

# Analysis on the Influencing Factors of China's Export of Forest Products to Vietnam Based on CMS (Constant Market Share) Model

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## ABSTRACT

**Based on the Constant Market Share (CMS) model, this article analyzes the factors affecting the growth of China's export of forest products to Vietnam from 2002 to 2018. The research results show that the interaction effect of the supply and demand structure has the most prominent role in promoting China's export of forest products to Vietnam, among which the scale effect of import demand is the most important factor. And the hindering factors are insufficient export competitiveness and irrational export structure. For this reason, China should promulgate and formulate new forest product export trade development guidelines as soon as possible to further improve the export competitiveness of China's forest products and optimize the structure of export products.**

*Keywords: China, Vietnam, forest product, export changes, CMS model*

## I. INTRODUCTION

For a long time, forest product trade has played an important role in the trade cooperation between China and Vietnam. In recent years, China's forest product exports to Vietnam has accounted for more than 20% of China's total export of forest products. Therefore, a correct understanding and grasp of the growth of China's forest product exports to Vietnam is of great significance to promoting the sustained, stable and healthy development of China's export trade of forest products. This article will use the CMS model to analyze the main factors affecting the growth of China's export of forest products to Vietnam.

## II. STATUS QUO OF CHINA'S EXPORT TRADE OF FOREST PRODUCTS TO VIETNAM

Since joining the WTO in 2001, more and more products of China have moved to the international trade

arena, and China's export of forest products to Vietnam has increased significantly. According to statistics from the United Nations Commodity Trade Database, in 2002, China's export of forest products to Vietnam was US\$3 billion, accounting for 0.06% of China's total export of forest products. In 2018, exports of forest products to Vietnam have reached 474 million U.S. dollars, accounting for 2.99% of China's total exports of forest products. Overall, the trade volume of China's export of forest products to Vietnam continued to increase from 2002 to 2018, and the proportion of exports also continued to increase.

At the same time, the market share of Chinese export of forest products to Vietnam continues to increase. In 2002, Vietnam's imports of forest products from China accounted for 4.21% of its total imports, and it continued to rise since then, exceeding 20% in 2017 and reaching 33.28% in 2018. China has become Vietnam's largest import market for forest products in the world. (See "Fig. 1")

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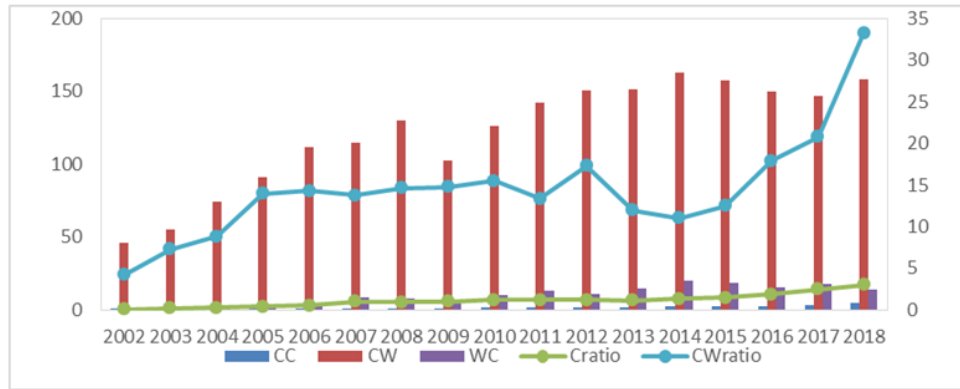


Fig. 1. Trends of China's export trade of forest products to Vietnam.

<sup>a</sup> Note: The abscissa represents the year, the left ordinate represents the trade volume, it uses scientific notation, the unit: 100 million U.S. dollars; the right ordinate represents the share, the unit: %. CC represents China's export trade volume of forest products to Vietnam, CW represents China's total export trade volume of forest products from the world, WC represents Vietnam's import trade volume of forest products from the world, Cratio=CC/CW\*100%, CWratio=CC/WC\*100%.

<sup>b</sup> Data source: UN comtrade database.

### III. CMS MODEL SETTING AND DATA DESCRIPTION

#### A. Model setting

The Constant Market Share (CMS) model was proposed by Tysynski (1951) and others. It decomposes

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

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

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

In the above formula,  $Q$  represents the total import value of industry I in region J from the world,  $Q_i$  represents the total import value of product i in region J from the world, and  $Q_j$  represents the total import value of industry I in country j from the world;  $S$  expresses the proportion of China's exports to the region J industry I to the total imports of the region J industry I,  $S_i$  expresses the proportion of China's exports to the

a country's product export change DEX for a certain region into three factors: import market scale effect IME, export competitiveness effect EXE, and supply and demand structure interaction effect EIE, forming the first level decomposition of the CMS model. The specific formula is as follows:

According to the revised method of scholars such as Jepma (1986) and the research needs of this article, the structural characteristics of the three factors are further explored, and the second-level decomposition of the CMS model is obtained. Among them, the import market scale effect IME can be decomposed into two parts: the overall scale effect GIM and the product market structure effect PIM. The specific formula is as follows:

region J product i in the total imports of the region J product i, and  $S_j$  is the proportion of China's exports to country j industry I in total imports of country j industry I.

The export competitiveness effect EXE is decomposed into two parts: the overall competitiveness effect GEX and the product structure competitiveness effect SEX. The specific formula is as follows:

$$\underbrace{\sum_i \sum_j \Delta S_{ij} Q_{ij}^0}_{EXE} = \underbrace{\Delta SQ^0}_{GEX} + \underbrace{\left( \sum_i \sum_j \Delta S_{ij} Q_{ij}^0 - \Delta SQ^0 \right)}_{SEX} \tag{3}$$

The supply-demand structure interaction effect EIE is decomposed into two parts, the pure second-order

effect PIE and the dynamic structure effect DIE. The specific decomposition formula is as follows:

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

**B. Data description**

The data used in the article are all from the United Nations Comtrade Statistics Database (UN Comtrade). The forest industry data is HS code chapters 44-46. The specific content is:

- Chapter 44 Log products, including wood and wood products, charcoal;
- Chapter 45 Cork products, including cork and cork products;
- Chapter 46 Wood braided products, including straw, orange stalks, stip grass or other braided materials, baskets and wicker braided products.

In the choice of year, this article selects 2002-2018 as the research object.

**IV. DECOMPOSITION RESULT AND ANALYSIS OF CMS MODEL**

In order to study the dynamic characteristics of exports, combined with the analysis of the above-mentioned export trade trends, this article divides

China's export trade data of forest products to Vietnam from 2002 to 2018 into two periods: 2002-2009 and 2009-2018.

**A. The first-level decomposition result of the CMS model**

As shown in "Table I", among the total effects, the contribution value and contribution rate of the interaction effect of the supply and demand structure were at the highest level from 2002 to 2018, at 367 million US dollars and 77.87% respectively. In general, the interaction effect has the most significant impact on China's export of forest products to Vietnam, reflecting that the growth of China's export of forest products to Vietnam is mainly due to the combined effect of the expansion of the Vietnamese import market and the improvement of the competitiveness of China's forest products. However, its significance varies greatly at different stages, and shows a downward trend year by year. Especially during 2009-2018, the contribution rate of the interaction effect of the supply and demand structure suddenly dropped to 28.16%, which may be a supplement to the scale effect and competitiveness effect.

TABLE I. THE FIRST-LEVEL DECOMPOSITION RESULTS OF CMS FOR CHINA'S EXPORT OF FOREST PRODUCTS TO VIETNAM

Category	2002-2018		2002-2009		2009-2018	
	Difference	Contribution rate	Difference	Contribution rate	Difference	Contribution rate
<i>DEX</i>	4.71	100.00	1.00	100.00	3.70	100.00
<i>IME</i>	0.99	21.07	0.26	26.33	2.81	75.79
<i>EXE</i>	0.05	1.06	0.04	4.30	-0.15	-3.95
<i>EIE</i>	3.67	77.87	0.70	69.37	1.04	28.16

<sup>a</sup>. Note: Difference unit: US \$100 million; Contribution rate unit: %.

The contribution of the scale effect of the import market ranked second. From 2002 to 2018, the competitiveness effect contributed 21.07%, reflecting that the growth of China's export of forest products to Vietnam was mainly due to the expansion of the Vietnamese import market, and China's export of forest products has better adapted to the growth of Vietnam's import demand for forest products. In stages, from 2002 to 2009, the contribution value of China's forest product import market scale effect was US\$26 million, with a contribution rate of 26.33%; from 2009 to 2018, the contribution value of the import market scale effect increased to US\$281 million, and the contribution rate

soared to 75.79%. This shows that the scale of Vietnam's forest product import market has grown rapidly, and its import of Chinese forest products has also grown rapidly.

From 2002 to 2018, the contribution value and contribution rate of the competitiveness effect were both at a relatively low level, at US\$0.05 billion and 1.06% respectively. In general, the competitiveness effect had a weaker impact on China's export growth of forest products.

**B. The second-level decomposition result of the CMS model**

As shown in "Table II", the structure of the interaction effect of the supply and demand structure shows that: During the entire sample period, the dynamic structural effect drove export growth of US\$267 million, with a contribution rate of 56.70%. The interaction effect of changes in the import structure and changes in export competitiveness was significant. This shows that China's export market share of forest products is generally consistent with the direction of changes in the demand structure. In countries and product markets where import demand has grown rapidly, the export market share has also grown rapidly. The pure second-order effect drove an export growth of 100 million US dollars, and a contribution rate of 21.17%. The changes in China's export competitiveness have adapted to changes in the overall import scale,

which has effectively promoted the growth of China's forest product exports, demonstrating the positive impact on both ends of supply and demand. However, between 2009 and 2018, the contribution rate fell to -4.07%, which indicates that China's export market share of forest products has deviated from the direction of the overall demand scale of importing countries, and the change in export share cannot simultaneously adapt to changes in the scale of import market demand.

The structural characteristics of the scale effect of the import market showed that from 2002 to 2018, the overall import scale effect contributed a large amount, reaching 12.13%, which played a leading role in the growth of China's export of forest products to Vietnam. The effect of the product market structure was the second, with a contribution rate of 8.94%, indicating that the adjustment of the import scale and structure was beneficial to China's export of forest products.

TABLE II. CMS SECOND-LEVEL DECOMPOSITION RESULTS OF CHINA'S EXPORT OF FOREST PRODUCTS TO VIETNAM

Category	2002-2018		2002-2009		2009-2018	
	Difference	Contribution rate	Difference	Contribution rate	Difference	Contribution rate
<i>GIM</i>	0.57	12.13	0.27	26.51	1.07	28.79
<i>PIM</i>	0.42	8.94	-0.00	-0.18	1.74	47.00
<i>GEX</i>	0.20	4.21	0.07	7.15	1.30	35.06
<i>SEX</i>	-0.15	-3.14	-0.03	-2.85	-1.44	-39.01
<i>PIE</i>	1.00	21.17	0.40	39.90	-0.15	-4.07
<i>DIE</i>	2.67	56.70	0.30	29.47	1.19	32.24

<sup>a</sup>. Note: Difference unit: US \$100 million; Contribution rate: %.

The structural characteristics of the export competitiveness effect showed that from 2002 to 2018, the overall market share of China's forest products in Vietnam had increased, driving exports to increase by US\$21 million, with a contribution rate of 4.21%. The positive contribution to overall competitiveness continued in 2002-2009 and 2009-2018, and the contribution rate in 2009-2018 reached 35.06%, which was significantly higher than the previous period and the average, showing that the improvement of the competitiveness of forest products during this period has become one of the main driving forces for the growth of China's export to Vietnam. 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 -39.01% and -1.44 respectively from 2009 to 2018. Compared with the previous interval, the fluctuation was larger, indicating that China's competitiveness in exporting products and markets with a larger scale had not been significantly improved, but had experienced a sharp decline in market share.

**V. CONCLUSIONS AND SUGGESTIONS**

**A. Conclusions**

Based on the CMS model, this paper studies the changing trends, dynamic characteristics and fluctuation factors of China's export growth of forest products to Vietnam. The main conclusions show that:

- The interaction effect of the supply and demand structure had a significant impact on the growth of China's export of forest products. China's export market share was generally consistent with the changes in the demand structure, but the changes in China's overall export competitiveness had not been well adapted to the changes in the overall import scale.
- The China's export scale of forest products in the Vietnamese market continues to grow, mainly due to the expansion of Vietnam's import demand.
- The China's export competitiveness of forest products in the Vietnamese market has dropped significantly, which has a significant negative impact on export growth, but the interactive effect with the scale of import demand has mitigated some of the adverse effects.

### *B. Suggestions*

In order to promote the sustained and stable growth of China's export trade of forest product with Vietnam, this article recommends:

- Optimizing the forest product export structure. It is necessary to pay close attention to the relevant trade regulations, policy changes and technical standards of forest product importing countries, and understand and grasp the latest development trend of its forest product imports, so as to make preparations for China to timely adjust the export structure and product scale of forest products.
- Continuing to enhance the international competitiveness of forest products. The first is to improve the quality of forest products, and continuously strengthen the quality management and supervision of the entire process of forest product production, processing, design and transportation in accordance with international standards. The second is to encourage export enterprises of forest products to increase the added value of their products, gradually increase the export share of processed products, and reduce the export share of primary products.

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