

Research on the Impact of Trade Facilitation on China-ASEAN Bilateral Trade Volume

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Abstract. With the increasingly significant degree of economic globalization, trade liberalization has developed to a certain extent, some insignificant but far-reaching trade barriers have begun to attract the attention of countries and regions: too long transportation time, complicated declaration documents, layers of declaration procedures, the government supervision system is not perfect, etc. Over the past ten years since the establishment of the China-ASEAN Free Trade Area, the two sides have issued many policies to improve the economic and trade environment and enhance the level of facilitation. However, due to the differences in the infrastructure and business environment, the level of trade facilitation between China and ASEAN member states is not high enough. Based on this, the paper takes the China-ASEAN trade volume as the research object, establishes the trade facilitation evaluation index system, measures the level of trade facilitation in the ten ASEAN countries, studies the influence of it and its four primary indicators on the total trade volume based on the gravity model. The results show that the level of trade facilitation has an important impact on the bilateral trade between China and ASEAN. There is a significant positive correlation between the trade facilitation level of partner countries and trade volume. For every 1% increase in the trade facilitation level of ASEAN partners, its trade volume with China will increase by about 1.248%. Countries can improve the customs and institutional environment, improve the construction of high-efficiency ports and high-level e-commerce to improve the level of trade facilitation, and strengthen trade cooperation with China.

Keywords: ASEAN; trade facilitation; gravity model; trade volume.

1. Introduction

In the past 10 years, the bilateral trade volume between China and ASEAN has grown rapidly, the trade volume has increased year by year, and its proportion in China's total foreign trade has continued to increase, which shows that ASEAN is playing an increasingly important role in China's foreign trade. In 2011, China-ASEAN bilateral trade was us \$363.09 billion, accounting for 10 percent of China's foreign trade. In 2021, the bilateral trade volume between China and ASEAN was 878.2 billion US dollars, accounting for 14.5 percent of China's total import and export volume, 2.4 times that of 2011, and the largest growth from 2011 to 2021.

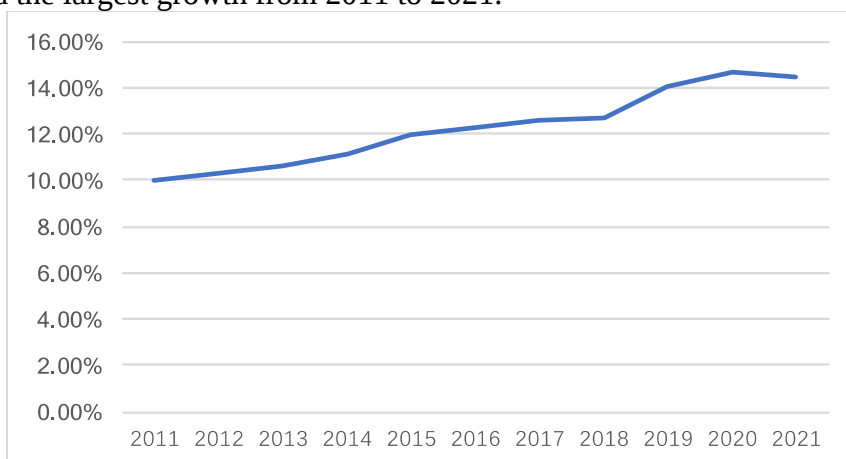


Fig. 1 Proportion of China-Asean Bilateral Trade in China's Total Foreign Trade

In the 21st century, China has been deepening bilateral and multilateral cooperation with other countries, but tariff and non-tariff barriers are becoming less impactful in international trade. However, there are still obstacles to trade due to factors such as legal and regulatory tendencies, logistics and transportation infrastructure, and customs clearance procedures. China and ASEAN have been working to improve their economic and trade environment, but differences in infrastructure and other factors have hindered trade facilitation. High tariffs, cumbersome customs procedures, and long waiting times increase trade costs and decrease efficiency, making it a priority for leaders to reduce trade costs and improve trade facilitation.

Currently, scholars have conducted extensive research on trade facilitation, but most of it focuses on agricultural and mechanical/electrical products, with limited research on China-ASEAN trade facilitation. This paper will examine trade facilitation between China and ASEAN countries, analyze the current level of trade facilitation, identify factors that promote or hinder bilateral trade, and propose targeted measures based on empirical research to improve trade facilitation. The findings of this study may offer insights for related research fields.

2. Literature review

2.1. Current Status of Trade Facilitation Research

Regarding the meaning of trade facilitation, different organizations have different views, but they all agree that trade facilitation can improve trade efficiency, optimize trade conditions, and promote the development of global trade. Dee (1998)^[1] proposed that by taking corresponding trade facilitation measures, APEC revenue can be increased by more than 200 billion US dollars. After investigation and research, Raven (2001)^[2] discussed the impact of customs policy, trade port management and other trade facilitation measures on the country's import and export. Fink (2002)^[3] focused on analyzing the impact of trade facilitation policies on tariffs, and proposed that the daily shortened delivery time (considering the customs' improved customs clearance speed) is equivalent to a 0.5% reduction in price and tax. Kim and Park (2004)^[4] selected three Asian countries, China, Japan, and South Korea for measurement. When a country's trade facilitation level is improved, the country's GDP level will increase. Engman(2005)^[5] analyzed the impact of trade facilitation on a country's economic indicators, focused on the role of trade facilitation in the field of commodity circulation, and proposed that further improvement and optimization of customs procedures on the existing basis can effectively increase trade flow.

Domestic scholars have also conducted extensive research on the impact and benefits of trade facilitation on export trade. Wang Zhongmei (2014)^[6] examined the trade facilitation of some developed countries with the help of data from major economic organizations in the world, and proposed that the scope of trade facilitation coverage tends to expand, the selection of evaluation indicators is becoming more and more refined, and emerging market countries The trade facilitation of China has ushered in an important stage of improvement. Kong Qingfeng and Dong Hongwei (2015)^[7] proposed that compared with tariff policy, improving the trade convenience of countries along the "Belt and Road" can greatly promote the development of trade, and port efficiency is the most critical factor in promoting trade development.

2.2. Measurement Method of Trade Facilitation

The calculation methods used by early scholars mainly include simple arithmetic mean method, statistical survey analysis method and policy simulation method. Among them, Portuguese-Perez and Wilson (2012)^[8] used the simple arithmetic average method to measure the trade facilitation level between European countries and the United States. Mustafa and Amjad (2020)^[9] used the simple arithmetic average method to investigate the trade facilitation between China and Pakistan. Jallab (2020)^[10] calculates the level of trade facilitation among countries in the Free trade area on the African continent through qualitative and quantitative analysis. Sukoco (2020)^[11] also used analytic hierarchy Process to calculate trade facilitation in the agricultural field of Zambia. Safaeimanesh and

Jenkins (2021) ^[12] investigated the correlation between multiple variables and measured the trade facilitation level of trading countries within the ECOWAS region.

In addition to the studies of various international organizations, most scholars follow the research system of Wilson (2003), which contains four categories of indicators: port efficiency, customs environment, institutional environment and e-commerce. Chen Jiyong and Liu Yishuang (2018) ^[13] expand the trade facilitation index from the general secondary system to the tertiary system. The primary index expands the original port efficiency into logistics and infrastructure indicators, and e-commerce into finance and e-commerce. The secondary index innovates the market access module. In addition, information technology is incorporated into logistics and infrastructure links, and there are as many as 40 three-level indicators, which are divided into more systematic levels and reduce the intersections among indicators. Cheng Yunjie and Dong Chenghui (2021) ^[14] constructed a facilitation system in line with the actual situation of international trade development according to the indicator framework published by the World Economic Forum, including 5 first-level indicators and 21 second-level indicators, and processed the data with principal component analysis.

3. The Mechanism of Trade Facilitation Affecting Trade Scale

The core connotation of trade facilitation is to reduce obstacles to cross-border circulation and reduce transactions in the process of trade circulation. Based on this, this paper expounds the impact mechanism of ASEAN countries' trade facilitation index on China-ASEAN trade volume from four aspects: port and logistics efficiency, customs management, regulatory environment and e-commerce environment.

3.1. Affect Trade Scale Through Infrastructure Construction

In international trade, the infrastructure environment can reflect the efficiency of ports and logistics, and is usually the indicator that most directly affects the efficiency of cross-border circulation^[16]. Logistics service, as an expansion service of infrastructure, can also have a direct impact on the time and cost of transportation. When the infrastructure of partner countries is improved and the efficiency of ports and logistics is improved, the trade with China will also be greatly improved.

3.2. Affect Trade Scale through Customs Environment

The customs environment usually involves the prevalence of non-tariff barriers, irregular payment and bribery, tariff level and efficiency of customs clearance, etc. The customs environment is an essential link in the process of international trade circulation, and an open and transparent customs supervision system can promote the circulation of trade to the greatest extent^[17]. Although tariff and non-tariff barriers have an important impact on international trade, there is little room for adjustment in actual trade. Only by seeking dialogue and cooperation mechanism can tariff and non-tariff barriers be reduced to a certain extent. The promotion of free trade agreements has made it possible to realize such cooperation mechanism. To find countries that are willing to help each other to jointly pursue economic development and establish a community of economic cooperation to improve the quality and efficiency of trade.

3.3. Affect Trade Scale Through the Regulatory Environment

The sound development of international trade requires the growth of a stable and dynamic business environment. The institutional environment of a country is the basis for the smooth operation of trade activities. If a country has a good institutional environment, such as perfect laws and regulations, judicial justice and honest government, enterprises will not incur additional costs due to unfair treatment^[18]. For example, the US government suppressed China's electronic information industry in the Sino-US trade friction. Combined with the government intervention theory analyzed above, the

government can guide the sustainable and healthy development of the market by issuing and implementing relevant legal norms and policies.

3.4. Influence Trade Scale Through E-commerce Technology

Influence trade scale through the dimension of e-commerce environment is based on free trade theory and transaction cost theory. With the continuous promotion of modern international information network technology and its global economic development, cross-border e-commerce is developing in full swing in international trade. On the one hand, the Internet shortens the spatial distance between countries. Enterprises can use the Internet to conduct market research and discover product needs, which reduces labor costs and ensures the accuracy of research ^[19]. On the other hand, Internet technology has greatly reduced the labor cost and time cost of communicating with other countries. Enterprises can quickly and effectively communicate with other countries, and use real-time visual communication to conduct trade negotiations with other countries, which shortens the waiting cost of communication and effectively improves the efficiency of communication with other countries ^[20].

4. Construction of trade facilitation evaluation system

This chapter measures the development level of trade facilitation so as to pave the way for the empirical analysis in the next chapter. Firstly, this paper constructs the evaluation system of trade facilitation, calculates the trade facilitation index of ten ASEAN countries from 2014 to 2019 by means of arithmetic average score method, and makes a comparative analysis.

4.1. Construction of Trade Facilitation System

Scholars generally established trade facilitation evaluation system based on Wilson et al. (2003). On this basis, this paper selects four first-level indicators: port efficiency, customs environment, institutional environment and e-commerce, and constructs an evaluation system of trade facilitation between China and 30 trading partners, including four first-level indicators and ten second-level indicators. See Table 4.1 for the specific evaluation system:

Table 1. Trade Facilitation Evaluation System

Primary indicators	Secondary indicators	Score range
Infrastructure	Quality of roads X ₁	1-7
	Quality of railroad infrastructure X ₂	
	Quality of port infrastructure X ₃	
	Quality of air transport infrastructure X ₄	
Customs environment	Burden of customs procedures X ₅	0-100
	Prevalence of non-tariff barriers X ₆	
	Corruption perceptions index X ₇	
Institutional environment	Regulatory quality X ₈	0-100
	Rule of law X ₉	
Electronic commerce	Individuals using Internet X ₁₀	0-100

The secondary indicators of the trade facilitation evaluation system constructed in this paper come from the Global Competitiveness Report (GCR) of the World Economic Forum, the Global Governance Index (WGI) of the World Bank and the International Corruption Perceptions Index (CPI) of Transparency International).

4.2. Calculation of Trade Facilitation Indicators

Due to the difference between the number of people on the Internet (with a score ranging from 0-100) and other evaluations (with a score ranging from 1-7) in the secondary evaluation indicators, the

original data cannot be used. To be relevant and comparable, all indicators must be standardized and processed uniformly. The specific steps are shown in formula (4-1).

$$Y_i = X_i / X_{\max} \quad (4-1)$$

Among them, X_i refers to the original score of the 14 secondary indicators, $X_{\max}$ is the maximum score of the indicator, and Y_i is the standardized data. After normalization, each indicator has a score of 0-1. Regarding how to determine the weights, this paper calculates the weights of each secondary indicator by simple arithmetic average method, and multiplies the scores of each indicator to obtain the values of the four primary indicators, and then uses a similar method to obtain the trade facilitation index.

Table 2. Trade Facilitation Index of ASEAN Countries

	2014	2015	2016	2017	2018	2019
Singapore	0.85	0.87	0.89	0.89	0.90	0.91
Malaysia	0.71	0.71	0.72	0.73	0.72	0.73
Brunei	0.61	0.62	0.63	0.67	0.75	0.77
Thailand	0.49	0.50	0.52	0.55	0.54	0.57
Philippine Islands	0.48	0.46	0.45	0.47	0.56	0.56
Viet Nam	0.46	0.48	0.50	0.54	0.52	0.59
Indonesia	0.43	0.40	0.46	0.48	0.51	0.55
Laos	0.34	0.35	0.35	0.41	0.43	0.35
Cambodia	0.32	0.35	0.35	0.40	0.45	0.32
Myanmar	0.24	0.25	0.28	0.29	0.32	0.34

As shown in Table 2, it can be seen that among these 10 countries, Singapore has the highest trade facilitation index, and its facilitation score in 2019 reached more than 0.9 points; Malaysia has a higher degree of trade facilitation, ranging from 0.7 to 0.8. However, the trade facilitation degree of ASEAN countries such as Laos, Cambodia and Myanmar is relatively low, with an average score of less than 0.4 points.

5. Empirical Results

5.1. Model Construction and Data Source Description

When studying trade flows, Tinbergen (1962) and Poyhonen (1963) were the first to use the gravity model and found that the economic aggregate between two countries can promote trade flows, while the distance between the two countries hinders the increase in trade flows. Based on the experience and research of predecessors, and combined with the economic and trade development of countries along the route and my country, the following variables are added to the traditional gravity model: trade facilitation level (TFI), economic freedom (EF). The extended gravity model of is as follows:

$$\ln EXP_{it} = a_0 + a_1 \ln TFI_{it} + a_2 \ln D_{it} + a_3 \ln EF_{it} + a_4 \ln GDP_{it} + a_5 \ln POP_{it} + U_{it} \quad (1)$$

Where TFI_{it} is the trade facilitation level of country i in period t , POP_{it} is the total population of country i in period t . GDP_{it} represents the gross domestic product of country i in period t ; EF_{it} represents the degree of economic freedom of country i in period t ; D_{it} represents the geographic distance between country i and our country. $\ln$ represents the natural logarithm of the variable, a_0 is a constant, a_1 , a_2 , a_3 , a_4 , a_5 are the substitute estimation parameters, and U_{it} is the random error term. The specific variable descriptions and data sources are all from the World Bank, UN Comtrade, CEPII and the Heritage Foundation.

5.2. Analysis of Empirical Results

5.2.1 LM test

Before performing regression analysis, it is necessary to judge which model to choose. The results obtained by different measurement models are quite different, which will affect the accuracy of empirical research. The results of the F test and LM test in this paper are shown below. The P value is 0.000, indicating that the original model should contain random disturbance items that can directly reflect individual characteristics, so we chose the random effect model.

Table 3. F Test and LM Test Results

	F-test	LM-test
Statistics	163.47	282.22
P	0.0000	0.0000

5.2.2 Overall empirical results and analysis

In this paper, Stata16.0 software is used to conduct regression analysis on the panel data of ten ASEAN countries from 2014 to 2019 using a random effect model. The result is as follows:

Table 4. Overall Regression Results

$\ln EXP_{it}$	Coef.	St.Err	t-value	p-value
$\ln TFI_{it}$	1.248***	0.308	4.05	0.000
$\ln GDP_{it}$	0.240**	0.120	2.00	0.045
$\ln EF_{it}$	0.748**	0.358	2.09	0.037
$\ln D_{it}$	-0.088	0.263	-0.34	0.737
$\ln POP_{it}$	0.091*	0.049	1.86	0.063
cons	-1.360	3.363	-0.40	0.686
Mean dependent var	7.253	SD dependent var	0.730	
Overall r-squared	0.067	Number of obs	126.000	
Chi-square	89.419	Prob > chi2	0.000	
R-squared within	0.496	R-squared between	0.059	

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

From the regression results in Table 5.5, the following equation is obtained:

$$\ln EXP_{it} = -1.360 + 1.248 \ln TFI_{it} - 0.088 \ln D_{it} + 0.748 \ln EF_{it} + 0.24 \ln GDP_{it} + 0.09 \ln POP_{it} + U_{it}$$

5.2.3 Empirical results and analysis of sub-indicators

In order to ensure the robustness of the model and avoid the bias of the comprehensive indicators of trade facilitation environment to the empirical results, this section replaces the trade with infrastructure (IE), institutional environment (RE), customs environment (CE), and electronic commerce (EB) respectively. The facilitation comprehensive index (TFI) was added to the regression equation to obtain the following four sets of models.

$$\ln EXP_{it} = a_0 + a_1 \ln RE_{it} + a_2 \ln D_{it} + a_3 \ln EF_{it} + a_4 \ln GDP_{it} + a_5 \ln POP_{it} + U_{it} \quad (2)$$

$$\ln EXP_{it} = a_0 + a_1 \ln CE_{it} + a_2 \ln D_{it} + a_3 \ln EF_{it} + a_4 \ln GDP_{it} + a_5 \ln POP_{it} + U_{it} \quad (3)$$

$$\ln EXP_{it} = a_0 + a_1 \ln IE_{it} + a_2 \ln D_{it} + a_3 \ln EF_{it} + a_4 \ln GDP_{it} + a_5 \ln POP_{it} + U_{it} \quad (4)$$

$$\ln EXP_{it} = a_0 + a_1 \ln EB_{it} + a_2 \ln D_{it} + a_3 \ln EF_{it} + a_4 \ln GDP_{it} + a_5 \ln POP_{it} + U_{it} \quad (5)$$

Through the empirical test and analysis of the role of China-ASEAN import and export volume through these four replaced explanatory variables, it can not only test the robustness of the model, but also further determine which factor has a more significant impact on foreign trade in trade facilitation. The results are as follows:

Table 5. Regression results of models (1) - (5)

VARIABLES	(1) $\ln EXP_{it}$	(2) $\ln EXP_{it}$	(3) $\ln EXP_{it}$	(4) $\ln EXP_{it}$	(5) $\ln EXP_{it}$
$\ln TFI_{it}$	1.248*** (0.308)				
$\ln EF_{it}$	0.748** (0.358)	1.177* (0.625)	1.516*** (0.586)	1.482*** (0.566)	1.423** (0.569)
$\ln GDP_{it}$	0.240** (0.120)	0.149 (0.116)	0.202* (0.116)	0.188 (0.116)	0.243** (0.109)
$\ln D_{it}$	-0.0881 (0.263)	-0.0962 (0.234)	-0.0564 (0.236)	-0.0636 (0.238)	-0.0864 (0.255)
$\ln POP_{it}$	0.0909* (0.0490)	0.160*** (0.0528)	0.205*** (0.0362)	0.199*** (0.0390)	0.232*** (0.0591)
$\ln EB$		0.183** (0.0790)			
$\ln CE$			0.0956 (0.181)		
$\ln IE$				0.211 (0.199)	
$\ln RE$					0.569** (0.290)
Constant	-1.360 (3.363)	-1.877 (3.303)	-4.536 (2.983)	-4.094 (3.079)	-7.244** (3.125)
Observations	126	126	126	126	126
Number of country	21	21	21	21	21

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

This chapter carried out multicollinearity test and unit root test on the data measured in the previous chapter, and used LM test and F test and found that the expanded model is suitable for random effects model. Next, the trade facilitation indicators measured in the previous chapter were put into the expanded gravity model for regression and the results showed that for every 1% increase in the trade facilitation level of ASEAN countries, the trade scale between China and ASEAN will increase by about 1.248%. Next, in order to verify the stability of the model and the respective utility of the four first-level indicators in trade facilitation, the original trade facilitation was replaced with four first-level variables and their respective regressions were performed. Finally, the regression results show that: In the import and export trade between China and the ten ASEAN countries, the trade volume has a significant positive correlation with the GDP, trade facilitation, population, and economic freedom of each country and region, and a negative correlation with the distance between the two places, but not significantly. The volume of import and export trade has a positive correlation with the overall level of facilitation of each country and the four first-level indicators of trade facilitation. Among them, the regulatory environment and e-commerce have the greatest role in promoting trade scale.

6. Conclusions and Recommendations

6.1. Conclusion

In order to explore the impact of trade facilitation on the trade scale between China and ASEAN countries, this paper selects panel data of ASEAN countries from 2014 to 2019 for research. First, according to the data collected by Global Competitiveness Report (GCR) of the World Economic Forum, Global Governance Index (WGI) of the World Bank and International Corruption Perception

Index (CPI) of Transparency International, the trade facilitation index of these 10 countries is calculated using arithmetic average method, and it is found that Singapore has the highest trade facilitation index. Its trade facilitation score for 2019 was 0.91. Malaysia scored high on trade facilitation, with a score between 0.7 and 0.8. However, Laos, Cambodia, Myanmar and other ASEAN countries have a low level of trade facilitation, with an average score below 0.4.

Then, this paper selected a random effect model to regress a total of 60 groups of panel data from these 10 countries and draws a conclusion according to the regression results: trade facilitation has the most significant impact on the trade scale between China and ASEAN, and for every 1% increase in the trade facilitation index of ASEAN countries, its trade volume with China will increase by about 1.248%. At the same time, the study found that the GDP, economic freedom, and population of the ten ASEAN countries are proportional to the trade scale between China and ASEAN. The geographical distance has an inhibitory effect on the trade scale, but the effect is not obvious. In addition, from the regression of sub-indicators, different aspects of trade facilitation have different influences on the scale of trade. The e-commerce environment and regulatory environment indicators have a significant positive impact on the trade scale, while the partner country's customs environment and infrastructure indicators have no significant impact on the China-ASEAN trade volume. The possible reasons include improper selection of secondary indicators and defects in the arithmetic mean method.

6.2. Policy Suggestions

6.2.1 Strengthen institutional environment construction

To increase a country's import and export volume, it's important to improve its institutional environment. This can be done by creating a more transparent policy environment and better customs clearance facilities, which can improve the export efficiency of high-tech products and reduce logistics costs. Governments can also work with businesses to establish a sound trade and legal environment to protect high-tech exports. It's also important to combat corruption and promote integrity, as well as streamline administration, delegate power, and simplify procedures to avoid excessive time costs and increase competitiveness in overseas markets.

6.2.2 Optimize customs environment and improve customs clearance efficiency

China has issued policies to reduce customs clearance documents and shorten the customs clearance process, such as the use of checklist verification and summary declaration for cross-border e-commerce exports. China can also cooperate with ASEAN countries by building a credit management system and information platform sharing mechanism, mutual recognition of qualifications, and implementing differentiated supervision modes for enterprises with different qualifications.

6.2.3 Improve infrastructure construction and enhance port efficiency

Investing in infrastructure construction and modernizing the management of ports can positively impact the scale of import and export trade. The government can make comprehensive plans based on the actual development status of the port, optimize resource allocation according to ports with different flows and sizes, and strengthen infrastructure construction for areas with backward transportation facilities. Additionally, opening up and building small and medium-sized ports can create a good port environment and reduce the software quality gap between them.

6.2.4 Focus on promoting cross-border e-commerce

Cross-border e-commerce can greatly benefit from a safe, efficient, and standardized e-commerce business environment. China and ASEAN can strengthen infrastructure construction and promote the application of e-commerce by cooperating in big data, cloud computing, and artificial intelligence. Developing systems and conducting research can reduce operating costs and cultivate new growth points for business development. For example, customs can facilitate trade by enabling electronic payment of import and export taxes and fees through EDI.

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