

Measurement of Development Level and Study on Influencing Factors of Hangzhou's Cross-border E-commerce

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Abstract

Based on an analysis of the current development status of Hangzhou's cross-border e-commerce industry, this study further constructs an evaluation index system for cross-border e-commerce development level, and by integrating relevant data from 2021 to 2024 and applying the entropy weight method and comprehensive evaluation index calculation, the study reveals that the development level of Hangzhou's cross-border e-commerce has increased year by year—among the dimensions of production factors, supply and demand, and related industries, indicators of related industries such as the number of overseas warehouses and the volume of logistics and express delivery services exhibit close correlations with export transaction volume and exert significant impacts with noticeable fluctuations, while production factor indicators(e.g., talents from colleges and universities, per capita income)have not yet shown obvious impacts in the short term but are of crucial importance in the long run. In addition, Hangzhou's cross-border e-commerce industry faces such challenges in its development as the lack of distinctive features of small and medium-sized cross-border e-commerce brands and increased costs driven by supply chain risks, and based on the above findings, this study proposes targeted countermeasures from the aspects of optimizing the allocation of production factors, strengthening the linkage between supply and demand, upgrading related industries, and establishing a collaborative mechanism, which are intended to promote Hangzhou's cross-border e-commerce industry to transition from scale-driven growth to a high-quality development stage, thereby providing references for industrial development and policy formulation.

Keyword: Development Level of Hangzhou's Cross-border E-commerce, Entropy Value Method, Influencing Factors

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I. Introduction

Cross-border e-commerce has become the most powerful new engine and a key driver for the development of China's foreign trade, as well as a practical force that has profoundly reshaped the global trade pattern. In 2024, the Decision of the Communist Party of China Central Committee on Further Comprehensively Deepening Reform and Promoting Chinese-Style Modernization[1], pointed out the direction for deepening reforms in the development of digital trade and cross-border e-commerce. As a national leader in cross-border e-commerce, Zhejiang Province has witnessed long-term vigorous development in its cross-border e-commerce industry, which has remained at the forefront of the country and become an important pillar for leading Zhejiang's high-level opening-up and driving high-quality development. In recent years, the scale of Hangzhou's cross-border e-commerce has continued to expand: in 2023, its total import and export volume reached 140.04 billion yuan, with a year-on-year growth of 16.4%, and the declared export volume increased significantly, making a prominent contribution to the growth of the city's foreign trade exports.

As a national pilot city, Hangzhou accounts for a large proportion of Zhejiang's import and export volume; however, its growth rate is unstable, and its growth drivers need to be further explored. Against this backdrop, the development trend and level of Hangzhou's cross-border e-commerce have become an important research topic. This paper constructs an evaluation index system for the development level of Hangzhou's cross-border e-commerce, calculates the weights using the Entropy Value Method and obtains the comprehensive evaluation values over the past five years. Meanwhile, it explores the influencing factors of cross-border e-commerce development, aiming to provide a scientific quantitative basis for policy formulation and references for enterprises to adjust their strategic directions.

II. Analysis of the Current Status of Hangzhou's Cross-border E-commerce Industry

(1) Gradually Expanding Market Scale In recent years, cross-border e-commerce has achieved remarkable development results, with its market scale expanding continuously. From a temporal perspective, the total volume rose from 1.06 trillion yuan in 2018 to 2.38 trillion yuan in 2023, achieving a 1.2-fold growth in just five years. In the first half of 2024, its import and export volume reached 1.22 trillion yuan, with a year-on-year growth rate of 10.5%—4.4 percentage points higher than the overall growth rate of China's foreign trade in the same period[2].

In terms of international cooperation, China has established bilateral e-commerce cooperation mechanisms with 31 countries, building a global sales network. It can be seen that the global demand for China's e-commerce products is constantly on the rise; cross-border e-commerce not only brings high efficiency but also provides new models and higher economic benefits for China's international trade. From a regional perspective, as a frontier in cross-border e-commerce development, Hangzhou holds a significant share in the national market. In 2023, its import and export volume reached 145.3 billion yuan, accounting for 54% of Zhejiang Province's total. Since Hangzhou became China's first comprehensive cross-border e-commerce pilot zone in 2015, its cross-border e-commerce industry has shown vigorous development momentum. In 2024, Hangzhou's total cross-border e-commerce import and export volume stood at 151.995 billion yuan, with 65,000 cross-border e-commerce sellers and 1,586 enterprises recording an annual transaction volume of over 20 million yuan. Over the past decade, the import and export scale of Hangzhou's cross-border e-commerce has increased by 1,267 times, and the number of sellers has grown by 325 times[3].

(2) Remarkable Achievements in Emerging Market Expansion

From the perspective of market layout, traditional European and American markets remain the primary export destinations for Hangzhou's cross-border e-commerce; however, the pace of exploring emerging markets is accelerating. ASEAN has continued to maintain its position as China's largest trading partner. The total trade volume between China and ASEAN reached 6.99 trillion yuan, representing a 9.0% growth and accounting for 15.9% of China's total foreign trade value. Meanwhile, China's imports and exports to countries participating in the "Belt and Road" Initiative increased by 6.4%, and for the first time, this volume accounted for over 50% of China's total import and export value, reaching 50.3%[4].

Numerous cross-border e-commerce enterprises in Hangzhou have actively responded to the trend of emerging market expansion, increasing their investment in emerging markets such as Southeast Asia and the Middle East—including those within the "Belt and Road" framework. Through targeted marketing and other strategies, these enterprises have gradually gained a foothold and expanded their presence in these markets.

(3) The industrial chain has been gradually improved. From suppliers to cross-border e-commerce service platforms and then to end consumers, the cross-border e-commerce consumption path in Hangzhou has become increasingly clear. Moreover, Hangzhou has implemented the "cross-border e-commerce B2B export" pilot program since 2020, which has significantly enhanced the improvement of global supply chains and export chains[5].

III. Evaluation System for the Export Development of Hangzhou's Cross-border E-commerce

3.1 Construction of the Evaluation System

Based on Michael Porter's "Diamond Model"[6], this paper establishes a relatively comprehensive development evaluation system. It conducts multi-dimensional assessment and analysis from three aspects—production factors, supply and demand, and related industries—thereby constructing a complete and realistic evaluation framework.

(1) Production Factors

As a composite industry integrating international trade, digital technology, and the service sector, the development of cross-border e-commerce exhibits a significant rigid demand for diversified production factors. From the perspective of industrial practice, this demand is reflected in two dimensions: On one hand, the commodity manufacturing process relies on a large number of basic labor forces, covering the entire workflow from raw material procurement, processing and assembly to quality inspection, which serves as the cornerstone for ensuring supply chain stability. On the other hand, the digital nature of the industry determines its in-depth dependence on high-quality interdisciplinary talents. Such talents need to master professional skills including cross-border payment, overseas market compliance, multilingual operation, and intelligent product selection algorithms to cope with complex scenarios in cross-border transactions.

(2) Supply and Demand

The dynamic balance between supply and demand is the core driving force for the sustainable growth of the cross-border e-commerce industry, and the coordinated evolution of the two directly affects the vitality and

competitiveness of the industrial chain. From the supply side, the export transaction volume of cross-border e-commerce is a core indicator for measuring the industrial supply capacity. The expansion of market coverage intensifies industry competition, prompting enterprises to improve product quality and service standards and driving the industry towards high-quality development. From the demand side, the increase in per capita consumption expenditure is an important signal of the release of domestic demand potential. By monitoring the dynamic changes in export transaction volume and per capita consumption expenditure, the degree of market supply-demand matching can be accurately grasped: When the export growth rate is faster than the domestic demand growth rate, it is necessary to guard against the risk of overcapacity and guide enterprises to optimize product structure; when the domestic demand growth rate takes the lead, policy incentives—such as expanding the import list—can be adopted to further release consumption potential and achieve coordinated growth of both supply and demand sides.

(3) Related Industries

As supporting industries in the cross-border e-commerce industrial chain, related industries directly determine transaction efficiency and user experience, and serve as a key link connecting the production end and the consumption end. This study selects three core fields—overseas warehouses, ports, and logistics—to quantify their enabling role in industrial development.

Table 1 Evaluation Indicators of Cross-border E-commerce Development Level in Hangzhou

First-level Indicator	Second-level Indicator	Third-level Indicator	unit
Factor of production	Human resources	Population of talents trained by universities	10,000 people/year
	capital	Average disposable income	10,000 yuan/person
	technology	Applicable market solutions	piece
Demand and supply	market	Cross-border E-commerce Export Transaction Volume	100 million yuan
	consumers	Average consumption expenditure	10,000 yuan
Related industries	Overseas warehouses	Quantity of overseas warehouses	piece
	delivery	Delivery business volume	100 million pieces

In accordance with the principles of scientific adaptability and practical operability, the evaluation index system for the development level of Hangzhou's cross-border e-commerce is constructed as shown in Table 1.

3.2 Determination of Index Weights and Calculation of Comprehensive Evaluation Values Using the Entropy Value Method

In this study, aiming at the initial matrix composed of the evaluation index data for Hangzhou's cross-border e-commerce development level, the information entropy is used to determine the index weights. This method reduces human interference and makes the evaluation more in line with the actual situation[6]. The steps are as follows:

- (1) Standardization of Index Data. All indexes in this study are benefit-type indexes, so no positive transformation is required. The standardization is carried out using the following formula:

$$x'_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}}, \text{ among them, } x_{ij} \text{ represents the value of the } j\text{-th evaluation index in the } i\text{-th year. } m \text{ denotes}$$

the number of objects to be evaluated, and n denotes the number of indexes.

- (2) Calculate the proportion of the j -th index: $p_{ij} = \frac{x'_{ij}}{\sum_{i=1}^m x'_{ij}}$.
- (3) Calculate the entropy value of the j -th index: $e_j = -k \sum_{i=1}^m p_{ij} \ln p_{ij}$, among it, $k = 1/\ln m$, ensure $0 \leq e_j \leq 1$, where m denotes the number of objects to be evaluated.
- (4) Calculate the information entropy redundancy: $d_j = 1 - e_j$.
- (5) The weight of the j -th index is calculated as follows:
- (6) Calculation of the Comprehensive Evaluation Index Based on the Entropy Weight Method $S_i = \sum_{j=1}^n w_j \cdot x_{ij}'$.

The calculated indicator weights are presented in Table 2.

Table 2 indicators'weights

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First-level Indicator		Second-level Indicator	Third-level Indicator		Weight (W)	Weight of First-level Indicator
Factor of production		Human resources	Population of talents trained by universities		0.1525	0.4264
		capital	Average disposable income		0.1589	
		technology	Applicable market solutions		0.115	
Demand and supply		market	Cross-border E-commerce	Export	0.1989	0.3433
		consumers	Transaction Volume Average consumption expenditure		0.1444	
Related industries		Overseas warehouses	Quantity of overseas warehouses		0.115	0.23
		delivery	Delivery business volume		0.115	

The comprehensive scores of Hangzhou's cross-border e-commerce exports from 2021 to 2024 were calculated by multiplying the proportion of each index in the annual sample by the corresponding weight(in a weighted manner)and then summing up the products.The results are shown in Table 3.

Table 3 Comprehensive Score of Hangzhou's Cross-border E-commerce Export Development Level

year	2021	2022	2023	2024
Comprehensive score	0.17	0.35	0.52	0.7

IV. Conclusions and Recommendations

4.1 Conclusions

From the perspective of first-level index weights, the production factors have the highest weight, accounting for 0.4264.This indicates that in the evaluation system for Hangzhou's cross-border e-commerce development level, production factors carry significant weight, highlighting their critical value for industrial development. In terms of industrial driving forces, production factors include human resources, capital, technology, and other elements; the high weight demonstrates that the input and allocation of these resources are the core drivers of cross-border e-commerce progress. From the industrial trend perspective, it signals that future development will revolve around the optimization of production factors. This not only reflects the direction of professionalization and technological upgrading but also underscores the need for industrial upgrading—requiring improvements in the quality and efficiency of factors, as well as exploration of new technology applications.

When examining secondary indicators in detail, university talents(with a weight of 0.1525)and market-adaptable solutions(with a weight of 0.1150)represent the primary sources of future competitiveness, determining whether the industry can shift from scale expansion to innovation-driven development.

Within Hangzhou's cross-border e-commerce development ecosystem, related industries, as a supportive supporting field,have a weight of 0.2300.Although lower than that of production factors,they are crucial for ensuring the efficient operation of cross-border transactions.These industries cover core areas such as cross-border logistics,overseas warehouse services,cross-border payment and financial services,and comprehensive service platforms.Through specialized division of labor,these industries enhance process efficiency;in the future,they need to integrate with production factors such as technology to promote the sound advancement of cross-border e-commerce.

While focusing on individual factors,we also need to explore from a broader perspective:production factors(weight:0.4264)and related industries(weight:0.2300)must work in synergy.Leveraging talents and technology among production factors to optimize from the source of the supply chain;relying on logistics and overseas warehouses within related industries to build an efficient fulfillment system—storage in overseas warehouses shortens delivery cycles,and high-quality logistics ensures the transportation quality of goods.

Overall,the development of Hangzhou's cross-border e-commerce follows an evolutionary logic:verification of market transactions,guarantee of production factors,and subsequent efficiency improvement of related industries.The current stage is characterized by transaction outcomes depending on resource reserves,with market indicators such as export transaction volume dominating short-term industry behaviors.However,in the long run,it is necessary to strengthen talent cultivation and technology application,address development shortcomings,and drive the industry to enter a new phase of innovation-driven development instead of scale expansion.

4.2 Development Countermeasures and Recommendations

Based on the factor weight characteristics and industrial ecosystem status of Hangzhou's cross-border e-commerce development, systematic development countermeasures should be formulated from four dimensions—upgrading production factors, boosting both supply and demand sides, upgrading related industries, and establishing a coordination mechanism—to promote the industry's transformation from scale expansion to high-quality development.

(1) Optimization of Production Factors

To address the shortage of talent reserves, it is necessary to promote in-depth alignment between cross-border e-commerce programs in universities and industry needs, add practical courses such as cross-border compliance, multilingual operation, and overseas market analysis, and conduct targeted talent cultivation. In terms of technology, priority should be given to supporting the optimization of product selection algorithms and digital supply chain management to lower the threshold for technology application. On the capital side, it is essential to innovate financial support models to alleviate the capital pressure of enterprises in links such as logistics; meanwhile, leveraging Hangzhou's advantages in financial technology, explore cross-border pilots to reduce the risk of exchange rate fluctuations.

(2) Linkage between Supply and Demand

Efforts should be made to balance the utilization of domestic existing resources and the expansion of overseas markets. For overseas markets, while consolidating market share in mature European and American markets, leverage the dividends of regional trade agreements such as RCEP to focus on the layout of emerging markets, and actively encourage e-commerce enterprises to participate in international exhibitions to enhance international recognition. For domestic demand, build a one-stop platform based on Hangzhou's advantages in the digital economy, integrate e-commerce sales services, and provide consumers with a better experience.

(3) Upgrading of Related Industries

The upgrading of related industries should focus on continuous optimization of efficiency and functions. In the logistics field, accelerate the intelligent transformation of ports, increase international freight routes, and establish flexible operation models. In terms of overseas warehouse layout, guide enterprises to advance the integration process in key markets to improve efficiency, optimize services, and reduce return rates. In the construction of comprehensive service platforms, integrate various regulatory data and market resources to build a relatively complete service system, minimizing operating costs for small and medium-sized enterprises.

V. Establishment of a Coordination Mechanism

Furthermore, it is necessary to establish a cross-departmental and cross-subject collaborative development mechanism. The government should take the lead in establishing a cross-border e-commerce development alliance, hold regular matchmaking meetings for production factor suppliers, e-commerce enterprises, and related service providers to promote the flow of talents, technology, and capital to key links of the industrial chain. Improve the cross-border e-commerce statistical monitoring system to track the dynamics of various indicators in real time and provide data support for policy adjustments. Set up e-commerce pilot zones to take the lead in trials related to talent settlement, tax incentives, and technology application, forming replicable experience models. Through multi-dimensional efforts, promote in-depth integration of production factors, supply and demand, and related industries, enabling Hangzhou's cross-border e-commerce to maintain its scale advantages while building a competitive barrier centered on innovation.

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