

# Ecological Niche Measurement and Effect Analysis of Hub Cities Based on Logistics Network Integration

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**Abstract:** In recent years, academic research on regional economies has gradually shifted toward policy studies with cities as the primary spatial carriers. Against the backdrop of globalization and digitalization, resource elements such as capital, technology, and human resources have transcended traditional economic boundaries, establishing new carriers for economic development between cities and regions. Cities are no longer confined to their immediate hinterlands but are forming connections with broader areas, intensifying inter-city competition. The Outline for Building China's Comprehensive Three-Dimensional Transport Network, released in February 2021, proposed establishing a "trinity" national comprehensive transport hub system, emphasizing the accelerated development of approximately 20 international comprehensive transport hub cities and 80 national comprehensive transport hub cities to promote a new regional spatial development model characterized by "hub-network" connectivity. As core carriers of regional economic development, hub cities leverage platforms in transportation, logistics, and information to perform critical functions in the aggregation, radiation, and diffusion of economic factors. These cities serve as innovation leaders in regional network structures, acting as key nodes connecting global and domestic supply chains and as central elements in building efficient supply chain service systems. This study primarily employs niche theory models to measure and comprehensively analyze the development of hub cities' ecological niches, providing constructive recommendations to help each hub city clarify its current developmental status. By adjusting urban development strategies and industrial structures based on their ecological niches, cities can focus on enhancing core competitiveness to drive high-quality regional economic growth. The research specifically examines the impact of hub cities' ecological niches on logistics industry agglomeration. Control variables include labor input, government intervention, openness, and government support, with a bidirectional fixed-effects Durbin model used to explore how niche fitness influences industrial agglomeration. The results indicate that niche fitness has a significantly positive effect on logistics industry agglomeration. Among the control variables, human capital and openness exhibit positive spatial spillover effects on logistics industry growth in both local and neighboring cities. Based on these findings, the study proposes four key strategies to promote high-quality development of China's hub cities: (1) Implementing a "dual coordination" strategy to strengthen internal and external resource integration and regional collaboration, thereby enhancing logistics network resilience; (2) Adopting differentiated positioning strategies to guide hub cities in ecologically overlapping regions like East and Central China toward specialized development, establishing coastal-inland synergies; (3) Building a symbiotic logistics network system through policy coordination and resource sharing to form an integrated "corridor-hub-network" framework; (4) Deepening openness and cooperation by optimizing trade policies and cultural coordination to boost international logistics competitiveness. These strategies collectively provide theoretical foundations and practical pathways for optimizing China's national logistics hub system and fostering coordinated regional development.

**Keywords:** Hub cities; Logistics network; Niche competitiveness; Industrial agglomeration; Fixed effects.

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## 1. Introduction

The level of ecosystem suitability can, to some extent, reflect the competitiveness of hub cities. Hub cities with high niche suitability can attract greater concentrations of enterprises, talent, capital, and technological resources, forming resource hubs. Through market mechanisms and government guidance, these cities achieve efficient allocation of resources across the upstream and downstream logistics industrial chain, thereby enhancing overall operational efficiency. An environmentally suitable ecosystem improves the overall condition of the logistics ecosystem. Hub cities with high niche suitability typically possess a favorable innovation environment, facilitating technological and business model innovation among logistics enterprises. Higher levels of niche suitability, along with regional economic development, logistics service capabilities, infrastructure resources, and technological innovation capacity, all positively influence industrial agglomeration. Therefore, this study incorporates logistics competitiveness as an auxiliary variable in the research framework. To assess

the impact of hub cities' niche suitability on regional logistics industry agglomeration, this study employs a Spatial Durbin Model (SDM), which integrates all the aforementioned factors for comprehensive analysis.

## 2. Literature Review

Since its inception, niche theory has undergone significant expansion and deepening from ecology to multidisciplinary applications. Johnson first employed the niche concept to examine interspecies relationships and species-environment interactions. Gause [1] enriched the theory with the competitive exclusion principle, positing that two species cannot indefinitely coexist in identical niches, inevitably forming dominant-subordinate relationships through competition. Odum [2] redefined the niche as a species' functional position within ecosystems, emphasizing both biotic-abiotic interactions and interspecies relationships as competitive outcomes. Hutchinson [3] mathematically formalized niche boundaries through n-dimensional hypervolume theory, while Whittaker [4] conceptualized niches as spatiotemporal occupation patterns. Subsequent

scholars including Grubb [5], Laland [6], and Tilman [7] advanced the theory toward multidimensional, dynamic analyses, enhancing its applicability across disciplines. Sophisticated logistics hub networks constitute essential infrastructure for urban economic expansion and efficiency. Integrated transport hubs amplify economic agglomeration and spatial radiation effects [8, 9]. Sun Wenxia and Ding Xue [10, 11] analyzed logistics enterprise niches through overlap, separation, and expansion dimensions, proposing "internal horizontal cooperation, external vertical collaboration" development pathways with differentiated competition strategies. Liu Sijing [12] optimized Chongqing's logistics spatial layout using niche modeling. Qin Ligong et al. [13] applied niche fitness theory to develop minimal-cost logistics center location models. Liu Zhaohui [14] introduced port niche theory, evaluating Hebei's port competitiveness through niche width and overlap metrics.

Substantial evidence confirms positive spatial correlations between logistics agglomeration and regional economic growth [15, 16]. Zhong Changbao and Qian Kang [17] demonstrated Yangtze River Economic Belt's logistics clusters positively influence economic development via spatial econometrics. Xu Qiuyan and Fang Shengfei [18] identified significant spatial spillover effects to neighboring regions. Subsequent studies revealed: logistics-social capital spatial interdependence [19], technology-efficiency mediated spillovers [20], and Guangdong's growth-logistics agglomeration linkages [21]. Min Xudong et al. [22] emphasized logistics-industrial synergy for regional development. In urban logistics hub research, Bai Yangmin and Li Yan [23] integrated ecological and innovation cluster theories to conceptualize logistics innovation ecosystems. Cao Bingru [24] advocated dismantling administrative barriers for spatiotemporal logistics resource optimization. Qin Lu [25] developed China's urban logistics network hierarchy using 5A-level enterprise distributions. Li Mingfang [26] and Liang Chen [27] constructed Beijing-Tianjin-Hebei hub-and-spoke logistics networks through gravity modeling and genetic algorithms respectively, advancing niche theory's application in logistics agglomeration studies.

### 3. Research Area and Research Methods

#### 3.1. Research Area

This study constructs a spatial econometric model using panel data from 99 Chinese hub cities spanning 2011 to 2021. The dataset was carefully selected based on data continuity and availability, with all original data sourced from: The China Statistical Yearbook (published annually). Local statistical yearbooks officially released by each hub city's statistics bureau

#### 3.2. Indicator Selection

##### 3.2.1. Dependent Variable

To examine the influencing factors of logistics network integration in hub cities, this study adopts industrial agglomeration (LQ) as the dependent variable. The agglomeration of logistics industry typically relies on transportation hub facilities (e.g., ports, airports, rail freight terminals, highway hubs), R&D institutions, and administrative bodies. These facilities and institutions provide essential infrastructure and support for logistics

network integration, thereby enhancing the efficiency and fluidity of logistics activities. Industrial agglomeration furnishes the necessary infrastructural foundation and support conditions for network integration, while network integration further optimizes resource allocation and service quality within industrial agglomerations.

In measuring logistics industry agglomeration levels, location quotient (LQ) serves as a core explanatory variable widely employed to quantify regional specialization in logistics. This method evaluates agglomeration levels by comparing the ratio of value-added in logistics to total economic value-added within a given region. Specifically, the location quotient is calculated as follows:

$$LQ_{it} = \frac{E_{it} / E_t}{Y_{it} / Y_t}$$

$LQ_{it}$  Logistics industry agglomeration degree of city  $i$  in period  $t$ .  $E_{it}$  Value-added of logistics industry in city  $i$  during period  $t$ .  $E_t$  Total logistics industry value-added across all hub cities in period  $t$ .  $Y_{it}$  GDP value-added of city  $i$  in period  $t$ .  $Y_t$  Total GDP value-added of all hub cities in period  $t$ . Based on the location quotient (LQ) values, logistics industry agglomeration levels are classified into four tiers:  $LQ < 0.5$ : Dispersed logistics industry (below-average concentration).  $0.5 \leq LQ < 1$ : Moderately concentrated logistics industry (approaching average).  $1 \leq LQ < 1.25$ : Medium concentration (above-average specialization).  $LQ \geq 1.25$ : Highly concentrated logistics industry (significant specialization advantage)

##### 3.2.2. Explanatory Variable

Niche suitability serves as a critical indicator for assessing industrial development within hub cities' ecosystems, effectively reflecting the current state of their logistics ecosystems.

##### 3.2.3. Control Variables

This chapter examines the spatial spillover effects of hub cities' niche suitability on logistics industry agglomeration. Given that multiple factors beyond niche suitability influence agglomeration patterns, and to mitigate potential endogeneity bias, the following control variables are introduced:

(1) Labor input (l):

Within Lucas' human capital theoretical framework, labor is recognized as a pivotal economic variable affecting output. In logistics, practitioners' expertise and skills significantly impact operational efficiency. Professionals optimize critical processes including transportation, warehousing, and distribution through route planning, loading efficiency improvements, and cargo loss reduction, thereby enhancing overall system performance. This study quantifies this factor using the annual average number of logistics industry employees in each hub city.

(2) Government intervention (gov):

Local government fiscal policies substantially influence regional economic growth, with public expenditure serving as a key policy implementation mechanism. Industrial agglomeration theory suggests that appropriate governmental interventions tailored to regional development needs can effectively promote industrial growth. This study measures this variable through the ratio of municipal fiscal expenditure to local GDP, accurately reflecting governmental

participation in economic activities.

(3) Openness level (open):

Trade openness correlates strongly with trade facilitation measures, crucially impacting cross-border trade and international logistics development. Enhanced openness facilitates trade policy implementation, expands international trade volumes, and stimulates logistics demand. This variable is quantified by the proportion of total import/export value to local GDP.

(4) Government support intensity (support):

This indicator measures governmental commitment to technological innovation, quantified by the proportion of science and technology expenditure in total fiscal spending. Recent data reveals sustained growth in national R&D investments, with 2023 expenditures reaching 3,335.71 billion yuan (8.4% YoY growth), representing 2.65% of GDP (+0.09 percentage points). This reflects strengthened national policy support, providing both guidance and funding for regional innovation initiatives.

### 3.3. Study Methods

#### 3.3.1. Urban ecological niche suitability model

Ecological niche suitability represents the species within a certain range of adaptation to the environment resources, for urban system, can use the niche suitability model comparison hub urban system of the ecological factor in the actual value and optimal deviation degree, to measure the hub city development needs the optimal ecological environment and now have the fit between the space resources. Calculate the i-niche suitability F of the hub city<sub>i</sub> The real ecological niche is  $x'_{ij}$ , With the optimal ecological niche  $x_{aj}$  Close to the use of Wu Cui and Tan Qingmei The mathematical expression is:

$$K_i = \sum_{j=1}^n \omega_j \frac{\min\{|x'_{ij} - x_{aj}|\} + \beta \max\{|x'_{ij} - x_{aj}|\}}{|x'_{ij} - x_{aj}| + \beta \max\{|x'_{ij} - x_{aj}|\}}$$

$x_{aj}$  is the optimal value of the ecological factors. Since it is difficult to do large-scale experiments in urban systems, this paper will use the maximum value in the evaluation index to determine the optimal demand. The evaluation indexes of urban ecological niche are all positive factors, and the optimal ecological value of ecological factor j meets the following formula:

$$x_{aj} = \max(x'_{aj})$$

$\omega_j$  It is the weight of the th ecological factor calculated by the entropy weight method; it is the model parameter and can be calculated with =0.5:  $\beta K_i$

$$\beta = \frac{\frac{1}{nm} \sum_{i=1}^m \sum_{j=1}^n (|x'_{ij} - x_{aj}|) - 2 \min\{|x'_{ij} - x_{aj}|\}}{\max\{|x'_{ij} - x_{aj}|\}}$$

$\beta$  For the parameters, Li Zizhen et al. considered about 0.35 as appropriate to measure the ecological niche suitability of crops.

To further evaluate the evolutionary space of the niche, the evolutionary momentum E of the niche suitability of urban ii:

$$E_i = \sqrt{\frac{\sum_{j=1}^n |x'_{ij} - x_{aj}|}{n}}$$

#### 3.3.2. Spatial Durbin Model (SDM)

The Spatial Durbin Model represents an advanced extension that synthesizes features of both the spatial lag model (SLM) and spatial error model (SEM). It simultaneously incorporates spatial lags of both dependent and independent variables to capture comprehensive spatial interaction effects. The model specification is expressed as:

$$y = \rho Wy + X\beta + \gamma WX + \varepsilon$$

Spatial spillover coefficient ( $\rho$ ): Quantifies the impact of neighboring regions' independent variables on the focal region's dependent variable. his model provides precise characterization of: patial spillover effects in the dependent variable. Spatial externalities generated by various explanatory factors

## 4. Regression Analysis of Hub Cities' Niche Suitability on Logistics Industry Agglomeration

### 4.1. Spatial Autocorrelation Analysis

The presence of spatial dependence may lead to decreased model fit and biased variance estimation in conventional regression, significantly deviating from results obtained under the independent sample assumption. Therefore, accurately identifying spatial autocorrelation characteristics is crucial for constructing appropriate spatial econometric models.

This section examines whether the study data exhibit spatial autocorrelation, providing empirical justification for subsequent spatial econometric modeling. If significant spatial dependence is confirmed, dedicated spatial econometric techniques must be employed for robust analysis.

#### 4.1.1. Global Spatial Autocorrelation Test

Prior to spatial regression, Moran's I test was conducted on industrial agglomeration levels using: Software: Stata 17.0

Weight matrix: Economic-distance-based spatial weights

Result: Positive Moran's I index (see Table X for significance levels)

**Table 1.** Global Spatial Autocorrelation Analysis

year	I	Z	P-value
2011	0.1105	2.6069	0.0091
2012	0.1458	3.3638	0.0008
2013	0.0943	2.2588	0.0239
2014	0.1676	3.8495	0.0001
2015	0.1581	3.6379	0.0003
2016	0.1757	4.0102	0.0001
2017	0.1747	3.9869	0.0001
2018	0.1657	3.7965	0.0001
2019	0.1706	3.9030	0.0001
2020	0.1566	3.6053	0.0003
2021	0.0945	2.2951	0.0217

The table reveals that, except for 2013 and 2021 which were significant at the 5% level, the global Moran's I indices

for the 99 hub cities in other years consistently hovered around 0.3 and all reached the 1% significance level. This indicates a stable positive spatial autocorrelation in industrial agglomeration across China's hub cities, with Moran's I indices fluctuating within the range of 0.0943 to 0.1757 throughout the study period, demonstrating remarkable consistency in spatial clustering patterns.

#### 4.1.2. Local Spatial Autocorrelation Analysis

The local spatial autocorrelation analysis serves to identify and capture localized spatial characteristics that may be obscured in global analysis, thereby providing a more nuanced understanding of spatial patterns. Using the local Moran's I index with an economic-geographic weight matrix, this study focuses on key policy implementation years (2011 and 2021) for comparative assessment of policy effectiveness. Based on cross-sectional data reflecting the varying scales of logistics agglomeration across China's hub cities, we generated scatter plots to analyze local spatial autocorrelation patterns. These visualizations compare the industrial agglomeration relationships between hub cities and their neighboring areas for the two selected years, revealing the evolving spatial dynamics of logistics concentration over the decade. The analysis employs an economic-distance-based spatial weights matrix to examine significant local clusters (hot spots and cold spots) while controlling for multiple comparisons. The quadrant plots (HH, LL, HL, LH) demonstrate how spatial associations between hub cities and their surroundings have transformed between the beginning and end of the study period, offering critical insights into the localized impacts of regional development policies on logistics industry distribution patterns.

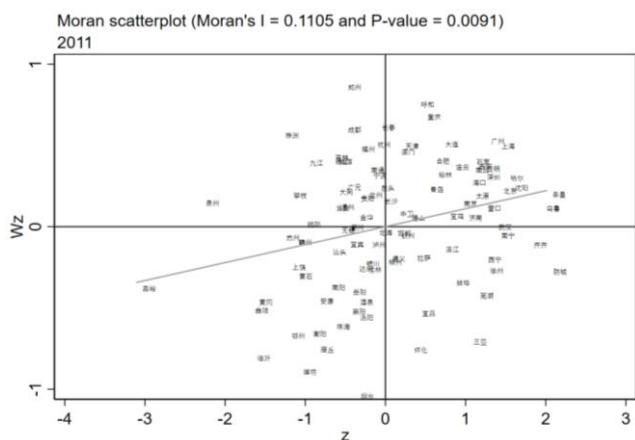


Figure 1. Moran's I Scatter Plot (2011)

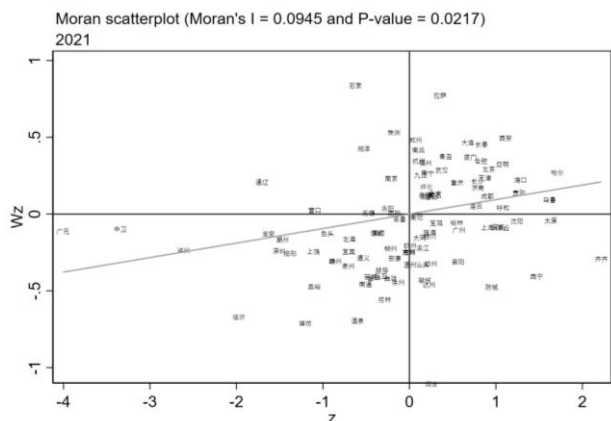


Figure 2. Moran's I Scatter Plot (2021)

## 4.2. Analysis of Regression Results

The table presents the estimation results from the two-way fixed effects model. The coefficient of the core explanatory variable, niche suitability, is 0.485, indicating that improvements in the ecological niche suitability of hub cities can directly influence industrial agglomeration during the logistics industry clustering process.

The direct effect of urban niche suitability on logistics industry agglomeration in hub cities is 0.487, demonstrating a significantly positive impact of niche suitability on logistics industry clustering. However, the indirect effect is not statistically significant, suggesting that the niche suitability of hub cities does not exhibit noticeable spatial spillover effects. This implies that while the agglomeration of logistics industry in each city promotes its own economic growth, it does not significantly affect the growth of logistics industry agglomeration in neighboring hub cities.

Table 2. Regression Results of Suitability on Logistics Agglomeration

Variables	Main	Wx	Spatial	Variance
Insuit	0.485*** (0.10)	0.387 (0.33)		
lnl	0.991*** (0.10)	-0.217 (0.27)		
Ingov	-0.141* (0.07)	- 0.517*** (0.23)		
lnopen	0.048* (0.03)	0.147* (0.08)		
Insupport	- 0.068*** (0.02)	- -0.058 (0.06)		
rho			0.131* (0.08)	
sigma2_e				0.088*** (0.00)
Observations	1089	1089	1089	1089
R-squared	0.082	0.082	0.082	0.082
Number of id	99	99	99	99

Note: \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

To more precisely examine the influence of various factors on the evolution of logistics industry agglomeration in hub cities from 2011 to 2021, this study employs the partial differential effects decomposition method to analyze both direct effects and spillover effects. The decomposition results are presented in the table below.

The direct effect coefficient of ecological niche suitability level (Insuit) is 0.496, and the spillover effect coefficient is 0.529. The direct effect coefficient is significantly positively correlated and passed the test at the 1% significance level. The spillover effect coefficient also showed a significant positive correlation and passed the test at the 10% significance level. The improvement of ecological niche suitability will increase the agglomeration of logistics industry in hub cities, and the positive correlation of spillover effects indicates that the ecological niche suitability of surrounding areas will also increase the agglomeration of logistics industry development in the local area, indicating that there is a positive spatial

spillover effect of urban ecological niche suitability. The total effect is 1.025, which passed the test at a significance level of 1%. This comprehensive effect not only emphasizes the direct impact of ecological niche suitability on local logistics industry agglomeration, but also highlights its indirect promotion effect on the development of logistics industry agglomeration in surrounding hub cities. Therefore, it can be clearly stated that in the process of improving the ecological niche suitability of cities, it not only has a significant impact on the development of logistics industry in the local area, but also effectively promotes the agglomeration and development of logistics industry in surrounding hub cities.

**Table 3.** Double Fixed Effects Spatial Durbin Model Regression Decomposition

Variables	Direct effects	spillover effects	total effects
Insuit	0.496*** (0.11)	0.529* (0.34)	1.025*** (0.36)
lnl	0.985*** (0.10)	-0.104 (0.30)	0.881*** (0.32)
Ingov	-0.141** (0.07)	-0.616*** (0.23)	-0.757*** (0.24)
lnopen	0.049* (0.03)	0.183* (0.09)	0.232** (0.10)
Insupport	-0.069*** (0.02)	-0.076 (0.07)	-0.144** (0.07)

Note: \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

The direct benefit coefficient of labor input level (lnl) is 0.985, the spillover effect coefficient is -0.104, and the total effect is 0.881. The direct effect coefficient is significantly positively correlated and passed the test at a significance level of 1%. The spillover effect coefficient is negatively correlated but not significant. A high-level workforce means higher work efficiency, stronger technological innovation capabilities, and better service quality, all of which are key factors in the agglomeration of the logistics industry. Therefore, there is a direct positive correlation between labor level and logistics industry agglomeration. The correlation coefficient of 0.985 indicates that for every unit increase in labor level, the degree of logistics industry agglomeration will correspondingly increase by 0.985 units, demonstrating a strong positive driving effect. In hub cities, with the agglomeration of logistics industries, labor mobility tends to be more developed cities, which does not provide good help for the development of talent in surrounding areas. High skilled labor can bring advanced concepts and technologies to cities with higher levels of industrial agglomeration during the mobility process, resulting in uneven distribution of talent and inhibiting the overall improvement of the industry. Therefore, the spillover effect of labor has a negative driving effect on the agglomeration of the logistics industry. The quality of labor plays an important role in the agglomeration of logistics industry in hub cities. The government and enterprises should pay more attention to improving the level of labor force, and enhance the professional skills and comprehensive quality of labor force through education and training, talent introduction, etc., to provide strong talent support for the agglomeration of logistics industry. The mobility of labor facilitates the dissemination of knowledge and the exchange of skills. The government should establish

a sound talent mobility mechanism to promote the rational flow and optimized allocation of labor within hub cities. At the same time, encourage cross regional enterprises to strengthen communication and cooperation, and jointly enhance the competitiveness of the entire industry.

The direct effect coefficient of government intervention (Ingov) is -0.141, and the spillover effect coefficient is -0.616, both showing a negative correlation. The direct effect coefficient is significant at the 5% level, and the spillover effect coefficient is significant at the 1% level. This may be because excessive government intervention may limit free competition in the market, leading to inefficient resource allocation. In the construction of hub cities, if the government excessively participates in the planning and layout of the logistics industry, it may interfere with the natural selection process of the market, making it difficult for some competitive logistics enterprises to obtain sufficient development space. In addition, the total effect coefficient is -0.757, which is significant at the 1% level, indicating that local and neighboring government interventions jointly suppress logistics agglomeration. There may be many reasons for this, and government intervention may trigger rent-seeking behavior, increase operating costs for enterprises, and further suppress the agglomeration of the logistics industry. The spillover effect is negatively correlated, which may be because government intervention may disrupt the self-regulation mechanism of the market, making it difficult for the development of the logistics industry to match market demand. In addition, government intervention may trigger a series of chain reactions, such as distorting market price signals and suppressing corporate innovation, which will have adverse spillover effects on the agglomeration of the logistics industry.

The direct benefit coefficient of lnopen level is 0.049, and the spillover effect coefficient is 0.183. Empirical results show that the direct effect coefficient is significantly positive and the spatial spillover effect coefficient also shows a positive relationship. This phenomenon indicates that hub cities have strengthened their economic ties with overseas markets and expanded the scale and scope of import and export trade by continuously increasing their level of openness to the outside world. The increasing demand for foreign trade has provided development momentum for the local logistics industry and promoted the improvement of the level of logistics industry agglomeration. Secondly, with the improvement of the level of opening to the outside world, more logistics enterprises are attracted to enter the local market, which not only promotes the development of the local logistics industry, but also drives the coordinated development of the logistics industry in surrounding areas through mechanisms such as knowledge spillover and industrial chain extension. With the improvement of openness, advanced international logistics concepts, technologies, and management experience have been introduced and disseminated domestically, promoting the overall improvement and progress of the logistics industry. In addition, the improvement of openness can enhance the international competitiveness of the domestic logistics industry and promote its development to a higher level. Therefore, the spillover effect of openness has a positive driving effect on the agglomeration of the logistics industry.

The direct benefit coefficient of government support level (Insupport) is -0.069, and the indirect effect coefficient is -0.076. The significant negative correlation between the direct

effect coefficient and In support level indicates that government support has a negative driving effect on the agglomeration of the logistics industry. Although the government has provided support, it may not have directly transformed into a driving force for the agglomeration of the logistics industry. Perhaps due to the mismatch between the way, intensity, or direction of government support and the actual needs of logistics industry agglomeration, the support effect is limited. In addition, government support may be overly concentrated in certain specific fields or enterprises, while neglecting the balanced development of the entire logistics industry, resulting in negative effects. The spillover effect coefficient shows a negative correlation, but not significant. The overall effect is negatively correlated and passes the test at a significance level of 5%. Although government support directly promotes the development of the logistics industry, excessive government support may lead to weakened market competition and uneven resource allocation. This may reduce the innovation drive and market adaptability of logistics enterprises, thereby having a certain negative impact on the agglomeration of the logistics industry. Alternatively, government support may lead to an imbalance in resource allocation, making it difficult for some logistics companies to obtain necessary resources and support, thereby hindering the formation of logistics industry agglomeration. This result suggests that the government needs to reflect on its policies and measures to support the logistics industry. The government should have a deeper understanding of the actual needs and development trends of the logistics industry, and formulate more precise and effective support policies. The government should strengthen the coordinated development of other industries related to the logistics industry. By promoting the deep integration and coordinated development of manufacturing, commerce, and logistics industries, a positive interaction and synergistic development effect between the upstream and downstream of the industrial chain can be formed. Therefore, the government should continue to increase its support for the logistics industry, optimize the policy environment, and improve the effectiveness of policy implementation to further promote the agglomeration and development of the logistics industry. At the same time, the government should also pay attention to balancing market competition and resource allocation, and avoid the adverse consequences caused by excessive intervention.

## 5. Development Strategy for Hub Cities

(1) Implementing the "dual synergy" development strategy to promote high-quality development of hub cities

In the study, it was found that the ecological niche width of most hub cities is generally low, and low width ecological niche cities occupy fewer resource dimensions. In response to this phenomenon, the city should strengthen the all-round expansion of logistics resources, promote internal resource sharing and coordinated development of different resources, and enhance the city's aggregation and radiation capabilities. The competitive relationship between hub cities is significant, but this pattern can be changed by promoting division of labor, cooperation, functional complementarity, and coordinated development between large cities and surrounding small and medium-sized cities. At present, the construction of urban agglomerations in China has entered a stage of high-quality development. The optimization of logistics networks not only expands the scope of logistics resource utilization, but also improves resource utilization efficiency and avoids resource

waste. The trend of "dual synergy" development within and between cities can help promote the high-quality development of logistics network systems.

(2) Implementing a misaligned competition strategy to promote differentiated development of hub cities

Land port hub cities such as Jinan, Changsha, and Xi'an, as well as port hub cities such as Nanjing, Lianyungang, and Wuhan, should adopt ecological niche differentiation strategies, focus on developing port logistics, improve port logistics infrastructure, build a coastal inland linkage development pattern, form a unique logistics development model, achieve efficient integration and utilization of logistics resources, and comprehensively enhance the comprehensive ecological niche level.

(3) Implementing a logistics network symbiosis strategy and building an efficient collaborative logistics system

Promoting regional coordinated development of animal flow industry has significant economic benefits, not only effectively reducing operating costs, but also significantly improving service efficiency. To achieve this goal, it is necessary to rely on policy guidance and institutional guarantees at the national level, and promote the establishment of normalized cooperation mechanisms between cities. By building a logistics resource sharing platform, we can promote the orderly flow of talent, technology, and other factors between regions; At the same time, we will strengthen cross regional urban cooperation, create a logistics collaborative development pattern centered on the Bohai Rim Economic Zone, gradually extending inland, and ultimately achieve integrated regional transportation development.

(4) Deepen the strategy of cooperation and opening, and create a new pattern of "interconnectivity, interaction, and intercommunication"

The empirical analysis based on the spatiotemporal double fixed effects spatial Durbin model (SDM) shows that the improvement of regional openness to the outside world can not only significantly promote local economic growth, but also have positive spatial spillover effects on surrounding areas. Therefore, optimizing the policy system of opening to the outside world, enhancing the level of opening up to the outside world, and improving the pattern of opening up to the outside world have important strategic significance. Specifically, it can be promoted from the following dimensions: firstly, on the basis of strengthening regional economic and trade cooperation, efforts should be made to improve the investment environment, lower market access barriers, and eliminate trade barriers caused by local competition; Secondly, deepen regional cultural exchange and cooperation, fully utilize the rich cultural resources of specific regions such as the Yangtze River Delta, and build a new pattern of cultural openness through joint development of characteristic cultural tourism projects; Thirdly, while deepening regional opening up, actively expanding international open space, relying on the advantageous geographical location of the region, focusing on building an international logistics system, and comprehensively enhancing the level of opening up to the outside world.

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