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Comparison of Logistics Level Between China and ASEAN

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Abstract

As a dialogue partner of the Association of Southeast Asian Nations (ASEAN), China has engaged in economic and trade cooperation with ASEAN for over a decade. The process of trade liberalization and facilitation between China and ASEAN has significantly influenced logistics operations while also posing new demands. To meet the requirements of expanding trade, it is imperative to comprehensively elevate logistics capabilities. This paper undertakes a longitudinal and cross-sectional comparison of China's and ASEAN's logistics capabilities, focusing on three primary dimensions: logistics performance index, logistics infrastructure, and logistics service quality. It analyzes six specific indicators, including the quality of trade and transport-related infrastructure, transport frequency, customs efficiency and border management clearance, tracking and positioning capabilities, logistics service quality, and timeliness. The findings indicate that, in longitudinal terms, Singapore has emerged as a leading logistics power, China's logistics performance surpasses the average of the ten ASEAN member states, while the other nine ASEAN countries still have substantial room for improvement in their logistics capabilities. In cross-sectional terms, from 2016 to 2023, China's various logistics performance indicators have remained stable or seen only limited enhancements. To further elevate its logistics capabilities, China should adopt measures such as enhancing customs efficiency, promoting widespread adoption of logistics internet technologies to strengthen logistics intelligence, reducing logistics costs, expanding logistics infrastructure investments, and broadening avenues for cultivating specialized logistics talent.

Keywords: logistics performance index (LPI), logistics capabilities, infrastructure, service level

1. Introduction

Since 2004, the China-ASEAN Exposition has been held 20 times in Nanning, China. With the mission of promoting the construction of the China-ASEAN Free Trade Area (CAFTA) and sharing opportunities for cooperation and development, the exposition focuses on economic and trade cooperation within the free trade area, opening up to the world to create new opportunities for businesses from all countries and unlocking the door to economic cooperation between China and ASEAN. In 2023, the bilateral trade volume between China and ASEAN countries reached RMB 6.41 trillion. ASEAN has maintained its position as China's largest trade partner for four consecutive years, and China has also been ASEAN's largest trade partner for several years. The frequent economic exchanges between China and ASEAN have accelerated the development of the logistics industry and brought more opportunities and room for improvement. At the same time, the rapid development of bilateral trade has also put forward newer and higher requirements for the trade logistics of China and ASEAN countries. Therefore, through a comparative analysis of relevant indicators related to the development of logistics levels between China and ASEAN countries, identifying the advantages and disadvantages in the development of China's logistics industry, and finding targeted solutions, will not only benefit the development and improvement of China's logistics industry but also enhance its international competitiveness.

In previous studies on logistics levels, Su *et al.* (2012) used principal component analysis to measure the logistics level of the Shandong Peninsula Blue Economic Zone.Li and Zhu (2020) employed factor analysis to evaluate the logistics development level of various provinces, autonomous regions, and municipalities in China.Wang and Huang (2020) used entropy weight method and grey relational analysis to evaluate the logistics development level of Anhui Province. Sun *et al.* (2022)applied fuzzy matter-element analysis to conduct horizontal and vertical evaluations of the regional logistics development status of various cities in Guangxi over the past 15 years. Hu and Huang (2022) utilized the logistics performance indicators issued by the World Bank to analyze and compare the logistics development of the ten ASEAN countries.

This paper conducts a comprehensive analysis of the logistics capabilities between China and ASEAN through both longitudinal and cross-sectional comparisons across three primary dimensions: Logistics Performance Index (LPI), logistics infrastructure, and logistics service quality. Six specific indicators are utilized for this comparison: the quality of trade and transport-related infrastructure, transportation frequency, customs efficiency and border clearance management, tracking and tracing capabilities, logistics service quality, and timeliness. Based on the research findings, pertinent policy recommendations are formulated.

2. The Comprehensive Comparison of Logistics Performance Levels between China and ASEAN

Since 2007, the World Bank has been compiling a biennial report on the Global Logistics Performance Index (LPI), which analyzes the logistics performance levels of countries based on six indicators: the quality of trade and transport-related infrastructure, transportation frequency, customs efficiency and border management clearance, tracking and positioning capabilities, logistics service quality, and timeliness. These indicators also reflect the international logistics capabilities and trade facilitation levels of countries around the world. Both domestic and international scholars widely acknowledge that the Logistics Performance Index can facilitate regional trade growth.

2.1 China's Logistics Performance Index

Table 1. China's Logistics Performance Index Scores and World Rankings from 2010 to 2023

year	2010	2012	2014	2016	2018	2023
score	3.49	3.52	3.53	3.56	3.61	3.7
ranking	2 7	26	28	27	26	19

Note. Data is from LPI Report, World Bank database.The index is updated every two years, with a hiatus after 2018 and resumed updating in 2023, with scores ranging from 1 (worst) to 5 (best).

From 2010 to 2018, through a horizontal comparison of five sets of data, we can see that China's Logistics Performance Index score and ranking have shown a positive trend. In terms of ranking, China has generally been around 26th or 27th in the world. In terms of score, the Logistics Performance Index has been consistently increasing. Overall, China's Logistics Performance Index score has been on the rise, but there has been no significant improvement in its world ranking. This indicates that while China's logistics industry has made progress, the speed of its progress has not outpaced the overall global logistics level, especially as the logistics level in developed countries has improved even faster. Data from 2023 shows that despite a modest increase in China's Logistics Performance Index over the past five years, its world ranking has improved significantly.

2.2 The Logistics Performance Index Scores of the Ten ASEAN Countries.

Table 2. Logistics Performance Index Scores and World Rankings of the Ten ASEAN Countries from 2010 to 2023

country	2010	2012	2014	2016	2018	2023
Singapore	4.09/2	4.13/1	4.00/5	4.14/5	4.00/7	4.3/1
Thailand	3.29/35	3.18/38	3.43/35	3.26/45	3.41/32	3.5/34
Vietnam	2.96/53	3.00/53	3.15/48	2.98/64	3.27/39	3.3/43
Malaysia	3.44/29	3.49/29	3.59/25	3.43/32	3.22/41	3.6/26
Indonesia	2.76/75	2.94/59	3.08/53	2.98/63	3.15/46	3.0/61
Philippines	3.14/44	3.02/52	3.00/57	2.86/71	2.90/60	3.3/43
Cambodia	2.37/129	2.56/101	2.74/83	2.80/73	2.58/98	2.4/115
Burma	2.33/133	2.37/129	2.25/145	2.46/113	2.30/137	--/--
Brunei	--/--	--/--	--/--	2.87/--	2.71/--	--/--
Laos	2.46/ 118	2.50/ 109	2.39/ 131	2.07/ 152	2.70/ 82	2.4/115

Note. Data is from LPI Report, World Bank database."--" indicates that the relevant data cannot be found.

Overall, the logistics performance index scores and rankings of ASEAN countries show a polarized distribution. Singapore stands out, ranking among the top in the world in 2010 and 2012, maintaining the fifth position in 2014 and 2016, and slipping to seventh place globally in 2018. Despite a decline in its world ranking, it still maintains

a significant lead over other ASEAN countries and regained the top spot in 2023. By 2023, Thailand, Vietnam, Malaysia, and the Philippines maintained their logistics performance rankings in the top 50 globally. Indonesia, Cambodia, Myanmar, Brunei, and Laos lag behind in global logistics performance.

From this, it can be seen that China's overall logistics performance level is relatively high in the world, with strong comprehensive logistics capabilities. In horizontal comparisons with ASEAN countries over the years, China has only lagged behind Singapore (with Malaysia ranking higher than China in 2014). However, compared to developed countries, there is still much room for improvement in China. Among the ten ASEAN countries, logistics performance is distributed in three tiers. Singapore's logistics performance is in the first tier, with a significant gap from other countries. This is mainly due to Singapore's advantageous geographical location, which provides a natural advantage for the development of the logistics industry. Coupled with strong government support and guidance, Singapore's logistics industry has developed rapidly and become a pillar industry, with both hardware and software strengths leading the world. Thailand, Vietnam, Malaysia, and the Philippines belong to the second tier. Indonesia, Cambodia, Myanmar, Brunei, and Laos fall into the third tier in terms of logistics performance rankings, and their logistics capabilities need to be strengthened.

3. Comparison of Logistics Infrastructure Levels between China and ASEAN

3.1 Comparison of Logistics Infrastructure

Logistics infrastructure is a hard requirement for the development of the logistics industry and serves as the fundamental guarantee for its progress. Within the category of logistics infrastructure, the quality of trade and transport infrastructure and the transport frequency are included. By combining these two indicators, one can reflect the overall situation of a country's logistics infrastructure construction. Differences in economic development levels have led to significant disparities in logistics infrastructure among ASEAN countries.

3.1.1 The Trade and Transport Infrastructure.

The quality of trade and transport infrastructure refers to the availability of transport infrastructure.

Table 3. The quality scores of trade and transport infrastructure between China and the ten ASEAN countries from 2010 to 2023.

country	2010	2012	2014	2016	2018	2023
China	3.54	3.6	3.67	3.75	3.75	4.0
Singapore	4.22	4.15	4.28	4.20	4.06	4.6
Thailand	3.16	3.08	3.41	3.12	3.14	3.7
Vietnam	2.56	2.68	3.11	2.70	3.01	3.2
Malaysia	3.50	3.43	3.56	3.45	2.90	3.6
Indonesia	2.54	2.54	2.92	2.65	2.90	2.9
Philippines	2.57	2.80	2.60	2.55	2.73	3.2
Cambodia	2.12	2.36	2.58	2.20	2.12	2.1
Burma	1.92	2.10	2.14	2.33	2.00	--
Brunei	--	--	--	--	2.46	--
Laos	1.95	2.40	2.21	1.76	2.44	2.3

Note. Data is from LPI Report, World Bank database."--" indicates that the relevant data cannot be found.

In the period spanning from 2010 to 2023, China's performance in terms of the quality of trade and transport infrastructure exhibited a generally upward trajectory. The score in 2018 remained consistent with that of 2016, yet it witnessed a notable enhancement in 2023. Beyond the construction of traditional trade and transport infrastructure, the ongoing government initiatives to foster the development of smart ports, green ports, and intelligent shipping have significantly contributed to the elevation of China's score in this regard. Among the ten ASEAN member countries, Singapore, characterized by its robust logistics capabilities, consistently maintained a score exceeding 4.00 for this particular indicator. Malaysia, positioned subsequently, observed a decrement in its score, reaching a low of 2.90 in 2018, albeit experiencing a rebound in 2023. Thailand, Vietnam, and the Philippines collectively demonstrated an upward tendency in their overall scores. Conversely, the scores of the remaining ASEAN countries did not surpass the threshold of 3.00 points.

3.1.2 Transport frequency

Transport frequency, also known as international transport capacity, refers to a country's international transport capability reflected through data such as the number of equipment, route arrangements, and cargo volume in modes of transportation including water, air, land, and pipeline transport.

Table 4. Scores of transport frequency between China and the ten ASEAN countries from 2010 to 2023

country	2010	2012	2014	2016	2018	2023
China	3.31	3.46	3.50	3.71	3.54	3.6
Singapore	3.86	3.99	3.70	3.96	3.58	4.0
Thailand	3.27	3.21	3.30	3.37	3.46	3.5
Vietnam	3.04	3.14	3.21	3.12	3.16	3.3
Malaysia	3.50	3.40	3.64	3.48	3.35	3.7
Indonesia	2.82	2.97	2.87	2.90	3.23	3.0
Philippines	3.41	2.97	3.33	3.01	3.29	3.1
Cambodia	2.19	2.61	2.83	3.11	2.79	2.3
Burma	2.37	2.47	2.14	2.23	2.20	--
Brunei	--	--	--	3.00	2.51	--
Laos	2.70	2.40	2.50	2.18	2.72	2.3

Note. Data is from LPI Report, World Bank database."--" indicates that the relevant data cannot be found.

From 2010 to 2023, in terms of transport frequency, China scored the highest among the six sets of data in 2016. Compared to 2016, China's score in 2018 decreased by 0.17 points, but the overall score showed an upward trend. Among the ten ASEAN countries, Singapore's scores for the first five sets of data did not exceed 4.00 points, and the overall score was on a downward trend, finally rebounding to 4.0 points in 2023. Malaysia's scores over the years fluctuated within the range from 3.50 points in 2010 to 3.70 points in 2023. Myanmar's scores for the five sets of data did not exceed 3.00 points, with some fluctuations. Compared to 2010, the score in 2018 decreased by 0.17 points, indicating an overall downward trend. The Philippines' scores also fluctuated up and down, but were concentrated around 3 points, showing an overall downward trend as well. Brunei exhibited a downward trend from 2016 to 2018. The remaining ASEAN countries' scores for transport frequency were generally in a state of fluctuation. A longitudinal comparison reveals that in 2018, China's and Singapore's scores for transport frequency were relatively close, but the gap widened again in 2023. China's scores for transport frequency with most ASEAN countries exceeded 3 points, except for Cambodia, Myanmar, Brunei, and Laos. Overall, China's international transport capacity is slightly higher than the average level of ASEAN countries.

3.2 Transportation Infrastructure

Regarding the infrastructure construction for logistics, in addition to having large warehouses as storage space and a sound logistics internet system as key components, the most fundamental infrastructure is actually transportation. Only with well-developed transportation infrastructure can the entire logistics chain operate smoothly.

3.2.1 Maritime Transport

Maritime transport is a method of transporting goods between ports in different countries and regions using ships through sea routes, and it is the primary mode of transportation in international trade.

Table 5. Top 20 global port container throughput in 2022

ranking	port	country	2022 (TEU)	2021 (TEU)	speed increase
1	Shanghai	CHN	47303000	47030300	0.6%
2	Singapore	SGP	37289600	37470000	-0.5%
3	Ningbo Zhoushan	CHN	33351000	31070000	7.3%
4	Shenzhen	CHN	30036200	28767600	4.4%
5	Qingdao	CHN	25670000	23710000	8.3%
6	Guangzhou	CHN	24857600	24466500	1.6%
7	Busan	KOR	22078195	22706130	-2.8%
8	Tianjin	CHN	21021300	20269400	3.7%
9	Hong Kong	CHN	16685000	17798000	-6.3%

10	Rotterdam	NLD	14455000	15300000	-5.5%
11	Dubai	UAE	13970000	13742000	1.7%
12	Antwerp	BEL	13500000	12020000	12.3%
13	Kelang	MAS	13220000	13724460	-3.7%
14	Xiamen	CHN	12434700	12045700	3.2%
15	Tanjung Puraipas	MAS	10512800	11200000	-6.1%
16	Los Angeles	USA	9911155	10677610	-7.2%

Note. Data is from Guangzhou Port Shipping Association.

In the 2022 global port rankings, nine Chinese ports made it into the top 20, reflecting China's strong overall maritime transport capabilities and the efficient operational performance of its various ports. Among them, the Port of Shanghai has securely held the top spot globally for thirteen consecutive years.

Among the ten ASEAN countries, ports from Singapore, Malaysia, and Thailand made it into the top 20 globally. The most notable performance was from Singapore, with the Port of Singapore ranking second in the world, just after the Port of Shanghai.

3.2.2 Air Transportation

Air transportation is characterized by speed and safety, and is widely used in international cargo transportation, especially for the transportation of valuable items, perishable products, precision instruments, and the like.

Table 6. Statistics on Air Cargo Volume between China and ASEAN in 2021

	2020 (unit: million tons-kilometers)	2021 (unit: million tons-kilometers)
China	19264.24	20961.21
Singapore	3019.93	3666.85
Malaysia	816.75	1119.41
Thailand	684.21	604.02
Indonesia	674.80	772.9 0
Vietnam	572.08	676.5 1
Philippines	360.70	530.28
Brunei	40.23	23.0 8
Burma	1.24	18.3 6
Cambodia	0.00	0.00

Note. Data is from World Bank database.

In 2020, most countries experienced negative growth, but China's air cargo volume still far exceeded that of all ASEAN countries. Compared to China, most Southeast Asian countries did not perform well in epidemic prevention and control, with many imposing certain levels of lockdown. Cambodia, Laos, and other countries implemented comprehensive lockdowns and embargoes, significantly impacting the development of shipping. In 2021, air cargo volumes in various countries began to recover, showing significant growth compared to 2020.

3.2.3 Railway Transportation

The characteristics of railway transportation are large carrying capacity, high speed, relatively low cost, and generally not being restricted by climatic conditions, making it suitable for long-distance transportation of bulk and heavy goods.

Table 7. Statistics on Railway Freight Volume between China and the Ten ASEAN Countries

country	year	Railway freight volume (unit: million tons-kilometers)
China	2019	3 018 200
Malaysia	2020	818
Thailand	2011	2 562
Vietnam	2020	3 759
Indonesia	2019	15 573

Philippines	2004	0.764
Cambodia	2005	92
Burma	2006	885
Singapore	--	--
Brunei	--	--
Laos	--	--

Note. Data is from World Bank database."--" indicates that the relevant data cannot be found.

Due to the relatively small population and land area of most ASEAN countries, some countries only have subways, while others do not even have the conditions to lay railways, resulting in underdeveloped railway transportation. Additionally, railways are not the preferred mode of transportation for ASEAN countries, which leads to significant differences in railway freight volumes among countries. In China, however, people choose trains, bullet trains, or high-speed trains for intercity travel, and during peak delivery periods, the railway department also operates dedicated express trains. Compared to ASEAN countries, China's railway transportation is more developed.

4. Comparison of Logistics Service Levels between China and ASEAN

Logistics services are the soft conditions for the development of the logistics industry. The evaluation of logistics service levels takes into account factors such as customs efficiency and border management clearance, tracking and positioning capabilities, as well as the quality and timeliness of logistics services. Logistics services can organically integrate circulation, packaging, and information processing. Comparing the gap between China and ASEAN countries is beneficial for China to clarify the direction and strategies for improving the quality of logistics services.

4.1 Customs Efficiency and Border Management Clearance

Customs efficiency and border management clearance, in simple terms, involves a comprehensive assessment of a country's customs efficiency based on factors such as the processing speed of customs procedures, clearance efficiency, complexity of procedures, and the quality of customs services.

Table 8. Scores for Customs Efficiency and Border Management Clearance between China and the Ten ASEAN Countries from 2010 to 2023

country	2010	2012	2014	2016	2018	2023
China	3.16	3.26	3.21	3.32	3.29	3.3
Singapore	4.02	4.10	4.01	4.18	3.89	4.2
Thailand	3.02	2.95	3.21	3.11	3.14	3.3
Vietnam	2.68	2.65	2.81	2.75	2.95	3.1
Malaysia	3.11	3.28	3.37	3.17	2.90	3.3
Indonesia	2.43	2.53	2.87	2.69	2.67	2.8
Philippines	2.68	2.63	3.00	2.61	2.53	2.8
Cambodia	2.28	2.30	2.67	2.62	2.37	2.2
Burma	1.94	2.24	1.97	2.43	2.17	--
Brunei	--	--	--	2.78	2.62	--
Laos	2.17	2.39	2.45	1.85	2.61	2.3

Note. Data is from LPI Report, World Bank database."--" indicates that the relevant data cannot be found.

From 2010 to 2023, China's customs efficiency has improved, but the pace of improvement has been slow and the magnitude not very significant. Singapore scored 3.89 in 2018, a 7% decrease from previous scores and the first time Singapore's score in this indicator fell below 4.00. Malaysia's customs score also fell below 3.00 for the first time in 2018, an 8.5% decrease compared to previous scores. The Philippines' score for customs efficiency and border management clearance fluctuated. The overall trend for other countries showed a slight increase, but the magnitude was not significant. In a vertical comparison, only China, Singapore, and Thailand scored above 3 in 2018, but by 2023, Vietnam and Malaysia were added to the list of countries scoring above 3. China and most ASEAN countries scored relatively low in this category, but Singapore, as a logistics powerhouse, maintained an average score above 4.00. This is mainly because Singapore has established a seamless "one-stop" electronic

customs clearance system where all applications, declarations, reviews, licenses, and controls related to import, export (including transshipment) trade are conducted through the TradeNet. This network operates 24 hours a day, automatically receiving, processing, approving, and returning electronic data declared by enterprises. For items requiring government department control, applications are automatically submitted to these departments for review and approval through the system. Businesses can complete all declaration procedures through computer terminals in 10 seconds and receive a response on approval within 10 minutes. If approved by regulatory authorities and customs, the system prints out a customs clearance permit. Upon arrival of the goods, customs verifies the permit, checks the container number or scans the permit barcode, and the TradeNet system determines whether the goods need to be inspected. Through the TradeNet system, declarations can be made to various government departments in advance, and targets requiring supervision can be predetermined, enabling efficient completion of import approval, customs clearance, and inspection processes. The import and export documents required by China and most ASEAN countries are too cumbersome, and the customs clearance time is long, seriously affecting the scores for customs efficiency and border management clearance.

4.2 Tracking and Positioning Capability

Tracking and positioning capability refers to the ability to track goods during the transportation process. Through comprehensive positioning of the goods, the transportation status can be promptly viewed, which is beneficial for supervising and managing the goods while they are in transit.

Table 9. Scores for Tracking and Positioning Capability between China and the Ten ASEAN Countries from 2010 to 2023

country	2010	2012	2014	2016	2018	2023
China	3.55	3.52	3.50	3.68	3.65	3.8
Singapore	4.15	4.07	3.91	4.05	4.08	4.4
Thailand	3.41	3.18	3.45	3.20	3.47	3.6
Vietnam	3.10	3.17	3.19	2.84	3.45	3.4
Malaysia	3.32	3.54	3.58	3.46	3.15	3.7
Indonesia	2.77	3.12	3.11	3.19	3.30	3.0
Philippines	3.29	3.30	3.00	2.86	3.06	3.3
Cambodia	2.50	2.77	2.92	2.71	2.52	2.8
Burma	2.35	2.34	2.36	2.57	2.20	--
Brunei	--	--	--	--	2.75	--
Laos	2.46	2.49	2.20	1.76	2.91	2.4

Note. Data is from LPI Report, World Bank database."--" indicates that the relevant data cannot be found.

From the above data, we can see that in terms of tracking and positioning capability for goods, the scores of China and the ten ASEAN countries have generally improved while fluctuating, and the scores of China, Singapore, Thailand, and Malaysia have all exceeded 3.00, indicating that China and most ASEAN countries have strong capabilities in tracking and positioning goods.

4.3 The Quality of Logistics Services

The quality of logistics services, which is synonymous with logistics capability, as the logistics industry falls within the scope of the service industry, therefore, assessing the quality of logistics services is equivalent to evaluating logistics capability.

Table 10. Scores for Logistics Service Quality between China and the Ten ASEAN Countries from 2010 to 2023

country	2010	2012	2014	2016	2018	2023
China	3.49	3.47	3.46	3.62	3.60	3.8
Singapore	4.12	4.07	3.97	4.09	4.10	4.4
Thailand	3.16	2.98	3.29	3.14	3.41	3.5
Vietnam	2.89	2.68	3.09	2.88	3.40	3.2
Malaysia	3.35	3.45	3.47	3.34	3.30	3.7
Indonesia	2.47	2.85	3.21	3.00	3.10	2.9
Philippines	2.95	3.14	2.93	2.70	2.78	3.3

Cambodia	2.29	2.50	2.67	2.61	2.41	2.4
Burma	2.01	2.42	2.07	2.36	2.78	--
Brunei	--	--	--	--	2.71	--
Laos	2.14	2.49	2.31	2.10	2.65	2.4

Note. Data is from LPI Report, World Bank database."--" indicates that the relevant data cannot be found.

Through a comparison of the data in the above table, we can observe that the overall trend in logistics capability scores for China and the ten ASEAN countries is on the rise. China's score experienced a slight decline in 2018, but the overall score has been on an upward trajectory. Myanmar's score in 2018 increased by 38% compared to 2016. Although the score is not very high, the growth rate is relatively fast. Only three countries have consistently maintained scores above 3.00, namely China, Singapore, and Malaysia.

4.4 Timeliness

Timeliness encompasses aspects such as timely shipment, timely pickup, timely transportation of goods, and timely feedback on cargo information. The strength of timeliness also reflects logistics speed and efficiency.

Table 11. Timeliness Scores for China and the Ten ASEAN Countries from 2010 to 2023

country	2010	2012	2014	2016	2018	2023
China	3.92	3.80	3.86	3.90	3.84	3.7
Singapore	4.23	4.39	4.25	4.40	4.32	4.3
Thailand	3.73	3.63	3.96	3.56	3.81	3.5
Vietnam	3.44	3.65	3.49	3.50	3.67	3.3
Malaysia	3.86	3.86	3.92	3.65	3.46	3.7
Indonesia	3.47	3.61	3.53	3.46	3.67	3.3
Philippines	3.83	3.30	3.07	3.35	2.98	3.9
Cambodia	2.84	2.95	2.75	3.31	3.16	2.7
Burma	3.29	2.59	2.83	2.85	2.91	--
Brunei	--	--	--	3.19	3.17	--
Laos	3.23	2.82	2.65	2.68	2.84	2.8

Note. Data is from LPI Report, World Bank database."--" indicates that the relevant data cannot be found.

In terms of logistics timeliness, both China and ASEAN countries have demonstrated strong capabilities. China's scores for the six sets of data are all close to 3.9, approaching the level of a logistics powerhouse. Eight ASEAN countries have scores above 3.00, with most of them scoring above 3.50, and Singapore's score reaching as high as 4.40 at its peak. This indicates that both China and ASEAN countries have done an excellent job in logistics timeliness.

5. Policy Recommendations to Promote China's Logistics Capabilities

A horizontal comparison of the development of China's logistics capabilities, coupled with a vertical comparison of the strengths and weaknesses between China and ASEAN countries, reveals that China's logistics industry needs improvement in the following aspects:

5.1 Enhancing Customs Efficiency

5.1.1 Expanding the Application of Computer Technology in Customs Clearance and Supervision

The full electronic and intelligent customs clearance process is an inevitable trend in the development of international customs today. The application of computer technology in customs clearance and supervision can effectively reduce the burden on customs operations and improve administrative efficiency. Specific applications include:

1) Implementing a fully electronic customs system that includes electronic customs declaration and electronic document examination, accelerating the construction of "electronic customs" and port information sharing networks, and promoting "paperless customs clearance" to save costs while improving regional customs clearance efficiency.

2) Accelerating the construction of a national single window. The national single window is an important measure proposed by the WTO to promote trade facilitation, requiring all parties involved in international trade

and transportation to submit standardized information and documents through a single platform to meet the requirements of relevant laws, regulations, and management. This can standardize and refine trade and logistics information, while promoting information exchange between China and ASEAN customs. The "14th Five-Year Plan for Customs Development" issued by China's General Administration of Customs in 2021 mentions deepening the government service functions of the "single window," gradually covering the entire chain of international trade management, and promoting interconnectivity and data exchange with the "single windows" of major trading partners, with the number of countries (regions) interconnected with overseas "single windows" expected to increase from 1 in 2020 to 15 by 2025.

5.1.2 Simplifying Import and Export Customs Procedures and Shortening the Time Required for Imports and Exports

There are significant differences in customs procedures and efficiency between China and ASEAN customs. The import and export documents required by China and most ASEAN countries are too cumbersome, and the customs release time is long, seriously affecting the expansion and development of import and export trade. Measures to simplify customs procedures and improve efficiency include:

1) Implementing "one-stop" customs. "One-stop" customs pursues the convenience of completing tasks in one step or one go. Enterprises only need to declare customs once to complete all import and export customs clearance procedures. China and ASEAN customs should take Singapore's seamless "one-stop" electronic customs as a model to establish a convenient customs clearance system that matches domestic economic and legal conditions.

2) Actively promoting mutual recognition cooperation among customs AEO ("Authorized Economic Operator") within the region, improving the dynamic management of customs enterprise classification, and providing conveniences such as guaranteed release, appointment customs clearance, and specialized coordination to law-abiding enterprises. Classify the scope of AEO into importers, exporters, and bonded warehouse operators. Currently, the cooperation process among CAFTA countries in customs AEO mainly involves formulating unified enterprise certification standards and connecting them with the customs "single window" system. The Singapore government has taken the lead by opening up market participation permissions for this system while improving the regulatory system, allowing skilled private teams to take on this task in an orderly manner. Other countries can also learn from Singapore's government-enterprise cooperation model.

5.2 Full Deployment of Logistics Internet

The world is striding towards the era of intelligence, where human resources can no longer meet the demands of large-scale management and operation. The emergence of intelligence better enables the realization of enterprise operation plans and satisfies enterprise development needs. Therefore, the full deployment of the logistics internet and the enhancement of logistics digitalization are indispensable links for the sustainable development of the logistics chain. Specifically, logistics digitalization involves integrating logistics service information, making timely decisions, and strengthening the operation of automated processes (loading and unloading, warehousing, ordering, and distribution).

5.2.1 Developing Smart Warehousing Technology

Modern warehousing systems are characterized by complex and diverse goods, as well as intricate warehousing operations that involve both storage and movement, sorting, and combination. Smart warehousing leverages sensors, barcodes, lasers, infrared technology, etc., to assist logistics companies in achieving functions such as perception, positioning, identification, measurement, sorting, and monitoring in warehousing. Therefore, the optimization and upgrade of warehouse-centric logistics center information systems will be a highlight of future logistics industry development.

5.2.2 Establishing Smart Handling and Sorting Systems

In modern logistics systems, the logistics industry primarily relies on manual handling, with limited application of smart robots. There are two main types of smart robotic handling: palletizing robots for stacking and palletizing logistics operations, and automated guided vehicles (AGVs) for automated handling. As palletizing robot technology and AGVs continue to develop, they have the potential to become executors of IoT operations in the logistics field, enabling efficient stacking, palletizing, and handling. With advancements in sensing and information technology, AGVs are poised to become important smart terminals in the logistics sector, with significant development prospects.

An intelligent sorting system is an essential facility for advanced distribution centers. As an intelligent sorting system in the era of the logistics internet, it must possess characteristics such as connectivity, intelligence,

automation, and flexibility. An intelligent sorting system can quickly sort goods with a very low error rate, and a fully automated sorting system enables basically unmanned sorting operations.

5.2.3 Increasing the Utilization Rate of Smart Delivery Equipment

With the advancement of urbanization, there are increasingly higher requirements for traffic control in the country. Autonomous driving can promote innovation in the logistics industry and facilitate the smooth operation of intelligent traffic management, enabling seamless upstream and downstream connections in the logistics field. However, it has not yet been widely promoted. Firstly, drones will also be an option for logistics distribution, capable of real-time route updates and extracting recipient smartphone information to track their location. Drones can communicate with each other and with recipients through the internet. Secondly, smart delivery terminals in urban logistics systems can be fully utilized. Delivery boxes are placed in centralized areas for the last mile of logistics, reducing the delivery distance for terminal delivery personnel. With the help of a delivery box freight shuttle system, multiple daily collections and transports of goods in delivery boxes can be achieved. Upon arrival, the shuttle can quickly load and unload, saving waiting time for parcel collection.

5.2.4 Safeguarding Logistics Internet Security

The public nature of the internet enables the concentration of scattered social resources for resource sharing and reuse. However, there are also drawbacks to information disclosure, such as the potential leakage of personal privacy and corporate confidential information. As the network terminal for logistics supervision and the medium for online transactions between e-commerce platforms and consumers, safeguarding cybersecurity is a top priority for the logistics internet. For the government, it should first take the lead and set an example by establishing relevant cybersecurity laws and regulations, legalizing and standardizing online transactions, and protecting the legitimate rights and interests of consumers, suppliers, and carriers. Additionally, the government should fulfill its regulatory responsibilities, as the intangible world of the internet requires the practical implementation of laws and regulations to realize their value. The combination of tangible legal regulations and intangible supervision and management is the foundation for establishing a secure internet environment. For logistics companies, while enjoying the convenience brought by the internet, they should improve internet management mechanisms, conduct routine network maintenance, promptly identify and fix system vulnerabilities, and ensure the safe and effective operation of the logistics internet. For consumers and suppliers, honesty and trustworthiness are the foundations of online transactions. While abiding by online regulations, they should also pay attention to protecting their personal information, strengthen their awareness of safeguarding rights, and maintain the stability of network order.

5.3 Reducing Logistics Costs and Increasing Investment in Logistics Infrastructure

China ranks high in logistics performance, but logistics costs are not low. Significant expenses are incurred for packaging, transportation, and labor. Labor costs can be reduced through the adoption of artificial intelligence and robotics. For packaging costs, logistics companies need to make efforts. The establishment of packaging standards, the selection of packaging materials, and the arrangement of packaging procedures all have an impact on packaging costs. The establishment of packaging standards is the foundation for goods packaging. With standardized specifications, goods can be packed in an orderly manner. Companies should select or even manufacture packaging materials that save raw materials, effectively protect goods, and ideally can be recycled. Different packaging materials should be used for different goods to fully utilize resources in a targeted manner. Packaging procedures should avoid redundant binding that wastes materials and may damage goods. The key to reducing transportation costs is for logistics companies to utilize transportation tools reasonably, which hinges on the government improving infrastructure construction.

5.4 Expanding Channels for Cultivating Specialized Logistics Talents

Sustainable development in logistics cannot be achieved without talent. Modern logistics is a technology-intensive industry, and professional and technical talents who master logistics management are crucial for logistics development. [10] To accelerate the development of China's logistics industry, the key lies in cultivating professional talents. On the one hand, various methods should be adopted to strengthen logistics training and cultivate a high-quality team of logistics management personnel. Logistics management majors should be established in higher education institutions, especially comprehensive universities. Vocational education should be provided to ensure that logistics company employees meet the requirements of their job positions, thereby improving the overall quality of logistics personnel. On the other hand, well-paid positions should be offered to attract management talents with rich experience in logistics management or research talents who are knowledgeable about international logistics development trends. They can conduct logistics research at different levels, providing theoretical and technical support for the development of China's logistics industry.

6. Discussion

Through a comparative study on the logistics levels between China and ASEAN, we can clearly observe the development status and trends of both parties in multiple aspects, including logistics infrastructure and logistics service levels. As an important trade partner of ASEAN, China's logistics level has significantly improved over the past few years, not only surpassing the average level of the ten ASEAN countries but also demonstrating potential to compete with Singapore, a logistics powerhouse, in certain aspects.

At the same time, the logistics levels of ASEAN countries also show a significant differentiation trend. Singapore, with its uniquely advantageous geographical location and strong government support, stands out as a logistics power within the region. Other countries such as Thailand, Vietnam, and Malaysia, although gradually enhancing their logistics capabilities, still have a considerable gap compared to Singapore. Indonesia, Cambodia, Myanmar, Brunei, and Laos lag behind in logistics development, requiring more investment and reforms to promote the growth of their logistics industries.

In summary, the comparative study on the logistics levels between China and ASEAN not only reveals the current development status and trends of both parties in the logistics field but also provides useful references for future cooperation and development. We look forward to both parties working together to jointly promote the prosperity and development of the logistics industry and make greater contributions to the sustained prosperity of the regional economy.

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