

# A Study on the Dynamic Growth of Wood Forest Products Exports Between China and Countries Along the Belt and Road\*

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## ABSTRACT

Based on the analysis of the current situation of wood forest products trade between China and countries along the Belt and Road from 2000 to 2018, this study uses the CMS (constant market share) model to analyze the reasons for the dynamic growth of wood forest products exports between China and countries along the Belt and Road. The results show that in terms of China's exports, the increase in demand from countries along the Belt and Road has a positive effect on the growth of China's wood forest products exports, the export structure of wood forest products is not well matched, and the export competitiveness gradually declines. In terms of exports from countries along the Belt and Road, the increase in Chinese market demand has become the absolute driving force for the growth of wood forest products exports and the structure of wood forest products exported to China needs to be further optimized and adjusted.

**Keywords:** *The Belt and Road, Wood forest products, CMS model, Dynamic growth.*

## 1. INTRODUCTION

In 2013, after the joint construction of the Belt and Road Initiative was put forward, trades between countries along the Belt and Road has developed rapidly. In 2018, the trade value between China and the countries along the Belt and Road reached US\$1,276.524 billion, accounting for 27.58% of China's total global trade, with a very close trade relationship. Among them, the dependence on foreign trade of wood forest products between China and countries along the Belt and Road was relatively high. In 2018, the trade value reached US\$31.170 billion, accounting for 25.36% of China's total trade in wood forest products, of which exports accounted for 22.42% and imports accounted for 26.89%. Because of the close relationship between China and the countries

along the Belt and Road in the trade of wood forest products, there have been many studies on this aspect in China. Some scholars have compared the international competitiveness of forest products in the countries along "the Belt and Road" [1]; some have analyzed the competitiveness and complementarity of forest product trade between China and the countries along "the Belt and Road" [2]; more researches focus on discussing the influencing factors and trade potential of wood forest products between China and countries along "the Belt and Road" [3][4][5][6]. From the current research results, there are few studies on China's trade fluctuations of wood forest products in the Belt and Road countries. Based on this, this paper will use the CMS model to analyze the two-way changes of wood forest products trade between China and the countries along the Belt and Road on the basis of analyzing the current situation of wood forest products trade between China and countries along the Belt and Road since the 21st century, discuss the effect of the growth of wood forest products trade between the two sides, and provide reference for promoting the healthy development of

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wood forest products trade between China and countries along the Belt and Road.

## 2. MATERIALS AND METHODS

### 2.1 Overview of Research Objects

According to the existing research results [7], this study selected the countries along the Belt and Road as 65 countries, including Mongolia in East Asia, 18 countries in West Asia and North Africa such as Iran, 5 countries in Central Asia such as Kazakhstan, 8 countries in South Asia such as India, 10 ASEAN countries such as Malaysia, 7 CIS countries such as Russia, and 16 Central and Eastern European countries such as Poland.

In order to fully reflect the fluctuation of bilateral trade in wood forest products between China and countries along the Belt and Road, according to the HS1992 code classification, in this study, the scope of wood forest products is determined as logs and log products, converted timber, wood-based panels, cork and cork products, wood pulp and cellulose pulp, etc., paper and paper products, and wooden furniture.

### 2.2 Data Sources

The trade data used in this paper are from the United Nations Comtrade Database (UN Comtrade). The time period of this study is from 2000 to 2018. It further divides the research period into 3 stages by taking the global financial crisis (the period before 2008 was also a deficit stage) and the year of the Belt and Road Initiative as time nodes: 2000-2008 (stage 1), 2009-2013 (stage 2) and 2014-2018 (stage 3).

$$S^0\Delta X + [\sum_i S_i^0\Delta X_i - S^0\Delta X] + \Delta SX^0 + [\sum_i \Delta S_i X_i^0 - \Delta SX^0] + (X/X^0 - 1)\sum_i \Delta S_i X_i^0 + [\sum_i \Delta S_i \Delta X_i - (X/X^0 - 1)\sum_i \Delta S_i X_i^0] \quad (2)$$

In this formula, the structure effect is refined into two effects: growth and product structure, where the growth effect is the extent to which the growth of China's (the countries along the Belt and Road) exports of wood forest products is caused by the increase in the scale of imports of the countries along the Belt and Road (China), and the product structure effect reflects the matching degree between China's (the countries along the Belt and Road) export of wood forest products and the fast-growing wood forest products imported by countries along the Belt and Road (China). The

### 2.3 Analysis Method

This paper will use the CMS model to analyze the reasons for the growth of two-way trade in wood forest products between China and countries along the Belt and Road. After Tyszynski[8] first used the CMS model, Jepma[9] and other scholars have revised and improved this model many times, and it has become an important model for studying trade growth. On the basis of referring to the classical model and drawing on the construction of CMS by Chinese scholars [10], this study regards 65 countries along the Belt and Road as a single market and proposes the following model.

The first-level decomposition of the model:

$$\Delta X = \sum_i S_i^0 \Delta X_i + \sum_i \Delta S_i X_i^0 + \sum_i \Delta S_i \Delta X_i \quad (1)$$

In formula (1), the trade changes of wood forest products exported from China (countries along the Belt and Road) to countries along the Belt and Road (China) are decomposed into three effects of structure, competitiveness, and competitiveness and structure crossover. Among them, the structure effect refers to the changes in the export value of China (the countries along the Belt and Road) caused by the changes in the scale and structure of imported wood forest products from countries along the Belt and Road (China). The competitiveness effect is the change in the export value caused by the export competitiveness of wood forest products in China (countries along the Belt and Road). The competitiveness and structure crossover effect is the change in the export value caused by the interaction between the structural changes of wood forest products exported by China (countries along the Belt and Road) and the changes in the import scale and structure of countries along the Belt and Road (China).

The second-level decomposition of the model:

competitiveness effect is refined into two aspects: comprehensive competitiveness and product competitiveness, where the comprehensive competitiveness reflects the impact of changes in the proportion of wood forest products exported from China (countries along the Belt and Road) to countries along the Belt and Road (China) on export growth, and the product competitiveness is the impact of changes in the export proportion of certain wood forest products in China (countries along the Belt and Road) on the fluctuation of exports from China (countries along the Belt and

Road). The competitiveness and structure crossover effect is refined into net crossover and dynamic crossover effects, where the net crossover effect reflects whether the fluctuation of the export structure of wood forest products from China (countries along the Belt and Road) matches the changes in imports of countries along the Belt and Road (China). A positive dynamic crossover effect means that China's (the Belt and Road countries) exports of wood forest products also grow faster in the share of the faster-growing products imported by the Belt and Road countries (China).

In formulas (1) and (2), 0 represents the base period,  $i$  represents the type of wood forest products exported,  $\Delta$  represents the variation between the two periods,  $S$  represents the proportion of wood forest products exported by China (countries along the Belt and Road) in the total global imports from countries along the Belt and Road (China),  $S_i$  indicates that the export value of China's (the countries along the Belt and Road) category  $i$  wood forest products accounts for the share of the total trade value of imports of category  $i$  wood forest products from the countries along the belt and road (China) from the world,  $X$  represents the total trade value of wood forest products imported from the world by China (countries along the Belt and Road), and  $X_i$  represents the total trade value of wood forest products imported by China (countries along the Belt and Road) from the world.

### 3. RESULTS AND ANALYSIS

#### 3.1 *Status Quo of Trade in Wood Forest Products Between China and Countries Along the Belt and Road*

##### 3.1.1 *General Analysis of Trade in Wood Forest Products Between China and Countries Along the Belt and Road*

From 2000 to 2018, the total trade value of wood forest products between China and countries along the Belt and Road continued to grow, from US\$4.189 billion in 2000 to US\$31.170 billion in 2018, with an average annual growth of 41.3%. Among them, the export value increased by nearly 38 times and the import value increased by 4.3 times. From 2000 to 2008, China's export trade of wood forest products to countries along the Belt and Road has been in a deficit state, reaching the maximum in 2004, with a deficit of US\$3.675 billion. Since 2009, China's export value of wood forest products to countries along the Belt and Road

has turned a deficit into a surplus and the export value has grown rapidly. From 2014, the export value has dropped significantly, but the import has shown a fluctuating growth trend. It can also be seen from "Figure 1" that the proportion of China's export value of wood forest products to the countries along the Belt and Road in the total export value has been on the rise, rising rapidly especially before 2011. The proportion of the trade value of wood forest products imported from countries along the Belt and Road to China's total wood forest product import value generally shows a downward trend. Before 2010, the proportion of China's import and export trade of wood forest products to countries along the Belt and Road was very large. In 2000, China's imports of wood forest products from countries along the Belt and Road accounted for 35.39%, while the export proportion was only 7.03%. After that, with the continuous growth of China's export value, the gap in the proportion of import and export value gradually narrowed, and the two were almost equal by 2010. In general, the two-way trade between China and the countries along the Belt and Road has grown rapidly. China's export trade value was low in the early stage and grew rapidly in the later stage. After the Belt and Road Initiative, China's export value has been declining, and the import value has shown a trend of falling first and rising later.

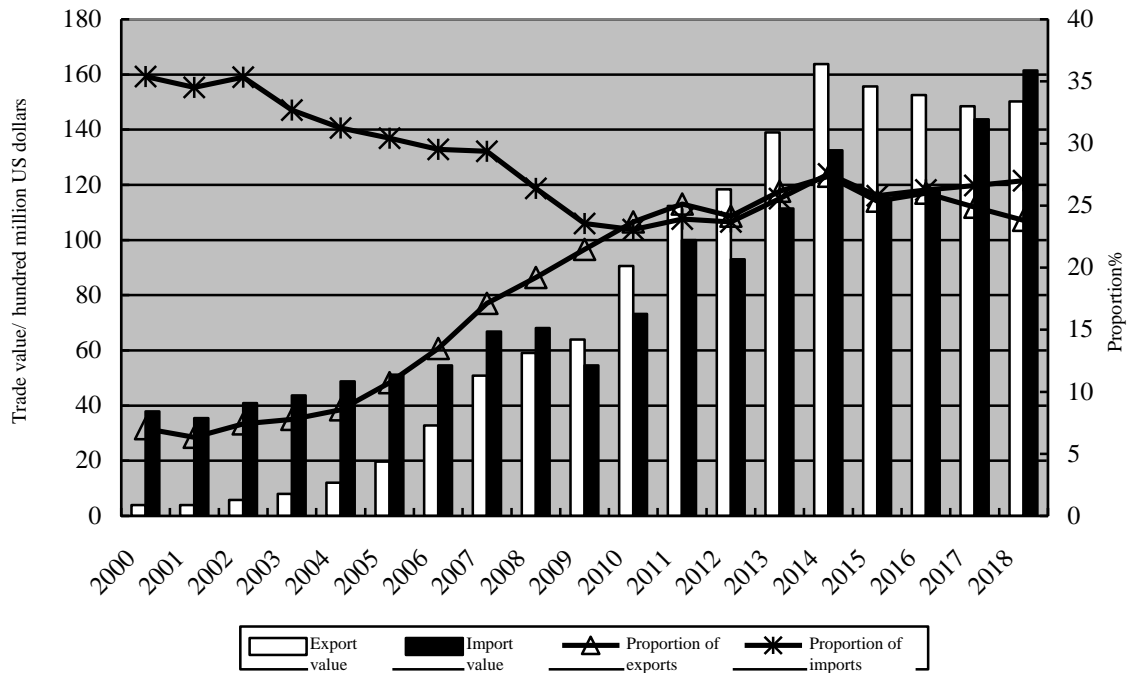


Figure 1 The trade situation of wood forest products between China and countries along the Belt and Road from 2000 to 2018.

### 3.1.2 Analysis of Trade Pattern of Wood Forest Products Between China and Countries Along the Belt and Road

It can be seen from "Table 1" that in 2018, the trade value of wood forest products exported from China to the top 15 countries accounted for 79.33% of the total export value, of which exports to Malaysia, Singapore and the Philippines ranked in the top three, with export proportions of 10.49%, 9.66% and 8.55% respectively. The trade value of wood forest products imported from the top 15

countries accounted for 96.62% of the total import value, of which imports from Russia, Indonesia and Thailand ranked in the top three, accounting for 41.60%, 25.62% and 13.49% respectively, and the import value of these three countries alone accounted for 80.71% of the total import, with a high concentration ratio, which were also the main import sources of logs in China. In general, China's trade in imported wood forest products to countries along the Belt and Road is highly concentrated and its export trade is relatively widespread.

Table 1. The trade pattern of wood forest products between China and countries along the Belt and Road in 2018, hundred million US dollars, %

Export			Import		
Country	Export value	Proportion (%)	Country	Import value	Proportion (%)
Malaysia	14.27	10.49	Russia	41.60	41.60
Singapore	13.14	9.66	Indonesia	25.62	25.62
the Philippines	11.63	8.55	Thailand	13.49	13.49
India	10.27	7.55	Singapore	2.71	2.71
United Arab Emirates	9.65	7.09	Laos	2.47	2.47
Saudi Arabia	9.52	7.00	Malaysia	2.12	2.12
Thailand	7.44	5.47	Czech Republic	1.46	1.46
Indonesia	6.00	4.41	Poland	1.43	1.43

Export			Import		
Country	Export value	Proportion (%)	Country	Import value	Proportion (%)
Russia	5.71	4.19	Romania	1.38	1.38
Israel	4.03	2.96	India	1.23	1.23
Iraq	3.71	2.72	Ukraine	0.84	0.84
Iran	3.32	2.44	Latvia	0.72	0.72
Poland	3.24	2.38	the Philippines	0.54	0.54
Pakistan	3.16	2.32	Lithuania	0.53	0.53
Turkey	2.85	2.10	United Arab Emirates	0.47	0.47
Total		79.33			96.62

### 3.2 Analysis of Model Results

#### 3.2.1 Analysis of Fluctuations in China's Exports of Wood Forest Products to Countries Along the Belt and Road

##### 3.2.1.1 Demand Factor

From "Table 2", it can be seen that from 2000 to 2018, the increase in market demand in the 65 countries along the Belt and Road had a positive effect on the growth of China's wood forest products exports. The growth effect contribution was 7.2%, driving exports to increase by US\$1.05 billion. The growth effect of the three stages were US\$800 million, US\$2.94 billion and US\$310 million, with a contribution rate of 14.6%, 39.1% and 22.9%, respectively. It can be seen that since China's accession to the WTO, along with the continuous expansion of trade cooperation between China and countries along the Belt and Road, the increase in consumer demand for China's wood forest products from countries along the Belt and Road has promoted the export of China's wood forest products. The 2008 financial crisis didn't affect the demand for Chinese wood forest products in countries along the Belt and Road. Since stage 3, the growth effect has declined compared with the previous stages, and the need for pulling effect gradually becomes weaker.

##### 3.2.1.2 Structural Factor

From 2000 to 2018, the benefits of product structure had only a weak pulling effect on China's wood forest products exports, with an overall contribution rate of 0.6% and a decrease of US\$90 million in exports. Among them, the contribution rate of product structure benefit in stage 1 and stage 2 was 2.0% and 0.7% respectively, which led to an

increase of US\$110 million and US\$50 million respectively in China's exports of wood forest products to countries along the Belt and Road. The product structure effect in stage 3 negatively pulled US\$540 million, with a contribution rate of -40.1%. This shows that although China's export of wood forest products in the first two stages have a small degree of matching with the wood forest products imported by countries along the Belt and Road, which have grown rapidly, in stage 3, the export structure of China's wood forest products deviates from the demand structure of countries along the Belt and Road and the structure of export products needs to be optimized and adjusted. This is mainly due to the decline in the export scale of China's wood pulp and cellulose pulp, wooden furniture and other products in stage 3, so the product structure benefit has a reverse pulling effect. At the same time, the dynamic crossover effect of the three stages drove the export growth by US\$580 million, a deficit of US\$50 million, and US\$130 million, respectively, with a contribution rate of 10.5%, -0.7% and 9.5%, respectively, showing a weak pulling effect. This further shows that China's exports of wood forest products to countries along the Belt and Road are not well matched with those of fast-growing imports, the contribution rate is very low (or negative), and the export structure of wood forest products needs to be optimized.

##### 3.2.1.3 Competitiveness Factor

On the whole, from 2000 to 2018, China's wood forest products had good competitiveness, and the contribution rate of competitiveness effect was 24.0%, driving China's wood forest products exports to increase by US\$3.5 billion. However, the competitiveness effect of the three stages had obvious fluctuations. In stage 1, it drove an export growth of US\$1.33 billion, with a contribution rate

of 24.1%. In stage 2, it drove an export growth of US\$3.13 billion, with a contribution rate of 41.7%. In stage 3, there was a negative effect, negatively driving exports by US\$1.22 billion, with a contribution rate of -90.6%. Among them, the contribution rate of comprehensive competitiveness dropped from 28.2% in stage 1 to -120.6% in stage 3, and the contribution rate of product competitiveness increased from -4.1% in stage 1 to 30.0% in stage 3. This shows that China's export scale of wood forest products in the markets along the Belt and Road has declined significantly, especially after China has fully protected natural forests and stopped logging of natural commercial forests, the export scale has continued to decline. However, the export of wood products, planks and other products has certain advantages, but the

pulling effect is not obvious. In recent years, the rapid increase in the cost of production materials and labor has made the price advantage in the early stage not prominent and to a certain extent has also affected the export growth of China's wood forest products. The net crossover effect in stage 1 drove an export growth of US\$2.69 billion, with a contribution rate of 48.9%, which was the main force of crossover effect and actual export growth. However, it continued to decline in the latter two stages, and the contribution rate in stage 3 was -1.7%, which negatively drove the export growth of US\$20 million. This further shows that the export competitiveness of China's wood forest products has gradually declined and the export growth has been affected.

Table 2. Analysis of the growth of China's trade in wood forest products to countries along the Belt and Road, unit: Hundred million US dollars, %

Growth factor analysis	2000~2008		2009~2013		2014~2018		2000~2018	
	Absolute amount	Proportion	Absolute amount	Proportion	Absolute amount	Proportion	Absolute amount	Proportion
Actual export growth	55.1	100.0	75.0	100.0	-13.5	-100.0	146.3	100.0
<b>Structure effect</b>	<b>9.1</b>	<b>16.6</b>	<b>29.9</b>	<b>39.8</b>	<b>-2.3</b>	<b>-17.2</b>	<b>11.3</b>	<b>7.8</b>
Growth effect	8.0	14.6	29.4	39.1	3.1	22.9	10.5	7.2
Product structure effect	1.1	2.0	0.5	0.7	-5.4	-40.1	0.9	0.6
<b>Competitiveness effect</b>	<b>13.3</b>	<b>24.1</b>	<b>31.3</b>	<b>41.7</b>	<b>-12.2</b>	<b>-90.6</b>	<b>35.0</b>	<b>24.0</b>
Comprehensive competitiveness	15.5	28.2	31.3	41.7	-16.3	-120.6	37.2	25.4
Product competitiveness	-2.3	-4.1	0.0	0.0	4.1	30.0	-2.2	-1.5
<b>Crossover effect</b>	<b>32.7</b>	<b>59.4</b>	<b>13.9</b>	<b>18.5</b>	<b>1.1</b>	<b>7.8</b>	<b>99.9</b>	<b>68.3</b>
Net crossover effect	26.9	48.9	14.4	19.1	-0.2	-1.7	92.8	63.4
Dynamic crossover effect	5.8	10.5	-0.5	-0.7	1.3	9.5	7.1	4.9

### 3.2.2 Analysis on the Fluctuation of Wood Forest Products Exports from Countries Along the Belt and Road to China

#### 3.2.2.1 Demand Factor

From 2000 to 2018, the main reason for the increase in the export of wood forest products from countries along the Belt and Road was the increase in Chinese market demand. The increase in China's market demand led to an increase of US\$17.36 billion in the export of wood forest products, with a contribution rate of 140.5%. The growth effect of the three stages drove the export growth of US\$5.34 billion, US\$4.81 billion and US\$3.21 billion respectively, and the contribution rates were 177.1%, 84.6% and 111.2% respectively. Since

China's entry into the WTO, the rapidly growing Chinese market demand has greatly driven the export of wood forest products from countries along the Belt and Road and has become the absolute main driving force for export growth.

#### 3.2.2.2 Structural Factor

From 2000 to 2018, the product structure effect led to an increase of US\$3.25 billion in trade value exported to China from countries along the Belt and Road, with a contribution rate of 26.3%. In the first two stages, the product structure effect had a positive effect on export growth, accounting for 23.5% and 37.1%, respectively, driving export growth of US\$710 million and US\$2.11 billion, showing that in the first two stages, the export of

countries along the Belt and Road to China was concentrated on products with faster demand growth and the export product structure was more reasonable. The product structure effect of stage 3 drove exports to decrease by US\$1.02 billion, with a contribution rate of -35.5%. During this stage, the Belt and Road market didn't adjust the export structure of wood forest products in time with the diversification of the Chinese market demand structure. On the whole, the dynamic crossover effect drove exports to decrease by US\$2.64 billion, with a contribution rate of -21.3%. It also shows that the market along the Belt and Road needs to optimize the export structure of wood forest products.

### 3.2.2.3 *Competitiveness Factor*

From 2000 to 2018, the competitiveness effect drove the export growth of countries along the Belt and Road to decrease by US\$1.01 billion, with a contribution rate of -8.2%. Among them, the comprehensive competitiveness effect drove exports to decrease by US\$900 million, with a contribution rate of -7.3%, and the product competitiveness reduced exports by US\$110 million, with a contribution rate of -0.9%. The comprehensive competitiveness effect reduced

exports by US\$970 million and US\$260 million in stage 1 and stage 3 respectively, and the contribution rates were -32.0% and -9.0%. Stage 2 drove an increase of US\$460 million, with a contribution rate of 8.2%. The product competitiveness in stage 1 and stage 3 drove exports by US\$60 million and US\$520 million respectively, with contribution rates of 2.1% and 17.8%. Stage 2 drove exports to decrease by US\$900 million, with a contribution rate of -15.8%. Although the export share of wood forest products from countries along the Belt and Road to China increased in some periods, the overall trend was declining. After the Belt and Road Initiative was proposed, by increasing the export share of specific products (wood pulp and cellulose pulp, wooden furniture, etc.), the competitiveness of products has been improved to a certain extent, but the pulling effect is limited. From 2000 to 2018, the net crossover effect reduced exports by US\$4.61 billion, with a contribution rate of -37.4%, indicating that the export structure of wood forest products from countries along the Belt and Road was not well matched with changes in China's import scale. Even if the net crossover effect in stage 3 drove the export growth by US\$60 million, the contribution rate was only 2.1%, and the driving effect was not significant. ("Table 3")

Table 3. Analysis of the growth of trade in wood forest products from the Belt and Road countries to China, unit: 100 million yuan, %

Growth factor analysis	2000-2008		2009-2013		2014-2018		2000-2018	
	Absolute amount	Proportion	Absolute amount	Proportion	Absolute amount	Proportion	Absolute amount	Proportion
Actual export growth	30.2	100.0	56.9	100.0	28.9	100.0	123.5	100.0
<b>Structure effect</b>	<b>60.5</b>	<b>200.5</b>	<b>69.2</b>	<b>121.7</b>	<b>21.9</b>	<b>75.7</b>	<b>206.1</b>	<b>166.9</b>
Growth effect	53.4	177.1	48.1	84.6	32.1	111.2	173.6	140.5
Product structure effect	7.1	23.5	21.1	37.1	-10.2	-35.5	32.5	26.3
<b>Competitiveness effect</b>	<b>-9.0</b>	<b>-29.9</b>	<b>-4.4</b>	<b>-7.7</b>	<b>2.6</b>	<b>8.9</b>	<b>-10.1</b>	<b>-8.2</b>
Comprehensive competitiveness	-9.7	-32.0	4.6	8.2	-2.6	-9.0	-9.0	-7.3
Product competitiveness	0.6	2.1	-9.0	-15.8	5.2	17.8	-1.1	-0.9
<b>Crossover effect</b>	<b>-21.3</b>	<b>-70.6</b>	<b>-8.0</b>	<b>-14.1</b>	<b>4.5</b>	<b>15.4</b>	<b>-72.5</b>	<b>-58.7</b>
Net crossover effect	-12.7	-42.1	-3.8	-6.8	0.6	2.1	-46.1	-37.4
Dynamic crossover effect	-8.6	-28.5	-4.2	-7.3	3.8	13.3	-26.4	-21.3

## 4. CONCLUSION AND RECOMMENDATION

### 4.1 Conclusion

Based on the analysis of the current situation of wood forest products trade between China and countries along the Belt and Road from 2000 to 2018, this study uses a simplified CMS model to analyze the reasons for the dynamic growth of two-way exports of wood forest products between China and countries along the Belt and Road. The results show that China's trade in imported wood forest products to countries along the Belt and Road is highly concentrated and its export trade is relatively widespread. From 2000 to 2008, China's export trade of wood forest products to countries along the Belt and Road has been in deficit. Since 2009, the export trade value has turned from a deficit to a surplus and the export value has grown rapidly. But since 2014, the export value has been declining. The imports of wood forest products from countries along the Belt and Road show a fluctuating growth trend. In terms of China's exports to countries along the Belt and Road, the increase in demand from countries along the Belt and Road has a positive effect on the growth of China's wood forest products exports, the matching degree of exported wood forest products is not high, and the export competitiveness of products is gradually declining. In terms of exports to China from countries along the Belt and Road, the increase in Chinese market demand has become the absolute driving force for the growth of wood forest products exports. The structure of wood forest products exported to China in the early stage is relatively reasonable, and the current products' matching degree is not high, and further optimization and improvement are needed.

### 4.2 Recommendation

According to research conclusions, in order to maintain the healthy development of China's wood forest products trade, this study proposes: firstly, continuing to enhance the competitiveness of superior wood forest products. actively give play to the comparative advantages of wooden furniture, planks, wood products and other products, continue to improve the technological content and added value of China's wood forest products, produce differentiated products, continuously improve the competitiveness of wood forest products, and expand export scale. Secondly, it proposes gradually realizing the diversification of the wood forest products trade market. At present, China's

trade in wood forest products with countries along the Belt and Road is relatively concentrated, especially the import trade. On the basis of stabilizing the existing market, it is necessary to support and encourage export enterprises of wood forest products to continuously explore the markets of other countries along the Belt and Road and the markets of neighboring countries or regions, expand the trade pattern, and ensure the safety of Chinese wood. Thirdly, it proposes strengthening trade dialogue and cooperation. Efforts should be made to give full play to China's coordinating role in "the Belt and Road" wood forest products trade, strengthen exchanges and cooperation with countries along the route, rationally plan trade targets, increase investment in countries along the route, and make the cake of wood forest products trade bigger to share trade cooperation interests.

## AUTHORS' CONTRIBUTIONS

This paper is independently completed by Zhangfa Liu.

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