

# Research on the Resilience Assessment of Cross-border E-commerce Supply Chains under the RCEP Agreement

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**Abstract:** Under the RCEP (Regional Comprehensive Economic Partnership) agreement, cross-border e-commerce supply chains face the multiple risks that can lead to supply chain disruptions, severely affecting a nation's economic security, trade stability, and international market competitiveness. Enhancing supply chain resilience is a key method to address supply chain disruptions. This study, based on an analysis of the characteristics of cross-border e-commerce supply chains, utilizes Grounded Theory and Social Network Analysis to construct an evaluation indicator system. The resilience indicator system for cross-border e-commerce supply chains under the RCEP agreement developed in this study aids in the efficient and stable development of businesses.

**Keywords:** RCEP; Cross-border E-commerce Supply Chain; Evaluation Indicator System; Grounded Theory.

## 1. Introduction

Cross-border e-commerce is a product of the rapid development of "Internet Plus," increasingly becoming a new driving force for the development of our country's foreign trade, a new channel for transformation and upgrading, and a new lever for high-quality development. However, the sudden outbreak of the COVID-19 pandemic in 2019 posed unprecedented challenges to the global supply chain system, with the disruption of the cross-border e-commerce supply chain being particularly severe, manifesting in issues such as logistical delays, supplier shutdowns, demand fluctuations, and policy changes. Compared to traditional supply chains, cross-border e-commerce supply chains are characterized by a large number of nodes, cross-border nodes, and complex structures. Enhancing the resilience of the supply chain is an effective method to address the risk of supply chain disruptions, which is not only crucial for enterprises and even nations to quickly recover from crises but also significant in actively responding to changes brought about by environmental uncertainties. In the report of the 20th National Congress of the Communist Party of China, it was explicitly stated that focusing on improving the resilience and security levels of industrial chains and supply chains is a key factor in achieving high-quality development. Especially at present, with frequent global emergencies, the prevalence of protectionism and unilateralism, and the shadow of US-China trade frictions, these severe and complex situations continually impact the cross-border e-commerce supply chain. A comprehensive evaluation of the resilience of the cross-border e-commerce supply chain can effectively identify and reduce the risks of supply chain disruptions, enhancing our country's competitiveness and voice in international trade.

## 2. Literature Review

### 2.1. Supply Chain Resilience Definition

CHRISTOPHER describes supply chain resilience as the ability of the system to return to its previous state or achieve a better state after being damaged[1]. SHEFFI believes that supply chain resilience manifests as the adaptability and

recovery speed of enterprises when facing the risk of supply chain disruptions, which has a positive effect on improving overall enterprise performance[2]. IVANOV and SOKOLOV view supply chain resilience as the performance of maintaining and recovering planned operations and the capacity to accept or adapt in the face of challenges[3]. HOSSEINI was the first to consider supply chain resilience as the continuity and self-healing ability of the supply chain when facing risks [4] While BEHZADI, building on this, emphasizes that a highly resilient supply chain should have alternative options, such as selecting backup suppliers and maintaining adequate inventory[5], and possess self-regulating characteristics [6].

### 2.2. Factors Influencing of Supply Chain Resilience

In terms of research on the influencing factors of traditional supply chain resilience, SHEFFI, through empirical analysis, proposed that resilience embedding and increasing redundancy levels have an impact on supply chain resilience [7]. PETTIT believes that the influencing factors of supply chain resilience depend on two main aspects: the supply chain's own capabilities and its vulnerability when facing external environments. In terms of evaluation methods, there is currently a lack of research on the resilience evaluation of cross-border e-commerce supply chains both domestically and internationally[8]. REZA D's study opted to combine the intuitionistic fuzzy number method with the entropy weight method, introducing the concept of information entropy to solve the problem of information asymmetry and successfully determining the weights of qualitative indicators[9]. R.RAJESH's research, based on fuzzy set theory, proposed using a fuzzy index to measure the resilience level of the supply chain to identify the key attributes affecting supply chain resilience[10]. Although previous studies have analyzed the influencing factors of cross-border e-commerce supply chain resilience, they tend to focus on supply chain capability factors and lack enterprise-level resource factors, resulting in an indicator system that is not systematic or comprehensive.

Therefore, based on the organization and analysis of domestic and international literature, this study utilizes

grounded theory and social network analysis to construct an evaluation indicator system for cross-border e-commerce supply chain resilience, including both resource-related and capability-related influencing factors. A comprehensive analysis of the cross-border e-commerce supply chain is a key component of implementing a high-quality development strategy, helping to enhance the global competitiveness of national industries, ensure the stability and sustainability of economic operations, and thereby promote high-quality economic development.

### 3. Evaluation Indicator System

#### 3.1. Principles for Constructing the Indicator System

1.Principle of Comprehensiveness. The cross-border e-commerce supply chain is a complex organic whole, formed by the combined force of multiple links. It faces a variety of factors that affect its resilience, necessitating measurement from multiple perspectives.

2.Principle of Scientific Validity. This study uses existing research on supply chain resilience measurement and cross-border e-commerce supply chain resilience measurement as theoretical support. It also makes flexible adjustments in accordance with the specific context and needs of this research, selecting appropriate indicators.

3.Principles of Objectivity and Specificity. In selecting indicators, one should follow the principles of objectivity and specificity, choosing indicators that can objectively reflect its characteristics.

#### 3.2. Construction of the Indicator System

Firstly, based on the principles for constructing the indicator system and combining expert interviews and case materials, a series of preliminary indicators are selected through grounded theory. Then, through literature review and utilizing social network analysis, the preliminary indicators are pruned and merged. Ultimately, a scientific and rational evaluation indicator system for the resilience of the cross-border e-commerce supply chain is constructed. This indicator system includes five primary indicators: supply chain forecasting ability, response ability, resistance ability, recovery ability, and adaptability. Additionally, there are 16 secondary indicators and 34 tertiary indicators.

##### 1.Forecasting Ability

Forecasting ability is the foundation of resilience management for cross-border e-commerce supply chains. Through accurate risk forecasting, the supply chain can make adjustments and preparations in advance to deal with risks and challenges.

Risk Forecasting Ability: The longer supply chain of cross-border e-commerce entails greater risks. Hence, enterprises' understanding and foresight of risks are crucial. The signing of the RCEP agreement provides a more stable trade and investment environment, making the market within the region more stable and predictable.

Supply Chain Visibility: Refers to the ability to grasp information and data about the supply chain. The signing of RCEP enhances the flow of information, reduces trade barriers, and simplifies trade procedures, thus enhancing the visibility of the supply chain and the smoothness of cross-border trade.

##### 2.Response Ability

Response ability emphasizes the ability to respond quickly

and take action when the supply chain is subjected to external shocks or changes, reducing or eliminating the impact and enhancing the ability to deal with changes. This includes the ability to respond quickly to market and customer demands.

Supply Chain Agility: The ability of the supply chain to adapt and develop under continuously changing and unpredictable market conditions. This requires the supply chain to react swiftly to unforeseen events, building a responsive network that can quickly adapt to environmental changes.

Dynamic Adjustment Ability: Refers to the supply chain's ability to flexibly adjust its network, supplier relationships, and operational modes according to market demand and environmental changes.

Cross-border Logistics Service Ability: The RCEP agreement promotes logistics cooperation by lowering trade barriers and simplifying trade procedures, helping to improve the efficiency of cross-border logistics services.

Cross-border Payment Ability: Includes understanding and applying payment rules of different countries or regions and handling cross-border payment procedures. The RCEP agreement involves financial cooperation and payment facilitation among member countries, improving the flexibility and responsiveness of the cross-border e-commerce supply chain's payments.

##### 3.Resistance Ability

Resistance ability refers to the capacity to take appropriate measures and strategies to maintain normal operation and production capacity when facing various risks and uncertainties.

Economic Scale of Enterprises: Reflects competitiveness and resource advantages in the market. The RCEP agreement expands market access, promoting the economic scale expansion of cross-border e-commerce enterprises.

Cost Management Ability: Involves the enterprise's ability to control and optimize costs. Good cost management can help enterprises withstand risks and maintain supply chain stability.

Real-time Monitoring Ability: The RCEP agreement promotes the establishment of a more open and transparent data sharing mechanism, helping to improve the supply chain's control ability and timely detect and solve problems.

##### 4.Recovery Ability

Recovery ability denotes the capacity to effectively return to normal operations when facing various risks and challenges.

Degree of Social Security: Provides better economic and social support for affected enterprises and workers, making the supply chain more stable and thus improving its recovery ability.

Cross-regional Collaboration Ability: The RCEP agreement creates favorable conditions for cross-border e-commerce collaboration among member countries, with measures like tariff reductions and simplified customs procedures all contributing to more efficient and possible cross-regional collaboration, thus enhancing the diversity and stability of the supply chain and its recovery ability.

Government Support: The RCEP agreement encourages member countries to strengthen cooperation and provide government support, playing a crucial role in guiding and supporting the recovery of the supply chain during disasters or crises.

##### 5.Adaptability

Adaptability involves how enterprises continuously optimize and improve their supply chains based on

environmental changes and internal conditions.

**Information Sharing Ability:** The cross-border e-commerce supply chain requires close cooperation and information sharing among all links and stakeholders. The RCEP agreement helps to enhance the exchange of information and collaboration among supply chain participants, strengthening the trust and cooperative relationships between partners.

**Infrastructure Construction:** Good infrastructure supports the logistics transportation, information transmission, and payment settlement of the cross-border e-commerce supply chain. The RCEP agreement promotes increased investment and cooperation in infrastructure construction among member countries.

**Information Management Ability:** The RCEP agreement encourages member countries to enhance their information management capabilities, especially in the fields of cross-border e-commerce and the digital economy, promoting the capability of digital information management.

**Redundant Design Ability:** Involves establishing backup equipment, overseas warehouses, and safety stocks in the cross-border e-commerce supply chain's redundant design, enabling better adaptation to market demand changes, transportation interruptions, etc., and maintaining stable operations.

## 4. Conclusion and Recommendation

### 4.1. Conclusion

Against the backdrop of globalization and rapid technological advancement, the cross-border e-commerce supply chain faces challenges including political shifts, economic fluctuations, climate change, and health crises. These challenges demand that supply chains operate not only efficiently but also with sufficient flexibility and resilience to address these issues. Therefore, from a long-term and strategic perspective, supply chain resilience has a significant impact on the stability and development of national economies and societies. This study begins by considering both resource-related and capability-related factors to construct a comprehensive and systematic indicator system. It then employs the Analytic Hierarchy Process (AHP) and Fuzzy Entropy Weight Method to assign weights to the indicator system. Through fuzzy comprehensive evaluation, the resilience level of enterprise cross-border e-commerce supply chains is explored. The results show that this evaluation method effectively assesses the resilience of cross-border e-commerce supply chains. It also finds that the importance ranking of the cross-border e-commerce supply chain resilience evaluation indicators is response ability > resistance ability > adaptability > recovery ability > forecasting ability.

### 4.2. Recommendations

Stabilizing and enhancing supply chain resilience is closely related to national security and economic growth. In light of this, the study proposes the following recommendations:

1. Establish International Multilateral Cooperation Mechanisms.

The implementation of the RCEP agreement serves as a model for establishing international multilateral cooperation mechanisms. By reducing trade barriers among member countries, it has created a more open and convenient international trade environment for China's cross-border e-commerce. Building on this, China can further deepen

cooperation in the field of cross-border e-commerce with RCEP member countries, by jointly formulating international rules and standards in e-commerce, supply chain management, and other areas, to promote a more unified and efficient regional supply chain system. Actively participating in the construction of international multilateral cooperation mechanisms can not only enhance China's discourse power and influence on the international stage but also promote the resilience and stability of international supply chains, laying a solid foundation for the long-term healthy development of China's cross-border e-commerce.

### 2. Advance Infrastructure Construction

Increase investment and construction in infrastructure, especially in the construction and upgrading of key nodes such as ports, airports, logistics centers, and information networks. By improving the modernization level and interoperability of infrastructure, the efficiency and reliability of cross-border e-commerce logistics can be effectively enhanced, reducing the time cost of transportation and transactions. At the same time, strengthening the connection between domestic and international logistics networks provides enterprises with diversified logistics options, increasing the flexibility of the supply chain and its ability to resist external shocks. Furthermore, developing advanced information technology infrastructure, such as 5G networks and big data centers, provides strong technical support for the digital transformation and intelligent management of the supply chain.

### 3. Develop Comprehensive Supply Chain Risk Management Policies

Develop comprehensive supply chain risk management policies and frameworks, including aspects such as supply chain security, data protection, and trade facilitation. Based on this, regular supply chain stress tests can be conducted to establish emergency plans and recovery mechanisms, ensuring a rapid response and recovery in the event of sudden incidents. Meanwhile, the government can encourage enterprises to invest in technologies and measures related to supply chain security and resilience enhancement, such as establishing diversified supply bases and using blockchain technology to increase supply chain transparency, through fiscal and tax incentives.

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