Measurement Analysis of Trade Facilitation in China-asean Free Trade Area

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ABSTRACT: Economic and trade cooperation between China and ASEAN countries has made new progress with the introduction of the concept of Belt and Road. In 2015, China and ASEAN formally signed the outcome document of negotiations on an upgraded free trade area, which shows that China-asean relations have became better. Enhancing the trade facilitation level of the Free Trade Area can improve the economic and trade exchanges between China and ASEAN. The premise of studying how to improve the trade facilitation level of Free Trade Area is to measure the trade facilitation level of free trade area. In this paper, trade facilitation is divided into four categories and 19 sub-indexes, and the measurement model of trade facilitation in free trade area is established to measure the trade facilitation level between China and ASEAN countries.

1 The construction of model and index system

Wilson, the first foreign scholar to study trade facilitation, divided the indicators into four categories, namely, port efficiency, customs environment, institutional environment and e-commerce, and then refined them into small indicators, the value of each indicator is derived from the global competitiveness report and hence the Trade Facilitation Score. However, the rapid economic development in recent years, the impact of trade facilitation specific indicators have also changed. According to the characteristics of the economic development of China and ASEAN countries, the first-level indicators are divided into transport infrastructure (A) , customs environment (B) , regulatory environment (C) and finance and E-commerce (D) , and specifically divided into 19 secondary indicators, so that the measurement of trade facilitation more accurate.

Table 1 indicator composition of trade facilitation measurement system

Primary Index	Secondary Index	Source of indicators
Transport Infrastructure (A)	Quality of port infrastructure(X_{11})	GCR
	Quality of air transport infrastructure(X_{12})	GCR
	Quality of road infrastructure(X_{13})	GCR
	Train service efficiency(X_{14})	GCR
Customs Environment (B)	The prevalence of Non-tariff barriers to trade(X_{21})	GCR
	The complexity of tariffs(X_{22})	GCR
	Clearance efficiency(X_{23})	GCR
	Incidence of corruption(X_{24})	GCR
	Unfair competition(X_{25})	GCR
Rules and regulations (C)	Applicability of law(X_{31})	GCR
	Efficiency of legal settlement of disputes(X_{32})	GCR
	Regulatory Burden on the government(X_{33})	GCR
	Judicial independence(X_{34})	GCR
	Transparency in government policy-making(X_{35})	GCR
Finance and	Availability of finance(X_{41})	GCR

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Electronic Commerce (D)	Availability of venture capital(X_{42})	GCR
	The soundness of banks(X_{43})	GCR
	The absorption of new technology by enterprises(X_{44})	GCR
	Availability of new technologies(X_{45})	GCR

2 Methods of data processing and measurement

The subjects are China, Malaysia, Singapore, Indonesia, Philippines, Cambodia, Vietnam, Thailand, Brunei and Laos. According to the Global Competitiveness Report (GCR) , the data of each indicator can be obtained. The range of the indicators is divided into 1-7. The higher the score, the better the performance of a country on this indicator under the uniform evaluation criteria of the international economic organization. First, the index is standardized, so that the value range of the secondary index is between 0-1(including 1) . Using the raw data of the second-level indicators divided by the maximum that can be obtained from the second-level indicators, that is, $X_{ij} = y_{ij}/y_{max}$, Xij represents the standardized values of the second-level indicators of the first-level indicators of the first-level indicators of the second-level indicators of the j, y_{max} represents the maximum of all secondary metrics.

To calculate the value of trade facilitation, principal component analysis is used in this paper. Firstly, using SPSS25.0 software to do principal component analysis, make variance maximum rotation, get KMO test statistic result is 0.726, more than 0.6 explain the correlation between variables, can get four principal components: COMP1, Comp2, Comp3, see table 2.

Table 2 Composition Matrix A

	Composition		
	1	2	3
VAR00001	.745	.595	-.040
VAR00002	.910	.153	-.280
VAR00003	.823	-.353	-.415
VAR00004	.917	.023	-.291
VAR00005	.927	.213	-.141
VAR00006	.911	.331	.129
VAR00007	.798	-.397	-.231
VAR00008	.958	.139	.125
VAR00009	.958	.095	.046
VAR00010	.945	.182	.192
VAR00011	.776	-.084	-.589
VAR00012	.825	-.358	.293
VAR00013	.883	.065	.188
VAR00014	.090	.782	-.097
VAR00015	.816	.084	.345
VAR00016	.954	-.122	.031
VAR00017	.864	-.154	-.102
VAR00018	.684	-.075	.691
VAR00019	.669	-.638	.162
Extraction method: Principal Component Analysis.			
a. I extracted three ingredients.			

The principal component expression for this article is:

Y_1=0.0562X_{11}+0.0686X_{12}+0.062X_{13}+0.0691X_{14}+0.0699X_{21}+0.0687X_{22}+0.0602X_{23}+0.0722X_{24}+0.0722X_{25}+0.0712X_{31}+0.0585X_{32}+0.0622X_{33}+0.0666X_{34}+0.0068X_{35}+0.0615X_{41}+0.0719X_{42}+0.0651X_{43}+0.0516X_{44}+0.0504X_{45}

Y_2=0.0449X_{11}+0.0115X_{12}-0.0266X_{13}+0.0017X_{14}+0.0161X_{21}+0.0257X_{22}-0.0299X_{23}+0.0105X_{24}+0.0072X_{25}+0.0137X_{31}-0.0063X_{32}-

$0.027X_{33}+0.0049X_{34}+0.0589X_{35}+0.0063X_{41}-0.0092X_{42}-0.0116X_{43}-0.0057X_{44}-0.0481X_{45}$

$Y_3=-0.003X_{11}-0.0211X_{12}-0.0313X_{13}-0.0219X_{14}-0.0106X_{21}+0.0097X_{22}-0.0174X_{23}+0.0094X_{24}+0.0035X_{25}+0.0145X_{31}-0.0444X_{32}+0.0221X_{33}+0.0142X_{34}-0.0073X_{35}+0.026X_{41}+0.0023X_{42}-0.0077X_{43}+0.0521X_{44}+0.0122X_{45}$

According to the above-mentioned principal component expression, each principal component is multiplied by the percentage of variance of the square sum of the extracted loads, and then the sum is calculated:

$Y=0.0439X_{11}+0.0474X_{12}+0.0377X_{13}+0.0466X_{14}+0.0497X_{21}+0.0515X_{22}+0.0373X_{23}+0.0523X_{24}+0.0515X_{25}+0.0524X_{31}+0.0364X_{32}+0.0423X_{33}+0.0482X_{34}+0.0106X_{35}+0.0458X_{41}+0.0494X_{42}+0.0435X_{43}+0.0398X_{44}+0.0309X_{45}$

Y_1, Y_2, Y_3 are three principal components, X_{11}, X_{12}, $X_{13...}X_{45}$. To select a second grade index, the sum of the coefficients of each second grade index represents the weight of each index in the principal component, the weight of the first index is obtained by comparing the sum of the second index coefficients under each first index with the sum of all the second index coefficients. Finally, the weight of each index is obtained.

Table 3 Weight of trade facilitation indicators

Secondary Index(X_{ij})	**Weight**
Quality of port infrastructure	0.0537
Quality of air transport infrastructure	0.058
Quality of road infrastructure	0.0461
Train service efficiency	0.057
The prevalence of Non-tariff barriers to trade	0.0608
The complexity of tariffs	0.063
Clearance efficiency	0.0456
Incidence of corruption	0.064
Unfair competition	0.063
Applicability of law	0.0641
Efficiency of legal settlement of disputes	0.0445
Regulatory Burden on the government	0.0517
Judicial independence	0.059
Transparency in government policy-making	0.013
Availability of finance	0.056
Availability of venture capital	0.0604
The soundness of banks	0.0532
The absorption of new technology by enterprises	0.0487
Availability of new technologies	0.0378

3 Comprehensive Evaluation Model of trade facilitation

The measurement of trade facilitation in china-asean Free Trade Area is obtained through the comprehensive evaluation model, that is, the standardized value of the secondary indicators is multiplied by the coefficient of the comprehensive evaluation model, the Coefficient is expressed by Z, and the final sum is obtained. Therefore, this paper's trade facilitation comprehensive model

$$Y= \sum_{k=1}^{n} ZXij \qquad (1)$$

4 Measurement and analysis of trade facilitation level

In this paper, we put the standardized data into the above integrated model to get the trade facilitation values of ASEAN countries and China, and then rank them.Singapore>Malaysia>China>Indonesia>Thailand> Brunei>Philippines>Vietnam>Laos>Cambodia.From this we can see that there is a wide gap in the level of trade facilitation among countries. Singapore, which ranks first, has a high level of infrastructure development and the institutional policy and customs environment also contribute to the development of trade facilitation, its trade facilitation level has been ranked first among ASEAN countries. China is in third place and Malaysia is in second

place, but with the continuous development of China's economy, the level of trade facilitation still has room for development. Cambodia, Laos, the Philippines and other countries are limited by the level of development, hardware facilities, government efficiency and other comprehensive indicators, the level of trade facilitation constraints in their economic cooperation in the FTZ.

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