: %.

2) *The second-level decomposition of the CMS model:* As shown in "Table III", the structural characteristics of the scale effect of the import market show that from 2002 to 2018, the product market structure effect contributed the most, reaching 47.69%, which played a leading role in the growth of aquatic product exports from China and Thailand, indicating that the adjustment of import scale and structure was beneficial to the export of China's aquatic products; the overall import scale effect took the second place, with a contribution rate of 33.22%.

The structural characteristics of the export competitiveness effect show that from 2002 to 2018, the overall market share of Chinese aquatic products in Thailand increased, driving exports to increase by US\$67 million, with a contribution rate of 16.68%; the positive contribution to overall competitiveness continued in 2002-2010 and 2010-2018, and the contribution rate in 2010-2018 reached 39.55%, which was significantly higher than the previous period and the average, showing that the improvement of the competitiveness of aquatic products during this period became the main driving force for the growth of China's exports to Thailand. Throughout the inspection period and in different subdivisions, the contribution of the product competitiveness structure effect was negative, and its negative contribution rate had an increasing trend, reaching -20.75% and -0.73 respectively from 2010 to 2018, showing that China's competitiveness in exporting large-scale products had not been significantly improved, but the market share shrunk significantly.

The structure of the interaction effect of the supply-demand structure shows that during the entire sample

period, the pure second-order effect drove an export growth of US\$68 million, with a contribution rate of 16.90%. The changes in China's export competitiveness adapted to changes in the overall import scale and effectively promoted the growth of China's aquatic product exports, demonstrating the positive impact on both ends of supply and demand. The interaction effect between changes in import structure and changes in export competitiveness was not significant, with a contribution rate of -3.44%, but it fluctuated greatly during different inspection periods. Among them, the contribution rate from 2002 to 2010 was changed to -10.28%, and from 2010 to 2018, it boosted export growth by US\$30 million, and the contribution rate was 8.47%. China's export share increased in the fast-growing product market.

TABLE III. THE SECOND-LEVEL DECOMPOSITION RESULTS OF CMS OF CHINA'S AQUATIC PRODUCT EXPORT TO THAILAND

Category	2002-2018		2002-2010		2010-2018	
	Difference	Contribution rate	Difference	Contribution rate	Difference	Contribution rate
<i>GIM</i>	1.34	33.22	0.49	98.14	0.86	24.34
<i>PIM</i>	1.92	47.69	0.12	24.22	1.10	31.23
<i>GEX</i>	0.67	16.68	0.00	0.89	1.40	39.55
<i>SEX</i>	-0.45	-11.05	-0.03	-6.66	-0.73	-20.75
<i>PIE</i>	0.68	16.90	-0.03	-6.31	0.61	17.16
<i>DIE</i>	-0.14	-3.44	-0.05	-10.28	0.30	8.47

^a. Note: difference unit: 100 million US dollars; contribution rate unit: %.

IV. CONCLUSION

Based on the current status of Chinese aquatic product exports to Thailand from 2002 to 2018, this paper uses the CMS model to analyze the reasons for the growth of Chinese aquatic product exports to Thailand. The results show that the scale effect of the import market is the most important reason for the growth of China's aquatic product exports to Thailand, that is, there is a high degree of matching between the aquatic products exported by China to Thailand and the aquatic products whose import is growing fast in Thailand. During this period, China takes full advantage of the expansion of the market size of Thailand aquatic products to achieve growth in exports to Thailand. At the same time, the interaction effect of China's aquatic products in the Thailand market has increased slightly, but the export competitiveness effect is not obvious. From the results of the second-level decomposition, the import market scale effect of the growth of China's aquatic product exports to Thailand is mainly derived from the overall import scale effect. The export competitiveness effect mainly comes from overall competitiveness, and the competitiveness of product structure has a certain degree of restriction on China's export sales of Thailand aquatic products.

In view of the factors restricting the growth of China's aquatic product export sales to Thailand, this paper proposes the following suggestions for improvement: first, it is necessary to take the second five-year plan (2019-2023) of China-Thailand marine cooperation as an opportunity to give full play to geographical advantages, strengthen communication and exchanges with Thailand in terms of trade policies, and continue to maintain the existing advantageous aquatic products' competitive advantage in the Thailand market; second, it's needed to fully pay attention to the changes in the Thailand aquatic product import market demand, and timely adjust the types and quantities of aquatic products supplied by China; third, efforts should be made to innovate the production methods of aquatic products in China, vigorously develop the deep processing industry of aquatic products, optimize the structure of China's aquatic products, and increase the added value of aquatic products.

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