

Research on the impact of trade facilitation level on China's export of mechanical and electrical products under the framework of RCEP

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Abstract

with the development of world economic integration and regional integration, tariff restrictions are less and less. As an invisible obstacle, "inefficiency" has become a major reason for restricting national exports. Therefore, how to improve the level of trade facilitation has become an urgent problem for all countries. RCEP member countries occupy an important market for China's export of mechanical and electrical products. With the signing of the regional economic cooperation agreement (RCEP), it marks the formal establishment of the free trade zone with the largest population and trade scale in the world, which is of strategic significance to improve the "inefficiency" of trade, improve the level of trade facilitation and promote the export of mechanical and electrical products. Firstly, this paper constructs the evaluation index system of trade facilitation level. On this basis, the principal component analysis method is used to make statistics on RCEP member countries, and the score of trade facilitation degree is obtained; On this basis, the project will empirically test the effect of trade facilitation on China's mechanical and electrical products exports to other countries based on the panel data of China's RCEP member countries from 2011 to 2019 and the expanded gravity model. The research results show that: except Singapore, New Zealand and Japan, the trade facilitation of other countries is not convenient, and there are certain differences in the level of trade facilitation among countries; The empirical results show that the improvement of trade facilitation, GDP, total population and trade openness of each country have a significant role in promoting the export of China's mechanical and electrical products to RCEP member countries, and the distance between the two countries has a significant inhibitory effect.

Keywords

Trade Facilitation; RCEP Member States; Electromechanical Products

Introduction

RCEP was launched in 2011 to promote economic integration in East Asia and cope with the impact of the trans Pacific Partnership (TPP). The ASEAN summit was held in Phnom Penh, Cambodia, on November 20, 2012. The heads of 16 countries jointly issued the joint statement on launching RCEP negotiations; Since May, 2013, Brunei

has initiated the first round of consultations on the "free trade agreement", established three working groups on "trade in goods", "trade in services" and "investment", and conducted consultations on relevant issues; From 2016 to 2018, RCEP held a series of leaders' meetings and consultations, and its process was significantly accelerated. In particular, after the United States announced its withdrawal from the TPP, members accelerated the negotiation process in order to counter the economic sanctions of the United States; On November 15, 2020, with the convening of the fourth signing agreement of the agreement, leaders of 15 countries participated in the signing of the agreement, and the agreement was finally signed successfully. The signing of the agreement laid the foundation for the establishment of the world's largest free trade area, greatly reduced the average tariff of trade, and had a far-reaching impact on the regional and even global economy. However, with the outward promotion of trade and the development of multinational cross regional trade and cooperation, some problems caused by non-tariff have led to the increase of trade costs, and countries have also begun to realize the importance of trade facilitation.

The purpose of trade facilitation is to promote global economic growth and strengthen trade links between countries. Especially in the economic recovery stage after the epidemic, trade facilitation enhances foreign trade and promotes economic development by reducing trade costs. As an important issue in the new round of multilateral trade negotiations under the WTO framework, trade facilitation began at the first WTO Ministerial Conference held in Singapore in 1996. After several rounds of negotiations, WTO members finally reached a consensus on the issue of trade facilitation and signed the agreement on trade facilitation. Since then, trade facilitation has been playing an important role in promoting.

Mechanical and electrical products are an important part of China's export commodities, and the growth of their export value directly drives the increase of China's total foreign trade volume. Mechanical and electrical products, with their high added value, high-tech content and other characteristics, have formed a strong competitive advantage in the world and played a great role in the development of the national economy. The increase in foreign exchange reserves has strengthened our international payment capacity and provided us with financial guarantee for the introduction of advanced technology, equipment and resources from abroad. Mechanical and electrical products have always been the leading product of China's exports, accounting for an important share of China's total exports. According to the data of authoritative agencies such as the General Administration of customs, the export of mechanical and electrical products accounts for a large part of China's total exports. The export volume of China to RCEP countries also shows an upward trend year by year, and the development speed is very fast. On this basis, this paper uses the principal component analysis method to measure the degree of trade facilitation among RCEP member countries, and then empirically explores the impact of trade facilitation.

tion on China's export of mechanical and electrical products, in order to provide reference and suggestions for the promotion and improvement of China's export scale and structure of Mechanical and electrical products.

1. Literature Review

The research on trade facilitation mainly focuses on the establishment of trade facilitation indicators and its impact on exports. On this basis, Wilson (2003) first proposed and measured the indicators of "port efficiency", "customs environment", "institutional environment" and "e-commerce"; On this basis, other scholars further adjusted the primary indicators or secondary indicators according to different research objects. For example, Peng Tao (2023) added e-commerce analysis to the primary indicators to analyze the impact of trade facilitation on cross-border e-commerce exports [2]; Mengqinglei and wangyuhao (2022) used e-commerce and innovation to replace e-commerce, and added financial market complexity and capital liquidity to secondary indicators to measure e-commerce and finance [3]; Wang Min et al. (2011) and Dong Li et al. (2022) [4][5] added "agricultural policy cost" to the sub indicator to highlight its role in trade facilitation. In the research on the impact of trade facilitation on export trade, many scholars have made empirical research on it by establishing gravity model and taking it as the core explanatory variable. For example, Liu Wen (2023) has demonstrated that trade facilitation has an obvious promoting effect on the promotion of China's export trade on the basis of the gravity model of communication expansion [6]; Yaoling and Zhang Yong (2024) incorporated trade facilitation data into the gravity model and found that for every 1% increase in trade facilitation, China's high-tech export trade to RCEP member countries will increase by 1.22% [7]; Peng Hong (2022) took the agricultural exports of China and 10 ASEAN countries as the research object. Through the extended gravity model, the study found that infrastructure, customs environment and regulatory environment have a significant promoting effect on the export of agricultural products, while e-commerce will not have a significant impact on the export of agricultural products [8].

In a word, although the existing literature on trade facilitation is relatively perfect, there is a lack of research on some specific industries, including the impact of trade facilitation level on the export of mechanical and electrical products. Therefore, based on the existing research, this paper selects the panel data from 2011 to 2019 to explore the influencing factors of the export of mechanical and electrical products by constructing an extended trade gravity model, taking the level of trade facilitation as the core explanatory variable, other control variables, and the export volume of mechanical and electrical products as the explained variable.

2. Measurement Of Trade Facilitation Level

2.1 Index System Construction

Trade facilitation involves a wide range and complexity. At present, there is no

standard system for measuring the level of trade facilitation in the world. Most domestic scholars use Wilson (2003) for reference to build an index system. Based on the research of xiangyijun (2021), this paper selects four first-class indicators, including institutional environment, infrastructure, customs environment, finance and e-commerce. On this basis, it uses the research of Liao Jia, liguangqin, Ma Huiqiong and Su Hui [9][10][11] for reference to select 13 second-class indicators, including judicial independence, the quality of highway infrastructure, the prevalence of trade barriers, and the number of Internet users, to build a trade facilitation level measurement system, as shown in table 2-1:

Table 2-1. index system of trade facilitation level

Primary indicator	Secondary index		Score range	data sources
Institutional environment	Judicial independence	A1	1-7	GCR
	Dispute settlement efficiency	A2	1-7	
	Burden of government regulation	A3	1-7	
	Efficiency of the legal framework in regulatory challenges	A4	1-7	
Infrastructure	Quality of highway infrastructure	B1	1-7	GCR
	Quality of railway infrastructure	B2	1-7	
	Aviation infrastructure quality	B3	1-7	
	Port infrastructure quality	B4	1-7	
Customs environment	Customs procedure burden	C1	1-7	GCR
	Universality of trade barriers	C2	1-7	
Finance and e-commerce	Bank conservatism	D1	1-7	GCR
	Availability of venture capital	D2	1-7	
	Number of Internet users	D3	1-100	

2.2 Measurement Of Trade Facilitation Level

2.2.1 data sources

The above secondary index data are all from the global competitiveness report (GCR) issued by the world economic forum, and GCR only published data before 2019. Therefore, the research time of this paper is up to 2019. Due to the serious lack of data in Brunei, Laos and Myanmar, and the small market share of China's exports of mechanical and electrical products, these three countries are directly excluded.

2.2.2 Data Processing

The score range of the number of Internet users is 1-100, and other indicators are 1-7. There are different value ranges between secondary indicators. In order to facilitate the subsequent measurement of the level of trade facilitation, it is necessary

to standardize the data. This study uses the min max method to find out the minimum and maximum score of secondary indicators, subtract all indicators from the minimum value and divide the maximum value minus the minimum value, and finally make the value range of all indicators between 0-1. The specific formula is as follows:

$$Y_i = \frac{X_i - X_{min}}{X_{max} - X_{min}}$$

2.2.3 Weight Determination

In this paper, the principal component analysis method is used to determine the weight of each index. This method uses the dimensionality reduction method to replace multiple indexes with several principal component factors, specifically using the overall contribution of each index to determine the principal component factors, and then using the final comprehensive score to replace the original index value. Before principal component analysis, kmo and Bartlett spherical test should be performed on the data. The software used in this paper is stata18.0.

Table 2-2. kmo and Bartlett test

Kmo sampling appropriateness quantity	0.849	
Bartlett sphericity test	Approximate chi square	2435.959
	degree of freedom	78
	Significance	0.000

It can be seen from table 2-2 that the kmo value is 0.849 and the significance is 0.000, indicating that there is a strong correlation between the 13 secondary indicators, which is suitable for principal component analysis. Then, the principal component analysis method is used to obtain the variance interpretation table. The first three principal components (Comp1, Comp2, comp3) with eigenvalues greater than 1 are selected, and the cumulative interpretation rate is 87.166%, indicating that the first three principal components can cover 87.166% of the 13 indicators. The expression of the three principal components is as follows:

$$\text{Comp1} = 0.294A1 + 0.326A2 + 0.241A3 + 0.296A4 + 0.285B1 + 0.238B2 + 0.312B3 + 0.307B4 + 0.268C1 + 0.281C2 + 0.247D1 + 0.237D2 + 0.254D3$$

$$\text{Comp2} = 0.039A1 + 0.121A2 + 0.264A3 + 0.227R4 - 0.355B1 - 0.488B2 - 0.214B3 - 0.180B4 + 0.032C1 + 0.296C2 + 0.315D1 + 0.331D2 - 0.352D3$$

$$\text{Comp3} = -0.336RA + 0.004A2 + 0.564A3 - 0.054A4 + 0.097B1 + 0.223B2 + 0.092B3 + 0.004C1 - 0.230C2 - 0.424D1 + 0.440D2 - 0.269D3$$

According to the above three principal component expressions, the coefficient of each indicator is multiplied by the corresponding contribution rate, then divided by the cumulative contribution rate of the three principal components, and finally added to obtain the comprehensive evaluation model of the Trade Facilitation Index System of RCEP Member States, the expression is as follows:

$$\text{Comp} = 0.213A1 + 0.253A3 + 0.349A2 + 0.215A4 + 0.183B1 + 0.065B2 + 0.219B3 + 0.237B4 + 0.207C1 + 0.143C2 + 0.044D1 + 0.343D2 + 0.230D3$$

Then, the normalized method is used to process the index coefficients in the comprehensive evaluation model to obtain the weight of each secondary index, and then the coefficient of the secondary index is added to obtain the weight of the primary

index as institutional environment (0.372), infrastructure (0.254), customs environment (0.127), finance and e-commerce (0.248), from which the comprehensive evaluation model of trade facilitation system of RCEP member states can be obtained:

$$\text{Comp}=0.213A1+0.253A3+0.349A2+0.215A4+0.183B1+0.065B2+0.219B3+0.237B4+0.207C1+0.143C2+0.044D1+0.343D2+0.230D3$$

The weight of each indicator is shown in table 2-3 below:

Table 2-3. weight of each indicator

Primary indicator	Secondary index	Secondary index weight	Primary indicator weight
Institutional environment	Judicial independenceA1	0.077	0.372
	Dispute settlement efficiencyA2	0.091	
	Burden of government regulationA3	0.126	
	Efficiency of the legal framework in regulatory challengesA4	0.078	
Infrastructure	Quality of highway infrastructureB1	0.066	0.254
	Quality of railway infrastructureB2	0.023	
	Aviation infrastructure qualityB3	0.079	
	Port infrastructure qualityB4	0.086	
Customs environment	Customs procedure burdenC1	0.075	0.127
	Universality of trade barriersC2	0.016	
Finance and e-commerce	Bank conservatismD1	0.124	0.248
	Availability of venture capitalD2	0.108	
	Number of Internet usersD3	1-100	

2.3 Results And Analysis Of Trade Facilitation Level

According to the comprehensive evaluation model of the trade facilitation system of RCEP Member States, the standardized data are substituted into it to get the score of trade facilitation of RCEP member states from 2011 to 2019. The closer the score is to 1, the higher the level of trade facilitation.

Table 2-4. trade facilitation scores of RCEP member states from 2011 to 2019

	2011	2012	2013	2014	2015	2016	2017	2018	2019	mean value
Japan	0.601	0.588	0.620	0.649	0.671	0.684	0.687	0.712	0.723	0.659

Table 2-4. (Continued)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	mean value
Korea	0.460	0.472	0.455	0.426	0.446	0.476	0.492	0.509	0.529	0.474
Australia	0.594	0.592	0.553	0.551	0.568	0.547	0.553	0.553	0.559	0.563
New Zealand	0.659	0.698	0.704	0.707	0.681	0.664	0.689	0.659	0.662	0.680
Indonesia	0.220	0.228	0.275	0.302	0.268	0.281	0.325	0.328	0.349	0.286
Malaysia	0.590	0.583	0.571	0.620	0.633	0.592	0.583	0.576	0.561	0.590
the Philippines	0.100	0.160	0.199	0.217	0.201	0.113	0.103	0.147	0.152	0.155
Singapore	0.861	0.858	0.830	0.821	0.850	0.858	0.852	0.807	0.810	0.839
Thailand	0.363	0.306	0.308	0.282	0.285	0.289	0.310	0.290	0.313	0.305
Vietnam	0.149	0.124	0.129	0.138	0.173	0.191	0.176	0.157	0.191	0.159
Cambodia	0.184	0.222	0.157	0.073	0.064	0.094	0.081	0.086	0.113	0.119

According to Zeng Zheng et al. (2008), this paper divides the level of trade facilitation into four levels: TFI greater than 0.8 is very convenient; TFI between 0.7 and 0.8 is convenient for comparison; TFI between 0.6 and 0.7 is generally convenient;

TFI below 0.6 is not convenient. It can be seen from table 3-4 that except for Singapore, New Zealand and Japan, which have achieved trade facilitation, other RCEP member countries have not achieved trade facilitation, and the overall level of trade facilitation is low. Specifically, the average score of Singapore's trade facilitation level is 0.839, which is a very convenient level; The average scores of trade facilitation of Japan and New Zealand were 0.659 and 0.680 respectively, which belonged to the level of general facilitation; Countries with very low scores in trade facilitation include the Philippines, Vietnam and Cambodia, which are only 0.155, 0.159 and 0.119, respectively. There is a large gap in the level of trade facilitation among member countries. From the perspective of change trend, the change degree of trade facilitation level of RCEP member countries from 2011 to 2019 is relatively small, and countries with low scores of trade facilitation still have a lot of room for improvement.

3. Empirical analysis of the impact of trade facilitation on China's export of mechanical and electrical products

After measuring the level of trade facilitation, this chapter uses the expanded gravity model, takes the level of trade facilitation as the core explanatory variable, and conducts an empirical study on 11 RCEP member countries based on the data from 2010 to 2019.

3.1 Model Construction

The basic gravity model believes that the volume of trade between the two countries is directly proportional to their GDP and inversely proportional to the distance between them. The core of this study is to study the impact of the level of trade facilitation of RCEP member states on China's exports of mechanical and electrical products. Therefore, based on the standard gravity model, the level of trade facilitation is taken as the core explanatory variable, the export volume of mechanical and electrical products of China's RCEP Member States is taken as the explanatory variable, and other control variables such as the total population of RCEP Member States and the trade openness of RCEP member states are added. At the same time, the logarithm of the model is taken to obtain the expanded gravity model as follows:

$$\ln Y_{ijt} = \alpha_0 + \beta_1 TFI_{jt} + \beta_2 GDP_{it} + \beta_3 GDP_{jt} + \beta_4 DIS_{ijt} + \beta_5 POP_{jt} + \beta_6 OPEN_{jt} + \mu$$

Among them, I represents China, J represents RCEP member countries, y_{ijt} represents China's exports of mechanical and electrical products to j in T , gdp_{it} is China's GDP in T , gdp_{jt} is the GDP of J in T , DIS is the geographical distance between the two countries in t period, pop_{jt} is the total population of J in T , α_0 is a constant term, β_1 , β_2 , β_3 , β_4 , β_5 , β_6 are elastic coefficients, and μ is an error term.

3.2 Variable Interpretation And Data Sources

The explanatory variable selected in this study is that China's exports of mechanical and electrical products to RCEP member countries are replaced by the exports of

machinery and transportation equipment in category VII of sitcrv.4 under the latest version of international trade standards. The core explanatory variable is the level of trade facilitation. The control variables are China's gross domestic product, the gross domestic product of RCEP member countries, the distance between the two countries and the total population of RCEP member countries. The trade export volume of mechanical and electrical products is from the uncomtrade database. The level of trade facilitation is measured from the above. The trade openness, gross domestic product and total population are from the world bank database, and the distance between the two countries is from the CEPII database. Each variable is explained below.

(1) Trade facilitation level

The level of trade facilitation is a comprehensive indicator reflecting a country's institutional environment, infrastructure, customs environment, finance and e-commerce. If a country's level of trade facilitation is higher, the country's trade barriers will be smaller, which can promote the country's trade transactions, improve trade efficiency and reduce trade costs. The expected sign is positive.

(2) China's gross domestic product

GDP can measure the economic development level of a country. The higher the GDP, the higher the supply capacity of mechanical and electrical products to other countries. After meeting the domestic demand, it can promote the trade of mechanical and electrical products with other countries. The expected sign is positive.

(3) GDP of RCEP member countries

It can reflect the economic strength of a country. The more developed the economy, the stronger the national consumption ability, the greater the market demand for mechanical and electrical products, and the expected symbol is positive.

(4) Distance between two countries

The distance between the two countries affects the size of trade costs. The longer the distance, the higher the time and transportation costs, which increases the trade costs and is not conducive to promoting trade transactions between the two countries. The expected sign is negative.

(5) Total population of RCEP Member States

On the one hand, the larger the total population of a country, the greater the consumption demand of the country, and the greater the demand for foreign imports, which can increase the amount of trade imports; On the other hand, the increase of population will increase domestic substitutes and reduce the demand for foreign trade. The expected sign is uncertain.

(6) Trade openness of RCEP Member States

Trade openness is measured by the proportion of a country's import and export trade volume in GDP, which indicates the contribution of import and export trade to a country's economic growth. The higher the degree of trade openness, the higher the enthusiasm of countries to participate in import and export trade, which is more

conductive to the export of China's mechanical and electrical products. The expected sign is positive.

3.3 Descriptive Statistical Analysis

Because some variables' values are too large, logarithms are taken and descriptive statistical analysis is carried out with stata18.0 software. The results are shown in table 3-1:

Table 3-1. descriptive statistics of variables

variable	sample size	mean value	standard deviation	minimum	Maximum
lnYijt	99	23.21058	1.277566	20.26504	24.92103
lnTFIjt	99	-1.023179	.6968637	-2.748872	-.1496608
lnGDPit	99	30.00841	.2009707	29.65277	30.28988
lnGDPjt	99	26.81141	1.393265	23.27502	29.46717
lnDISijt	99	8.194893	.6473204	6.861712	9.283126
lnPOPjt	99	17.4808	1.235601	15.29347	19.41239
lnOPENjt	99	4.456359	.6675236	3.407675	5.937797

Table 3-1 statistics the average, standard deviation and maximum value of the data of 11 RCEP member countries in the past 10 years. It can be seen from the table that China's exports of mechanical and electrical products, population size and economic development level to RCEP member countries are in a large gap, and there are also some differences in the level of trade facilitation and trade openness among countries.

3.4 Stability Test

In this paper, LLC test and Fisher PP test are used to test the stability of panel data. Since the distance variable between the two countries is constant, it is not necessary to test the unit root. The results are shown in table 3-2. Lnyijt, lntfijt, lngdpit, lngdpjt, lnpopjt and lnopenjt are significant at the levels of 1% and 5%, that is, there is no unit root, and the panel data has good stability.

Table 3-2. unit root LLC inspection results

variable		Statistical value	Pvalue	conclusion
lnYijt	LLCtest	-2.6936	0.0035***	stable
	Fisher-PPtest	60.0702	0.0000***	
lnTFIjt	LLCtest	-10.8871	0.0000***	stable
	Fisher-PPtest	34.2296	0.0465**	
lnGDPit	LLCtest	-3.4182	0.0003***	stable
	Fisher-PPtest	47.7326	0.0012***	
lnGDPjt	LLCtest	-5.4414	0.0000***	stable
	Fisher-PPtest	45.6838	0.0022***	
lnPOPjt	LLCtest	-7.1799	0.0000***	stable
	Fisher-PPtest	330.2727	0.0000***	

Table 3-2. (Continued)

variable		Statistical value	Pvalue	conclusion
lnOPENjt	LLCtest	-7.7170	0.0000***	stable
	Fisher-PPtest	43.7799	0.0038***	

3.5 Regression Analysis

This paper uses stata18.0 software RCEP member countries to explore the impact of trade facilitation on China's exports of mechanical and electrical products, and selects the panel data from 2011 to 2019 for regression analysis. Before regression analysis, it is necessary to choose between mixed effect model, fixed effect model and random effect model. First, F-test the regression results of mixed effect and fixed effect, with a p value of 0.000, rejecting the original hypothesis, indicating that fixed effect model should be selected between fixed effect model and mixed effect model. Then LM Test was performed on the regression results of mixed effect and random effect, and the p value was 0.000, indicating that the random effect model should be selected between the above two. Finally, the fixed effect and random effect regression results were tested by Hausman test, and the result was $\text{prob} > \chi^2 = 0.3294$. The original hypothesis could not be rejected, and the random effect model was selected between the two. In addition, the distance between two countries in the gravity model of this study will not change with time, and the fixed effect model is not applicable. Finally, the random effect model is selected.

LM Test is generally used to judge between random effect model and mixed effect model. The p value of LM Test is 0.000, less than 0.05, rejecting the original hypothesis, so this paper uses random effect model. The regression results are shown in table 3-3:

Table 3-3. regression results of random effects

variable	(1)	(2)
lnTFIjt	0.2057461*** (0.0747909)	0.253162*** (0.0602101)
lnGDPit	0.4895484*** (0.0778398)	0.5374706*** (0.0581903)
lnGDPjt	0.8338694*** (0.0998311)	0.8015294*** (0.0580738)
lnDISijt	-0.6601153** (0.3213047)	-0.2839438** (0.1414418)
lnPOPjt		0.2864547*** (0.0842723)
lnOPENjt		0.9378029*** (0.0998538)
Constant term	-8.217109** (3.694777)	-21.00891*** (2.882654)
R2	0.7316	0.8157

Column (1) is the regression result obtained by incorporating only the core explanatory variables into the gravity model. Column (2) is the regression result obtained by adding the other two control variables on the basis of the core explanatory variables. It can be seen that the goodness of fit of the model with other control variables is higher and the significance is better than that with only the core explanatory variables. The regression results are analyzed below:

(1) Trade facilitation level TFI of RCEP member states: trade facilitation level is the core explanatory variable of this paper. Its coefficient is 0.25. It passed the significance test at the 1% confidence level, which is in line with expectations. It shows that trade facilitation level of RCEP Member States has a significant role in promoting China's export of mechanical and electrical products. Every 1% increase in trade facilitation level will increase China's export of mechanical and electrical products by 0.25%.

(2) GDP of China and RCEP members: both passed the 1% confidence level test, and the regression coefficients were 0.54 and 0.8 respectively, which was in line with the theoretical expectation, indicating that for every one percentage point increase in China's GDP and RCEP member's GDP, China's exports of mechanical and electrical products would increase by 0.54 and 0.8 percentage points.

(3) Dis: there is a significant negative correlation between the export volume of mechanical and electrical products and the distance between the two countries, with a coefficient of -0.28, which is in line with expectations. For every 1% increase in the distance between the two countries, China's exports of mechanical and electrical products will be reduced by 0.28%. The distance between the two countries has a restraining effect on China's exports of mechanical and electrical products, reducing the scale of China's exports of mechanical and electrical products.

(4) Total population of RCEP Member States pop: the total population has passed the significance test at the confidence level of 1%, and the regression coefficient is 0.29, indicating that the export volume of China's mechanical and electrical products will increase by 0.29% for every 1% increase in the number of members. In the previous prediction, the impact of this variable is not clear. On the one hand, the increase of the total population will expand the market demand and increase the demand for mechanical and electrical products; On the other hand, the increase of the total population will refine the domestic division of labor and reduce external demand. The results show that population growth has a significant effect on the export of China's mechanical and electrical products, which may be due to the increase in consumer demand caused by population growth, thus promoting the export of mechanical and electrical products.

(5) Trade Openness: the trade openness of member countries has passed the 1% confidence level test, and the regression coefficient is 0.94, indicating that the export volume of China's mechanical and electrical products will increase by 0.94% every time the trade openness of member countries increases by 1%. In general, the higher a country's trade openness, the higher its dependence on foreign trade, and the more conducive it is to China's export of mechanical and electrical products.

3.6 Robustness Test

The above empirical results show that the trade facilitation level of RCEP member countries has a significant role in promoting the export of mechanical and electrical products. In order to ensure the robustness of the results, considering the possible

endogenous problems in the regression process, this paper uses cuixinsheng (2020)'s ideas for reference, and replaces the original data with the data lagging behind the level of trade facilitation for the robustness test to avoid endogenous. The test results are shown in table 3-4:

Table 3-4. robustness test results

variable	(1)	(2)
lnTFIjt-lag	0.1254938** (0.0601506)	

Table 3-4. (Continued)

variable	(1)	(2)
lnTFIjt		0.253162*** (0.0602101)
lnGDPit	0.5137455*** (0.0728548)	0.5374706*** (0.0581903)
lnGDPjt	0.8512935*** (0.0603793)	0.8015294*** (0.0580738)
lnDISijt	-0.2476603* (0.1403503)	-0.2839438** (0.1414418)
lnPOPjt	0.2635969*** (0.0832966)	0.2864547*** (0.0842723)
lnOPENjt	0.9928681*** (0.1058263)	0.9378029*** (0.0998538)
Constant term	-21.90252*** (3.157786)	-21.00891*** (2.882654)
R2	0.7729	0.8157

It can be seen from table 3-3 that the significance and sign direction of the core explanatory variable trade facilitation level have not changed, and the significance and sign direction of other variables are the same as the original. The coefficient size has changed, but the fluctuation range is reasonable. Although the goodness of fit is reduced, it still can better reflect the relationship between variables. Therefore, the empirical results of this paper are robust.

4. Conclusions And Suggestions

4.1 Conclusion

Based on the panel data of RCEP countries from 2011 to 2019, this paper empirically analyzes the trade facilitation degree of China's electromechanical products among RCEP member countries. First, by establishing an index system to measure the degree of trade facilitation, the PCA method is used to measure and analyze the degree of trade facilitation of RCEP member countries. On this basis, based on the expanded gravity model, the measured level of trade facilitation is taken as the main explanatory variable, and the export volume of China's mechanical and electrical products to Member States is taken as the explanatory variable for regression. The main conclusions are as follows: first, there is a large gap in the level of trade facilitation among RCEP member countries. Only Singapore, New Zealand and Japan have reached the level of trade facilitation. The level of trade facilitation in other coun-

tries is relatively backward, and it has little change from 2011 to 2019, and there is still much room for growth. Second, according to the expanded gravity model, the degree of trade facilitation between China and ASEAN countries has a significant role in promoting China's export of mechanical and electrical products, with an increase of 0.25%. The degree of trade facilitation between China and ASEAN countries is an important way to promote its export growth; At the same time, the total population and trade openness of RCEP member countries can promote the export of China's mechanical and electrical products.

4.2 Suggestions

First: strengthen financial e-commerce cooperation with RCEP Member States, provide financial support and improve infrastructure construction. The Trade Facilitation Index system is composed of institutional environment, infrastructure, customs environment and finance and e-commerce. China cannot directly intervene in other countries' institutional environment and customs environment, but it can improve other countries' infrastructure construction and financial and e-commerce level by providing corresponding financial and technical support. From the results of the level of trade facilitation, it can be seen that the overall level of trade facilitation of RCEP member countries is low, and the vast majority of ASEAN countries are developing countries. An important reason for the low level of trade facilitation is the lack of corresponding funds and technologies to improve infrastructure. Therefore, it can promote the financial and e-commerce cooperation between China and ASEAN countries, broaden financing channels, provide certain financial support for ASEAN countries by using some infrastructure construction investment banks and foreign investment banks, and accelerate the construction of infrastructure such as logistics and information networks. At the same time, in terms of e-commerce, we should promote the construction of an e-commerce system of "Internet+infrastructure", build a trade information platform conducive to mechanical and electrical products, and increase the import and export trade volume of mechanical and electrical products.

Second: strengthen the construction of institutional environment and improve the level of trade facilitation. The institutional environment has the largest weight in the index system of trade facilitation level, which is crucial to the improvement of trade facilitation level. Compared with the infrastructure, the institutional environment can not produce a direct positive effect on the export of mechanical and electrical products, but from the perspective of long-term development, a good institutional environment provides a stable market environment for the export of mechanical and electrical products in China, reducing the barriers of trade friction on export and reducing trade costs. On the one hand, governments of all countries should establish sound laws and regulations, improve the supervision system, take severe measures against violations of rules and regulations, strengthen the credibility of the government, and create a good business environment; On the other hand, we

should enhance the judicial independence of RCEP countries and the transparency of policies in the formulation and implementation process, timely publish relevant information, reduce trade costs caused by information asymmetry, build a trade dispute settlement mechanism, reduce disputes and improve the efficiency of dispute settlement.

Third: promote infrastructure connectivity among member states in combination with the construction of the "belt and road initiative". Infrastructure is the key factor in the index system of trade facilitation level. High quality infrastructure is the basic condition of trade transactions. If there is no perfect transportation facilities, the smooth implementation of bilateral trade will be restricted. The empirical results also show that the distance factor between the two countries will have a significant inhibitory effect on the export of mechanical and electrical products. Therefore, the interconnection of national infrastructure can effectively reduce the phenomenon of regional segmentation. First of all, countries can improve the original transportation network facilities according to their geographical location and terrain characteristics to ensure that the sea, land and air transportation networks among countries in the region are interconnected. Secondly, countries should strengthen investment and cooperation in transportation infrastructure. China should assist Member States to promote infrastructure construction, complete infrastructure optimization through financial and technical support, and help relatively backward Member States improve the construction of water, land and air transportation channels, truly achieve interconnection, and provide convenience for the trade and export of mechanical and electrical products.

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