The Impact of Trade Facilitation of RCEP Countries on China's Agricultural Exports: Empirical Analysis Based on 13 Countries

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Abstract

Purpose – Using trade data from 2008 to 2019, this study analyzes the impact of trade facilitation on China's agricultural exports under the RCEP framework using a gravity model based on the level of trade facilitation in 13 RCEP countries.

Design/methodology – This study constructs a complete set of trade facilitation index systems, comprehensively measures the trade facilitation level of RCEP member countries, and uses a gravity model to verify the critical role of trade facilitation level in enhancing the trade volumes of RCEP member countries.

Findings – We found that trade facilitation has a significant impact on China's agricultural exports as a whole. The effect of each primary indicator varies in magnitude, with finance and e-commerce (F) having the most significant impact, followed by customs efficiency (C) and infrastructure development (1); the institutional environment has no significant effect.

Originality/value – This study analyzes the impact of trade facilitation on China's agricultural exports from the perspective of exports, and uses the latest data to study the degree of the impact of trade facilitation in importing countries. Measures to jointly enhance trade facilitation among member countries under the RCEP framework are proposed.

Keywords: Agricultural Products, Export Trade, Trade Facilitation, RCEP
JEL Classifications: Q17, F14

1. Introduction

The Regional Comprehensive Economic Partnership Agreement (RCEP) is an agreement initiated by ASEAN in 2012, which took eight years and was signed by 15 member countries, including China, South Korea, Japan, Australia, New Zealand, and ten ASEAN countries in 2020, as shown in Figure 1. The signing of the Regional Comprehensive Economic Partnership Agreement (RCEP) marks the official departure of the world's most populous free trade area in the world at present. The Regional Comprehensive Economic Partnership Agreement is the largest and most important free trade agreement negotiation in the Asia-

Pacific region, covering nearly half of the world's population and almost one-third of its trade volume, making it the free trade area covering the largest population with the most diversified membership and most dynamic development (Ministry of Commerce of China, 2021).

According to the agreement, RCEP came into force for six ASEAN members, Brunei, Cambodia, Laos, Singapore, Thailand, and Vietnam, and four non-ASEAN members, China, Japan, New Zealand, and Australia, on January 1st, 2022. The agreement entered into force for South Korea on February 1st, 2022. As the world's largest FTA, Korea's exports to RCEP members account for about half of Korea's total exports, and China has been an essential source of agricultural imports for Korea. The signing of RCEP will greatly improve the level of intra-regional trade facilitation and will have further far-reaching effects on Chinese-Korean agricultural trade.

Combing the current research status of domestic and foreign scholars, we find that the literature mainly focuses on four aspects. The first measures the current trade situation of RCEP member countries using trade indices (comparative advantage index, trade complementarity index, and trade intensity index). Liu and Zhao (2017) measured the competitiveness of agricultural products of RCEP member countries using the RCA index, and found that New Zealand was the most competitive, and China was less competitive, in each product. Xue and Zhang (2016) measured agricultural trade using the trade complementarity index and trade intensity index, and found that China has strong complementarity with Japan and New Zealand in agricultural trade. Diao and Tai (2015) analyzed the current situation of the services trade among RCEP member countries, and found that there is a large gap in services trade among member countries, with New Zealand and India having a higher level of services trade than the world average, and China's services show a trade deficit increasing year to year. The second aspect uses a GTAP model to measure the economic effects of the RCEP agreement. Liu and Zhao (2017) used GATP measurements to find that countries will gain overall after RCEP is completed, and Liu and Chen (2014) argued that RCEP's achievement of zero tariffs will positively impact China's GDP, welfare level, and the economy. Liu and Chen (2014) argued that the achievement of zero-tariffs will have a significant contribution to China's GDP, welfare level, and the scale of import and export trade, while Dong (2017) argued that China's service industry will face a reduction in exports after joining RCEP, and emphasizes that the magnitude of tariff reduction has a proportional impact on the extent of its damage. The third aspect is an impediment to the completion of RCEP negotiations. Zhang (2013) argued that the uneven level of tariff concessions is one of the obstacles to the completion of the negotiations. Wang (2013) argued that the lack of political mutual trust among member countries interfered with the RCEP negotiations. Zhang (2013) argued that ignoring the development divide among member countries will greatly burden negotiations. The fourth area is a comparison between RCEP and other trade agreements, mainly focusing on the comparison between RCEP and TPP. Zhao (2014) argued that the RCEP model is currently more favorable to developing regional economic integration in East Asia. Based on the above literature, this paper finds that the current literature on RCEP mainly focuses on the current trade situation of RCEP member countries, predictions of economic effects, resistance to the completion of negotiations, and comparison with other trade agreements. At the same time, there are few studies on the trade facilitation of RCEP member countries.

For China, the signing of RCEP will bring many opportunities and challenges to RCEP member countries. As we all know, China is the world's largest agricultural country, and agriculture plays a vital strategic role in China's economic development. As all RCEP member

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countries regard agriculture as pillar industries, the implementation of facilitation measures in the FTA will impact agricultural trade. At the same time, because of the great proportion of agricultural trade in China's foreign trade, the author believes that the impact of trade facilitation on agricultural production and trade must be actively studied at the same time, which is very important for promoting China's agricultural production and further expanding the development space of China's agricultural products in the international arena. As a hot issue in the field of international trade, literature on trade facilitation is relatively abundant and has great reference value. However, most studies focus on the static role of the level of facilitation in trade, and little attention has been paid to the dynamic effects of the level of facilitation. In line with the economic development of developing countries and the shift in the focus of facilitation research toward developing economies, this paper examines the changes in the impact of facilitation levels on China's agricultural trade, with RCEP member countries as the main focus. In addition to the important role of agricultural products in FTA member countries, agricultural products are also characterized by strong timeliness, sensitivity to changes in the trade situation, and a greater impact on the trade process.

What is the level of trade facilitation in RCEP member countries? Does improving the level of trade facilitation contribute to trade among RCEP member countries? What are the priorities and paths to enhance the trade facilitation level of RCEP member countries? To address these questions, this paper constructs a comprehensive trade facilitation index system, measures the trade facilitation level of RCEP member countries using principal component analysis, and verifies the important role of the trade facilitation level in enhancing trade among RCEP member countries using a gravity model. The study found that trade facilitation as a whole has a significant impact on China's agricultural exports, and the impact of each primary indicator on agricultural exports varies in magnitude, with finance and e-commerce (F) having the greatest impact, followed by customs efficiency (C) and infrastructure development (I), in that order. The institutional environment has no significant impact. RCEP member countries make full use of RCEP, the world's largest free trade agreement, to provide reciprocal policies for economic and trade exchanges between countries, and take advantage of this opportunity to achieve a win-win situation by increasing the level of trade facilitation.

Fig. 1. RCEP Trade Pact
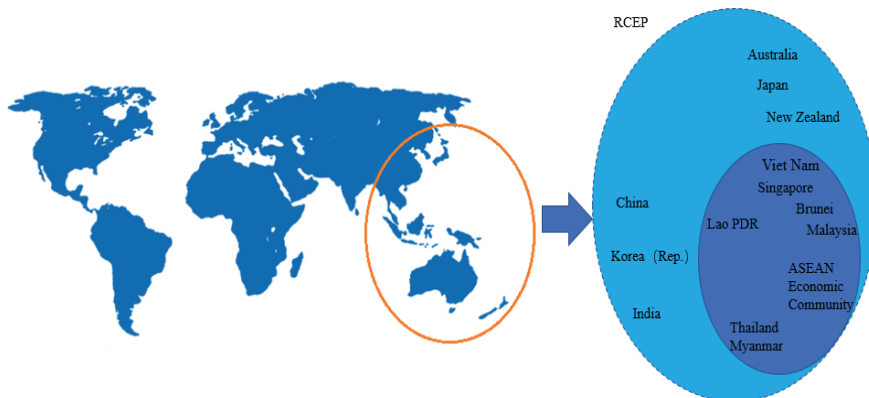
2. Literature Review

2.1. Relevant Theories of Trade Facilitation

2.1.1. Transaction Cost Theory

Coase, a British economist, pioneered the theory of transaction costs, which he considered to be the cost of negotiating and contracting for each transaction that occurs in the marketplace. Williamson subdivided transaction costs into the costs of finding information about the object of the transaction and the commodity, costs of bargaining over contracts, prices, and quality, costs of making decisions, and costs of defaulting on a contract. He then divided transaction costs into ex-ante and ex-post costs. Ex-ante mainly refers to contracting, negotiating, and securing contracts, while ex-post mainly refers to the cost of negotiating matters that are not agreed upon and the cost of resolving disputes between the two parties after contracting.

Transaction costs in the field of international trade involve a country's customs environment (whether customs procedures are cumbersome), institutional environment (whether various policies related to trade are transparent and open, and whether judicial procedures are fair and equitable), infrastructure, and so on. Therefore, the improvement of infrastructure, a fair and transparent institutional environment, simplified customs clearance procedures, and the use of information technology in trade facilitation are conducive to the reduction of transaction costs (Coase, 1937).

2.1.2. Free Trade Theory

From the 19th to 21st century, free trade theories have gone through three stages of development, from classical trade theories, to neoclassical trade theories, to the latest modern trade theories. Each stage focuses on a certain degree of change in direction, but the most basic propositions of these theories about free trade are the same. They argue the necessity of international trade and its benefits by analyzing the absolute advantages of each country, explain the necessity and benefits of international trade for each country, and elaborate on the benefits of free trade, as well as the overall social production efficiency and benefits. On this basis, David Ricardo further argued that a country could profit from international trade, even if it does not have absolute advantages. David Ricardo explained the international division of labor between countries to achieve specialized production and participate in the international market exchange, such that both parties involved in trade gain benefits from trade. The common idea of both is to advocate the benefits of international trade. Based on the theory of customs unions, Mead proposed the theory of free trade. His explanation of free trade theory is that when a free trade agreement is signed between countries, and countries to establish a free trade zone, trade exchanges between member countries in the free trade zone will eliminate tariffs, non-tariff trade barriers will be eliminated, and the governments of both sides will introduce preferential policies for each that are conducive to mutual investment, lowering the market access threshold for goods in cross-border trade, and member countries will be able to achieve trade in services, people, and technology. Trade in goods and other related factors between member countries will be able to achieve a free flow of services, people, and technology. The theory of free trade zones has started to become the main form of country-to-country trade exchange, and it has been very effective in many countries (Wang, 2008).

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These theories have become the cornerstone of the development of international trade theory, which is the theoretical foundation of economic globalization, regional economic integration, and the WTO multilateral trading system. Trade facilitation is the concrete implementation of free trade activities at the national and international levels, and the ultimate realization of trade liberalization by reducing transaction costs, transportation costs, and other trade costs. Free trade theory is one of the most basic theoretical foundations of trade facilitation.

2.1.3. Theory of Big Market

The theory of big market is a step forward from customs unions. To be precise, it is the goal pursued by APEC. From a theoretical point of view, the big market theory is an important guideline for APEC to achieve economic integration. In the post-Cold War Asia-Pacific region, there is a growing trend of diversification, with the coexistence of multiple levels of economic development and multiple economic forms. The cumulative dynamic process emphasized by this theory has already emerged within APEC, and is likely to continue for a long time to come, forming a virtuous circle of positive expansion, thus actively promoting the process of APEC integration and ultimately achieving the goal of a common market (Deniau, 1988).

The big market is an international economic integration organization in which two or more countries sign an agreement to achieve free trade, establish a unified external tariff, and achieve the free movement of factors of production such as services, capital, and labor. The purpose of the theory of big market is to analyze the impact on the prices and returns of factors of production in member countries when factors of production are able to move freely. It is a dynamic analysis of the economic effects of international regional economic integration. Analysis of the big market mainly deals with the competitive effects of international regional economic integration. The core idea of the theory of big market is that market expansion is a prerequisite for obtaining economies of scale; the increased competition brought about by market expansion will contribute to the realization of the benefits of economies of scale. Scitovsky and Deniau analyzed the economic effects of the big market theory from the perspectives of "small market" and "big market", respectively. Scitovsky believed that a "vicious circle" would appear in a "small market" economy. Therefore, after the establishment of the "big market", a "virtuous circle" would appear in the large market economy. Deniau believed that after the establishment of the large market, the economy would begin to expand (Tibor, 1958).

Based on the theory of the big market, and taking into account the actual situation in the Asia-Pacific region, if the various scattered markets in the Asia-Pacific region can be combined into large markets, economic competition in the region can be strengthened, thus realizing benefits such as economies of scale, bringing benefits to each member country.

2.1.4. Information Asymmetry Theory

Asymmetric information refers to the uneven and asymmetric distribution of information among economic individuals: some people have more information about certain things than others. Information asymmetry arises from both subjective and objective reasons. The subjective aspect is due to the different information obtained by different economic individuals, and the access to different information is related to their respective ability to

obtain information; the subjective reason for information asymmetry is the asymmetry of different economic abilities to obtain information. With the development of the social division of labor and the increase of specialization, the information difference between professionals and non-professionals will become larger, and the information distribution among members of the society will become more asymmetrical. Therefore, information asymmetry exists objectively.

In various markets, there are various forms and manifestations of asymmetric information. The basic forms can be divided into three categories. First is information asymmetry arising from information differences between buyers and sellers, specifically when a buyer has relatively complete information and the seller is in a zero-information state. In the second, both buyers and sellers have incomplete information, while one has more information than the other. The third occurs when a seller has relatively complete information and the buyer is in a zero-information state (Xin, 2001).

2.2. Mechanistic Analysis of Trade Facilitation Affecting Export Trade

2.2.1. Mechanistic Analysis of Infrastructure on National Trade

Infrastructure refers to the quality and efficiency of a country's infrastructure, such as ports and airlines. Since agricultural products have a short shelf life and are perishable, the impact of infrastructure on the agricultural trade is very important. In a study on the impact of trade facilitation on the trade cost of agricultural products, Liu (2015) argued that improving the quality of infrastructure can shorten transportation time, improve transportation efficiency for agricultural products, and promote agricultural exports (Liu, 2015). Infrastructure generally covers four aspects: roads, railroads, seaports, and airports. An improvement in the quality of transportation facilities can improve transportation efficiency, which in turn reduces the transaction and time costs in the international trade process. Infrastructure, based on the free trade theory and transaction cost theory, has two main impacts on agricultural exports.

First, high quality infrastructure and a strong transportation capacity can save time costs, which in turn promotes the export of agricultural products. Since agricultural products require a precise storage environment, transportation time is particularly important in order to allow them to reach the buyer. The better the quality of a country's infrastructure, and the stronger the transportation capacity, the more time will be saved in the transportation of agricultural products, and the quality of the products will be ensured. Significant losses due to the quality of agricultural products and the inability of agricultural products to reach the market in time will be reduced.

Second, high quality infrastructure and efficient transportation can reduce direct and indirect transaction costs, which in turn affects agricultural exports. Improving the quality of infrastructure not only saves time costs but also direct transaction costs due to time delays, such as costs to be compensated for missed agreed delivery times and storage fees for agricultural products, as well as indirect transaction costs, which can easily lead to spoilage, losses, and even missed best business opportunities (Liu & Wang, 2017).

2.2.2. Mechanistic Analysis of the Customs Environment on National Trade

Customs is a state administrative process that regulates and inspects imported and exported goods, and is an important tool for the state to conduct international trade. The

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impact of the customs environment on international trade is significant, and the import and export links of international trade goods are completed through customs regulation, which involves cargo data information statistics, regulation, and inspection, and is an important means of bilateral trade through trade policy measures under specific reinforcement. Thus, the impact of the customs environment on trade volume is direct and significant. It focuses on whether a country's customs administration is clean and fair, and is standardized and efficient in border management. Goods in transit must go through the corresponding customs clearance procedures, and transparent and standardized customs system can improve the efficiency of customs clearance, reduce trade costs, reduce the money and time spent on goods crossing borders, and is more conducive to trade activities.

2.2.3. Mechanistic Analysis of Institutional Environment on National Trade

The trade facilitation process is influenced by the effects of the institutional environment. There are bilateral or multilateral trade subjects in the world trade exchange, and different subjects have different constraints on the way they participate in trade, and a country's regulations on constraints are directly expressed in the context of its regulatory environment for participation in international trade. This indicator is used to measure the normativity and transparency of a country's policy environment, reflecting whether traders can conduct international trade in an excellent macro environment. The indicators selected for the institutional environment include the burden of government oversight, the transparency of government decision-making, efficiency of legal and regulatory dispute resolution, and the cost of agricultural policies, judicial independence, and the cleanliness index. To improve customs transparency, China has implemented a number of regulations. Measures for the Administration of the Designation of Customs Normative Documents were implemented in 2003 to improve the transparency of customs operations, while Measures for the Disclosure of Customs Affairs of the Customs of the People's Republic of China were reintroduced in 2006 to further improve the transparency of customs affairs. On the other hand, the government formulated policies favorable to agricultural trade to promote the cross-border circulation of agricultural products, such as inspection and quarantine fee reform in 2010, which reduced and waived the fees for many agricultural products, thus reducing the burden of enterprises and promoting the development of exports (Tan & Hua, 2016). In addition, due to the wide application of Internet technology, the openness and transparency of government work has been greatly improved, which greatly increases the transparency and effectiveness of government implementation. In general, there are still many shortcomings in the regulations, especially in foreign cooperation land laws. Due to the rapid development of the country, the legal system needs to be updated and repaired to further adapt to the new economic situation.

2.2.4. Analysis of the Mechanism of Financial and Electronic Commerce on National Trade

Modern means are frequent and necessary in international trade, and the rapid development of a country's international trade is inevitably dependent on the popularity of the Internet, the use of e-commerce, and new technologies concerning information and communication. Therefore, e-commerce is an important factor in measuring the convenience of modern trade (Zeng & Zhou, 2008). Financial services will promote trade facilitation in two

ways.

First, the construction of infrastructure is the basis for improving the level of trade facilitation, but the construction of infrastructure requires a large amount of capital and a long construction period. As investors need money to operate, they must rely on financial services to ensure the normal operation of funds. Among financial services, open services are based on the premise of government credit, linked to national strategies, and play an important role in supporting the construction of public infrastructure. Financial services guarantee the construction of infrastructure, and the improvement of infrastructure will shorten logistics time, reduce trade costs, and improve the level of trade.

Second, the opening of the financial sector to the outside world and international cooperation provide basic guarantees for the development of trade facilitation.

Opening between countries will reduce risks in cross-border trade and create a favorable trade environment. International trade risk is divided into pre-trade risk and post-trade risk. Pre-trade risk refers to the relevant costs paid by trade parties before trade in order to establish trade relations. Post-trade risk refers to the relevant costs paid by trade parties after trade relations have been formed in order to maintain the resulting trade relations. Secondly, the cooperation and development of financial services will enrich the product system of financial services, and promote the development of the financial service industry. The opening and cooperation of financial services will expand the scope of financial services. The wider the scope of financial service opening and cooperation, the more it will promote a relationship between trading countries, improve the efficiency of financial-related business in trade, and facilitate in-depth cooperation. Modern means in the use of international trade are frequent and necessary, and the rapid development of a country's international trade is inevitably inseparable from the popularity of the Internet, the use of electronic commerce, information and communication, and other new technologies. Therefore, e-commerce is also an important factor in measuring the convenience of modern trade. The level of e-commerce is mainly reflected in the degree of national Internet penetration, the application of new technologies by enterprises, and the usage rate of e-commerce. The number of Internet users is the basis of the level of e-commerce, and the increasingly widespread use of the Internet provides a platform for the development of e-commerce. E-commerce will become the consumption method of more and more people, which will promote the development of international trade. From the perspective of enterprises, e-commerce allows information about goods to beomce clearer, which is conducive to the absorption and application of new technologies, increasing innovation, competitive advantages, and increasing international trade volume.

3. Measurement and Comparison of Trade Facilitation Levels under the RCEP Framework

3.1. Construction of Trade Facilitation Indicator System

At present, there is no uniform definition of trade facilitation in academia and international organizations, and it is difficult to measure the trade facilitation level quantitatively. Wilson's method (Wilson et al., 2003) of measuring trade facilitation has been accepted by the academic community (Zhang, 2018; Zhang & Gong, 2015). However, with the changes in

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international trade rules and the development of information technology, the influencing factors of trade facilitation have also changed significantly (Zhang et al., 2016). In this paper, while drawing on Wilson's research results and the related studies(Chao Wang et al., 2020; Tang & Gu, 2019; Zhang & Li, 2015; Jordan, 2014), a trade facilitation indicator system (Table 1) has been constructed based on the nature of trade facilitation and the trade characteristics of agricultural products in RCEP countries. The indicator system includes four main aspects of financial and e-commerce, customs environment, regulatory environment, and infrastructure, and is subdivided into 18 secondary indicators, which cover the content of the Trade Facilitation Agreement. The data were obtained from the Global Competitiveness Report and the Corruption Perceptions Index Report.

Table1. Trade Facilitation Indicator System

Primary Indicators	Secondary Indicators	Value Range	Data Sources
Regulatory Environment (R)	Burden of government regulation(R_1)	1~7	GCR
	Transparency of government policy making(R_2)	1~7	GCR
	Efficiency of legal framework in settling disputes(R_3)	1~7	GCR
	Agricultural policy costs(R_4)	1~7	GCR
	Judicial independence(R_5)	1~7	GCR
	CPI(R_6)	1-100	CPI
Infra Structure(I)	Quality of roads(I_1)	1~7	GCR
	Quality of railroad infrastructure(I_2)	1~7	GCR
	Quality of port infrastructure(I_3)	1~7	GCR
	Quality of air transport infrastructure(I_4)	1~7	GCR
Customs Environment (C)	Prevalence of trade barriers(C_1)	1~7	GCR
	Irregular payments and bribes(C_2)	1~7	GCR
	Burden of customs procedures(C_3)	1~7	GCR
Finance andE-commerce (F)	Availability of financial services(F_1)	1~7	GCR
	Affordability of financial services(F_2)	1~7	GCR
	Availability of latest technologies (F_3)	1~7	GCR
	Firm-level technology absorption(F_4)	1~7	GCR
	Individuals using Internet, %(F_5)	1~100	GCR

Data Sources: the Global Competitiveness Report and the Corruption Perceptions Index Report.

3.2. Measurement of Trade Facilitation Level

In order to accurately measure the trade facilitation level and eliminate the influence of variable size and scale, this paper adopts Li and Guo (2016), Xiang and Zhao (2021), and Kong and Dong's (2015) methods, using the linear transformation method to standardize the original data and limit the range of all secondary indicators to 0 to 1. In order to make the measurement results more scientific and objective, this paper uses principal component analysis to measure the weights of each secondary indicator. This paper uses Stata 16.0 to conduct principal component analysis and obtain the three principal components, $Comp_1$, $Comp_2$, and $Comp_3$, and the variance contribution rate of each principal component. The cumulative variance contribution rate of these three principal components was 87.005%,

which reflected 87.005% of the information of the original variables. Therefore, the original 18 secondary indicators were replaced by the three principal components in this paper. The coefficients corresponding to each secondary indicator of the principal component (Table 2) are multiplied by the contribution rate corresponding to that principal component, then divided by the cumulative variance contribution rate of the three principal components, and finally summed to find the integrated weights of the principle components (Table 3).

Based on the above calculations, the integrated model of the trade facilitation level can be obtained.

Com_p=0.2891R1+0.2509R2+0.2687R3+0.2205R4+0.1960R5+0.1616R6+0.1931I1+0.1679I2+0.2199I3+0.2162I4+0.2318C1+0.1739C2+0.2591C3+0.2299F1+0.2707F2+0.1434F3+0.1374F4+0.1186F5

(1)

The coefficients in the integrated model can be normalized to obtain the weights of each secondary indicator, and the weight of the primary indicator is the sum of the weights of the secondary indicators included (Table 4). The weights of regulatory environment (R), infrastructure (I), customs environment (C), and finance and e-commerce (F) were calculated to be 0.370, 0.213, 0.177, and 0.24, respectively. After finishing, the comprehensive evaluation indicator of trade facilitation (TFI) is:

TFI=0.0771R1+0.0669R2+0.0717R3+0.0588R4+0.0523R5+0.0431R6+0.0515I1+0.0448I2+0.0586I3+0.0577I4+0.0618C1+0.0464C2+0.0691C3+0.0613F1+0.0722F2+0.0382F3+0.0367F4+0.0316F5

(2)

Table 2. Coefficients of Each Principal Component Index

	Com_1	Com_2	Com_3
Burden of government regulation(R_1)	0.228035	0.449444	0.757628
Transparency of government policy making(R_2)	0.264575	0.394968	-0.173205
Efficiency of legal framework in settling disputes(R_3)	0.273861	0.317805	0.118322
Agricultural policy costs(R_4)	0.200000	0.614817	-0.228035
Judicial independence(R_5)	0.264575	0.154919	-0.576194
CPI(R_6)	0.268328	-0.176068	-0.553173
Quality of roads(I_1)	0.256905	-0.449444	0.549545
Quality of railroad infrastructure(I_2)	0.238747	-0.522494	0.521536
Quality of port infrastructure(I_3)	0.268328	-0.273861	0.500000
Quality of air transport infra structure(I_4)	0.266458	-0.232379	0.393700
Prevalence of trade barriers(C_1)	0.242899	0.491935	-0.367423
Irregular payments and bribes(C_2)	0.272029	-0.154919	-0.451664
Burden of customs procedures(C_3)	0.273861	0.216795	0.151658
Availability of financial services(F_1)	0.246982	0.393700	-0.272029
Affordability of financial services(F_2)	0.252982	0.314643	0.411096
Availability of latest technologies (F_3)	0.262679	-0.413521	-0.337639
Firm-level technology absorption(F_4)	0.258844	-0.430116	-0.350714
Individuals using Internet, %(F_5)	0.248998	-0.449444	-0.479583

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Table 3. Integrated Weights of Principal Components

	Com₁	Com₂	Com₃	Com_sum
Burden of government regulation(R₁)	0.1861	0.0529	0.0502	0.2891
Transparency of government policy making(R₂)	0.2159	0.0465	-0.0115	0.2509
Efficiency of legal framework in settling disputes(R₃)	0.2235	0.0374	0.0078	0.2687
Agricultural policy costs(R₄)	0.1632	0.0724	-0.0151	0.2205
Judicial independence(R₅)	0.2159	0.0182	-0.0381	0.1960
CPI(R₆)	0.2190	-0.0207	-0.0366	0.1616
Quality of roads(I₁)	0.2096	-0.0529	0.0364	0.1932
Quality of railroad infrastructure(I₂)	0.1948	-0.0615	0.0345	0.1679
Quality of port infrastructure(I₃)	0.2190	-0.0322	0.0331	0.2199
Quality of air transport infrastructure(I₄)	0.2174	-0.0273	0.0261	0.2162
Prevalence of trade barriers(C₁)	0.1982	0.0579	-0.0243	0.2318
Irregular payments and bribes(C₂)	0.2220	-0.0182	-0.0299	0.1739
Burden of customs procedures(C₃)	0.2235	0.0255	0.0100	0.2591
Availability of financial services(F₁)	0.2015	0.0463	-0.0180	0.2299
Affordability of financial services(F₂)	0.2064	0.0370	0.0272	0.2707
Availability of latest technologies (F₃)	0.2143	-0.0487	-0.0224	0.1434
Firm-level technology absorption(F₄)	0.2112	-0.0506	-0.0232	0.1374
Individuals using Internet, %(F₅)	0.2032	-0.0529	-0.0317	0.1186

Data source: Calculated Based on the Global Competitiveness Report and the Corruption Perceptions Index Report.

Table 4. Results of the Weight Calculation of Trade Facilitation Indicators

Primary Indicators	Weight	Secondary Indicators	Weight
Regulatory Environment (R)	0.3699	Burden of government regulation(R1)	0.0771
		Transparency of government policy making(R2)	0.0669
		Efficiency of legal framework in settling disputes(R3)	0.0717
		Agricultural policy costs(R4)	0.0588
		Judicial independence(R5)	0.0523
		CPI(R6)	0.0431
Infrastructure (I)	0.2127	Quality of roads(I1)	0.0515
		Quality of railroad infrastructure(I2)	0.0448
		Quality of port infrastructure(I3)	0.0586
		Quality of air transport infrastructure(I4)	0.0577
Custom Environment (C)	0.1773	Prevalence of trade barriers(C1)	0.0618
		Irregular payments and bribes(C2)	0.0464
		Burden of customs procedures(C3)	0.0691
Finance and E-commerce (F)	0.2401	Availability of financial services(F1)	0.0613
		Affordability of financial services(F2)	0.0722
		Availability of latest technologies (F3)	0.0382
		Firm-level technology absorption(F4)	0.0367
		Individuals using Internet, %(F5)	0.0316

3.3. Results of Trade Facilitation Level Measurement

By substituting the values of each secondary indicator and the corresponding weights into Formula (2), the comprehensive measurement results of the trade facilitation levels of 13 RCEP member countries from 2008 to 2019 can be obtained, as shown in Table 5.

Table 5. Comparison of Trade Facilitation Levels between China and 12 RCEP Countries

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Korea	0.743	0.694	0.689	0.683	0.670	0.699	0.686	0.693	0.706	0.713	0.731	0.740
Japan	0.787	0.774	0.772	0.776	0.779	0.803	0.823	0.827	0.838	0.837	0.858	0.856
Singapore	0.947	0.954	0.948	0.950	0.954	0.948	0.943	0.951	0.961	0.962	0.965	0.967
New zealand	0.827	0.857	0.864	0.873	0.899	0.901	0.902	0.884	0.874	0.885	0.880	0.877
Australia	0.802	0.807	0.818	0.808	0.812	0.793	0.785	0.803	0.791	0.791	0.802	0.807
Malaysia	0.781	0.754	0.758	0.794	0.800	0.801	0.836	0.833	0.810	0.807	0.824	0.823
Thailand	0.653	0.659	0.669	0.645	0.641	0.650	0.641	0.639	0.638	0.654	0.656	0.677
Philippine	0.531	0.524	0.518	0.532	0.571	0.598	0.612	0.591	0.557	0.547	0.582	0.583
Indonesia	0.571	0.600	0.607	0.599	0.609	0.640	0.653	0.635	0.649	0.673	0.680	0.691
Vietnam	0.542	0.565	0.567	0.549	0.550	0.558	0.564	0.576	0.585	0.577	0.579	0.600
Cambodia	0.507	0.525	0.546	0.573	0.596	0.563	0.526	0.520	0.532	0.521	0.533	0.544
China	0.644	0.663	0.670	0.677	0.671	0.680	0.688	0.679	0.693	0.707	0.704	0.706

Data source: Calculated Based on Principal Component Analysis.

In terms of comprehensive level, the overall trade facilitation levels of non-ASEAN countries in RCEP member countries are higher than those of ASEAN countries. The top five countries in trade facilitation level in 2019 were Singapore, New Zealand, Japan, Malaysia, and Australia, and only Singapore and Malaysia are ASEAN countries. The highest level of trade facilitation among ASEAN countries is Singapore, with a score of 0.967 in 2019, which is consistent with the findings of Kong and Dong (2015). The highest level among non-ASEAN countries was New Zealand, with a score of 0.876. The last two countries in trade facilitation rankings are the ASEAN countries of the Philippines and Cambodia, with trade facilitation levels that need to be improved.

From a country perspective, there is still a large difference in the level of trade facilitation among RCEP member countries. In 2017, for example, China, as the largest economy among RCEP member countries, had a medium level of trade facilitation. Singapore and New Zealand had great advantages compared to other countries, but there remained potential and space for improvement. Malaysia and Japan are relatively convenient countries, and South Korea is a generally convenient country. Cambodia is at the bottom of the list, and the level of trade facilitation needs to be improved (Fig. 2).

In terms of trends, the trade facilitation level of most countries is steadily increasing, but the growth rate shows differences. China's trade facilitation level rose from 0.644 in 2008 to 0.706 in 2019. Indonesia grew the fastest, from 0.571 in 2008 to 0.691 in 2019. South Korea

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started to decline in 2009 with a level of 0.6937 until 2016, when it started to show a steady increase.

In summary, the trade facilitation levels of RCEP member countries all have more room for improvement, especially for emerging market countries such as China and Malaysia. Countries ranked lower such, as the Philippines and Myanmar, have also improved trade facilitation levels to varying degrees.

Fig. 2. Distribution of Trade Facilitation Levels in China and Major Trading Partners in 2017
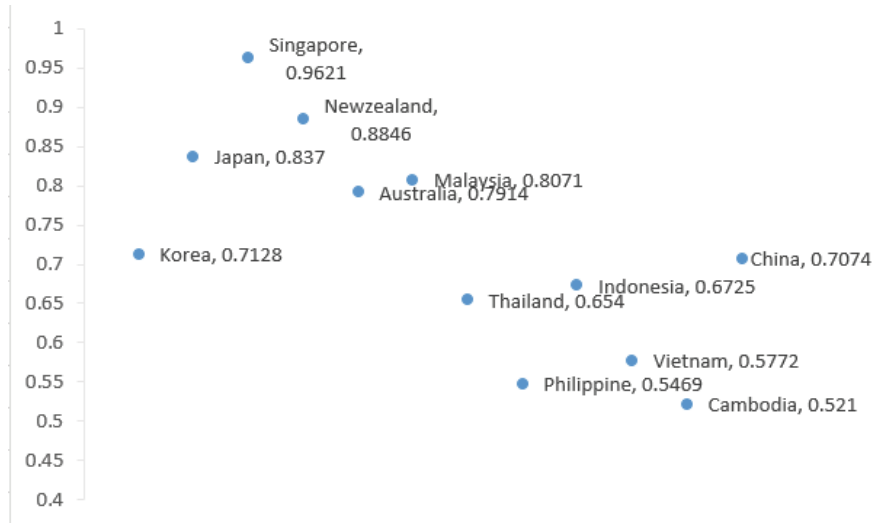
4. An Empirical Study on the Impact of Trade Facilitation on China's Agricultural Exports under the RCEP Framework

4.1. Model Setting

A gravity model is a tool used to study spatial interactions by applying the law of gravity from physics to socio-economic studies. Jan Tinbergen (1962) and Poyhonen (1963) were the first to use the gravity model to study trade flows, and their findings showed that the volume of trade between two economies was inversely proportional to the distance between the two countries, and positively proportional to the size of the economy. Since then, more explanatory variables have been added to the gravity model, including measurable population size, per capita income, tariffs, and others, as well as dummy variables that cannot be quantified, such as whether a trade agreement has been signed, or whether they belong to the same economic organization. The international trade gravity model is given by:

$$T_{ij} = \frac{AY_iY_j}{D_{ij}} \tag{3}$$

Where T_{ij} denotes the trade volume between country i and country j, A is a constant, Y_i denotes the economic scale of country i, and Y_j denotes the economic scale of country j. D_{ij} denotes the linear distance between country i and country j. To facilitate empirical analysis, the model is generally converted into a natural log-linear form for :

$$lnT_{ij} = \alpha_0 + \alpha_1 lnGDP_i + \alpha_2 lnGDP_j + \alpha_3 lnDIS_{ij} + \alpha_4 A_{ij} + \mu_{ij} \qquad (4)$$

where α_0 is the constant term, α_1, α_2, α_3, and α_4 are variable coefficients, and μ is the error term.

This paper explores the impact of the trade facilitation level on China's agricultural exports under the RCEP framework, and based on the basic gravity model, we introduce explanatory variables such as population size and facilitation indicators, as well as include two types of dummy variables: whether RCEP member countries are ASEAN countries, and whether China and the trading countries have signed an FTA. In view of the fact that the panel data of thirteen trading partner countries of RCEP from 2008 to 2019 were selected for regression analysis, the regression equation is constructed as follows.

$$lnEXP_{ijt} = \beta_0 + \beta_1 lnGDP_{jt} + \beta_2 lnPOP_{jt} + \beta_3 lnDIS_{ij} + \beta_4 ASEAN_{jt} + \beta_5 FTA_{ijt} + \beta_6 lnTFI_{jt} + \mu_{ij} \qquad (5)$$

Since the absolute values of export value, GDP, population, and straight-line distance between two countries are too large, the regression results will have large errors; thus, they are taken as logarithms. EXP_{ijt} denotes the total agricultural exports from China to country j in period t, GDP_{jt} denotes the gross domestic product of country j in period t, and POP_{jt} is the population size of country j in period t. DIS_{ij} is the distance between China and country j. $ASEAN_{jt}$ denotes whether country j is an ASEAN country; if the country joined ASEAN in year t, it is 1, and otherwise 0. FTA_{ijt} indicates whether China signed a free trade agreement with country j, and takes the value of 1 if it signed an FTA, and is 0 otherwise. TFL_{jt} denotes the value of trade facilitation level of country j in year t. β_0 is a constant term, β_k (k=1,2...,6) are the regression coefficients of the explanatory variables, and μ_{ij} is the random error term. The meanings and sign predictions of the explanatory variables in the model are shown in Table 6.

The primary indicators of trade facilitation have different influences on China's agricultural exports. In order to visualize the effects of different factors and propose targeted policies, this paper uses the four primary indicators of customs efficiency (C), infrastructure (I), institutional environment (R), and finance and e-commerce (F) as proxy variables for the level of trade facilitation (TFL), which leads to the following four regression equations.

$$lnEXP_{ijt} = \beta_0 + \beta_1 lnGDP_{jt} + \beta_2 lnPOP_{jt} + \beta_3 lnDIS_{ij} + \beta_4 ASEAN_{jt} + \beta_5 FTA_{ijt} + \beta_6 lnR_{jt} + \mu_{ij} \qquad (6)$$

$$lnEXP_{ijt} = \beta_0 + \beta_1 lnGDP_{jt} + \beta_2 lnPOP_{jt} + \beta_3 lnDIS_{ij} + \beta_4 ASEAN_{jt} + \beta_5 FTA_{ijt} + \beta_6 lnI_{jt} + \mu_{ij} \qquad (7)$$

$$lnEXP_{ijt} = \beta_0 + \beta_1 lnGDP_{jt} + \beta_2 lnPOP_{jt} + \beta_3 lnDIS_{ij} + \beta_4 ASEAN_{jt} + \beta_5 FTA_{ijt} + \beta_6 lnC_{jt} + \mu_{ij} \qquad (8)$$

$$lnEXP_{ijt} = \beta_0 + \beta_1 lnGDP_{jt} + \beta_2 lnPOP_{jt} + \beta_3 lnDIS_{ij} + \beta_4 ASEAN_{jt} + \beta_5 FTA_{ijt} + \beta_6 lnF_{jt} + \mu_{ij} \qquad (9)$$

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Table 6. Meaning, Sign Predictions, and Descriptions of Explanatory Variables

Explanatory Variable	Meaning of Variable	Expected Sign	Theoretical Description
$lnGDP_{jt}$	The size of the economy of the importing country j in year t	+	The larger the economy size of importing country j, the greater the demand for agricultural products, which in turn promotes China's exports.
$lnPOP_{jt}$	Population size of country j in year t	Uncertain	The larger the population, the higher its consumption. At the same time, the larger the population, the higher the degree of the domestic division of labor, the less favorable it is to international trade.
$lnDIS_{ij}$	Linear distance between country i and country j	-	The greater the distance between two countries, the higher the transportation costs, and the more easily the agricultural products spoil, which is an important factor that hinders trade.
$ASEAN_{jt}$	dummy variable, whether country j is an ASEAN country in year t	+	If country j belongs to ASEAN countries benefiting from the earlier signing of the free trade agreement between China and ASEAN, it is conducive to promoting the expansion of its import scale.
FTA_{ijt}	Dummy variable, whether country j has signed FTA agreement with China	+	Trade creation and trade transfer effects resulting from the signing of FTAs by both sides of trade can promote trade flows.
$lnTFI_{jt}$	Trade facilitation level of country j in year t	+	The higher the level of trade facilitation in importing country j, the lower the cost of trade between two countries, which helps to increase trade.

4.2. Data Sources and Descriptions

This paper selects 12 RCEP member countries as research objects to empirically analyze the impact of trade facilitation level on China's agricultural exports. The time span of the sample is from 2008 to 2019.

The annual agricultural export data of each country were obtained from the United Nations Commodity Trade Statistics Database (UNCOMTRADE); the GDP and *POP* of each member country were obtained from the World Bank Development Indicators (WBI) database. Data on the distance between countries were obtained from the CEPII online database of the French Research Centre for International Economics. Data on FTAs signed between member countries and China were obtained from the China Free Trade Zone Service (http://fta.mofcom.gov.cn/). Data on all secondary indicators measuring the level of trade facilitation were obtained from the Global Competitiveness Report published by the eWorld Economic Forum from 2008 to 2019 and the Corruption Perceptions Index Report published by Transparency International, and data on the integrated and primary indicators of trade facilitation level of each country were obtained from the results of this paper.

4.3. Empirical Test of Gravity Model in International Trade and Analysis of Results

This paper uses Stata16.0 analysis software to empirically analyze the balanced panel data of China and RCEP trading partners from 2008 to 2019. Pooled least squares estimation, fixed effects estimation, and random effects estimation were conducted for the sample data, and the results of the analysis are shown in Table 7.

Table 7. Overall Regression Results of Gravity Model in International Trade

Variable	Pooled Least Squares Estimation OLS	Random Effects RE	Fixed Effect FE
$lnGDP_{jt}$	0.7749328(11.48)***	1.305273(15.71)***	1.159381(10.06)***
$lnPOP_{jt}$	0.4552833 (7.37)***	-0.0471964(-0.41)	-1.490388(2.67)***
$lnDIS_{ij}$	-0.8326839(-9.65)***	-0.6930463(-2.23)**	-
$ASEAN_{jt}$	1.004887 (5.93)***	1.581615 (3.85)***	-
FTA_{ijt}	0.5487984 (4.95)***	0.219516 (3.71)***	0.171482(2.88)***
constant	-1.994365(-2.41)***	-0.1674097(-0.06)	7.690098(1.56)
R^2	0.9406	0.8999	0.996
F	409.72	-	148.37
F-test	Prob>F=0.0000	Fixed effects estimation is better than mixed least squares estimation.	
BP test	Prob>chibar2=0.0000	Random effects estimation is better than mixed least squares estimation.	
Hausman test	Prob>chi2=0.2031	Random-effects estimation is better than fixed-effects stimation.	

Note: T-values are in parenthesis: *$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

In the three regression analysis methods, the signs of the explanatory variables, except for population, were as expected, and most explanatory variables passed the significance level tests at 1%, 5%, and 10%. The F-test, BP-test, and Hausman test were conducted for each of the three regression analyses to determine which regression estimation was best. The F-test indicates that the fixed effects estimation is better than the pooled least squares estimation; the BP-test indicates that the random effects estimation is better than the pooled least squares estimation; and the Hausman test indicates that the random effects estimation is better than the fixed effects estimation. Therefore, this paper chose a random effects model to analyze the impact of the level of trade facilitation on China's agricultural exports, and derove the regression equation of the impact of trade facilitation on China's agricultural exports under the RCEP framework:

$$lnEXP_{ijt}=-0.168+1.305lnGDP_{jt}-0.047lnPOP_{jt}-0.693lnDIS_{ij}+1.582ASEAN_{jt}+$$
$$0.220FTA_{ijt}+2.432lnTFI_{jt} \qquad (10)$$

From the regression coefficients of the variables, trade facilitation has the largest impact on China's agricultural exports with a regression coefficient of 2.432, indicating that for every 1% increase in the trade facilitation level of RCEP countries, the trade volume of China's

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agricultural exports will increase by 2.432%, which is the largest source of gravitational force in bilateral trade. Secondly, the impact on China's agricultural exports is the GDP of the importing country, which reflects a country's economic capacity and potential trade demand. For every 1% increase in the total domestic production of the importing country, China's agricultural exports will increase by 1.305%. The population size of the importing country shows a non-significant effect on international trade volume. An increase in population represents an increase in diversity of demand and overall consumption demand, which is conducive to international trade, but at the same time, the larger the population, the higher the degree of domestic division of labor, which is not conducive to international trade. There is no correlation between population size and the trade flows of an importing country within the sample of this paper. The linear distance between China, its RCEP trading partners, and the export value of Chinese agricultural products show a negative relationship, and for every 1% increase in the distance between countries, the export value of Chinese agricultural products will decrease by 0.693%;transaction costs will increase due to the long linear distance, thus inhibiting the export of Chinese agricultural products. The two dummy variables also have a great impact on China's agricultural exports. The variable of whether an FTA was signed has a significant impact on the export value with an impact coefficient of 0.22; when China signs an FTA with an RCEP partner country, it will bring an increase of 0.22% to the value of China's bilateral trade. The dummy variable of whether to join ASEAN countries passed the significance test; if joining ASEAN countries, it promotes an 1.582% increase in China's trade with that country. China signed FTAs with ASEAN earlier, and its import and export promotion mechanism is already mature, while with non-ASEAN countries, except for the China-New Zealand FTA, the remaining FTAs were signed later than the China-ASEAN FTA, and the import/export promotion mechanisms are not mature.

In order to find the exact impact of the primary indicators of trade facilitation on China's agricultural exports, this paper selected an optimal random effects method with reference to the estimation of Model 3 and regresses Equations 6 through 9 separately to obtain the regressions of the four equations shown in Table 8.

It was found that the primary indicators of trade facilitation have different impacts on agricultural exports, with finance and e-commerce (F) having the greatest impact, followed by customs efficiency (C), infrastructure development (I), and institutional environment (R) with a negative regression coefficient. For every 1% increase in the level of finance and e-commerce, the trade volume of China's agricultural exports will increase by 2.098%. For each 1% increase in customs efficiency, China's agricultural exports will increase by 1.987%. For each 1% increase in infrastructure construction, China's agricultural export trade value will increase by 1.731%. The institutional environment does not have a significant impact, likely because most RCEP countries are developing countries, which have deficiencies in the technical, economic, and legal environments, resulting in a weaker technical level and institutional basis for trade facilitation. Infrastructure and other environments are more important in improving the level of trade facilitation in developing countries (Wilson JS. et al., 2005). That is, most developing countries in RCEP have a low level of trade facilitation, and the impact of the infrastructure on international trade is greater than that of the other environmental factors. Therefore, in the process of optimizing the trade facilitation level between China and RCEP trading partners, priority can be given to the widespread penetration of finance and e-commerce, as well as to strengthening the efficiency of customs and improving infrastructure construction, so as to promote bilateral agricultural trade.

Table 8. Regression Results of the Four Primary Indicators

Independent Variable	(6)	(7)	(8)	(9)
$lnGDP_{jt}$	1.38776(17.99)***	1.311984(16.01)***	1.328991(16.51)***	1.282115(15.03)***
$lnPOP_{jt}$	-.1396121(-1.16)	-0.0552003(-0.48)	-0.0631073(-0.52)	-0.0295379(-0.26)
$lnDIS_{ij}$	-0.562783(-1.63)	-0.5960362(-1.95)*	-0.7130771(-2.15)**	-0.6420527(-2.21)**
$ASEAN_{jt}$	1.33813(3.02)***	1.565843(3.85)***	1.576482(3.65)***	1.470257(3.82)***
FTA_{ijt}	0.2296862(3.91)***	0.2308233(3.93)***	0.2145663(3.62)***	0.2244125(3.81)***
constant	0.9007644 (0.28)	-0.5385522(-0.18)	0.1500051(0.05)	-0.350799 (-0.13)
lnR_{jt}	-1.207546 (-1.30)			
lnI_{jt}		1.731042(1.82)*		
lnC_{jt}			1.987068 (1.73)*	
lnF_{jt}				2.097726(2.08)**
R-Squared	0.9166	0.8975	0.9116	0.8878

Note: T-values are in parenthesis: $*p < 0.1$, $** p < 0.05$, $*** p < 0.01$.

5. Conclusion

Based on the analysis of the current situation of China's agricultural exports to RCEP member countries and the measurements of trade facilitation levels in member countries, this paper empirically analyzed the impact of the trade facilitation levels of RCEP member countries on China's agricultural exports, and draws the following conclusions.

First, from an overall perspective, the trade facilitation levels of RCEP member countries have generally shown an increasing trend in recent years, but there are differences in trade facilitation levels among countries. The overall levels of ASEAN countries are lower than those of non-ASEAN countries. New Zealand, Japan, Australia, and other non-ASEAN countries rank high in trade facilitation level, while the trade facilitation levels of ASEAN countries, such as the Philippines and Cambodia, need to be improved. The trade facilitation level of a country is related to its degree of economic development and trade liberalization, and trade facilitation levels, especially concerning ASEAN countries, need to be further improved.

Second, improvements in the trade facilitation levels of RCEP member countries have a significant positive impact on China's agricultural exports. The primary indicators of trade facilitation have varying degrees of impact on China's agricultural exports. Among these, finance and e-commerce have the greatest impact, followed by customs environment and infrastructure. Institutional environment has a negative impact on trade. This indicates that the development of information technology, popularization of Internet, and the construction and improvement of infrastructure in importing countries can simplify the trade process and reduce transaction costs, thus promoting the growth of China's agricultural exports.

Third, the GDPs of RCEP countries have a positive impact on China's agricultural exports. ASEAN membership can have a significant impact. If a member country signs an FTA with China, it can also affect agricultural exports. Physical distance plays a hindering role in agricultural exports. Thus, increasing processing of Chinese agricultural exports will help to weaken the hindering effect of the distance factor on the export of agricultural products with high freshness requirements and help increase the added value of agricultural exports, thus enhancing the market competitiveness of Chinese agricultural products in RCEP countries.

The results of this paper show that the improvement of the trade facilitation levels of RCEP member countries can significantly promote the export of Chinese agricultural products. If

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RCEP member countries commit to improving the indicators of domestic trade facilitation level, this will certainly promote the exports of Chinese agricultural products and boost bilateral economic development. Specific measures can be carried out.

First, it is neccesary to accelerate the construction of infrastructure to achieve transport interconnection. The interconnection of infrastructure provides transport support for trade, and is key to enhancing the level of trade facilitation in the RCEP region. Among RCEP member countries, the overall transport infrastructure construction in ASEAN countries is weak, and infrastructure construction often becomes a heavy economic burden. Therefore, China should work with RCEP member countries, including ASEAN, in development planning, and provide assistance in capital and technology. RCEP member countries should jointly build infrastructure, comprehensively improve transport capacity, promote the logistics and information flow of international trade, and reduce trade transaction costs.

Second, it is vital to increase investment in network construction and enhance the level of e-commerce. With the progress of science and technology, the information age has arrived, and e-commerce has become a global, open business activities. The promotion of cross-border e-commerce is an effective way to enhance the level of trade facilitation. Countries should encourage and support telecommunication and communication enterprises to strengthen international cooperation in the RCEP region, jointly promote e-commerce development and Internet construction, and realize network interconnection. As the development stage of e-commerce and the level of regulatory mechanism vary greatly among RCEP member countries, some governments in the RCEP region should not only further strengthen the investment in Internet construction and improve the coverage of the Internet but also seek common ground while reserving differences and strive to reach a consensus that applies to all countries.

Thirdly, enhancing financial freedom and opening capital financing channels must be undertaken . In order to improve the export volume of agricultural products and help the development of cross-border e-commerce in RCEP countries, China needs more comprehensive financial services. China should use the Asian Infrastructure Investment Bank as a carrier to realize financial integration among RCEP member countries and encourage active participation in the construction of agricultural trade and investment and financing systems, such that they can better meet the development needs of economic globalization.

Fourth, members must eliminate tariffs and non-tariff measures to promote the growth of agricultural trade between China and RCEP countries. After the signing of the RCEP agreement, China's agricultural trade is expected to achieve zero tariff exports, but non-tariff trade barriers may still exist. China should actively respond to the call of the WTO to implement the Trade Facilitation Agreement, and call on economic organizations to play a role in promoting the level of trade facilitation. China should also establish a cooperation mechanism, strengthen exchanges and communication with governments, enterprises, and personnel of RCEP countries, and strengthen the cooperation and construction of trade facilitation within countries in the RCEP region.

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