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Research Article

Spatial Correlation Network and Driving Factors of Trade between China and RECP Countries: Empirical Investigation Based on the Social Network Analysis Method

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This study adopts the revised gravity model to construct the spatial association network of trade in RECP countries and reveals its characteristics through a social network analysis method. The results are as follows: the spatial correlation of trade among RECP countries presents a complex, multithreaded network structure; the spatial correlation network of trade among RECP countries appears to fluctuate, indicating that their correlations, although influenced by the national environment, are still moving in the direction of regional integration; the degree centrality of China, Australia, and Korea is higher in terms of intermediary centrality and proximity centrality. This indicates that these countries are not only at the core of the network and have many associated relationships with other countries but also all are located at the center of the trade spatial association network; and the analysis results of the block model show that the trade spatial association network of RECP countries can be divided into four sections: net spillover, net benefit, broker, and two-way spillover. The spillover effect between the two sections has obvious gradient transmission characteristics.

1. Introduction

On April 15, 2021, China formally submitted the Regional Comprehensive Economic Partnership Agreement (RECP) to ASEAN, meaning that China has officially completed the RECP approval process. In recent years, with the increasingly severe antiglobalization situation and the resurgence of trade protectionism, especially the US–China trade war launched by the United States, the regional economy has shown further deterioration. To safeguard the multilateral trading system and construct an open world economy, China, Japan, South Korea, Australia, New Zealand, and ten ASEAN countries formally signed the RECP on November 15, 2020, marking the establishment of the world's largest free trade agreement.

RECP stands as a high-level free trade agreement initiated by 10 countries of ASEAN and later involving China, Japan, South Korea, Australia, New Zealand, and India, countries with which ASEAN has a free trade agreement. At the same time, the agreement was open to other economies in Central Asia, South Asia, and Oceania. The development of trade among RECP countries has shown two distinct features. One is that with advances in global information technology and shipping, foreign trade and economic development across countries and regions have outpaced the geographical proximity effect, and trade links between distant countries are active. The other is that the imbalance in the level of economic development, industry, and trade structure of countries provides realistic conditions for the formation of trade spatial connection networks but also poses difficulties for the disclosure of the structure of commercial spatial association networks.

RECP countries include developed countries, developing countries, coastal countries, and landlocked countries. The scientific construction of a spatial trade connection network under this condition and the exploration of its realistic impact on the construction of an open world economy and regional economic integration will have great theoretical and

practical significance. Our questions therefore include three main aspects: how to build a trade spatial association network? How to reveal the network structural characteristics of the trade spatial networks in RECP countries? How to analyze the spatial clustering characteristics of trade-related spatial networks?

Considering the signing of the Regional Comprehensive Economic Cooperation Agreement between China and the RECP countries, research on RECP has gradually entered the field of scholars. Currently, there are three main types of research based on different research perspectives.

RCEP is the largest and most important free trade agreement negotiated in the Asia Pacific region. It features the world's most populous and diverse membership and the most dynamic development of a free trade area. Since the RCEP officially took effect on January 1, 2022, the academic circles have increasingly enriched their research on RCEP. Some scholars broadened their research perspective to an international perspective and studied the economic effects between China and other member states in the context of RECP. For example, some scholars studied the changes in economic and trade cooperation between China and Japan after RCEP came into force [1] and the asymmetric characteristics of economic growth between China and RCEP member countries [2]. The perspective of some scholars has turned to domestic studies, mainly concerning the impact of China's manufacturing industry on trade [3] and the context of the China-ASEAN services trade quality development [4] of RCEP. Some scholars have explored the impact of RCEP on domestic regional development, the path of high-quality economic development in the Yangtze River Delta region from the perspective of RCEP [5], and the construction of the Guangxi Free Trade Zone (Li & Shang Mao & Zhong, 2022). However, the above studies only focus on China's economic and trade ties with a particular country or the impact of RCEP policies on domestic regional economic development. It can be seen that it does not focus on the spatial correlation of trade among RCEP countries.

Firstly, the development prospects, opportunities, and comparisons with other internationally traded organizations are examined based on the RECP. The chances, adjustments, and difficulties arising from the signature RECP have been widely studied by scholars [6, 7].

Most scholars often use the GTAP model to study RCEP, mainly focusing on the impact on industrial structure [7]. Through studying the differences, challenges, and responses of the RECP and TPP trade agreements [8] and the impact of the different trade agreements on China [9], some scholars have found that the RECP can effectively deal with the impact of the TPP construction on China's economy. Zhang and Yong [10] studied the economic impact of CPTPP and RECP on major economies in the Asia Pacific. All previous studies qualitatively analyzed the prospects, opportunities, and challenges of RECP and proposed countermeasures against TPP, but previous analysis has not paid attention to the impact of RECP nations' spatial connection partnership, to be more specific; after the signature of RECP agreement, obvious spatial association characteristics could be found in terms of regional trade and economic development.

Second, the impact of RECP on China's high-quality economic development has been widely studied. Liu et al. [11] studied the impact of RECP on China's economy from the perspective of time cost and found that if the reduction in time cost is considered, China's GDP will grow by 1.41%, 10 times more than that of tariff reduction scenario. By studying the impact of RCEP on China's textile import and export trade Zhao and Hong found that it could expand China's import and export scale in the textile industry and increase its market share. Zhao and Hong [12] studied the impact of RCEP on the creation and transfer of China's pork import trade. Wei and Zhu [13] studied the impact on China's manufacturing economy based on the GTAP model and found that the higher the degree of trade liberalization is, the greater the economic impact on China's manufacturing industry is. Li [14] found that the RECP has contributed to the formation of a "three-legged" production network model on a global scale, leading to an inward and unbalanced development trend in the market system and regional dependencies through the study of regional value chain reconstruction in China. The impact of the RECP on China's economy has been studied above, and it has been found to be an important catalyst for China's economic development, but trade relations between member countries have not been studied in terms of spatial association.

Third, the spatial connection network among countries has been noticed and its network structure has been studied. Some scholars take the Belt and Road Initiative as the research sample, from international trade [15, 19], economic development [22, 23], domestic investment [16], service trade [17], cultural trade [18], and analysis has been conducted in the spatial correlation of "Belt and Road" countries.

Third, the network of spatial connections between countries has been studied, as well as its internal structure. Some scholars have taken the Belt and Road Initiative as a sample for their research, and studies on the spatial relevance of countries under this subject include international trade [15, 19], economic development [22, 23], domestic investment [16], trade in services [17], and cultural trade [18]. It is found that there is a complex multithreaded spatial connection among countries along the Belt and Road Initiative.

Some scholars' research samples are RECP countries. From the perspective of trade networks, some studies [20, 21] have broken the limits of spatial economics with the first law of geography as a guide, built a connected network of spatial economics over long distances and in a wide range of fields, and studied the characteristics of the network structure using the method of social network analysis. However, no existing studies have employed spatial connection network analysis methods for RECP countries. Therefore, there is a gap in the social network analysis method for spatially connected relationships for business in RECP countries.

This study is based on existing research, and its main contributions are the following. First, from the perspective of theoretical analysis, this study analyzes the formation mechanism of national spatial relationship network of RECP. Second, taking 15 RECP member countries as the research sample, along with data of China, Japan, South

Korea, Australia, New Zealand, and 10 ASEAN countries from 2010 to 2019, using the modified gravity model, spatial connection network would be established and analyzed. Third, the social network analysis method is used to reveal the structural characteristics of industry spatially connected networks from the overall characteristics of the network, individual characteristics, and spatial clustering characteristics. On this basis, policy suggestions to improve the commercial space connection network will be put forward.

This study focuses on the structural characteristics of trade spatial association networks in RECP countries, and its marginal contribution is mainly manifested on two aspects. For one thing, this study adopts the social network analysis method for empirical analysis and tests the tightness and stableness of spatial networks via the measurement of network density, network relevance, network rank, and network efficiency, which fills the gap in the relevant literature. For another thing, this study is different from the traditional spatial econometric methods used to study trade issues and constructs a revised gravity model to break the restrictions of administrative regions more intuitively. It is no longer limited to the influence of geographical proximity and locality and deeply analyzes the trade spatial association network structure of RECP countries.

2. Research Method and Data Explanations

2.1. Gravity Model. The research on spatial correlation is a hot spot in regional economic research. The purpose of this study was to study the spatial correlation of trade among RECP countries. This study takes 15 countries such as China, Japan, South Korea, Australia, New Zealand, and 10 ASEAN countries as the points of trade spatial connection, and the commercial connections among countries are lines. These points and lines form a network of spatial commercial connections among the RECP countries. This study applies the gravity model (GM) to introduce trade relations between RECP countries. The gravity model in economics is inspired by the law of gravity and is also characterized by the mutual attraction between economic agents. Given that the strength diminishes as the distance between economies increases, to enhance the applicability of the gravitational model, this study proposes a modification of the traditional gravitational model in terms of trade space association, and the revised gravity model is as follows. The corrected gravity model is as follows:

$$Rij = k_{ij} \times \frac{\sqrt[3]{Pi \times Ei \times Gi}\sqrt[3]{Pj \times Ej \times Gj}}{D^2}, k_{ij} = \frac{E_i}{E_i + E_j}. \quad (1)$$

Among them, R_{ij} is the spatial correlation of trade between RECP countries and the gravity of the spatial relationship of trade between country i and country j; E_i and E_j stand for the total imports of countries i and j, respectively; P_i and P_j represent the year-end total population of countries i and j, respectively; Gi and Gj represent the total exports of countries i and j, respectively; and K_{ij} is an adjustment factor, which represents the contribution of country i to the spatial association of trade between country i and country j. In terms of distance measurement, to consider geographical and economic distance together, this study uses the distance D_{ij} between the two capitals for calculation, to figure out the gravity matrix. Each line of the gravity matrix represents the influence of special association of country i with other countries. In this study, the average gravity is taken as the critical value. If the influence of the trade spatial association of country i on country j is greater than the average gravity, then it is recorded as 1, and the pointing arrow from country i to country j should be drawn to show that there is an obvious spatial association between the two countries. According to this method, the author tested the spatial association between each set of two countries and drew the "connecting line" to construct the spatial correlation network among RECP countries.

This study examines a sample of 15 RECP countries, including China, Japan, Korea, Australia, New Zealand, Thailand, Singapore, Indonesia, Myanmar, Malaysia, Philippines, Brunei, Cambodia, Laos, and Vietnam. Total exports and imports are required to measure the gravity model, and population data are obtained from the World Bank in the process (https://www.worldbank.org/en/home).

2.2. Social Network Analysis Method. An analysis of social networks has been extensively applied to the study of the economic sector, air pollution, economic development, and international trade. In this study, the social network analysis method is used to investigate the characteristics with respect to trade spatial association networks. To be more specific, this study will analyze deeply through spatial association overall network structure characteristic, network individual centrality characteristic, and clustering model.

2.2.1. Analysis of the Overall Structure Characteristics of Spatial Association Networks. This study calculates the overall relevance of the trade spatial association network among RECP countries using the indicators such as the density, relevance, level, and efficiency of network.

Network density reflects the density of spatial relations among RECP members. The greater the network density is, the tighter relationship exists among members and the greater impact of network structure on trade among RECP member states. The network density is expressed as D_n, and the range of the index is [0, 1]. N is the number of cities in the network, L is the actual number of associations, and $N \times (n-1)$ is the number of maximum associations in the network. Therefore, network density can be expressed as follows:

$$D_n = \frac{L}{N \cdot (N-1)}. \quad (2)$$

The degree of network relevance shows the stability and vulnerability of the trade spatial association network among RECP countries. If there are direct or indirect links among each RECP members, then the conclusion can be that the spatial network has good association. If multiple lines of the spatial network are connected through a specific country, then the spatial network is highly dependent on that country;

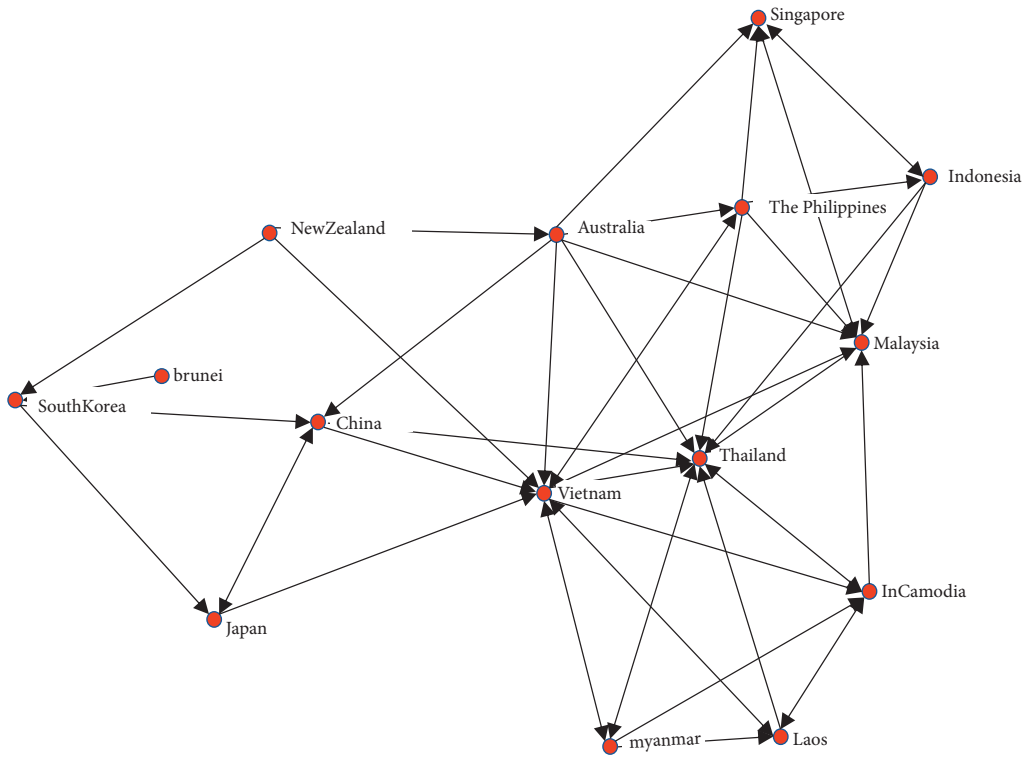

Figure 1: RECP countries' trade spatial connection network.

therefore, the network structure is unstable and the association is rather low. The index range of network relevance degree is [0, 1], V is the unreachable point in the network, N is the number of cities, and $N \times (n-1)$ is the maximum relevance number. The association degree of the network can be expressed as follows:

$$C = 1 - \frac{V}{N \cdot (N-1)/2}. \tag{3}$$

The network level shows the extent to which RECP members can achieve asymmetry, which reflects whether there is a dominant and dominated relationship in the spatial network structure. The level of the network is represented by H, the index range is [0, 1], and K is the number of symmetric points. Therefore, the network hierarchy can be expressed as follows:

$$H = 1 - \frac{K}{\max(K)}. \tag{4}$$

Network efficiency refers to the number of redundant lines in the spatial network and the number of lines required by components. In the trade spatial network of RECP countries, the higher the network efficiency is, the greater the spilled trade space exists, and the more stable the network relationship is. The network efficiency index range is [0, 1], and M is the number of redundant lines. Therefore, the network efficiency can be expressed as follows:

$$E = 1 - \frac{M}{\max(M)}. \tag{5}$$

3. Overall Network Characteristics of Spatial Association Network of RECP Countries

3.1. By Calculating Network Density, Levels, Relevance, and Efficiency. This study provides a description of the general characteristics of the spatial structure of trade relevance networks in RECP countries.

3.2. Analysis of Network Characteristics. The research in this study is focused on the 15 countries of the RECP. A revised gravity model was used to determine the spatial association of trade between RECP members, and then, the spatial trade association network between RECP countries was drawn using UCINET's visualization tool NetDraw (Figure 1). It is clear that the trade spatial connection network among RECP countries is complex and complicated. China, Vietnam, Thailand, Australia, and other countries are located at the center of the network. However, Brunei, Malaysia, and Indonesia are located at the edge. Those countries in the center have greater external radiation capacity and more complex relationship with many other countries. Due to the development of information technology and the increasing convenience of global transportation, the trade spatial connection network of the world's major economies has universal and common connection. However, due to the impact of Brexit from the EU and the Sino-US intangible trade war, trade uncertainty gradually accumulated and affected neighboring countries. Therefore, one conclusion can be taken from here: the network density is not that higher among the RECP countries. If a deep analysis has

been carried out for the deconstruction of the trade spatial network among RECP countries, three levels can be shown as follows: first, the spatial connection of trade networks between RECP countries radiates to other countries in the network; second, the trade spatial connection network among RECP countries has shifted from the bilateral trade development model to the multilateral regional trade development model; and third, there are many small groups in the RECP spatial connection network to form a final complex network. Therefore, it is necessary to let each member coordinate and cooperate.

3.3. Network Density. Network density is a measure of the proximity to the trade spatial connection network among RECP countries. The maximum possible association among the 15 countries is 210 (15 × 14). If the real number of associations in RECP is calculated to be 54 using UCINET, the spatially connected network of RECP countries is 0.2571. This indicates a high density of spatial connections among RECP countries, suggesting that further improvements are needed. When constructing the trade spatial association among countries, we should strive to improve the spatial correlation of trade among countries and create more opportunities and platforms. From 2010 to 2019, the trade spatial association network density of RECP countries showed a fluctuating trend. From 2010 to 2015, the network density increased from 0.2619 to 0.2714; however, from 2015 to 2016, it decreased to 0.2524. There is an upward trend from 2017 to 2018 and a downward trend from 2018 to 2019. This shows that the trade relations among RECP countries are affected by the international trade situation. With the Brexit and the US–China trade war, uncertainty is gaining increasing momentum. This has forced RECP countries to establish a comprehensive regional alliance, which not only can maintain the multilateral trading system effectively and create an open world economy but also has a significant practical implication for furthering regional economic integration and stabilizing the world economy. These results are shown in Figures 2 and 3.

3.4. Network Association Analysis. A method of social network analysis is used to measure network relevance through network relevance, efficiency, and level. Among them, the result of network relevance degree is 1, which shows that the spatial correlation of RECP countries is very close and easy to approach, and the spatial network structure is very sound. The measurement results of network efficiency show that the network density gradually increases from 2010 to 2019. This shows that the trade spatial connection network between RECP countries has a variety of spillover channels, and the trade spatial connection network among them is stable. The measurement results of the network level show an upward trend from 2010 to 2019, indicating that the network level of trade spatial links between RECP countries is becoming more and more strict. There are maritime and landlocked countries, so there is a hierarchical structure in the spatial network of mutually beneficial trade among countries. Combining the above indicators, this study concludes that

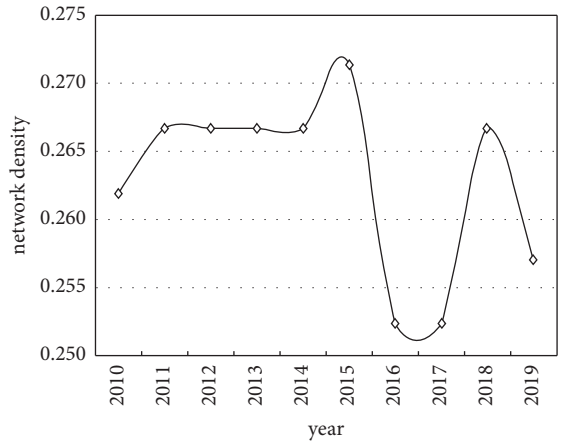

Figure 2: Evolution of network density.

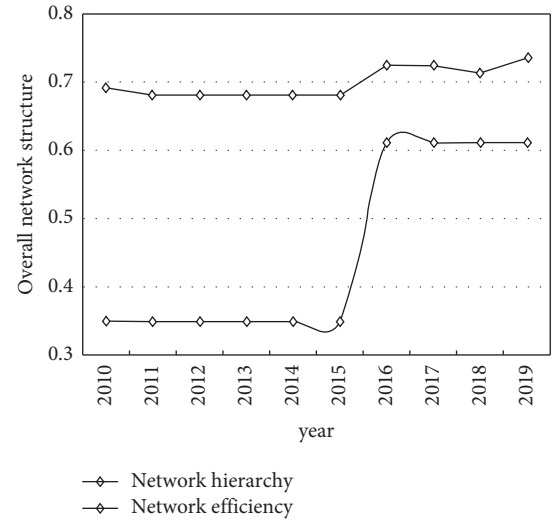

Figure 3: Evolution of network level and efficiency.

economic and trade exchanges between the world's major economies are increasingly frequent and that they are tightly linked to the globalization process. How to reconcile economic development with trade development is a growing concern for people, governments, and the public. In terms of trade development, it is important to take into account the spillover effects of economies, develop a unified development policy, and implement differentiated development measures to jointly guarantee the construction of a coordinated development mechanism for trade among RECP countries.

4. Individual Network Characteristics of the Trade Spatial Association Network of RECP Countries and China

The individual centrality of the RECP trade spatial relationship network is analyzed through measuring the centrality, intermediate centrality, and near centrality of the RECP countries' trade spatial relationship network.

4.1. Degree Centrality. The central point uses the number of links in the trade network to measure whether the country is at the center of the network. Based on the point centrality measurement results given in Table 1, the average point centrality of RECP countries is 36.1904, among which ten countries are higher than this figure, Vietnam, Australia, Malaysia, the Philippines, and Thailand. In the trade spatial network between RECP countries, the relationship with other countries is closer. Among them, Vietnam has the highest figure, reaching 71.429, indicating that Vietnam is in a central position in the trade space connection network between RECP countries. It is because Vietnam is the country with the largest economic aggregate in Southeast Asia, and its economic strength has gradually increased in recent years. According to the measurement results given in Table 1, Singapore ranks second among the least developed countries in terms of time concentration, which indicates that Singapore has less trade links with other countries. The reason may be that Singapore's industry is more inclined to tourism and finance, which is rather low in the trade among RECP countries, resulting in weak trade links.

4.2. Intermediary Centrality. Based on the centrality measures given in Table 1, RECP countries have an average intermediation of 6.96, above Australia, China, Korea, and Vietnam. In the spatial network of trade between RECP countries, they have strong control over trade with other countries. China's centrality is 13.90, indicating that China is at the center of the network of trade connections between RECP countries, acting as an "intermediary" and "bridge." Among the RECP countries, China has the largest economic and trade volume. Therefore, China serves as an intermediary in the RECP countries. Furthermore, China, Australia, South Korea, Vietnam, and the RECP countries have a high level of economic development and strong economic and trade ties. Brunei, Laos, and Myanmar are in third place, which indicates that these countries have a lower level of economic development and fewer economic and trade contacts with other countries. It is thus difficult to control and dominate the other countries in the network.

4.3. Near Centrality. According to the measurement results of centrality proximity given in Table 1, the average centrality of national RECP countries is 54.58, and the countries exceeding this average are Australia, China, Malaysia, and Vietnam. This suggests that in the spatial network of trade between RECP countries, these countries can establish internal links with other countries more quickly and take a central part in the network. The reason for this may be that these countries occupy a higher position in terms of their level of economic development and economic aggregates, with higher economic aggregates and foreign trade volumes. As a result, there are more spatial trade connections between these countries and other countries. Among the above countries, Vietnam has a centrality of 71.429, significantly higher than the other countries. This indicates that other countries are "closer" to Vietnam in the trade space connection network and it is the hub of the entire network of commercial space linkages among RECP countries.

Table 1: RECP countries' trade spatial connection network.

	RECP members	Outer	Inner	Degree	Near	Intermediary
1	Australia	8	1	57.143	66.667	14.542
2	Brunei	1	0	7.143	31.818	0
3	China	4	3	35.714	60.87	13.901
4	Indonesia	3	2	28.571	50	0.549
5	Japan	2	2	21.429	51.852	3.114
6	Cambodia	5	4	35.714	53.846	1.007
7	South Korea	2	3	28.571	45.161	15.201
8	Laos	4	3	28.571	50	0
9	Myanmar	4	4	28.571	50	0
10	Malaysia	2	7	50	58.333	4.982
11	New Zealand	3	1	21.429	56	6.777
12	Philadelphia	4	2	35.714	53.846	1.465
13	Singapore	2	4	28.571	46.667	0.275
14	Thailand	4	9	64.286	70	14.634
15	Vietnam	6	9	71.429	73.684	27.949
	Average	3.6	3.6	36.1904	54.58293	6.959733

5. Spatial Clustering Characteristics of the Trade Spatial Association Network of RECP Countries

To analyze the spatial clustering characteristics of trade network in RECP countries, the block model method of social network analysis is used to describe the status and role in relevant trade cyberspace. The standard with maximum segmentation depth of 2 and centrality of 0.2 was selected by the CONCOR method. If the 20 countries of RECP are divided into four blocks, the result is shown in Figure 4. The first plate has three countries, Australia, Japan, and South Korea, which are allies of the United States.

To analyze the spatial clustering characteristics of RECP countries' trade networks, an approach to the block model of social network analysis is used to describe the status and role of the relevant trade network spaces. The CONCOR method chooses a maximum segmentation depth of 2 and a centrality of 0.2 as criteria. The 20 countries of RECP are divided into four blocks, and the results are shown in Figure 4. The first block has three countries, Australia, Japan, and South Korea, which are US allies. The second section includes three developing countries: China, Brunei, and New Zealand, of which China is the most economically developed country. In Section 3, there are four members, namely Singapore, Indonesia, the Philippines, and Malaysia. They are all located in Southeast Asia and have sufficient labor force, land resources, and other factors. The fourth plate has five countries, Laos, Myanmar, Cambodia, Thailand, and Vietnam, all concentrated in Indochina Peninsula. It is not difficult to find that the economies and trade of the countries in the first and second plates are relatively developed, while the countries in the third and fourth plates are located in Southeast Asia, rich in labor and land resources.

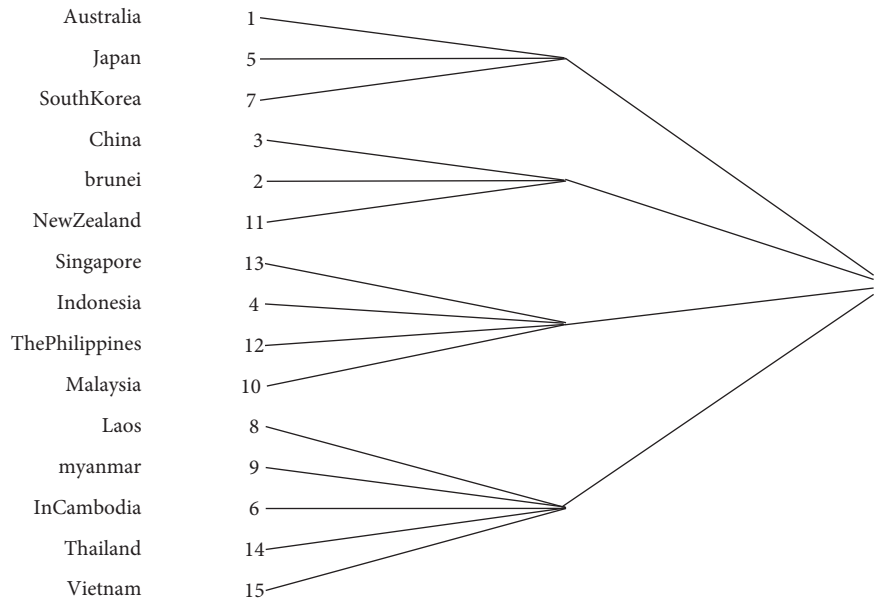

Figure 4: Clustering analysis of the trade spatial connection network.

Table 2: Block model of RECP nations' trade spatial connection network.

	Four blocks				Recipient		Sender		Interior proportion	Expected proportion
	Block I	Block II	Block III	Block IV	In the block	Out of the block	In the block	Out of the block		
Block I	1	4	4	3	1	5	1	11	8.33%	14.28%
Block II	5	0	0	3	0	4	0	8	0	14.28%
Block III	0	0	7	4	7	8	7	4	63.63%	21.43%
Block IV	0	0	4	19	19	10	19	4	82.60%	28.57%

Taking 2019 as an example, this part analyzes the role and position of each block in the RECP trading network. According to the above calculation, there are 54 links among the 15 countries, 27 of them are plate internal correlation and the others plate correlation among 15 countries, indicating that there is obvious spatial correlation and spillover effect in internal plate trade. The number of internal relations of board I is 1, and the sum of overflow rate with other boards is 11, while the overflow rate received from other boards is 5, and the actual ratio in the board is 8.33%, which is lower than the expected internal ratio of 14.28%. The internal ratio of the second board is 0, and the sum of the overflow rate and other boards is 4, while the overflow rate received from other boards is 8, and the actual ratio in the board is 0, which is far lower than the expected internal ratio of 14.28%. The gap and overflow effect between the inner and outer connecting plates are small, which can be divided into runner plates. The internal ratio of plate III is 7, and the sum of overflow ratio and other plates is 4, while the overflow ratio received from other plates is 8, and the actual ratio in the plate is 63.63%, which is much lower than the expected internal ratio of 21.43%. The internal ratio of plate IV is 19, and the total of the overflow ratios from other plates is 4. While the overflow ratio received from other plates is 10, the actual ratio in plate is 82.60%, and the expected internal ratio is 28.57%. The plate member not only emits the relationship but also receives the relationship from other plates and divides them into two-way overflow plates.

To further study the spatial correlation trading relationship between the four plates, this study calculates the network density matrix of each plate according to the distribution of correlation between plates. The density value of the whole network is 0.2571. If the density of the board is greater than the value, the value is specified as 1 and the value is specified as 0, so the density matrix of multiple values is converted into an image matrix, as given in Table 2. In addition, Figure 5 shows the relationship between the four parts of RECP national commercial space contact network. Therefore, due to the relatively high level of economic development of the first plate countries in Australia, Japan, and South Korea, the first plate plays a net spillover role in the trade and spatial connection network of Pacific island countries, and a higher industrial structure and commercial level can spill over to other sectors. However, the second sector mainly includes China. Due to the impact of regional economic integration, China plays a key role in the trade and spatial connection network of RECP countries. Its focus is to shift trade and development links from the first sector to the

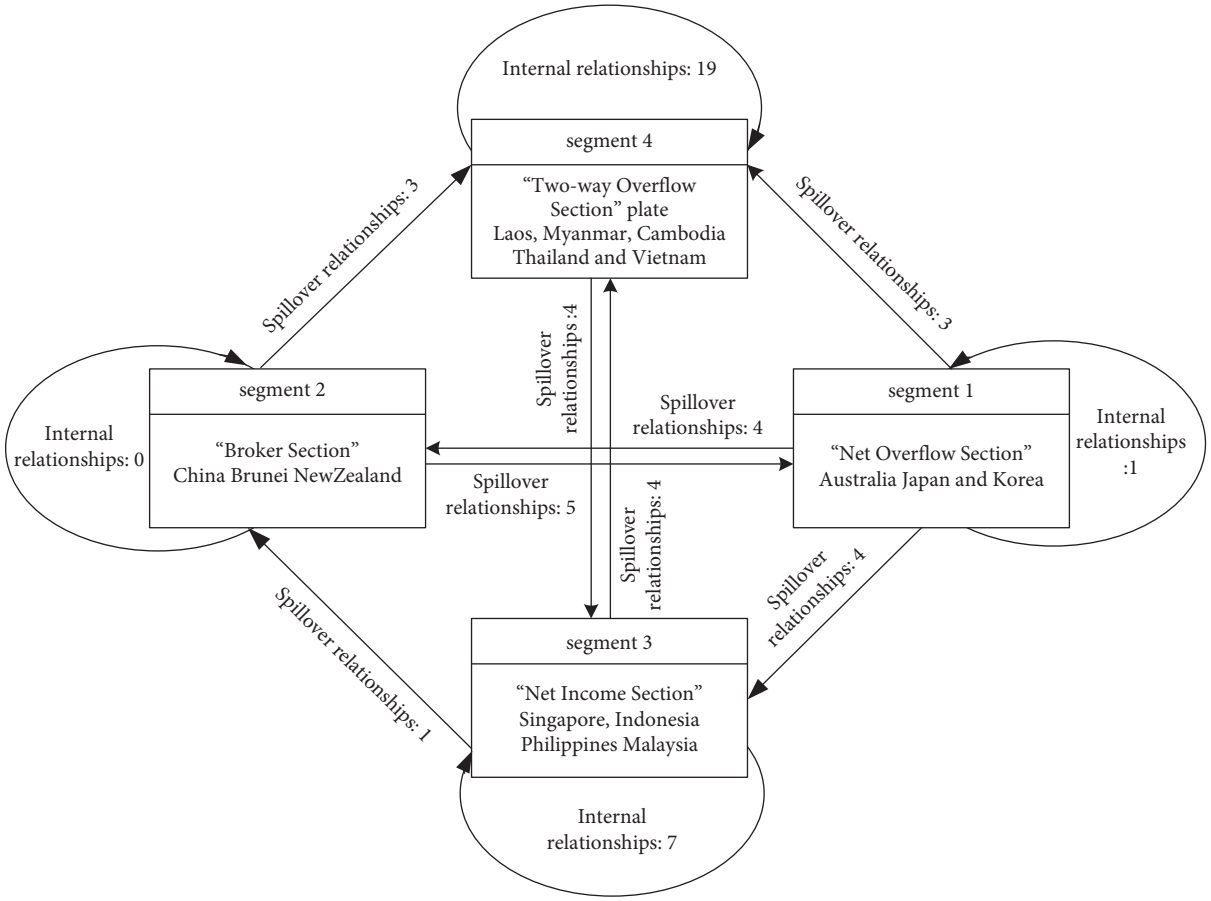

Figure 5: Correlation between the four sectors of the RECP national trade network.

Table 3: RECP trade spatial connection network density matrix and similar matrix.

	Density matrix				Similar matrix			
	Block I	Block II	Block III	Block IV	Block I	Block II	Block III	Block IV
Block I	0.167	0.444	0.333	0.2	0	1	1	0
Block II	0.556	0	0	0.2	1	0	0	0
Block III	0	0	0.583	0.2	0	0	1	0
Block IV	0	0	0.200	0.95	0	0	0	1

Note: 1 refers to connection exist and 0 refers to no connection.

fourth sector. With the abundant labor and land resources, third sector member countries are important engines in the network of trade and spatial connections of RECP countries. It transports a large number of production factors for the trade and economic development of the first and fourth plates. The fourth plate not only sends links but also receives links, playing a two-way spillover role in the trade and spatial link network of RECP countries. These results are given in Table 3.

6. Conclusion, Policy Suggestion, and Discussion

6.1. Conclusion. This study applies the correct gravity model to identify the spatial relevance of trade between China and RECP countries and explains the characteristics of the spatial relevance network of trade between PCRE countries using social network analysis methods and draws the following conclusions. Firstly, the commercial spatial connection network among RECP countries presents a complex and interrelated network structure. China, Vietnam, Thailand, Australia, and other countries are at the center of the network; however, Brunei, Malaysia, Indonesia, and other countries are at the edge of the network, while China, Vietnam, Thailand, Australia, and other countries are at the center of the network and have strong external radiation capacity and more countries are connected to it and their relations are complex. Second, from the perspective of the classification center, Vietnam, Australia, Malaysia, the Philippines, Thailand, and other countries have closer relations with RECP countries and other countries in the space trade contact network. Among them, Vietnam has the

highest concentration, reaching 71.7429, indicating that Vietnam is in the central position in the commercial space connection network between RECP countries. Third, the breakdown of brokerage centers shows that Australia, China, Korea, and Vietnam have strong control over trade between other countries in the RECP network of national trade spatial connections. The concentration of Chinese intermediaries is 13.90, indicating that China is in a central position in the trade connection network between RECP countries, acting as an "intermediary" and "bridge." Fourth, from the perspective of near central classification, Australia, China, Malaysia, and Vietnam have faster internal links with other countries in the commercial space network between RECP countries and play a central role.

6.2. Advice. Enhance coherence in trade development through the establishment of regional cooperation funds. There are great differences in the development level and industrial structure characteristics of members, as well as the cost and ability of air pollution control. As a target community in the context of air pollution, the national trade development fund can learn from the financing experience of the Green Climate Fund. Developed countries inject some funds into the mutual fund every year to promote the trade development of developing countries. At the same time, developing countries should also actively introduce foreign direct investment models, and members should pay fixed funds on a regular basis. Of course, we must also mobilize enterprises, social organizations, and other forces that may come together to actively develop and establish a "capital reserve" for multilateral cooperation to improve the spillover effect of trade among the least developed countries.

A national information, data, and technology exchange mechanism are established. The exchange of information and data between countries is not only conducive to better joint scientific research among countries, but this will also help strengthen bilateral cooperation and mutual trust and establish a better mechanism for coordinated trade development. Also, it has gained abundant investment experience in the construction of transport infrastructure. China can use its advantages to help build trade infrastructure in countries with weak infrastructure for trade development and promote information connectivity between RECP countries. At the same time, to achieve efficient and scientific trade among countries, it is necessary to establish a trade data exchange mechanism and a trade information database among RECP countries and carry out trade information exchange to promote high-quality economic development of developing countries.

6.3. Discussion. In recent years, the shadow of antiglobalization sentiment seems to have been significantly strengthened by the impact of COVID-19. Countries have established and participated in regional international trade organizations to enhance regional coordination of international economy and to govern the economic problems caused by antiglobalization; However, these measures are more based on geographical adjacent, and it aims not to break the limitation of geographical distance. If the economic governance measures were independent, there is no doubt that all countries will complete the task of international governance according to the goals, respectively. It is a spatial correlation.

Compared with previous studies, this study focuses on the spatial correlation of trade among RECP countries and improves on two aspects. For one thing, this study adopts a social network analysis for empirical research, testing the closeness and stability of spatial networks by the measurement of network density, network relevance, network rank, and network efficiency, bridging a gap in the relevant literature. Another aspect of this study is that it differs from the traditional approach of spatial econometrics in studying trade issues by constructing a revised gravity model that more intuitively breaks the restrictions of administrative regions. It is not restricted to the influence of geographical proximity and territoriality anymore and provides an in-depth analysis of the structure of the spatially connected network of trade in RECP countries.

The biggest characteristic of this study is to use the gravity model to identify the RECP space of the national trade associations, using the social network analysis method to reveal the spatial correlation structure characteristic of the network. However, as an empirical study, this study has its limitation; there is a lack of data to provide a in-depth analysis on the RECP influencing factors for the national trade association network. With the enrichment of data and the improvement of methods and technologies, this will become the direction of future academic research.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that there are no conflicts of interest.

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