Analysis of Export Trade Effects of Trade Facilitation Levels in the Context of RCEP

-- Based on an Extended Trade Gravity Model

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Abstract

This paper first measured the level of trade facilitation between China and the RCEP member countries using principal component analysis, and then used the extended trade gravity model to verify that the promotion effect of trade facilitation on China's export trade to the RCEP member countries is greater than the GDP of the importing and exporting countries, the population of the importing and exporting countries and the tariff reduction. In order to promote a higher quality of China's export trade, exchanges and cooperation among the member countries in the region should be continuously strengthened to further enhance the level of intra-regional trade facilitation.

Keywords

Trade Facilitation; Trade Effects; Principal Component Analysis; Gravity Model.

1. Introduction

The fourth Regional Comprehensive Economic Partnership (RCEP) Leaders' Meeting was held on 15 November and ten ASEAN countries, as well as 15 countries from China, Japan, South Korea, Australia and New Zealand, officially signed the Regional Comprehensive Economic Partnership (RCEP) agreement. This marks the birth of the world's most populous and diverse membership with the greatest development potential, and means that about one-third of the world's economic volume forms an integrated large market. My total trade with RCEP members accounts for about one-third of my total foreign trade. The formation of the RCEP integrated large market will unlock huge market potential and further promote intra-regional trade exchanges, which will help China to further optimise the layout of foreign trade and investment through a more comprehensive, deeper and more diversified opening to the outside world, continuously align with international high-standard trade and investment rules, and build a higher level of The RCEP provides for the enhancement of intra-regional trade facilitation as follows: customs procedures and trade facilitation measures, sanitary and phytosanitary measures, as well as measures on standards, technical regulations and conformity assessment procedures. In the area of customs procedures and trade facilitation, the RCEP simplifies customs clearance procedures and adopts pre-determination, pre-arrival processing and the use of information technology to facilitate efficient management of customs procedures. In the area of sanitary and phytosanitary measures, a range of measures have been developed to protect human, animal or plant life or health and to ensure that these measures are not, to the extent possible, trade restrictive and do not unreasonably discriminate against other RCEP members. In the area of standards, technical regulations and conformity assessment procedures, the RCEP promotes the reduction of unnecessary technical barriers to trade in the recognition of standards, technical regulations and conformity assessment procedures, and encourages standardisation bodies to strengthen information exchange and cooperation on

standards, technical regulations and conformity assessment procedures. These initiatives will greatly enhance the level of intra-regional trade facilitation, further reduce trade costs and promote the formation of a higher level of trade.

The term trade facilitation has been repeatedly used in various literature, but so far there is no universally accepted and uniform definition worldwide. Both WTO (1998) and UNCTAD (2001) consider trade facilitation as the simplification and harmonisation of international trade procedures (including the activities, practices and formalities required for the collection, provision, communication and processing of data for the international flow of trade in goods). OECD (2001) expresses trade facilitation as the simplification and standardization of the procedures and related information flows required for the international movement of goods from the seller to the buyer and payment to the other party. APEC (2002) defines trade facilitation generally as the use of new technologies and other measures to simplify and harmonize trade-related procedures and administrative barriers, reduce costs and promote better flow of goods and services. Trade facilitation is also addressed in the recently signed Regional Comprehensive Economic Partnership Agreement in terms of customs procedures and trade facilitation measures, sanitary and phytosanitary measures, as well as standards, technical regulations and conformity assessment process measures.

As there is no unified view on trade facilitation in academic circles, most scholars follow the idea of Wilson (2003) when constructing the trade facilitation indicator system, using four indicators such as port efficiency, regulatory environment, e-commerce and customs environment, and later scholars choose different indicators and data from different sides based on different research purposes to measure on this basis. It was Kong and Dong (2015) who constructed a more complete set of trade facilitation indicators system to measure the level of trade facilitation in 69 countries along the "Belt and Road", including four primary indicators and 22 secondary indicators. In the analysis of the impact of trade facilitation on China's trade volume with the "Belt and Road" countries, Lu (2019) uses infrastructure, e-commerce, customs efficiency and institutional environment as trade facilitation metrics. In order to assess the impact of trade facilitation on China's import trade, Cui and Li (2020) constructed a broad trade facilitation assessment index system based on the OECD facilitation indicators, which mainly includes 26 secondary indicators in five areas, including institutional environment, customs efficiency, import and export procedures, infrastructure, and transparency of border management.

A large number of scholars have conducted empirical studies on the relationship between trade facilitation and import and export trade, and agree that an increase in the level of trade facilitation can significantly boost China's import and export trade. Xie and Yue (2011) used a gravity model to quantitatively analyse the impact of trade facilitation on China's ASEAN trade flows and found that trade facilitation can create an efficient and transparent environment for international trade by simplifying trade procedures and harmonising legal regulations, thereby promoting bilateral trade. Based on trade data between China and countries along the Belt and Road, Lu (2019) argues that among the four trade facilitation indicators, namely infrastructure, e-commerce, customs efficiency and institutional environment, customs efficiency has the most significant positive impact on China's trade flows with countries along the Belt and Road. The positive impact of customs efficiency on trade flows between China and countries along the Belt and Road is the most significant. Yu and Nie (2018) showed that trade and investment facilitation has a significant positive impact on bilateral trade volume through the gravity model and quantile regression method. Shan and Zhou (2012) found that trade facilitation promoted the growth of a country's export volume more than tariff concessions based on trade data from APEC member countries.

Scholars at home and abroad agree that trade facilitation has a positive contribution to trade. There are abundant studies on the level of trade facilitation, but few scholars have studied the

relationship between the level of trade facilitation and bilateral trade between China and its member countries based on the context of the Regional Comprehensive Economic Partnership Agreement (RCEPA). The Regional Comprehensive Economic Partnership Agreement (RCEPA) was initiated by ten ASEAN countries in 2012 and was officially signed on 15 November 2020. This paper selects data from 2012-2019 for China and the trading partners of the RCEP (the ten ASEAN countries, China, Japan, Korea and New Zealand), and uses the principal component analysis method (Since the indicator evaluation system in the Global Competitiveness Report changed around 2018, this paper selects data from 2012-2017 for principal component analysis and uses this composite evaluation indicator to estimate the level of trade facilitation in each member country in 2018 and 2019.) to construct a better evaluation system of trade facilitation (Myanmar was excluded from the analysis using principal components due to significant missing data for the years 2012-2017.), taking into account the previous research results, the latest provisions on trade facilitation in the RCEP agreement and the characteristics of economic development of the member countries. An extended trade gravity model is used to measure the impact of trade facilitation levels on the scale of bilateral trade.

2. Construction and Measurement of the Trade Facilitation Indicator System

2.1. Construction of a Trade Facilitation Indicator System

At present, there is no internationally accepted standard definition of trade facilitation and there is a tendency for its coverage to expand (Wang, 2014). Although the formulation of trade facilitation varies among different organisations, the basic spirit is the same: to simplify and harmonise trade procedures and accelerate the cross-border movement of factors. Drawing on the studies of scholars such as Kong and Dong, and taking into account the relevant provisions of the Regional Comprehensive Economic Partnership Agreement on trade facilitation and the characteristics of the economic development of member countries, this paper sets the primary indicators as port efficiency (T), customs environment (C), regulatory environment (R) and e-commerce (E), and refines them to 14 secondary indicators.

Within the overall system, the two primary indicators, Port Efficiency (T) and Customs Environment (C), primarily reflect border barriers. Specifically, Port Efficiency (T) measures the quality of port and air infrastructure and the timeliness of transport. A higher score indicates a busier and more efficient port, while C) focuses on the time cost of customs clearance, direct costs and the transparency of customs regulations. The Regulatory Environment (R) and Electronic Commerce (E) are two tier one indicators that reflect a country's internal barriers to international trade. Specifically, the Regulatory Environment (R) measures the normative and transparent policy environment of a country and reflects whether importers and exporters can trade in a good macro environment. E-commerce (E) mainly reflects whether a country has good communication facilities and whether businesses are widely trading and negotiating with consumers and suppliers through e-commerce. The four indicators provide a comprehensive assessment of a country's level of trade facilitation in different ways, as shown in Table 1.

The 14 secondary indicators cited in this paper are all from the Global Competitiveness Report (GCR) and the Global Trade Facilitation Report (GETR), with scores ranging from 1-7, 0-1 or 0-100, with higher scores indicating higher levels of trade facilitation and more conducive to international trade. As the data sources of the indicators and the different range of values will have a dimensional impact and make the data less comparable with each other, this paper standardises all the secondary indicators to those with values between 0 and 1 through the linear transformation method of dividing the original indicator value by the maximum value of the indicator, with the formula

$$Y_i = X_i/X_{iMax} \tag{1}$$

where X_i is the original value of secondary indicator i, and X_{iMax} denotes the maximum value that can be taken for the secondary indicator i. Y_i is the data after indexation of indicator i, taking values in the range [0,1]. By calculating the simple average of the secondary indicators, the values of the primary indicators can be obtained as follows.

$$Z_j = \sum_i^n Y_i /n \tag{2}$$

Table 1. Trade facilitation indicator system

Tier 1 indicators	Secondary indicators		Score range	Source of indicators
Port efficiency (T)	Efficiency of port services	T1	1-7	GCR
	Efficiency of air transport services	T2	1-7	GCR
Customs environment (C)	Prevalence of Non-Tariff Barriers	C1	1-7	GCR
	Customs procedures	C2	1-7	GCR
	Unconventional payments and bribes	C3	1-7	GCR
Regulatory environment (R)	Government credibility	R1	1-7	GCR
	Judicial independence	R2	1-7	GCR
	The burden of government regulation	R3	1-7	GCR
	Legal framework for dispute resolution efficiency	R4	1-7	GCR
	Policy transparency	R5	1-7	GCR
	The business cost of crime and violence	R6	1-7	GCR
	Organized crime	R7	1-7	GCR
E-commerce (E)	Internet users	E1	0 - 100	GCR
	Accessibility of new technologies	E2	1-7	GCR

2.2. Measurement of the Level of Trade Facilitation in the 10+5 Member Countries

In order to measure the trade facilitation index system more accurately and reduce the multiple covariance of the data, this paper uses principal component analysis to assign the weights of each indicator. Firstly, Eviews 8.0 software was used to conduct principal component analysis, and three principal components could be obtained: Comp1, Comp2 and Comp3, which are shown in Table 2. 88.75% of the 14 indicators were covered by the three principal components, and two were ensured to be uncorrelated. The coefficients of each indicator of the comprehensive evaluation model can be obtained from these three principal components: the coefficient corresponding to each principal component is multiplied by the contribution of the corresponding principal component and divided by the cumulative contribution of these three principal components, and finally summed up. After calculation, the comprehensive evaluation model of the trade facilitation indicator system takes the following form.

Comp=0.2155T1+0.2291T2+0.2371C1+0.2562C2+0.2161C3+0.2426R1+0.2046R2+0.2476R3
+0.2649R4+0.2563R5+0.1997R6+0.2004R7+0.1398E1+0.1846E2

By normalising the coefficients in the above integrated model, the weights of each secondary indicator can be obtained, while the weight of a primary indicator is the sum of the weights of the secondary indicators it contains. From this, the weights of the four level 1 indicators of port

efficiency (T), customs environment (C), regulatory environment (R) and e-commerce (E) can be obtained as 0.1436, 0.2292, 0.5222 and 0.1049 respectively. The evaluation indicators of the integrated system of trade facilitation (TWTFI) can be expressed as

Table 2. Coefficient composition of each indicator of the principal components

Secondary indicators	Indicator Code	Comp1	Comp2	Comp3
Efficiency of port services	T1	0.2557	-0.2341	0.4276
Efficiency of air transport services	T2	0.2712	-0.1818	0.3568
Prevalence of Non-Tariff Barriers	C1	0.2440	0.2447	0.1406
Customs procedures	C2	0.3054	0.0035	0.0493
Unconventional payments and bribes	C3	0.2965	-0.1442	-0.2051
Government credibility	R1	0.2611	0.3897	-0.2144
Judicial independence	R2	0.2789	-0.0994	-0.2302
The burden of government regulation	R3	0.2011	0.5140	0.3988
Legal framework for dispute resolution efficiency	R4	0.2971	0.1587	0.0374
Policy transparency	R5	0.2848	0.1597	0.0581
The business cost of crime and violence	R6	0.2643	0.0644	-0.3793
Organized crime	R7	0.2705	0.0302	-0.3921
Internet users	E1	0.2380	-0.4546	-0.1321
Accessibility of new technologies	E2	0.2538	-0.3780	0.2182
Proportion/%		73.37	9.39	5.99

$$TWTFI = 0.0696T1 + 0.074T2 + 0.0766C1 + 0.0828C2 + 0.0698C3 + 0.0784R1 + 0.0661R2 + 0.08R3 + 0.0856R4 + 0.0828R5 + 0.0645R6 + 0.0648R7 + 0.0452E1 + 0.0597E2$$

2.3. Measurement of the Level of Trade Facilitation

Table 3. Levels of trade facilitation in partner countries, 2012-2017

Country	2012	2013	2014	2015	2016	2017
Vietnam	0.5183	0.5239	0.5264	0.5443	0.5433	0.5367
Thailand	0.5749	0.5666	0.5517	0.5489	0.5554	0.5717
Brunei	0.692	0.7141	0.6743	0.6436	0.5999	0.6257
Cambodia	0.5517	0.5181	0.4715	0.4719	0.4921	0.4782
Indonesia	0.54	0.5578	0.5681	0.5514	0.5628	0.5872
Laos	0.5629	0.5632	0.5491	0.5362	0.5413	0.5488
Malaysia	0.7181	0.7072	0.7367	0.7411	0.7174	0.7178
Philippines	0.5006	0.5185	0.5349	0.5191	0.4888	0.4785
Singapore	0.8867	0.8763	0.8705	0.8796	0.8876	0.8885
China	0.6059	0.6096	0.6145	0.6029	0.6264	0.6419
Japan	0.6988	0.7151	0.7399	0.7523	0.7518	0.7826
Korea	0.622	0.6138	0.5929	0.6097	0.6233	0.6316
New Zealand	0.8505	0.84	0.8337	0.8177	0.7987	0.8327
Australia	0.7504	0.7101	0.7146	0.7373	0.7308	0.7324

The level of trade facilitation for the 14 countries in the Regional Comprehensive Economic Partnership Agreement (except Myanmar) can be obtained based on the formulae for the evaluation indicators of the above integrated trade facilitation system. This is shown in Table 3. Among the 14 member countries, the highest level of trade facilitation is Singapore. According to Zeng Zheng and Zhou Xi's classification, Singapore and New Zealand are very

convenient countries; Australia, Japan and Malaysia are relatively convenient countries; Brunei, China and Korea are generally convenient countries; Vietnam, Thailand, Cambodia and the Philippines are not convenient countries. From the scores, the trade facilitation level of developed countries is generally high, but the trade facilitation level of ASEAN developing countries generally scores low. Considering the increasing trade volume between China and ASEAN countries in recent years, China's trade potential with ASEAN countries is huge, improving the infrastructure of ASEAN countries and upgrading their trade facilitation level is of great significance for expanding bilateral trade volume.

3. Model Design and Empirical Analysis

The idea and concept of the gravitational model of trade originates from Newton's law of gravity in physics. tinberge (1962) and Poyhonen (1963) were the first to apply the gravitational model to the study of international trade, arguing that the scale of bilateral trade between two countries is proportional to the total economic volume of the two countries and inversely proportional to the distance between them; Linnemann (1966) added the population variable to the gravitational model, arguing that the scale of trade between two countries is proportional to the number of people. (1966) added the population variable to the gravity model and concluded that the scale of trade between two countries is positively proportional to the size of the population.

The general form of the trade gravity model can be expressed as $EXP_{ij} = a_0 Y_i^{a1} Y_j^{a2} D_{ij}^{a3} A_{ij}^{a4}$. where EXP_{ij} denotes the value of exports from country i to country j in a given period, and Y_i is the GDP of the exporting country, the Y_j is the GDP of the importing country, and D_{ij} is the geographical distance between the two countries, and A_{ij} are other factors that facilitate or hinder trade. For regression purposes, the original model is generally transformed into a natural log-linear form, giving the following form.

$$\ln EXP_{ij} = \ln a_0 + a_1 \ln Y_i + a_2 \ln Y_j + a_3 \ln D_{ij} + a_4 \ln A_{ij} + \varepsilon_{ij}$$

where a_0 is the constant term, the ε_{ij} is the random error term and the coefficients a1, a2, a3 and a4 are elasticities. the logarithmic form of the extended trade gravity model of Linnemann (1966) is expressed as follows.

$$\ln EXP_{ij} = a_0 + a_1 \ln GDP_i + a_2 \ln GDP_j + a_3 \ln Dis_{ij} + a_4 \ln Peo_i + a_5 \ln Peo_j + \varepsilon_{ij}$$

where, EXP_{ij} denotes the volume of export trade from country i to country j. GDP_i and GDP_j denote the GDP of countries i and j, respectively. Dis_{ij} denotes the spatial distance between the capitals of the two countries. Peo_i and Peo_j denote the total population of countries i and j respectively.

In order to measure the degree of influence of the level of trade facilitation on China's export trade with the member countries of the Regional Comprehensive Economic Partnership Agreement, this paper adds the value of China's trade facilitation level with the regional member countries and the tariff level of each member country on the basis of model (2), and the extended gravity model is

$$\ln EXP_{ij} = a_0 + a_1 \ln GDP_i + a_2 \ln GDP_j + a_3 \ln Dis_{ij} + a_4 \ln Peo_i + a_5 \ln Peo_j + a_6 \ln TWTFI_j + a_7 \ln Tariff_j + \varepsilon_{ij}$$

where, EXP_{ij} denotes the volume of export trade from country i to country j.

GDP_i and GDP_j denote the GDP of country i and j, respectively. Dis_{ij} represents the space distance between the two capitals; Peo_i and Peo_j denotes the total population of countries i and j, respectively. $TWTFI_j$ denotes the level of trade facilitation in country j. $Tariff_j$ denotes the level of tariffs in country j. The expected signs, theoretical descriptions and data sources for each explanatory variable are shown in Table 4.

Table 4. Expected sign of explanatory variables and data sources

Explanatory variables	Expected symbols	Theoretical notes	Data sources
GDP_i GDP_j	Positive	The total size of a country's economy reflects the potential demand for trade	World Bank database (In US dollars)
Dis_{ij}	Negative	The greater the geographical distance between the two countries, the higher the cost of trade	Geographical distance calculator (in km)
Peo_i Peo_j	Uncertainty	The increase in population has led to an increase in consumer demand and may also reduce international trade due to the deepening of the domestic division of labor	World Bank database (Unit: persons)
$TWTFI_j$	Positive	Trade facilitation promotes trade by reducing trade costs	From the previous measurement
$Tariff_j$	Negative	The higher the level of tariffs the greater the cost of trade and the greater the impediment to trade	GCR

4. Empirical Analysis of the Trade Gravity Model and Discussion of the Results

This paper conducted a regression analysis using data on export trade between China and the 13 member countries of the Regional Comprehensive Economic Partnership Agreement (RCEP) from 2012-2017, using Eviews 8.0 on 78 sample data to obtain the following empirical equation.

$$\ln EXP_{ij}=6.34+0.21\ln GDP_i+0.35\ln GDP_j-0.65\ln Dis_{ij}+0.34\ln Peo_i+0.48\ln Peo_j +2.05\ln TWTFI_j-0.22\ln Tariff_j$$

Table 5. Combined model regression results

Variables	Regression coefficient	t-statistic
C	6.34	0.43
GDP_i	0.21**	2.54
GDP_j	0.35***	4.02
Dis_{ij}	−0.65***	-5.69
Peo_i	0.34***	4.32
Peo_j	0.48***	5.38
$TWTFI_j$	2.05**	2.61
$Tariff_j$	−0.22**	-2.32

According to the results of the above regression analysis, the following conclusions can be obtained: the higher the GDP of the exporting and importing countries, the greater the trade

exports of China to the partner countries, and the total size of a country's economy reflects the trade potential of a country. From the above regression results, the regression coefficients of the GDP of import and export countries are significant at the 1% and 5% levels respectively. For every 1% increase in the GDP of exporting countries, the volume of China's export trade increases by 0.21% on average; for every 1% increase in the GDP of importing countries, the volume of export trade increases by 0.35% on average. Geographical distance has a significant deterrent effect on the development of international trade. On average, a 1% increase in geographical distance between two countries is associated with a 0.65% decrease in export trade. However, as scientific and technological advances, improvements in transport infrastructure and diversification of modes of transport become more widespread around the world, the role of geographical distance between countries in impeding trade between them will continue to diminish. The size of the population of the importing and exporting countries has a significant contribution to export trade. On average, a 1% increase in the population of an exporting or importing country is associated with a 0.48% and 0.34% increase in the value of export trade respectively. An increase in the size of a country's population can, on the one hand, contribute to a further expansion of the domestic division of labor and, on the other hand, represent a diversification of demand and an increase in overall consumer demand, which is conducive to international trade. Trade facilitation has the greatest boosting effect on our export trade. For every 1% increase in the level of trade facilitation, the volume of our export trade increases by 2.05%. Therefore, due to the large differences in the level of economic development, systems and cultures of the member countries of the Regional Comprehensive Economic Partnership Agreement, the level of trade facilitation also varies greatly. Therefore, it is important to formulate specific differentiated measures to enhance the level of trade facilitation for the different situations of each member country, in order to enhance the export trade volume of China. Tariff levels reduce the trade volume between countries by raising the cost of international trade. For every 1% increase in tariff levels, the volume of China's export trade is reduced by an average of 0.22%. Overall, the level of tariffs has a relatively small degree of impact on the volume of export trade, and with the general reduction of tariff levels across countries and the deepening of regional economic cooperation, the impact of tariffs on international trade will be further reduced.

5. Conclusion

This paper measures the level of trade facilitation between China and the member countries of the Regional Comprehensive Economic Partnership Agreement (RCEPA) on the basis of a trade facilitation evaluation system, and applies a gravity model to measure the impact of the level of trade facilitation on China's export trade with the member countries, and the results indicate that trade facilitation has a significant positive effect on China's export trade. The results indicate that trade facilitation has a significant positive effect on China's export trade volume. Due to the differences in economic development, systems and cultures among the member countries of the Regional Comprehensive Economic Partnership Agreement, the level of trade facilitation also varies greatly. Therefore, in view of the different situations of each member country, specific differentiated measures to enhance the level of trade facilitation should be formulated to strengthen the economic, political and cultural exchanges between countries, so as to further enhance the level of trade facilitation of countries in the region. China can improve the level of trade facilitation with RCEP countries in the following ways.

RCEP member countries should actively participate in the "One Belt, One Road" connectivity projects to improve the quantity and quality of their infrastructure. The developed countries represented by Japan, South Korea and Singapore among the RCEP countries encourage their enterprises to go out and actively invest in ASEAN infrastructure construction, while the

countries with poor RCEP infrastructure can borrow from the Asian Infrastructure Investment Bank, introduce investment banks like Goldman Sachs, or bring in enterprises to invest in their own infrastructure construction.

The RCEP will be accompanied by a general reduction in tariff and non-tariff barriers between countries, but the reduction of tariff and non-tariff barriers alone will not be sufficient to improve the efficiency and transparency of border management; the RCEP members will also have to make efforts to harmonize customs rules, simplify import and export procedures, and improve the transparency of customs policies and the efficiency of customs clearance.

Support the development of cross-border e-commerce and provide cross-border financial services. In the context of the Internet era, it is important to use cross-border e-commerce as a breakthrough in trade development. Countries should promote the development of e-commerce trade rules, as well as the establishment of broader digital connectivity in the region.

Active communication between many parties to reduce trade frictions. Regular exchange and cooperation projects should be carried out with full respect for each other's politics, culture and customs, and the right to speak on an equal footing should be guaranteed for all parties, whether developed or developing. In the development of trade facilitation, it is difficult to reach agreement between different countries and conflicts should be resolved by organizing peaceful negotiations between multiple parties to prevent them from escalating.

RCEP member countries should actively create a favorable business environment and facilitate trade partners in terms of financial services and public services, etc. RCEP member countries should build a platform for cooperation among financial institutions and use the central role of finance as an entry point to provide support for trade credit and realize "financial integration". The RCEP member countries need to build a platform for cooperation among financial institutions, with finance playing a central role as an entry point, to provide support for trade credit and to realize "financial integration". In addition, the public service departments of RCEP member countries should provide efficient and convenient services to foreign businessmen to enhance their satisfaction and promote humanistic exchanges to realize "people-to-people contact".

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