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A Study on the Impact of Trade Facilitation on China's Agricultural Exports

-- An Empirical Analysis Based on RCEP Member Countries

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ABSTRACT

In the context of global trade liberalization, the implementation of RCEP to establish the world's largest FTA will promote trade growth and economic prosperity, which will have a positive effect on the trade of agricultural products, and trade facilitation is crucial for China, a large agricultural country, to export agricultural products. This study selects the panel data of 10 RCEP member countries between 2010 and 2019 as a sample, measures the trade facilitation level of the above member countries, and empirically analyzes it using the trade gravity model in order to explore the specific impact of trade facilitation on China's agricultural exports. The findings show that trade facilitation in RCEP member countries helps promote China's agricultural exports, while the diversified trade structure of RCEP leads to significant differences in economic development and trade facilitation levels among member countries. Based on this, the paper makes recommendations at the national, member state and enterprise levels.

KEYWORDS

Trade facilitation; RCEP; Chinese agricultural exports; Trade gravity modelling

1. INTRODUCTION

On January 1, 2022, the Regional Comprehensive Economic Partnership (RCEP) was formally implemented, which is inevitable in the context of trade globalization and regional economic integration. It was initiated by the ten ASEAN countries, with the participation of China, Japan, South Korea, Australia and New Zealand, and aims to establish a comprehensive, high-quality and mutually beneficial economic partnership. The RCEP FTA will reduce trade barriers, promote the free flow of factors, and create a fair and open market environment for enterprises. For China's agriculture, RCEP will bring broad market opportunities to expand agricultural exports, introduce advanced technology and management experience, promote the modernization and internationalization of agriculture, and promote in-depth cooperation between China and member countries for mutual benefit. this study explores how the trade facilitation level under the RCEP framework affects China's agricultural exports. What are the significant differences among countries that affect their trade facilitation levels? The study of the above questions has important theoretical and practical significance for deepening the understanding of trade facilitation and promoting China's agricultural exports. Finally, on this basis, we summarize the conclusions of the study and propose targeted measures.

2. LITERATURE REVIEW

Trade facilitation level measurement is the prerequisite basis for relevant research, such as etc. Some scholars believe that it is to simplify and coordinate the trade process and optimize global resource allocation (WANG Runqiao & CHEN Zilei, 2023); some scholars build evaluation systems to empirically analyze its impact mechanism on the embeddedness of global value chains (Zan Xin, 2024).

At present, academics have studied the trade between China and other RCEP member countries from multiple angles. Some scholars through the stochastic frontier gravity model analysis, pointed out that the RCEP countries (such as Australia, Vietnam, New Zealand) have more comparative advantages of agricultural products, the overall competitiveness is higher than that of China, in the short term, China's trade deficit is difficult to change; there are also through the comparative and empirical analysis method, to explore the other RCEP member countries of the far-reaching impact of technical barriers to trade on the exports of China's products (Wang Xiaoxu, 2023); there are more focus on the international trade of our country and RCEP member countries, to explore its information technology foundation, international logistics performance on China's export trade impact mechanism (Zhang Wencai, 2024). There is also a focus on China's international trade with RCEP member countries, which explores the influence mechanism of its information technology foundation and international logistics performance on China's export trade (Zhang Lanxin, 2024).

Trade and export is an important driving force for national economic growth, and the growth of agricultural exports is related to agricultural output and farmers' income. Some scholars have measured the level of trade facilitation between China and ASEAN countries, analyzed its impact on China's agricultural exports to ASEAN, and put forward policy recommendations (Deng Xiaoxue, 2022); some scholars have comprehensively analyzed and empirically analyzed the impact of green trade barriers on China's agricultural exports using the trade gravity model (Zheng Xutao & Guo Hong, 2023); and some scholars have empirically used econometric models, such as the PSM and gravity model, to analyze the relationship between trade exports and agricultural exports (Zheng Huiqing, 2024).

Although there are abundant studies on trade facilitation in the context of RCEP, there are insufficient specialized analyses focusing on member countries, and few systematic analyses of how trade facilitation dynamically affects China's agricultural products' market position in RCEP. In this regard, this study proposes a quantitative assessment strategy based on the trade gravity model to explore the link between trade facilitation indicators and China's agricultural export performance, to fill the knowledge blind spot, and to provide support for policy formulation and competitiveness enhancement.

3. THEORETICAL BASIS AND HYPOTHESIS

3.1. Theoretical Foundations

The theory of free trade advocates the removal of trade barriers and the free competition of goods and services in order to optimize the allocation of resources and enhance economic efficiency and welfare. Free trade and trade facilitation promote each other and jointly promote international trade and economic development. Some scholars have proved that free trade zones can boost agricultural trade among member countries (Zeng Huasheng & Tan Yanwen, 2021); Other scholars have shown that trade facilitation can reduce costs, increase exports and promote regional economic integration (Guo Nan, 2016). Customs union refers to the establishment of a unified customs border by two or more countries, the reduction or elimination of tariffs between the contracting parties, the application of a common tariff rate and foreign trade policy for goods outside the customs border, the internal tariff reduction and free flow of goods, and the harmonization of external tariff policies. The difference

between it and a free trade zone lies in the internal tariff treatment and the unity of external policy. The functions of a customs union are to promote market integration, to harmonize policies towards non-member countries, and to reduce barriers in order to improve the efficiency of resource allocation.

3.2. Mechanisms for the Impact of Trade

Infrastructure is mainly transportation, quality improvement can improve transportation efficiency, reduce costs, and promote exports; customs environment involves unconventional payments, trade barriers, etc., and its convenience is closely related to international trade; the regulatory environment reflects a country's system, and problems in any part of the policy transparency, etc., will affect the country and international trade; e-commerce and finance have a role in promoting international trade, and sound financial services can avoid risks, and the popularization of the Internet can improve the efficiency of transactions. Risks can be avoided by sound financial services, and the popularization of the Internet can enhance the efficiency of transactions.

Hypothesis 1: The growth of trade facilitation level in RCEP member countries will promote China's agricultural exports.

The Regional Comprehensive Economic Partnership Agreement (RCEPA) is a free trade area comprising a wide range of economies, including highly developed economies (e.g., Japan and the Republic of Korea), medium-sized economies (e.g., China and most of the ASEAN countries), and more economically backward countries (e.g., Myanmar and Laos). This diversified economic background has led to significant differences among member countries in terms of economic strength, industrial structure, technological level, and market demand. Such differences make countries' needs and priorities in terms of trade policy, market access, and economic cooperation different.

Hypothesis 2: The level of trade facilitation in RCEP member countries will have varying degrees of impact on China's agricultural exports, which will vary according to the level of development of the target country.

4. MEASUREMENT AND ANALYSIS OF TRADE FACILITATION LEVELS

4.1. Classification of Indicators

Trade facilitation is a multidimensional and integrated concept, covering policy, infrastructure, customs clearance, information technology applications, etc. Its assessment requires the selection of appropriate indicators and methods based on different criteria. In this paper, considering the complex factors such as the diversified structure of RCEP member countries, the different levels of infrastructure, and the environmental constraints on China's agricultural exports, combined with the availability of data, four stage indicators, namely, infrastructure, customs environment, regulatory environment, and e-commerce and finance, and subdivided into 14 secondary indicators, are cautiously selected for the purpose of accurately determining the level of trade facilitation.

Table 1. Classification of indicators

Level 1 indicators	Level 2 indicators	notation	range	sources
infrastructure	Road infrastructure	X_1	1-7	GCR
	Railway infrastructure	X_2	1-7	GCR
	Port infrastructure	X_3	1-7	GCR
	Aviation infrastructure	X_4	1-7	GCR
Customs environment	Unconventional payments and bribes	X_5	1-7	GCR
	Prevalence of trade barriers	X_6	1-7	GCR
regulatory environment	Transparency in decision-making	X_7	1-7	GCR
	Efficiency of government regulations for dispute resolution	X_8	1-7	GCR
	Judicial independence	X_9	1-7	GCR
	Burden of government regulation	X_{10}	1-7	GCR
E-commerce and Finance	Accessibility of financial services	X_{11}	1-7	GCR
	Credit facilitation	X_{12}	1-7	GCR
	Availability of venture capital	X_{13}	1-7	GCR
	Internet penetration	X_{14}	1-100	GCR

4.2. Measuring the Level of Trade Facilitation

4.2.1. Data standardization

Influenced by the differences in the data sources and ranges of different indicators, this study will standardize the raw data in order to ensure the comparability of the study. The specific methods are as follows:

Divide the raw data of the secondary indicators by the maximum value of the corresponding value range and transform it into a standardized scale to give the data of different indicators the same basis of comparison so as to facilitate further analysis. The formula is as follows:

$$Y_i = X_i / X_{\max} \tag{4-1}$$

Xi is the raw data value for secondary indicator i, Xmax is the maximum value of the indicator, Yi are standardized secondary indicator data values all standardized to a range of [0, 1], giving comparability of data.

4.2.2. Measurement process

(1) Perform KMO test and Bartlett's sphericity test

The KMO test and Bartlett's spherical test are two methods commonly used in statistics to assess the correlation and independence between variables respectively, the closer the KMO value is to 1 and the closer the Bartlett spherical test value is to 0, the better the data is analyzed using principal component analysis. Table 2 shows that the KMO value is 0.818 and the significant value of Bartlett's spherical test is less than 0.005, which indicates that the data in this paper is suitable for principal component analysis.

Table 2. Test structure

KMO test and Bartlett's sphericity test		
KMO Quantity of Sample Suitability		0.818
Bartlett's test of sphericity	approximate chi-square	1210.643
	degrees of freedom	91
	p	0

(2) Total Variance Explained

Using principal component analysis, we can draw the following summary from the table above: The percentage of variance of the first four principal components cumulatively explains 88.899% of the total variance, indicating their importance in the data. The remaining components still explain some of the variance, but their contributions are smaller and are mainly concentrated in smaller percentages of variance. Overall, the first four principal components already explain most of the variance in the data.

Table 3. Total Variance Explained

	Initial eigenvalue	Variance %	accumulate %	Extract	Variance %	accumulate %
1	8.471	60.509	60.509	8.471	60.509	60.509
2	1.797	12.837	73.346	1.797	12.837	73.346
3	1.103	7.878	81.224	1.103	7.878	81.224
4	1.075	7.676	88.899	1.075	7.676	88.899
5	0.525	3.75	92.649			
6	0.301	2.149	94.798			
7	0.267	1.908	96.706			
8	0.147	1.051	97.757			
9	0.1	0.715	98.471			
10	0.08	0.571	99.042			
11	0.053	0.38	99.422			
12	0.035	0.253	99.674			
13	0.028	0.202	99.876			
14	0.017	0.124	100			

The formulas for the four main components can be obtained from the component matrix in Table 3:

$$Y_1 = 0.284X_1 + 0.246X_2 + 0.290X_3 + 0.309X_4 + 0.308X_5 + 0.230X_6 + 0.297 X_7 + 0.312X_8 + 0.297X_9 + 0.243X_{10} + 0.218X_{11} + 0.188X_{12} + 0.228X_{13} + 0.253X_{14} \quad (4\text{-}2)$$

$$Y_2 = -0.330X_1 - 0.421X_2 - 0.204X_3 - 0.146X_4 - 0.089X_5 + 0.342X_6 + 0.074 X_7 + 0.192X_8 + 0.009X_9 + 0.278X_{10} + 0.316X_{11} + 0.398X_{12} + 0.176X_{13} - 0.341X_{14} \quad (4\text{-}3)$$

$$Y_3 = 0.230X_1 + 0.113X_2 + 0.244X_3 + 0.130X_4 - 0.189X_5 - 0.285X_6 - 0.354 X_7 + 0.204X_8 - 0.176X_9 + 0.028X_{10} + 0.523X_{11} + 0.224X_{12} - 0.416X_{13} - 0.214X_{14} \quad (4\text{-}4)$$

$$Y_4 = 0.137X_1 + 0.150X_2 + 0.135X_3 + 0.093X_4 - 0.299X_5 - 0.004X_6 - 0.003 X_7 - 0.032X_8 - 0.367X_9 + 0.539X_{10} - 0.035X_{11} - 0.421X_{12} + 0.407X_{13} - 0.267X_{14} \quad (4\text{-}5)$$

The principal component contributions and the corresponding coefficients are multiplied, and then the resulting product and their cumulative contributions are divided and summed. Finally, normalization is performed to obtain the final measurement formula:

$$Y = 0.069X_1 + 0.052X_2 + 0.077X_3 + 0.081X_4 + 0.066X_5 + 0.070X_6 + 0.073 \\ X_7 + 0.097X_8 + 0.067X_9 + 0.091X_{10} + 0.085X_{11} + 0.065X_{12} + 0.067X_{13} + 0.040X_{14} \quad (4\text{-}6)$$

4.2.3. Combined trade facilitation score

The classification criteria below refer to the study by Zheng Zeng&Xi Zhou (2008), which classifies the trade facilitation level into four levels, where the trade facilitation level score at [0, 0.6] is inconvenient, (0.6, 0.7] is moderately convenient, (0.7, 0.8] is relatively convenient, and (0.8, 1] is very convenient [13]. Table 4 shows that Singapore is the best performer in all the years with a mean value of 0.84, which is rated as 'very convenient'. New Zealand, Japan, and Malaysia are categorized as "relatively convenient" with mean values of 0.76, 0.73, and 0.72, respectively, while Australia and South Korea are considered "generally convenient" with mean values of 0.69 and 0.62, respectively. Thailand, Indonesia, the Philippines, and Cambodia are in the 'not convenient' range, with mean values ranging from 0.48 to 0.58, mainly due to their geographic location and infrastructure. Overall, the level of facilitation varies significantly across countries.

Table 4. Trade facilitation level score

convenience	nations	2010	2011	2012	2014	2015	2016	2017	2018	2019	AVE
Very	SGP	0.85	0.85	0.85	0.83	0.84	0.85	0.85	0.81	0.81	0.84
More	NZL	0.76	0.76	0.78	0.78	0.76	0.75	0.76	0.73	0.72	0.76
	JPN	0.70	0.71	0.70	0.74	0.75	0.75	0.75	0.75	0.76	0.73
	MYS	0.68	0.72	0.71	0.74	0.75	0.72	0.72	0.75	0.75	0.72
General	AUS	0.73	0.71	0.70	0.68	0.69	0.67	0.68	0.68	0.68	0.69
	KOR	0.60	0.60	0.61	0.59	0.60	0.62	0.62	0.65	0.66	0.62
Not	THA	0.60	0.58	0.57	0.56	0.57	0.58	0.59	0.58	0.57	0.58
	IND	0.55	0.53	0.53	0.57	0.56	0.56	0.59	0.62	0.61	0.57
	PHL	0.44	0.45	0.48	0.53	0.51	0.47	0.46	0.53	0.53	0.49
	KHM	0.48	0.50	0.52	0.44	0.45	0.46	0.46	0.47	0.48	0.48

5. MODEL, DATA AND METHODOLOGY

5.2. Model

The idea of the trade gravity model originated from Newton's law of universal gravitation, that is, the gravitational force between two objects is directly proportional to the mass and inversely proportional to the distance. The model initially included two variables: the level of economic development of two countries and the distance; some scholars first used it in the study of international trade, and independently analyzed the bilateral trade flows and came to a consistent conclusion: the size of the trade between two countries is positively proportional to the total amount of the economy, and inversely proportional to the distance (Tinbergen J, 1962).

Based on these two variables (geographical distance and economic development level), this study introduces export volume, trade facilitation level, population size, per capita arable land area, infrastructure level and the degree of openness to foreign trade as explanatory variables to analyse the influencing factors of China's agricultural product export trade in the context of RCEP and constructs the research model as follows:

$$LnF_{ijt} = \alpha_0 + \alpha_1 TFI_{jt} + \alpha_2 LnGDP_{jt} + \alpha_3 LnDIS_{jt} + \alpha_4 PE_{jt} + \alpha_5 AL_{jt} + \alpha_6 OPEN_{jt} + \alpha_7 LnPOP_{jt} + \beta_{ijt} \quad (5\text{-}1)$$

Where the explanatory variable is F_{ijt}, denotes the total export trade in agricultural products from the exporting country China to the importing Member State j in period t. The core explanatory variable is TFI_{jt}, denoting the level of facilitation in the importing country in period t. The explanatory variables include F_{ijt}, TFI_{jt}, GDP_{jt}, POP_{jt}, DIS_{jt}, Pe_{jt}, $OPEN_{jt}$, AL_{jt}, GDP_{jt} denotes the gross domestic product of the RCEP importing member country in period t, DIS_{jt} denotes the distance between China and the capital city of the importing country, POP_{jt} denotes the product of the total population of the importing country in period t, PE_{jt} denotes the level of infrastructure of the importing country in period t, $OPEN_{jt}$ denotes the degree of openness to foreign economic trade of the importing country in period t, and AL_{jt} denotes the per capita arable land area of the importing country in period t. α_0 is a constant term, α_1~α_7 denotes the coefficients of the explanatory variables, respectively, and β_{ijt} denotes the random error term.

5.2.Variables

The meanings of the explanatory and explained variables in the analytical model, as well as the expected impact of the explanatory variables on the explained variables are shown in Table 5.

Table 5. Explanation of variables

variant	notation	meaning	impact
Explained variable	F_{ijt}	China's agricultural exports to country j in year t	+
explanatory variables	TFI_{jt}	Level of trade facilitation in country j in year t	+
control variable	GDP_{jt}	GDP of country j in year t	+
	DIS_{jt}	Geographical distance between China and country j in year t	-
	PE_{jt}	Level of infrastructure in country j in year t	+
Control variable	AL_{jt}	Cultivated land area per capita in country j in year t	-
	$OPEN_{jt}$	Openness of the economy of country j in year t	+
	POP_{jt}	Total population of country j in year t	+

5.3. Data Sources

The variables involve a wide range of data sources, including geographic distance, population size, per capita cultivated land area, and infrastructure level from the WDI database; trade facilitation level measurement indicators from the GCR (Global Competitiveness Report); and exports and the degree of openness to foreign trade from UN Comtrade (United Nations Commodity Trade Statistics Database). In view of the new crown epidemic and changes in the international environment, the data for 2020 and beyond are inaccurate, and in order to ensure the scientific validity and rigor of this paper's research, this paper selects the data for a total of 10 years from 2010 to 2019, which is relatively flat.

6. RESULTS AND DISCUSSION

6.1. Descriptive Statistics of Variables

In order to intuitively show the degree of dispersion of each variable involved in the construction of the model and to test whether there are outliers, the first descriptive statistical analysis of the data of each variable, as shown in Table 6, the maximum value of the logarithm of the volume of exports of

agricultural products is 23.19, and the minimum is 16.91, which is a significant difference; at the same time, there is a significant difference in the logarithm of the level of trade facilitation of the Member States of the RCEP, with the maximum value being 0.854, the minimum value is 0.429; and GDP, DIS, POP after taking the logarithm also has a big difference, indicating that the sample of this paper study is very reasonable.

Table 6. Descriptive statistics for each variable

variant	observed value	average value	r	min	max
lnF	100	20.86	1.537	16.91	23.19
TFI	100	0.647	0.118	0.429	0.854
lnGDP	100	27.03	1.373	23.54	29.26
lnDIS	100	8.063	0.675	6.765	9.144
PE	100	4.78	1.096	2.728	6.543
AL	100	0.214	0.372	0.000	1.419
OPEN	100	54.85	48.22	14.41	203.3
lnPOP	100	17.39	1.265	15.29	19.41

6.2. Multicollinearity Test

In order to more scientifically analyse and study the intrinsic links between the variables and the explanatory variables, the above variables were analyzed using the Stata 18.0 software for VIF (Variance Inflation Factor), a statistical indicator used to detect multicollinearity in regression models. It measures the extent to which the linear relationship between an explanatory variable and other explanatory variables inflates its variance. Specifically, the higher the VIF, the more the variance of that variable is inflated by the covariance problem. Typically, a VIF value greater than 10 is considered to be indicative of severe multicollinearity and may require further treatment. Whereas, a VIF value of less than 10 indicates that the model can continue to be used. As shown in Table 7. From the table, it can be seen that the VIF between the explained variables and the explanatory variables is less than 10, which indicates that the regression model does not suffer from the problem of multicollinearity and can continue to be used.

Table 7. VIF calculation results

variant	VIF	1/VIF
TFI	18.42	0.054291
PE	12.48	0.080107
lnDIS	5.04	0.198553
lnGDP	7.68	0.130212
OPEN	1.96	0.509929
AL	2.13	0.468567
lnPOP	7.43	0.134534
MEAN VIF	7.88	

6.3. Benchmark Regression Results

Through the VIF test, we found that the panel data can continue to be used, so we use the F test, LM test, and Hausman test to analyse and compare the fixed effects model (FE), mixed effects model (OLS), and random effects model (RE), and finally we conclude that for the above models, the random effects model is used for subsequent regression analysis.

After the above analysis, this paper selects the random effect model and uses stata 18.0 software to conduct regression analysis on the econometric model, and the regression results are shown in Table 8.

Table 8. Benchmark regression analysis

variant	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TFI	2.345*	(0.8940)	1.0310	6.610***	8.289***	9.418***	9.268***
	(1.8165)	(-1.3722)	(1.6153)	(7.3523)	(5.2838)	(5.2042)	(5.2343)
InGDP		1.004***	0.869***	0.348***	0.377***	0.313***	0.367***
		(17.8756)	(16.4512)	(4.3051)	(4.5120)	(3.2002)	(3.7248)
InDIS			-0.683***	-0.704***	-0.833***	-0.956***	-0.923***
			(-6.1209)	(-7.9260)	(-6.2707)	(-5.7820)	(-5.6859)
InPOP				0.713***	0.690***	0.750***	0.767***
				(7.5217)	(7.1745)	(6.9851)	(7.2941)
PE					-0.202	-0.244	-0.313**
					(-1.3036)	(-1.5439)	(-1.9871)
AL						0.241	0.300
						(1.2408)	(1.5651)
OPEN							0.003**
							(2.3008)
_cons	19.346***	-5.706***	2.226	0.444	0.989	2.081	0.288
	(22.7897)	(-3.9063)	(1.2384)	(0.3062)	(0.6575)	(1.1968)	(0.1540)
N	100	100	100	100	100	100	100
R^2	0.0326	0.7747	0.8380	0.8984	0.9002	0.9019	0.9072

Table 8 shows that column (1) is the regression result of adding the trade facilitation level, and columns (2)-(7) are the results of gradually adding control variables such as GDP. The regression shows that the core variable trade facilitation level (TFI) is positively related to China's agricultural exports (F) to RCEP member countries, and every 10% increase in it increases agricultural exports by 2.345%. After adding control variables (Columns 4-7), the trade facilitation level significantly promotes agricultural exports at the 1% level, and Column (7) shows that for every 1% increase in it, the export value increases by 9.268%, which verifies Hypothesis 1.

From the control variables, the GDP of the importing country, the population size of China's agricultural exports in the 1% level of the role of positive and significant, GDP, the population size of every 1% increase in the value of exports of agricultural products increased by 0.367%, 0.767%, respectively. GDP reflects the economic capacity and trade demand, the size of the population is large, the market demand for large, conducive to the export of China's agricultural products. Geographic distance has a significant negative relationship, every 1% increase in distance between the two countries, agricultural exports decreased by 0.923%, due to increased transportation costs and perishable agricultural products, high trade risk. The degree of economic openness in column (7) is positive and significant, every 5% increase, the export value increased by 0.003%. the level of infrastructure in RCEP member countries, the per capita area of arable land on China's agricultural export quality is not significant, or because the role of infrastructure takes time to appear, per capita arable land is related to the yield rather than directly related to trade facilitation exports.

6.4. Robustness Tests

In order to ensure the robustness of the benchmark regression and to consider that there may be bidirectional causality between the quality of exported agricultural products and trade facilitation, i.e., the improvement of trade facilitation promotes the upgrading of agricultural products' quality, while the improvement of agricultural products' quality is more demanding for trade facilitation, stability and heterogeneity tests are required. The results of the robustness test are shown in Table 9. The first

column is the result of regression of agricultural products, the second column is the result after adding the control variable (OFDI), and the third column is the restriction of outliers by shrinking tail method. The test shows that the regression results are robust after removing the limiting factors, and the trade facilitation of RCEP member countries significantly improves the facilitation of China's agricultural exports.

Table 9. Robustness tests

variant	lnF	add variable (1)	Abbreviation (2)
TFI	9.2688***	4.978***	9.231***
TEI	(5.2343)	(2.6384)	(5.2559)
_cons	0.288	0.375	0.375
	(0.1540)	(1.0257)	(0.2022)
N	100	100	100
R^2	0.9072	0.9235	0.9082

6.5. Heterogeneity Test

The above empirical analysis is based on the overall test of all sample countries, but, in reality, the differences in the economic development and trade facilitation levels of different member states have different effects on China's agricultural exports. According to the in-depth analysis of the trade facilitation level of RCEP member countries, combined with the degree of economic development for comprehensive consideration, this paper divides RCEP member countries into developed countries and developing countries for heterogeneity testing. Developed countries include Japan, South Korea, Australia, New Zealand, Singapore, and Malaysia; developing countries include Thailand, Cambodia, Indonesia, and the Philippines.

The regression results in Table 10 show that the TFI coefficient is significantly positive, indicating that trade facilitation has a positive impact on improving the quality of exported agricultural products and is more significant in developing countries due to its large space and speed of improvement. The effect of lnGDP on the quality of agricultural products is insignificant in developed countries and significantly negative in developing countries, reflecting the difference in the mechanism of economic level influence. The negative effect of distance is more pronounced in developing countries due to imperfect cold chain logistics, which increases transportation costs and time and affects the freshness of agricultural products. Population significantly and positively affects the quality of agricultural products in both samples, and the effect is more significant in developing countries because of the large population base and increased demand. Infrastructure level has a significant negative effect in both samples, more so in developing countries due to increased competition in the market. Cultivated land area per capita is significant and positive in developing countries due to increased investment in agriculture. Openness to the outside world is significant in developed countries and has a weak effect in developing countries because of market access barriers.

Table 10. Heterogeneity test

variant	developed country	developing country
TFI	4.403***	6.788***
	(-3.3155)	(-4.0899)
lnGDP	-0.056	-0.250***
	(-0.8984)	(-2.8490)
lnDIS	-0.594***	-2.770***
	(-3.8684)	(-5.9104)
lnPOP	1.216***	3.272***
	(-23.7522)	(-11.3265)
PE	-0.440***	-0.847***
	(-2.6844)	(-4.4029)
AL	0.081	13.139**
	(-0.7211)	(-2.5548)
OPEN	0.008***	0.029*
	(-8.6619)	(-1.9433)
_cons	5.700***	-14.047***
	(-2.8427)	(-7.7520)
N	60	40
R^2	0.9895	0.9866

All in all, it is proved that RCEP, as a diversified free trade area, includes developed countries as well as developing countries and least developed countries, and this structural inclusiveness leads to significant differences in the level of economic development and trade facilitation among member countries. And the trade facilitation level of RCEP member countries will have different degrees of impact on China's agricultural exports, which will vary according to the level of development of the target countries.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusion

Based on the panel data of the 10 RCEP member countries from 2010 to 2019, this paper empirically analyses the impact of the trade facilitation level of these 10 countries on China's export of agricultural products and draws the following conclusions:

From the perspective of trade facilitation level, this paper selects the data of 14 indicators of 10 RCEP member countries from 2010-2019 from the GCR and calculates the comprehensive trade facilitation score of each country after obtaining the weights of each indicator by principal component analysis using SPSS software. Singapore is the best performer in all years and is rated as ‘very convenient’; New Zealand, Japan, and Malaysia are categorized as ‘relatively convenient’; Australia and South Korea are considered ‘generally convenient’; Thailand, Indonesia, and South Korea are considered ‘generally convenient’; and Thailand, Indonesia, and South Korea are categorized as ‘very convenient’. Australia and the Republic of Korea were considered ‘generally convenient’, while Thailand, Indonesia, the Philippines, and Cambodia were ‘not convenient’.

From the analysis of the impact of trade facilitation on China's agricultural exports, this study establishes moderate independence of variables and avoids the risk of covariance after the descriptive statistics of variables and multiple covariance test, which lays a robust foundation for the analysis. In-depth analysis using the random effects model reveals that the level of trade facilitation, GDP, population size, and the degree of economic openness are significantly positively correlated with

agricultural exports, and geographic distance is significantly negatively correlated. Further robustness tests, adding new control variables and shrinking the tails, confirm that the results are reasonable and reliable.

This paper finds through the heterogeneity test that there are significant differences in China's agricultural exports under different levels of economic development and trade facilitation. Developed countries and developing countries have different degrees of influence on agricultural exports in terms of geographic distance, population size and other aspects. This result verifies hypothesis two: the impact of trade facilitation level of RCEP member countries on China's agricultural exports varies according to the degree of development of target countries.

7.2. Recommendations

First, at the national level, China should deepen policy dialogue with RCEP member countries, formulate open and inclusive trade policies, pay attention to emerging areas, promote unified standards and certification, and reduce barriers. Increase investment in agricultural science and technology to improve the quality and brand effect of agricultural products; optimize the trade structure, increase the export of high value-added and deep-processed agricultural products; improve the docking of trade standards and certification system, promote mutual recognition, simplify the inspection process, strengthen the construction of agricultural products traceability system to ensure quality and safety, improve the efficiency of exports, and enhance international competitiveness.

Secondly, as far as RCEP member countries are concerned, they should build a mechanism for sharing market opportunities, set up an information-sharing platform and a supply chain synergy network, and pay attention to emerging markets and consumer upgrading. Promote the docking of technology and standards, simplify the testing and certification process, and reduce trade costs. Support the participation of small and medium-sized enterprises (SMEs) by providing policy and financial support, simplifying export procedures and launching services similar to the Trade Promotion Program. Strengthen multilateral cooperation, convene regular trade forums, set up joint working groups to study market access, promote interoperability of policies, build cooperation platforms, promote enterprise exchanges and enhance overall market competitiveness.

Third, at the enterprise level, it should strengthen brand and market research, use government resources to understand target market preferences and regulations, customize products and services, and enhance brand value. Enhance the efficiency of supply chain management, make use of policies to optimize the layout, cooperate with logistics companies, access smart logistics, and use digital technology to ensure the transparency and efficiency of the supply chain. Develop emerging market channels, consolidate traditional markets and reach global consumers through cross-border e-commerce platforms. Establish a diversified marketing strategy to reduce market dependence. Increase R&D investment and cooperation, set up a special fund, and cooperate with scientific research institutions to enhance product innovation and market competitiveness.

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