

Research on the Influencing Factors about China's Export of Mechanical and Electrical Products to the Five Lancang-Mekong Countries

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Abstract. This paper selects the data that China exports mechanical and electrical products (MEP) to the five Lancang-Mekong countries from 2010 to 2020. It uses the extended trade gravity model to analyze the influencing factors about MEP exported from China to the five Lancang-Mekong countries. The empirical analysis results show that GDP, the degree of openness to foreign trade, geographical distance, legal management, and whether they have a common border significantly affect China's export trade of MEP to the five Lancang-Mekong countries.

Keywords: Mechanical and electrical products; China's export; Trade gravity model; Lancang-Mekong countries.

1. Introduction

1.1. Background

In 2016, the first Lancang-Mekong cooperation (LMC) leaders' meeting was successfully held, which meant that the official start of this mechanism. LMC is a global sub-regional cooperation framework composed of China, Cambodia, Myanmar, Laos, Thailand and Vietnam. All the members are developing countries, and their top priority is development. At the same time, they are all in a critical period of industrialization and urbanization. By strengthening cooperation in production capacity, all countries can effectively raise the level of industrialization. China's export of MEP will also increase year by year, which is conducive to the better construction of the Lancang-Mekong countries.

In addition, the friction between China and the USA has intensified in recent years. In 2018, the USA imposed different levels of export tariffs and global safeguard measures of different lengths of time on some Chinese products^[1]. For example, in 2018, the United States imposed additional tariffs on products imported from China which is worth 50 billion U.S. dollars and announced the list of products to be subject to tariffs. In the list, there were a total of 1333 product codes of which 1047 were MEP accounting for 78.54%^[2]. With the outbreak of the epidemic in 2020, the global economy was sluggish, and many countries had begun to take action to protect their domestic markets. In face of this dilemma, the best way is to open multinational export markets to avoid the risk of rising economic costs brought about by trade protectionism. It is necessary for China to strengthen the economic relationship with the five Lancang-Mekong countries, and meanwhile grasp the feature of complementarity in trade. China can rely on the Lancang-Mekong's golden waterway and make major infrastructure as the hub, radiating and driving the development of the entire basin hinterland. This can promote two-way development of trade flows and the improvement of the quality and efficiency of the economy in the whole basin, which can not only cope with severe external challenges but also maintain the economic stability of the Lancang-Mekong region^[3].

At present, most scholars study the factors affecting trade in Europe and ASEAN, and fewer scholars study the sub-regional economic integration of the LMC. This paper examines the factors affecting China's exports of MEP to the five Lancang-Mekong countries and explores the possibility of conducting related research on LMC. Government changes frequently in the Lancang-Mekong River Basin, especially in the Golden Triangle, where drugs are rampant, and there are serious

security problems, which are closely related to the corruption of the surrounding countries. Therefore, in the research process, this paper incorporates the rule of law management index and the control of corruption index into the important factors affecting trade.

1.2. Literature Review

Trade gravity models are widely used to study the factors influencing trade and potentials of trade between two or more countries, either trade in goods or trade in services. Gold K and Rasiah R (2020) examined the institutional structure and other predictors of bilateral trade between Africa and China. They found that regions with low levels of political stability and weaker corruption controls had a significant impact on trade ^[4].

At present, the trade research between China and the Lancang-Mekong countries mainly focuses on the trade of the Lancang-Mekong countries, and this paper also takes the Lancang-Mekong countries. Liu (2020) used the stochastic frontier trade gravity model to analyze the export trade of agricultural products and obtained empirical results that the agricultural product trade between the Lancang-Mekong countries and China is a potential development type, and the potential of Thailand is the most prominent ^[5]. Liu (2019) analyzed the positive effect of infrastructure connectivity between China and the five Lancang-Mekong countries from the perspective of the level of infrastructure connectivity, mainly through the scale trade effect and trade creation effect to bring economic growth, and at the same time, it will produce negative effects. This is mainly due to the transfer of high-quality resources to developed regions due to the agglomeration effect ^[6]. Some foreign literatures also study the Mekong River mechanism composed of five countries. Wibulpolprasert et al (2021) believe that with the increase of interconnection among the Mekong River countries, the border trade volume has exploded, and the construction of infrastructure has improved the development of the industry ^[7]. Mainly from the perspective of infrastructure, they believe that supporting equipment is conducive to the long-term development.

The research on trade in MEP is mainly based on domestic literatures, because there are no item "electromechanical products" in the international trade classification. The main content of the relevant literature is mainly on the influencing factors, and the first is the technical trade barrier factor. Xiao (2008) believes that the export market of China's MEP is too concentrated on developed countries such as the European Union, the United States, and Japan, where the technical regulations and standards are well developed and formulated and has strict certification requirements, which is a challenge to China's electromechanical industry at the bottom of the global value chain ^[8]. China's electromechanical products urgently need to be upgraded in technology. If the production of electromechanical products has always been at a low level, then China will be at a disadvantage if there is a trade dispute with other developed countries. In the China-US trade friction, China's "337 investigations" has continued to increase, which has affected the export growth rate of high-added MEP. In this regard, Zheng (2019) analyzed the short-term and long-term impact of technical trade barriers on MEP export from a qualitative and quantitative perspective ^[9]. Secondly, on the export structure of MEP, Zhu et al (2015) analyzed the export structure of MEP in China through the trade gravity model and trade index as a supplement, and the scale of export of MEP is stable, but at the same time, China's own brands are relatively stable ^[10].

Based on the factors in the above literatures, this paper studies the factors that affect China's exports of MEP to the five Lancang-Mekong countries through an extended trade gravity model, mainly from the following factors: GDP, geographical distance, foreign trade opening of the five Lancang-Mekong countries degree, the management of the rule of law, and the governance of corruption.

2. The current situation of China's economic cooperation with Lancang-Mekong countries

2.1. China's import and export trade with the five Lancang-Mekong countries

As shown in Figure 2.1, China's bilateral trade volume with the five Lancang-Mekong countries from 2010 to 2020 showed an overall growth trend. In 2011, the lowest bilateral trade volume was only 89.56 billion US dollars. In 2020, the bilateral trade volume increased to a peak of 322.92 billion US dollars, an increase of about 72.27%. This seriously affected China's economic and trade exchanges with the Lancang-Mekong River Basin. At the end of 2011, China, Laos, and Myanmar strengthened law enforcement patrols in the Mekong River Basin, then since 2012, the Mekong River has begun normal trade and transportation. In 2015, international commodity prices fell sharply, global demand was sluggish, import and export pressure was greater, and the total amount of bilateral trade was affected, resulting in a 17% decline. Trade volumes maintained a high growth rate for the rest of the time. Since China optimized its import and export trade structure in 2016, the average growth rate of bilateral trade between China and the five countries has reached 20%. Although the growth of bilateral trade has slowed down in 2020 due to the impact of the COVID-19 epidemic, the overall trade volume is an upward trend, accounting for 47.2% of China's bilateral trade with ASEAN. After the start of the LMC in 2015, regional economic cooperation between the six countries has promoted the development of bilateral trade.

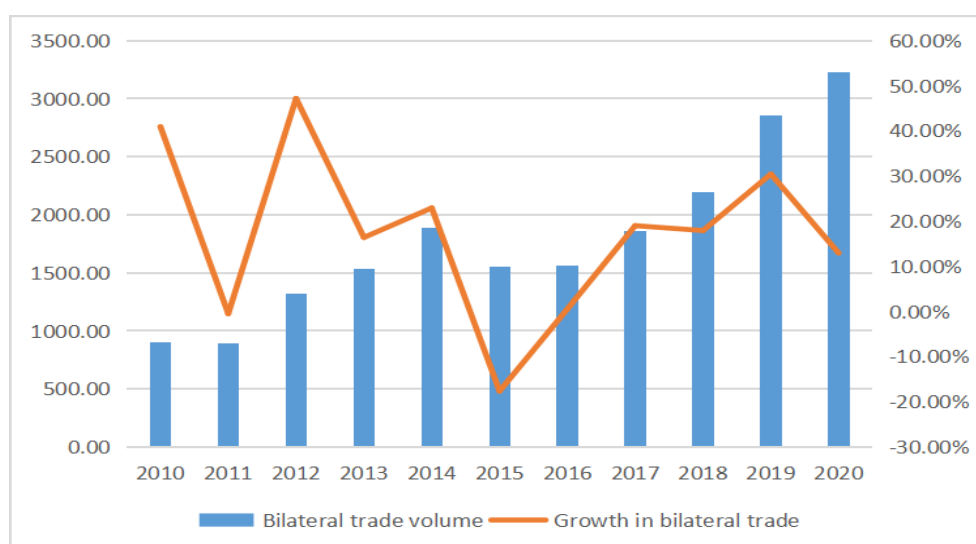


Figure 2.1 China's bilateral trade scale with the five Lancang-Mekong countries

Data source: UN COMTRADE database

2.2. China's export trade of MEP to the five Lancang-Mekong countries

2.2.1 The scale of China's export trade of MEP to the five Lancang-Mekong countries

Figure 2.2 shows the trade volume and growth rate of China's exports of MEP to the five Lancang-Mekong countries from 2010 to 2020. In 2010, the export trade volume of MEP was only 17.751 billion US dollars. By 2020, the trade volume had reached 80.427 billion US dollars, which is 4.5 times of the 2010 trade volume. In 2016, due to the weak recovery of the world economy, the restructuring of the global value chain, the shortening of the supply chain, and the increase in domestic costs, the production of MEP in China declined, and the export growth rate of MEP declined significantly. The total export value of MEP exported by China was 1,209.74 billion US dollars, a year-on-year decrease of 7.5%. As the world economy recovers and demand picks up, the growth rate in 2017 reached 20%. From 2017 to 2020, the export trade volume of MEP showed a fluctuating upward trend.

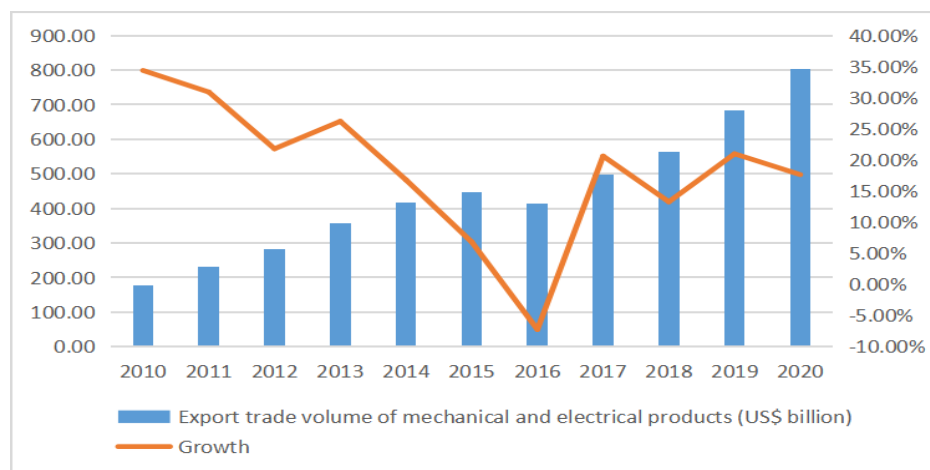


Figure 2.2 China's export trade volume of MEP to the five Lancang-Mekong countries

Data source: UN COMTRADE database

2.2.2 China's export structure of MEP to the five Lancang-Mekong countries

This paper adopts the Standard International Trade Classification 7 (SITC7) category of machinery and transportation equipment in the SITC (Rev.3) classification standard as the object of research on electromechanical products, mainly including the following 7 categories. See Table 2.1 for details.

Table 2.1 Product Code

SITC Rev.3 Product Code	The product category
7	Mechanical transport equipment
71	Power generation machinery and equipment
72	Special industrial machinery
73	Metalworking machinery
74	General industrial machinery equipment and mechanical parts
75	Office machines and automatic data devices
76	Telecommunications and recording and audio equipment
77	Electro-mechanical, appliance and electrical components
78	Road vehicles
79	Other transport equipment

As can be seen from Figure 2.3, China's exports of MEP to the five countries from 2010 to 2020 generally increased year by year. Except for the 76th category, which had fluctuated and declined since 2016, the other categories of MEP had increased year by year. Specifically, the 77th category, namely electrical machinery, appliances and electrical components, had grown from \$3.403 billion in 2010 to \$33.461 billion in 2020, an increase of nearly 883%. This is followed by the 75th category, namely office machines and automatic data equipment. The export value of the 75th category products in 2010 was 2.614 billion US dollars, and in 2020 it reached to 13.926 billion US dollars, an increase of 4.3 times during the period. In 2020, the five Lancang-Mekong countries had less demand for products of categories 79, 73, 71, and 78 from China, accounting for less than 1% of the total imports of the five countries.

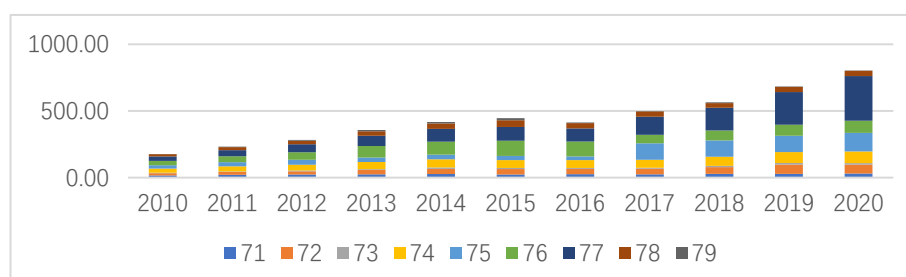


Figure 2.3 China's total exports of various MEP to the five Lancang-Mekong countries from 2010 to 2020

Data source: UN COMTRADE database

To sum up, China's exports of MEP to the five countries are concentrated on categories 75 and 77, followed by categories 76, 74 and 72.

2.2.3 Distribution of China's export trade of MEP to the five Lancang-Mekong countries

There is a serious imbalance in China's exports of MEP to the five Lancang-Mekong countries. As can be seen from Figure 2.4, China's main exporters within the five Lancang-Mekong countries are Thailand and Vietnam. Vietnam and Thailand account for more than 80% of China's exports to the five Lancang-Mekong countries, and which is expanding year by year, reaching 92.94% by 2020.

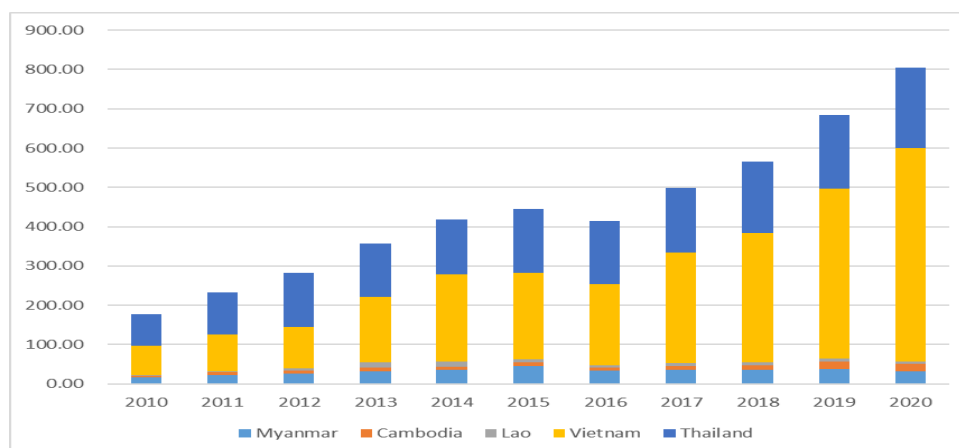


Figure 2.4 Distribution of China's MEP Exporters to the Five Lancang-Mekong Countries from 2010 to 2020

Data source: UN COMTRADE database

From 2010 to 2020, China's exports of MEP to Vietnam and Thailand were different. Table 2.3 shows that the proportion of China's MEP exported to Vietnam continued to increase, while the proportion of China's MEP exported to Thailand continued to decline. In 2020, China's exports of MEP to Laos accounted for 0.8% of the region's total. In the same year, China's exports of MEP to Vietnam reached 67.5%, accounting for more than half of the region's total imports of MEP. While China's export value of MEP to Thailand had dropped to 25.45% in 2020 and may further decline in the future.

Table 2.3 Changes of the proportion of China's MEP exported to the five countries from 2010 to 2020

	Myanmar	Cambodia	Lao	Vietnam	Thailand
2010	9.30%	1.58%	1.12%	42.71%	45.29%
2011	9.52%	2.93%	1.31%	40.53%	45.71%
2012	9.23%	2.41%	1.96%	37.80%	48.60%
2013	8.86%	2.61%	3.85%	46.48%	38.19%
2014	8.66%	1.52%	3.49%	53.27%	33.06%
2015	10.32%	1.76%	1.74%	49.45%	36.72%
2016	8.29%	1.83%	1.39%	49.74%	38.74%
2017	7.29%	1.81%	1.61%	56.18%	33.12%
2018	6.41%	1.98%	1.25%	58.15%	32.22%
2019	5.43%	2.71%	1.21%	63.35%	27.30%
2020	3.99%	2.27%	0.80%	67.50%	25.45%

Data source: UN COMTRADE database, obtained after calculation

3. Empirical analysis

3.1. Extended gravity model

The trade gravity model is a classic model for studying international import and export trade, and the trade gravity fundamentally originates from the law of universal gravitation. Economists Tinbergen and Poyhoen first used it to study international trade issues. The law of universal gravitation states that the mutual attraction between two objects is proportional to the mass of the two objects and inversely proportional to the distance between them. The trade gravity model draws on the law of gravity and assumes that the trade flow between two countries or two regions is proportional to the economic aggregate between the two economies and inversely proportional to the spatial distance between the two economies. The specific formula is set as follows:

$$X_{ij} = A(Y_i Y_j) / D_{ij} \quad (3.1)$$

Where X_{ij} represents the trade volume between the exporter i and the importer j ; A is a constant item; Y_i represents the GDP of the country i ; Y_j represents the GDP of the country j ; and D_{ij} represents the spatial distance between exporter i and importer j . In general, taking the logarithm on the two sides in formula 3.1 to get formula 3.2.

$$\ln X_{ij} = \alpha_0 + \alpha_1 \ln X_{ij} + \alpha_2 \ln Y_{ij} + \alpha_3 \ln D_{ij} + \alpha_4 \quad (3.2)$$

Where α_0 , α_1 , α_2 , α_3 , represent regression coefficient; and μ_{ij} represents the standard random error term.

When using the gravity model, domestic and foreign scholars will increase or decrease the explanatory variables on the original basis to enhance the persuasiveness of the model. The changed model is called the extended gravity model.

3.2. Variable selection and data source

3.2.1 Variable selection

This paper analyzes the factors that affect China's export of MEP to the five Lancang-Mekong countries. Based on the basic gravity model, we select the degree of foreign trade openness, political stability and non-riot index, legal management, and whether it is a neighbor of the importing and exporting countries, these are used as the explanatory variable, the export trade volume of MEP from China to the five Lancang-Mekong countries is employed as the explained variable, and the selected time period is 2010-2020.

(1) The nominal GDP of the five Lancang-Mekong countries is used to indicate the import demand of the five Lancang-Mekong countries. The larger the GDP scale, the stronger the potential purchasing power of the five Lancang-Mekong countries, and the greater the potential trade demand.

(2) The degree of openness to trade refers to the ratio of a country's total merchandise trade to its gross domestic product. The bigger the ratio, the higher the degree of openness, and the greater the demand for bilateral trade.

(3) The distance between China and the five Lancang-Mekong countries represents the potential trade cost. The farther the geographical distance is, the higher the transportation cost, and correspondingly the bilateral trade will be hindered.

(4) Control of corruption index. A lower index indicates that the country has a good and stable marketing environment, and a stable economic development, which will promote the development of bilateral trade.

(5) The Rule of Law Management Index reflects the state of the rule of law in a country and the extent to which the law protects contracts. A high-quality institutional environment will facilitate the bilateral trade.

(6) Whether there is a common border. If there is a common border, the trade transportation is facilitated, which in turn facilitates the conduct of trade.

See Table 3.1 below for details.

Table 3.1 Variables and descriptions

Name	Explanation	Unit	Expected Symbol
EXP_{ij}^t	In the t-year, China's export of MEP to the j country in the five Lancang-Mekong countries.	Million dollar	—
GDP_j^t	In the t-year, the nominal GDP of the j country in the five Lancang-Mekong countries.	Million dollar	+
$OPEN_{ij}^t$	The degree of foreign trade between China and the j country in the five Lancang-Mekong countries.	—	+
DES_{ij}	The geographical distance between China and the j country in the five Lancang-Mekong countries.	Kilometer	-
CON_j^t	The control of corruption index of country j in the five Lancang-Mekong countries in the t-year.	—	+
LAW_j^t	The law management index of country j is among the five Lancang-Mekong countries in the t-year.	—	+
$CONTIG_{ij}$	Whether there is a common boundary between the two countries, where 1 means yes, 0 indicates no.	—	+
ε_{ij}^t	Residual difference.	—	—

Data sources: UN COMTRADE database, IMF database, Gravity Dataset database, World Bank WGI database

3.2.2 Data Source and Processing

This paper will conduct a panel regression analysis on the selected data, the time span is from 2010 to 2020, and the cross-section is the five Lancang-Mekong countries. Among them, China's trade exports to these five countries come from the UNCOMTRADE database from 2010 to 2020; the GDP data between China and the five Lancang-Mekong countries comes from the IMF database; the geographic distance and whether they have a common border come from the Gravity Dataset database of French CEPII; and the political stability and non-violence index, and the regulatory quality index are from the World Bank WGI database.

In this paper, the control of corruption index and the rule of law management index are subjected to interval processing, where all the data of the two indexes are compressed into the range of [2.5, 7.5], and the mathematical units of the data are kept consistent. Then logarithms of the GDP, foreign trade openness of the five Lancang-Mekong countries, capital distance, processed rule of law index, and control of corruption index will be taken.

3.3. Measurement and analysis

According to the extended gravity model, the model in this paper is set as follows:

$$\ln EXP_{ij}^t = \alpha_0 + \alpha_1 \ln GDP_j^t + \alpha_2 \ln OPEN_{ij}^t + \alpha_3 \ln DES_{ij} + \alpha_4 CONTIG_{ij} + \alpha_5 \ln CON_j^t + \alpha_6 \ln LAW_j^t + \varepsilon_{ij}^t \quad (3.3)$$

First, from the collinearity analysis results as shown in Table 3.2, one can find that the VIF values are all less than 10. Therefore, there is no collinearity in this model, and the following experiments can be continued.

Table 3.2 Results of the multicollinearity test

Variable	VIF	1/VIF
lnGDP	6.70	0.149154
lnDES	8.82	0.113417
lnOPEN	2.07	0.484063
CONTIG	1.32	0.759435
lnLAW	5.2	0.192476
lnCON	6.21	0.161144
Mean VIF	5.05	

Since the geographical distance variable in the explanatory variable is a fixed value and will not change with time, the fixed effect model cannot be used, and only the mixed model or the random effect model can be selected. The LM test is performed to determine whether to choose a mixed model or a random effect model. The LM test shows that the P value is 1, which indicates that the null hypothesis that there is no individual random effect is not rejected. Therefore, after the LM test, the mixed regression method is chosen, and the results are shown in Table 3.3 below.

Table 3.3 Results of the mixed regression

Variables	Coefficient	Robust t-statistics	significance
lnGDP	0.982	26.47	***
lnOPEN	0.524	4.27	***
lnDES	-0.467	-8.21	***
CONTIG	0.567	5.82	***
lnCON	0.004	0.03	/
lnLAW	0.465	8.03	***
Constant	-0.064	-0.39	***
Observations	66		
R-squared	0.985		

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

According to the results of the mixed-effects model in Table 3.3, the collected data can be explained up to 98%. One can find that the GDP of the five Lancang-Mekong countries, the degree of openness to foreign trade, geographic distance, legal management, and whether they have a common border all have a significant impact on the export value of China's MEP. And the GDP of the five Lancang-Mekong countries, the degree of foreign trade openness, the rule of law management index, and whether there is a common border have a significant positive impact on the export of MEP. While the geographic distance has a significant negative impact on the export, and the government stability and non-riot index does not significantly affect exports of MEP. Specifically, analysis of the results are as follows:

(1) The GDP coefficient is positive and has passed the significance test of 1%. This indicates that the GDP of the five Lancang-Mekong countries has boosted China's exports of MEP to those countries. The coefficient is 0.982, indicating that for every 1% increase in GDP, with other factors remaining unchanged, the export volume increases by 0.98%.

(2) Geographical distance. The coefficient is negative and has passed the significance test of 1%. This indicates that the geographical distance has suppressed China's exports of MEP to the five Lancang-Mekong countries. The degree of improvement of transport infrastructure in the five countries is different, and some countries are relatively backward, so geographical distance is still a major obstacle to the development of export trade^[11].

(3) The degree of foreign trade. It passes a 1% significance test. It indicates that foreign trade has promoted the export of China's mechanical and electrical products, that is, for every unit increase, China's exports of mechanical and electrical products to the five Lancang-Mekong countries increase by 0.524 units.

(4) Control of corruption index. The sign of the regression coefficient is consistent with expectations, but the results are not significant. The higher the level of corruption control, the more honest the government will create a high-quality business environment and promote the export of products. The reason for the inconspicuous results may be due to a lack of data, with only eleven years of data available.

(5) Rule of Law Management Index. The sign of the regression coefficient is positive as expected and has passed the significance level test. The coefficient is 0.465, which means that for every 1% increase in legal management, the export volume of China's mechanical and electrical products will increase by 0.465%.

(6) Having common boundaries. The regression coefficient is consistent with expectations and has passed the 1% significance level test. When there is a common boundary, it is conducive to the development of mechanical and electrical import and export trade. The model results are as follows:

$$\ln EXP_{ij}^t = -0.064 + 0.982 \ln GDP_j^t + 0.524 \ln OPEN_{ij}^t - 0.467 \ln DES_{ij} + 0.567 CONTIG_{ij} + 0.004 \ln CON_j^t + 0.465 \ln LAW_j^t + \varepsilon_{ij}^t \quad (3.4)$$

4. Conclusion and recommendations

4.1. Conclusion

The Lancang-Mekong River Basin is one of the regions with the greatest development potential in Asia and even the world. The Lancang-Mekong cooperation adheres to the cooperation concept of development priority, equal consultation, pragmatism and efficiency, openness and inclusiveness, and has achieved results beyond expectations.

The bilateral trade between China and the five Lancang-Mekong countries is characterized by accelerated trade development and optimized trade structure. In general, the scale of bilateral trade is on the rise, and the bilateral trade volume has shown rapid growth, which is higher than the growth rate of China's foreign trade volume. There is a large economic development gap between China and the five countries in terms of trade. Through economic complementarity, the import of MEP from China will increase the construction of the five Lancang-Mekong countries' industrial infrastructure. The trade relationship between China and the five Lancang-Mekong countries is closer, and bilateral trade exchanges walk in the forefront with other countries.

Bilateral trade has made great progress, but there are still trade risks and trade imbalances in the cooperation between China and the five Lancang-Mekong countries on MEP. Thailand and Vietnam are China's major exporters of MEP in the region, with exports to the two countries accounting for more than 80 percent of China's total exports in the region. In recent years, Vietnam has become China's largest importer in the region, while Thailand's imports of China's MEP have been declining year by year. The growth rate of trade between China and the five Lancang-Mekong countries is on a downward trend, and the growth momentum is insufficient, which is related to the unstable political situation in the region.

The GDP of the five Lancang-Mekong countries, the degree of openness to foreign trade, geographic distance, legal management, and whether they have a common border all significantly affect China's exports of MEP to the five Lancang-Mekong countries.

4.2. Recommendations

China's electromechanical enterprises should strengthen the independent innovation ability of "learning by doing", actively upgrade the value chain, make brand and technological content an important means of upgrading the value chain of China's manufacturing industry, and enhance the export competitiveness of enterprises. China's electromechanical enterprises should take less detours in global value chain governance by digesting, absorbing and learning from foreign technical elements. At the same time, China's electromechanical enterprises should attach importance to scientific research investment, put product research and development innovation, independent

property rights and brand building in the first place, and cultivate the power source of sustainable development of enterprises.

China's mechanical and electrical enterprises should enter the five Lancang-Mekong countries with a more open attitude and move towards the forefront of economic and trade exchanges. Chinese enterprises are fully capable and should have enough confidence to step out to the forefront of Lancang-Mekong cooperation, establish joint ventures or wholly owned companies, plan and establish industrial parks, etc., and use their own advantages to increase the development of Lancang-Mekong cooperation. And it is necessary to seize the opportunity to improve the quality of MEP, further expand the Lancang-Mekong market, create huge economic benefits for enterprises, and at the same time effectively strengthen the trade closeness between China and the five Lancang-Mekong countries.

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