

Spatial Patterns and Influence Mechanisms of Nighttime Cultural Tourism Consumption Clusters in China: Postprint

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Abstract

Nighttime cultural-tourism consumption clusters serve as typical exemplars for advancing high-quality development of cultural-tourism integration, holding significant importance for guiding the development of the cultural-tourism industry and unlocking nighttime consumption potential. This study employs methods including GIS spatial analysis and geographical detectors to investigate the spatial patterns and influencing mechanisms of nighttime cultural-tourism consumption clusters in China. The results indicate: (1) These clusters exhibit an agglomerative distribution pattern characterized by “dense in the east and sparse in the west, more in the south and fewer in the north,” with prominent layout features of “surrounding cities, adjacent to water, and beside scenic areas,” and a significant spatial morphology of “one primary center, two secondary centers, and multiple micro-cores.” (2) The spatial distribution demonstrates significant positive spatial autocorrelation, presenting a concentric zonal decreasing spatial differentiation pattern from “hot in the east and cold in the west.” (3) Regarding typological structure, heritage site types are distributed in regions with long historical and cultural traditions, folk customs types are concentrated in ethnic minority areas, industry-themed types are widely distributed, scenic spot types are relatively evenly distributed, and integrated cultural-tourism-commercial types are mainly located in economically developed regions. (4) Terrain, rivers, and climate constitute fundamental factors influencing the distribution, while population quality, passenger transport capacity, industrial development, and policy support represent key factors affecting their distribution.

Full Text

Spatial Pattern and Influence Mechanism of Night-time Cultural Tourism Consumption Agglomeration Areas in China

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Abstract: Night-time cultural tourism consumption agglomeration areas serve as exemplary models for promoting high-quality development of cultural-tourism integration, holding significant importance for guiding the development of the cultural tourism industry and unleashing the potential of night-time consumption. This study employs GIS spatial analysis methods, alongside geographical detectors and other approaches, to investigate the spatial pattern and influencing mechanisms of night-time cultural tourism consumption agglomeration areas in China. The findings indicate the following: (1) The distribution trend of night-time cultural tourism consumption agglomeration areas exhibits clustering, characterized by a “dense in the east and sparse in the west, more in the south and less in the north” pattern. The layout features are conspicuous, emphasizing proximity to the city, water, and scenic locales. The spatial structure is marked by “one main, two subordinate, and multiple micronuclei”. (2) The spatial distribution of night-time cultural tourism consumption agglomeration areas demonstrates a significant positive correlation, portraying a circularly decreasing spatial differentiation pattern of “hot in the east and cold in the west”. (3) Regarding type structure, historical sites and relics are concentrated in areas with rich cultural histories, local customs and traditions thrive in ethnic minority regions, industrial-themed categories exhibit broad spatial distribution, scenic spots are relatively evenly spread, and comprehensive categories encompassing cultural, tourism, and commerce predominantly manifest in economically developed areas. (4) Fundamental factors such as topography, rivers, and climate significantly influence the distribution of night-time cultural tourism consumption agglomeration areas. Meanwhile, factors such as population quality, passenger transport capacity, industrial development, and policy support emerge as pivotal determinants affecting the distribution of night-time cultural tourism consumption agglomeration areas.

Keywords: night-time cultural tourism consumption agglomeration areas; spatial pattern; type structure; influencing factors; China

Accelerating the construction of a new development pattern with domestic circulation as the mainstay and mutual promotion of domestic and international dual circulations represents a major national strategic deployment in the new era. Night-time cultural tourism consumption, characterized by strong industrial relevance, high format integration, and prominent comprehensive benefits, has become a new engine for expanding domestic demand and stimulating con-

sumption, injecting strong momentum into key links of the domestic circulation. Under the interactive influence of policy guidance and market drivers, night-time cultural tourism consumption has shown vigorous development momentum. However, problems such as weak cultural awareness, severe homogenization, and incomplete supporting facilities have constrained the release of night-time cultural tourism consumption potential. In this context, China has begun planning the construction of night-time cultural tourism consumption agglomeration areas, attempting to organically integrate regional culture with night-time tourism through cultural exhibitions, artistic performances, and cultural experiences, thereby promoting the benign interaction between cultural heritage inheritance and socio-economic development. Nevertheless, due to significant differences in natural foundations and human environments across regions, the spatial distribution, type structure, and influencing factors of night-time cultural tourism consumption agglomeration areas are complex and diverse, with superimposed spatial heterogeneity elements causing numerous challenges for the construction of these agglomeration areas, such as increasing policy applicability difficulty and weakening the degree of supply-demand matching. Therefore, based on the actual construction of night-time cultural tourism consumption agglomeration areas, exploring their spatial patterns, type structures, and influencing mechanisms is of great practical significance for optimizing spatial ecology and cultivating new drivers of cultural tourism consumption.

Night-time cultural tourism research, as an interdisciplinary and multi-paradigm field, has always received academic attention. Foreign scholars have conducted extensive research on night-time cultural tourism consumption from perspectives spanning economics, sociology, and management, covering spatial carriers, experience types, and impact effects. Domestic scholars have conducted more systematic research on night-time cultural tourism consumption, primarily from a tourism discipline perspective, examining product types, development models, functional benefits, influencing factors, and improvement paths. Some scholars have also explored tourist night-time consumption behavior patterns, tourism experiences, and image perception from the tourist perspective. In recent years, night-time cultural tourism consumption space has gradually gained attention. For instance, Fu Caiwu et al. employed scene theory to analyze the spatial structure of night-time cultural tourism consumption in Changsha's Super Wenhoyou. Wang Lin et al., based on measuring night-time economic vitality, identified the spatial pattern and agglomeration types of Shanghai's night-time economic agglomeration areas, finding that different types exhibit obvious circular patterns. Mo Linli and Luo Yingying et al. respectively studied the spatial distribution and influencing factors of night-time cultural tourism consumption agglomeration areas at national and provincial scales. Research indicates that the spatial heterogeneity of night-time cultural tourism consumption agglomeration areas is significant, influenced by climatic conditions, resource endowments, economic foundations, and supporting facilities.

Overall, existing research is primarily qualitative, with relatively weak quantitative studies. Few studies address geographical spatial structure issues, but lack

systematic 梳理 of the type structure of night-time cultural tourism consumption agglomeration areas. Moreover, research on influencing factors of spatial distribution remains somewhat weak, with no systematic indicator framework yet formed. In view of this, this paper adopts a comprehensive geographical perspective, employing GIS spatial analysis and geographical detectors to investigate the spatial structure, type structure, and influencing mechanisms of China's night-time cultural tourism consumption agglomeration areas, aiming to provide scientific references for optimizing spatial ecology and cultivating new drivers of cultural tourism consumption.

1.1 Theoretical Framework

[Figure 1: see original paper] Theoretical framework of research on the spatial distribution and influencing factors of night-time cultural tourism consumption agglomeration areas

Geography is a systematic science studying the spatial distribution patterns, temporal evolution processes, and regional characteristics of geographical elements, with “spatial distribution” and “human-environment” relationships as its core research themes. Night-time cultural tourism consumption agglomeration areas, as cultural landscapes formed by the interaction between human activities and regional environments, are inherently spatial development issues and human-environment relationship issues. Geographical theories of spatial systems, human-environment relationships, and cultural ecology can provide theoretical explanations for their spatial distribution.

From the perspective of spatial system theory, night-time cultural tourism consumption agglomeration areas, as a geographical phenomenon, exhibit obvious spatial heterogeneity. Their spatial structural characteristics can be explored from dimensions such as spatial type, spatial density, and spatial association to reveal their spatial distribution patterns. From the human-environment relationship theory perspective, cultural landscapes serve as the intersection between humans and nature, representing the spatial manifestation of human-environment system interactions and important factors influencing human-environment system evolution. From the cultural ecology perspective, night-time cultural tourism consumption agglomeration areas result from the coupling of regional natural and human environments, reflecting the natural ecology and socio-economic conditions of agglomeration areas and representing the concentrated embodiment of harmonious human-environment system evolution. Therefore, cultural landscapes can be embedded into human-environment relationship research to reveal the influencing mechanisms of night-time cultural tourism consumption agglomeration area spatial distribution from the perspective of human-environment system interaction mechanisms. Natural ecology and resource endowments constitute the core content of the “environment” system, reflecting the influence of the natural environment on the distribution of night-time cultural tourism consumption agglomeration areas. Economic and social environments represent the external manifestations of human activities’

impact on natural systems, reflecting the influence of human environments on the distribution of night-time cultural tourism consumption agglomeration areas.

In view of this, this paper integrates spatial system theory, human-environment relationship theory, and cultural ecology theory to explore the spatial pattern and influencing mechanisms of China's night-time cultural tourism consumption agglomeration areas, following the geographical research thread of "spatial distribution" and "human-environment" relationships. This aims to provide theoretical support and decision-making references for the administrative management, planning, and layout optimization of night-time cultural tourism consumption agglomeration areas.

1.2 Data Sources

Data on night-time cultural tourism consumption agglomeration areas were derived from the list of national-level night-time cultural and tourism consumption agglomeration areas released by the Ministry of Culture and Tourism in 2021. Geospatial data were obtained by geocoding the addresses of these agglomeration areas using the Amap API and performing coordinate correction in ArcGIS 10.2. Digital Elevation Model (DEM), river systems, and climate zoning data were obtained from the Resource and Environmental Science and Data Center of the Chinese Academy of Sciences (<https://www.resdc.cn/>). Data on national key cultural relics protection units were derived from the State Council's published lists of national-level protection units (1st to 8th batches). Intangible cultural heritage data were sourced from the State Council's published national intangible cultural heritage lists (1st to 5th batches). Data on high-level scenic spots and star-rated hotels (2021) were obtained from the Ministry of Culture and Tourism. Socio-economic data were sourced from the 2021 China Statistical Yearbook and provincial/municipal statistical yearbooks.

1.3 Methods

1.3.1 Nearest Neighbor Index

The nearest neighbor index reflects the proximity degree among point elements, thereby revealing the spatial distribution type of night-time cultural tourism consumption agglomeration areas. The calculation formula is as follows:

$$R = (1/n) * \sum(d_i) / (0.5 * \text{sqrt}(A/n))$$

Where: R is the nearest neighbor index; d_i is the distance from point i to its nearest neighbor; n is the number of agglomeration areas; A is the study area.

1.3.2 Kernel Density Analysis

Kernel density analysis reflects the spatial agglomeration state of point elements and can characterize the distribution patterns and features of night-time cultural

tourism consumption agglomeration areas. The calculation formula is as follows:

$$f(x) = (1/(nh)) * \sum K((x - x_i)/h)$$

Where: $f(x)$ is the kernel density; $K(\cdot)$ is the weight function; n is the number of points; h is the bandwidth; x_i is the distance from point x to x_i .

1.3.3 Spatial Autocorrelation Analysis

The global Moran's I index reflects the influence of regions with spatial adjacency attributes on their neighbors, revealing the spatial association attributes of night-time cultural tourism consumption agglomeration areas. The calculation formula is as follows:

$$I = (n/\sum\sum w_{ij}) * (\sum\sum w_{ij}(x_i - \bar{x})(x_j - \bar{x})) / (\sum(x_i - \bar{x})^2)$$

Where: x_i and x_j represent the number of night-time cultural tourism consumption agglomeration areas in provinces i and j , respectively; \bar{x} is the average number of agglomeration areas; w_{ij} is the spatial weight; n is the number of study units.

The Getis-Ord G_i^* index reflects local high-low value clusters, enabling identification of cold and hot spot regions of night-time cultural tourism consumption agglomeration areas. The calculation formula is as follows:

$$G_i^* = (\sum w_{ij} x_j) / (\sum x_j)$$

Where: G_i^* is the local association index; $Z(G_i)$ is the Z-test value; $E(G_i)$ and $\text{Var}(G_i^*)$ are the mathematical expectation and variance, respectively.

1.3.4 Geographical Detector

Geographical detector is a statistical method for exploring spatial differentiation of geographical elements and their driving factors. This paper employs the factor detection module to reveal the influencing mechanisms of night-time cultural tourism consumption agglomeration area spatial distribution.

$$q = 1 - (1/N\sigma^2) * \sum(N_i \sigma_i^2)$$

Where: q is the factor explanatory power; N is the number of layers of the independent variable; N_i and N are the number of units in layer i and the entire region, respectively; σ_i^2 and σ^2 are the variances of layer i and the entire region, respectively. $q \in [0, 1]$, with larger q values indicating stronger factor explanatory power.

2 Results and Analysis

2.1 Spatial Distribution Characteristics

2.1.1 Spatial Distribution Type China's night-time cultural tourism consumption agglomeration areas exhibit an overall clustered distribution pattern

of “dense in the east and sparse in the west, more in the south and less in the north” (Figure 2). The nearest neighbor index analysis reveals a nearest neighbor index of 0.52, indicating a significant clustered distribution pattern. Regionally, using the “Hu Huanyong Line” as a boundary, night-time cultural tourism consumption agglomeration areas show a “dense in the east and sparse in the west” distribution characteristic, with obvious differences in quantity and density between the east and west sides, aligning with the regional differentiation of the Hu Huanyong population demarcation line. East of the “Hu Huanyong Line” there are 175 agglomeration areas, accounting for 89.71% of the national total, with a distribution density of 0.52×10^{-2} per km^2 . The Yangtze River Delta and Chengdu-Chongqing urban agglomerations host numerous agglomeration areas with significant spatial concentration. West of the “Hu Huanyong Line” there are 20 agglomeration areas, accounting for 10.29% of the national total, with a distribution density of 0.05×10^{-2} per km^2 . The Qinghai-Tibet Plateau region has few agglomeration areas, showing obvious spatial dispersion characteristics. From a north-south perspective, night-time cultural tourism consumption agglomeration areas exhibit a “more in the south and less in the north” distribution pattern, with 117 agglomeration areas in southern China (60.08% of the national total) and 78 in northern China (39.92% of the national total), demonstrating clear north-south differentiation.

2.1.2 Spatial Distribution Density The national distribution density of night-time cultural tourism consumption agglomeration areas is 0.25×10^{-2} per km^2 . Shanghai reaches a density of 18.93×10^{-2} per km^2 , Beijing 6.70×10^{-2} per km^2 , while Tibet Autonomous Region and Qinghai Province have only 0.02×10^{-2} and 0.03×10^{-2} per km^2 , respectively, indicating significant inter-regional density differences. Kernel density analysis using ArcGIS 10.2 reveals that night-time cultural tourism consumption agglomeration areas are mainly distributed around urban agglomerations and provincial capitals, forming a high-density region in the Yangtze River Delta, a secondary high-density region in the Beijing-Tianjin-Hebei area, a secondary high-density region in the Chengdu-Chongqing urban agglomeration, and multiple micronuclei clustering centers centered on provincial capitals. This presents a spatial pattern of “one main, two subordinate, and multiple micronuclei” (Figure 3). The main core region is centered on Shanghai, radiating to Jiangsu, Anhui, Zhejiang, and other provinces, with an obvious circular decreasing structure. The Beijing-Tianjin-Hebei subordinate core region is centered on Beijing, driving Tianjin, Hebei, Shandong, and other areas to form an obvious ring-shaped extension group. The Chengdu-Chongqing urban agglomeration subordinate core region is centered on Chengdu and Chongqing, decreasing sequentially from inside to outside with a clear “core-periphery” structure. Additionally, Xinjiang Uygur Autonomous Region, Tibet Autonomous Region, Gansu Province, Ningxia Hui Autonomous Region, and Shaanxi Province present obvious micronuclei clustering centers, which are centered on provincial capitals and spread stepwise to surrounding areas with clear hierarchical decreasing patterns. This

pattern conforms to central place theory logic, indicating that the spatial distribution of night-time cultural tourism consumption agglomeration areas is closely related to the urban network system. Urban agglomerations and provincial capitals, leveraging their locational advantages in economic foundations, market demand, and policy support, attract the clustering of night-time cultural tourism consumption agglomeration areas, making their “city-proximate” layout characteristics obvious.

2.1.3 Spatial Distribution Association Whether the “one main, two subordinate, and multiple micronuclei” spatial clustering structure can interact benignly is key to the cluster effect of night-time cultural tourism consumption agglomeration areas. Therefore, it is necessary to explore the spatial association characteristics of night-time cultural tourism consumption agglomeration areas. The global Moran’s I calculation results show a global Moran’s I index of 0.52 for night-time cultural tourism consumption agglomeration areas, passing the 1% significance test, indicating strong spatial positive correlation. The Getis-Ord G_i^* index analysis of local differentiation, using the Jenks classification method, divides areas into hot spots, secondary hot spots, secondary cold spots, and cold spots (Figure 4). Hot spots and secondary hot spots are concentrated east of the “Hu Huanyong Line” and south of the Qinling-Huaihe line, showing a “group-shaped, ring-nucleus” distribution. Hot spots exhibit a “group-shaped” distribution, including Zhejiang, Fujian, Anhui, Jiangxi, Henan, Hubei, and Hunan provinces. Secondary hot spots extend in a “ring-nucleus” pattern around hot spots, including Shanghai, Shaanxi, Guizhou, Guangdong, and other provinces/municipalities. Cold spots and secondary cold spots cluster near the “Hu Huanyong Line” and north of the Qinling-Huaihe line, showing circular diffusion characteristics. Cold spots exhibit a “belt-shaped” pattern, clustering in western and northeastern regions, while secondary cold spots show an “arc-shaped” pattern, including Beijing, Tianjin, Hebei, Shanxi, and other provinces/municipalities. The distribution pattern of night-time cultural tourism consumption agglomeration areas shows strong spatial association and obvious regional differentiation, concentrated in a “hot in the east and cold in the west” circularly decreasing spatial structure, primarily caused by regional differentiation and spatial association of natural environments and human elements.

2.2 Influencing Factors

2.2.1 Influencing Factor Selection Cultural ecology emphasizes the interaction between culture and environment, considering cultural landscapes as products of the interaction among natural, social, economic, and other environmental elements. Night-time cultural tourism consumption agglomeration areas, as cultural landscapes formed by the coupling of human activities and regional environments, are inevitably influenced by these elements. Therefore, referencing the selection criteria for night-time cultural tourism consumption agglomeration areas and drawing on relevant research findings, this paper selects

influencing factors for the spatial distribution of night-time cultural tourism consumption agglomeration areas from four dimensions: natural ecology, resource endowment, economic environment, and social environment (Table 2). Through overlay analysis and geographical detectors, the influencing mechanisms of night-time cultural tourism consumption agglomeration area distribution are analyzed.

2.2.2 Influencing Factor Analysis

2.2.2.1 Natural Ecology

- (1) Topographic characteristics. Overlay analysis of national elevation maps with the spatial distribution of night-time cultural tourism consumption agglomeration areas reveals obvious quantitative differences across topographic steps, showing a geometric series decreasing trend with increasing terrain elevation (Figure 5). The first step features numerous plateaus and mountains with high elevation and significant terrain 起伏, hosting few night-time cultural tourism consumption agglomeration areas (only 2.47% of the total), scattered around river valley basins with superior natural conditions. The second step shows increased agglomeration areas, but due to high elevation and complex terrain, they mainly cluster along canyon sides and basin edges, showing a scattered point distribution pattern. The third step features extensive plains and hills with significantly increased agglomeration areas, showing obvious low-altitude clustering characteristics, with 76.95% of night-time cultural tourism consumption agglomeration areas located below 500 m elevation.
- (2) River systems. River systems nurture rich cultural and eco-tourism resources, serving as important foundations for night-time cultural tourism consumption agglomeration area construction. Buffer analysis of third-level and above rivers using ArcGIS 10.2 shows that 44.03% of night-time cultural tourism consumption agglomeration areas are distributed within 0-5 km of water systems, with proportions of 29.22%, 8.64%, 6.17%, 5.35%, and 3.70% at distances of 5-10 km, 10-15 km, 15-20 km, and 20-25 km, respectively. This indicates obvious “water-proximate” characteristics of night-time cultural tourism consumption agglomeration areas. When the distance from water sources exceeds a certain threshold, the growth rate of agglomeration areas significantly slows, as riverine areas feature flat terrain, abundant water sources, and convenient transportation, serving as primary sites for human production and living and important cradles of human civilization.
- (3) Climatic conditions. Climate nurtures local ecology and human environments, shaping the spatial differentiation of night-time cultural tourism consumption agglomeration areas. Overlay analysis of night-time cultural tourism consumption agglomeration areas with China’s climate zoning

reveals that they are mainly distributed in subtropical and south temperate climate zones, with mid-subtropical zones accounting for 28.40%, north subtropical zones 20.99%, and south temperate zones 25.12%. These regions, affected by monsoon climates with simultaneous rainfall and heat, offer comfortable climate conditions conducive to population, economic, and cultural element agglomeration. Plateau climate zones and mid-temperate zones have fewer night-time cultural tourism consumption agglomeration areas, primarily because the Qinghai-Tibet Plateau region is extremely cold, northwest inland areas are dry, and northeast China experiences severe winters, resulting in poor water-heat combination conditions and short climate comfort periods, which constrain regional socio-economic development and night-time consumption activities. Overall, regions with suitable climate have more night-time cultural tourism consumption agglomeration areas, and vice versa, indicating that the distribution of night-time cultural tourism consumption agglomeration areas is closely related to climatic conditions.

2.2.2.2 Resource Endowment Resource endowment constitutes the resource base for night-time cultural tourism consumption agglomeration area construction, determining their layout and development. National-level cultural relics protection units and intangible cultural heritage, as concentrated expressions of local historical and cultural heritage, represent the cultural genes for night-time cultural tourism consumption agglomeration area construction. However, their influence on the distribution of night-time cultural tourism consumption agglomeration areas is weak (q-value of 0.08) and fails the significance test, possibly due to insufficient excavation of regional characteristic cultural resources. High-level scenic spots have a stronger influence on the distribution of night-time cultural tourism consumption agglomeration areas, with a q-value reaching 0.42, mainly because night-time cultural tourism consumption agglomeration areas rely on high-level scenic spots, which can fully utilize their reputation, influence, and supporting facilities to achieve resource complementarity, customer sharing, and industrial linkage. Additionally, high-level scenic spots feature beautiful landscapes, profound cultural heritage, and complete supporting facilities, making them important sites for night-time cultural tourism consumption agglomeration area location selection. In fact, 53.91% of night-time cultural tourism consumption agglomeration areas are themselves typical high-level scenic spots. Thus, night-time cultural tourism consumption agglomeration areas show obvious “scenic-proximate” layout characteristics.

2.2.2.3 Economic Environment The economic environment influences the production, operation, and consumption of night-time cultural tourism, providing the driving force for the development of night-time cultural tourism consumption agglomeration areas. Geographical detection results show that per capita GDP has a weak influence on the distribution of night-time cultural tourism con-

sumption agglomeration areas (q-value of 0.11) and fails the significance test, indicating that economic level does not significantly affect the development of night-time cultural tourism consumption agglomeration areas. This is mainly due to the spatial separation between resource endowment and economic level, which weakens the explanatory power of economic level on the distribution of night-time cultural tourism consumption agglomeration areas, as seen in underdeveloped areas with superior tourism resources such as Sichuan Province. Urban residents' per capita cultural, educational, and entertainment consumption expenditure and total tourism revenue have strong influences on the distribution of night-time cultural tourism consumption agglomeration areas, with q-values of 0.38 and 0.41, respectively, indicating that market demand and industrial foundation are important factors affecting the distribution of night-time cultural tourism consumption agglomeration areas. Higher cultural, educational, and entertainment consumption expenditure and total tourism revenue lead to stronger cultural tourism consumption willingness and capacity, helping to consolidate the customer market and industrial foundation for night-time cultural tourism consumption agglomeration area construction.

2.2.2.4 Social Environment

- (1) Social population. Population size and quality determine the market potential for night-time cultural tourism consumption, serving as the guide for night-time cultural tourism consumption agglomeration area construction. The explanatory power of year-end resident population and university student enrollment on the distribution of night-time cultural tourism consumption agglomeration areas is 0.35 and 0.43, respectively, indicating that population elements have a strong influence on the distribution of night-time cultural tourism consumption agglomeration areas. Larger population size leads to greater regional customer markets and development potential, conducive to spawning night-time cultural tourism consumption agglomeration areas. In particular, university students with high quality, abundant leisure time, and strong curiosity have an extremely strong influence on the development of night-time cultural tourism consumption agglomeration areas.
- (2) Infrastructure. Infrastructure, as a prerequisite for night-time cultural tourism consumption, provides the basic guarantee for the development of night-time cultural tourism consumption agglomeration areas. The explanatory power of road network density and passenger transport capacity on the distribution of night-time cultural tourism consumption agglomeration areas is 0.39 and 0.45, respectively, indicating that transportation conditions are core factors affecting the distribution of night-time cultural tourism consumption agglomeration areas, mainly because transportation facilities serve as media channels connecting consumption sites and source markets. Lighting facilities have weak influence on the distribution of night-time cultural tourism consumption agglomeration areas (q-value of

0.09) and are not significant, possibly due to their “city-proximate” layout location. Catering and accommodation have strong influence on the distribution of night-time cultural tourism consumption agglomeration areas (q-value of 0.36), serving as important guarantees for their development.

- (3) Policy environment. Night-time cultural tourism consumption agglomeration areas are policy products of the national strategy to stimulate cultural tourism consumption potential, and their construction and distribution have obvious policy orientation. At the macro level, national policy serves as the guide for night-time cultural tourism consumption agglomeration area construction, with policy directly determining their scale, quantity, and regional differentiation from cultivation, application, and selection to implementation. At the provincial level, cultural, tourism, sports, and media expenditure has an explanatory power as high as 0.48 on the distribution of night-time cultural tourism consumption agglomeration areas, indicating that the policy environment is a core factor influencing their development. This is because the policy environment provides financial support and institutional guarantees for construction, facilitating system reform, industrial transformation, and environmental optimization.

2.2.3 Influence Mechanism The spatial differentiation of night-time cultural tourism consumption agglomeration areas results from the coupling of human and natural systems, influenced by natural ecology, resource endowment, economic environment, and social environment (Figure 6). Natural ecology, as the natural foundation for night-time cultural tourism consumption agglomeration area construction, constitutes the basic factor affecting their distribution, with natural elements such as topography, rivers, and climate shaping regional production, living, and ecological spaces and influencing the scale, density, and morphology of night-time cultural tourism consumption agglomeration areas. Resource endowment, as the resource base for night-time cultural tourism consumption agglomeration area construction, represents an important factor affecting their distribution, with the spatial differentiation of cultural tourism resources determining the location selection and development patterns of night-time cultural tourism consumption agglomeration areas. The economic environment influences the production, operation, and consumption of night-time cultural tourism, providing financial support, market guarantees, and industrial foundations for construction, serving as the driving force for their development. The social environment provides important guarantees for night-time cultural tourism consumption agglomeration area construction, undertaking supply, demand, and regulatory functions in their development. First, national policy provides institutional guarantees and policy support for night-time cultural tourism consumption agglomeration area construction, determining their overall pattern. Second, regional differentiation of population elements influences spatial differences in night-time cultural tourism consumption demand. Finally, supporting facilities such as transportation and accommodation influence the supply capacity of night-time cultural tourism consumption, shaping local differentiation of

night-time cultural tourism consumption agglomeration areas.

3 Discussion

This study, based on a comprehensive geographical perspective, integrates spatial system theory, human-environment relationship theory, and cultural ecology theory to construct a theoretical framework for investigating the spatial pattern and influencing factors of night-time cultural tourism consumption agglomeration areas. It reveals the spatial structure, type structure, and influencing mechanisms of China's night-time cultural tourism consumption agglomeration areas. Compared with previous single-discipline research paradigms, this study enriches research on the type structure of night-time cultural tourism consumption agglomeration areas, expands multi-disciplinary integration research approaches, and offers innovations in research content and theoretical methods. This helps deepen understanding of the spatial distribution patterns and driving mechanisms of night-time cultural tourism consumption agglomeration areas and can provide scientific guidance for subsequent application, selection, and construction of night-time cultural tourism consumption agglomeration areas. However, limited by research data, this study only explores spatial distribution characteristics, without addressing temporal evolution processes. Future research should deepen investigations of spatio-temporal evolution processes. Additionally, revealing the formation and evolution mechanisms of different types of agglomeration areas' spatial layouts represents a future research priority.

4 Conclusions and Recommendations

4.1 Conclusions

- (1) China's night-time cultural tourism consumption agglomeration areas exhibit obvious regional differentiation characteristics, showing an overall clustered distribution pattern of "dense in the east and sparse in the west, more in the south and less in the north," with prominent layout patterns of "proximity to cities, water, and scenic spots." Geographically, the distribution shows clear fractal characteristics, forming a spatial pattern of "one main, two subordinate, and multiple micronuclei," with high-density regions mainly distributed around urban agglomerations and provincial capitals, conforming to central place theory logic of diffusion from administrative centers to surrounding areas.
- (2) The distribution of night-time cultural tourism consumption agglomeration areas shows significant spatial dependence, with obvious cold-hot spot differentiation among regions, presenting a "hot in the east and cold in the west" circularly decreasing spatial pattern. Hot spots mainly cluster in the middle and lower reaches of the Yangtze River, while cold spots are primarily distributed in western and northeastern regions.
- (3) The type structure of night-time cultural tourism consumption agglomer-

ation areas is diverse, with significant spatial differentiation among various types. Historical sites and relics are distributed in areas with long cultural histories, local customs and traditions cluster in ethnic minority regions, industrial-themed categories exhibit broad spatial distribution, scenic spots are relatively evenly distributed, and comprehensive cultural-tourism-commerce categories are mainly distributed in economically developed areas.

- (4) The spatial distribution of night-time cultural tourism consumption agglomeration areas results from the coupling of natural ecology, resource endowment, economic environment, and social environment. Topography, rivers, and climate are fundamental factors influencing their distribution, while population quality, passenger transport capacity, industrial development, and policy support are key determinants.

4.2 Recommendations

Currently, China's night-time cultural tourism consumption agglomeration area construction is still in its initial stage, with many existing problems. Based on the above research conclusions, the following development recommendations are proposed:

- (1) Night-time cultural tourism consumption agglomeration areas show obvious agglomeration trends and strong spatial association. Development should leverage the agglomeration advantages of high-density regions to promote coordinated development of night-time cultural tourism consumption agglomeration areas, avoiding blind, homogeneous, and involuted competition. Low-density regions, while cultivating regional characteristics and leveraging exemplary leading roles, should emphasize integration and connection with other cultural tourism resources to achieve resource complementarity, customer sharing, and industrial linkage.
- (2) Night-time cultural tourism consumption agglomeration area construction should follow patterns such as "proximity to cities, water, and scenic spots," especially in central and western regions. Efforts should enhance transportation connections between agglomeration areas and cities/scenic spots, leveraging the radiating effects of node cities and high-level scenic spots.
- (3) Policy should tilt toward central and western regions. These regions are rich in cultural tourism resources but have fewer night-time cultural tourism consumption agglomeration areas, requiring strengthened policy support to fully exploit regional characteristic cultural tourism resources. Additionally, selection criteria for night-time cultural tourism consumption agglomeration areas in central and western regions should be gradually optimized, weakening indicators such as economic scale and population flow while strengthening regional characteristics and cultural connotations.

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