The Spatial Pattern and Influencing Factors of Rural Tourism in Chengdu-Chongqing Urban Agglomeration

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Abstract. As the fourth national-level urban agglomeration, the Chengdu-Chongqing urban agglomeration has good conditions for the development of tourism industry. It is of great significance to improve the development level of rural tourism in the Chengdu-Chongqing region by understanding its spatial pattern and driving factors of rural tourism. This study analyzes the spatial pattern of rural tourism in the Chengdu-Chongqing urban agglomeration and explores its influencing factors by using the geographic detector model. It found that: (1) The spatial distribution of rural tourism in the Chengdu-Chongqing urban agglomeration presents the characteristics of agglomeration of "two big and three small"; (2) The structural ranking of urban agglomeration is the core factor affecting the spatial pattern of rural tourism; (3) Agricultural development level, economic development level, and tourism development level also have important influence on rural tourism; (4) The influence of resource endowments and natural conditions on it is not obvious. Therefore, the development of rural tourism in the Chengdu-Chongqing urban agglomeration should not be limited to the countryside and the resources itself, but should improve the level of urban development, the quality of agriculture and tourism development from the overall perspective of the urban agglomeration.

1. Introduction

The Chengdu-Chongqing urban agglomeration covers an area of more than 180,000 square kilometers, with a permanent population of nearly 100 million people, and a gross regional product of about 6 trillion yuan. It is the intersection of the construction of “The Belt and Road” and “The New Land-Sea Corridor” and an important strategic support for the coordinated development of the Yangtze river economic belt[1]. In recent years, the integration of Chengdu-Chongqing urban agglomerations has accelerated, Sichuan-Chongqing has signed the Action Plan for Deepening Sichuan-Chongqing Cooperation and Deepening the Development of the Yangtze River Economic Belt (2018-2022), and the Chongqing Cooperation to Promote the High-quality Integrated Development of Chengdu-Chongqing Urban Agglomeration Key Work Plan”[2] and other series of documents. Tourism is one of the six important industries cultivated by the Chengdu-Chongqing urban agglomeration. Analyzing the overall situation of the tourism industry in the Chengdu-Chongqing urban agglomeration is of great significance to promote the coordinated development of the urban agglomeration tourism industry.

The rural space is an organic part of the urban agglomeration space. Tourism, especially rural
tourism, plays an important role in the construction of the "native soil-ecological" space of urban agglomerations[3]. Therefore, it is of great significance to study and optimize the spatial pattern of rural tourism in Chengdu-Chongqing urban agglomeration.

The research on the spatial pattern of rural tourism and its driving force has always been a research hotspot in academic circles. At present, many scholars believe that the endowment of tourism resources and infrastructure conditions are the main factors affecting the spatial pattern of rural tourism. For example, Jiang Yongquan found that the spatial distribution of rural tourism in western Hubei was greatly affected by natural factors, especially factors of topographic and hydrological[4]. Chen Zheng found that the distribution of rural tourist spots in the Changsha-Zhuzhou-Xiangtan urban agglomeration was highly correlated with local natural resources[5]. Wang Xinyue and others found that the spatial distribution of rural leisure tourism destinations had a high degree of correlation with contour lines of scenic spots above 4A level[6]. Feng Zhe found that the spatial distribution of different rural tourism formats all reflected the law of distribution along the expressway[7]. However, it can be found that the above researches are usually carried out with the rural tourism spots or rural tourism demonstration villages selected in the specific level directory as the indicators from the analysis. The rural tourism demonstration villages or demonstration sites are usually the results of comprehensive evaluation, in which resource endowments and infrastructure conditions are important indicators for evaluation. Therefore, resource endowment and infrastructure conditions are obviously correlated with the distribution of rural tourism demonstration sites, it cannot be sure that resource endowment and infrastructure conditions are the driving factors for the spatial distribution of rural tourism.

As the source of rural tourism, cities have a decisive influence on the development of rural tourism. Wu Bihu discovered that 84% of rural tourist destinations are concentrated in the area within 100km of the central city of the first-class tourist source. The farther the distance from the city, the less rural tourist destinations[8]. Ye Chen also found that both the scale of neighboring central cities and the regional urbanization rate significantly affected the intensity of rural tourism passenger flow[9]. However, the spatial distribution of rural tourism does not have a simple linear relationship with the size and distance of cities. Meanwhile, the level of rural tourism development in domestic urban agglomerations is usually relatively high. For example, Yan Huili found that the spatial distribution of rural tourism demonstration sites are mainly concentrated in the Yangtze River Delta, Beijing-Tianjin-Hebei, Pearl River Delta, Southeast Fujian, Sichuan and Chongqing[10].

In summary, due to sample selection restrictions, it is doubtful whether resource endowments and infrastructure conditions are the main driving forces for the spatial pattern of rural tourism. The relationship between urban and rural tourism development is complex, and it is necessary to study the driving factors of the spatial pattern of rural tourism from the overall perspective of urban agglomerations.

Based on the scale of county-level administrative region, this paper intends to analyze the influence of these factors on the spatial pattern of rural tourism in Chengdu Chongqing urban agglomeration from the perspectives of the rank relationship of districts and counties in urban agglomeration, natural conditions, traffic conditions, population, economic conditions, tourism development level and agricultural development level.

This study takes the development of rural tourism enterprises as the indicators of the
development level of rural tourism in districts and counties, which is based on the fact that the
development of rural tourism enterprises is more representative of the development level of tourism
industry. And this study adopts the full sample data of the rural tourism enterprises in
Chengdu-Chongqing city cluster to avoid the problem of sample selection bias.

2. Research Area, Research Methods and Data Processing

2.1. Research Area

The study area are 142 districts and counties planned in the Chengdu-Chongqing City Cluster
Development Plan. In order to ensure the integrity of the research area, the entire area of Kaizhou
District and Yunyang County were taken as the research object during the research process.

2.2. Research Methods

2.2.1. Spatial Autocorrelation

With the help of ArcGIS software, this study calculates the spatial autocorrelation Moran's I index
and analyzes the spatial clustering characteristics of rural tourism in Chengdu-Chongqing urban
agglomeration. The formula is as follows:

\[
I = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij} (x_i - \bar{x})^2}
\]

2.2.2. The Index of Concentration

This study uses the index of concentration to analyze the agglomeration of rural tourism enterprises
in the study area. The formula is as follows:

\[
G = \frac{100\% \cdot \left( \sum_{i=1}^{N} \left( \frac{X_i}{N} \right)^2 \right)}{}
\]

2.2.3. Space Gini Coefficient

In this study, spatial Gini index is used to analyze the distribution of rural tourism enterprises in the
study area. The formula is as follows:

\[
G = -\frac{\sum_{i=1}^{N} P_i \ln P_i}{\ln N}
\]

2.2.4. The Geographical Detectors

Geographic detector is used to analyze the influencing factors of rural tourism spatial pattern in
Chengdu Chongqing urban agglomeration in this paper[11] The specific model is as follows:

\[
q = 1 - \frac{\sum_{i=1}^{k} n_i \sigma_i^2}{n \sigma^2}
\]
2.3. Data Sources and Processing

2.3.1. Data Sources

The data of this study mainly from the statistical yearbook, statistical bulletin and the official website of the people's government. Enterprise data comes from enterprise industrial and commercial registration data, which can be obtained by querying the official website of Qichacha.

2.3.2. Data Processing

1) Data acquisition and processing of rural tourism enterprises.

Rural tourism enterprises are defined as those enterprises whose business scope covers both agriculture and tourism, sightseeing and catering. Through the enterprise data mining on the official website of Qichacha, a total of 25,668 enterprises were found in 142 districts.

In order to analyze the spatial pattern of rural tourism in the Chengdu-Chongqing urban agglomeration, the total number of rural tourism enterprises and the density of rural tourism enterprises in districts and counties are adopted in this study. Due to the large difference in area between districts and counties in Chengdu-Chongqing urban agglomeration, compared with the absolute value, the density of rural tourism enterprises can better reflect the spatial pattern, and its value is the number/area of rural tourism enterprises.

2) The rank processing of districts and counties in urban agglomerations.

Through the analysis of buffer zone in ArcGIS software, the urban area of the mega-urban areas and the mega-urban suburban counties are used as the basic areas, the street area of the urban area is used as the buffer point, and 50km is the maximum buffer radius, if the intersecting area of a district with the buffer zone is greater than one-half, it is determined as a suburban county, which is used to determine metropolitan areas and metropolitan suburban counties.

3) Data processing of influencing factors.

Using the natural discontinuity method in ArcGIS software, this study discretized the collected data of 12 influencing factors.

3. The Spatial Pattern of Rural Tourism in Chengdu-Chongqing Urban Agglomeration

This study measures the development level of rural tourism through rural tourism enterprises. According to official website of Qichacha, there are 25,668 rural tourism enterprises in the Chengdu-Chongqing urban agglomeration, including 6,506 cooperatives, 61 state-owned enterprises, and 63 collectively-owned enterprises, with a registered capital of 150,79856 million yuan.
1) The distribution of rural tourism enterprises in the Chengdu-Chongqing urban agglomeration is relatively concentrated on the county scale. There are 25,668 rural tourism enterprises in Chengdu-Chongqing Urban Agglomeration. The total number of districts and counties is 142. Through the geographical concentration index formula, the geographical concentration index is calculated: $G = 13.78$. Assuming that 25,668 rural tourism enterprises are evenly distributed in 142 districts and counties, the number of rural tourism enterprises in each district and county is 180.76, and the geographic concentration index is calculated: $\bar{G}$ = 8.3. The result $G > \bar{G}$ shows that the distribution of rural tourism enterprises in Chengdu-Chongqing urban agglomeration is relatively concentrated on the county scale.

Through the spatial Gini coefficient formula, the spatial Gini coefficient of the 142 districts and counties in the Chengdu-Chongqing urban agglomeration is calculated: $G = 0.885$, indicating that the rural tourism enterprises in the Chengdu-Chongqing urban agglomeration are concentrated in the 142 districts and counties.

2) The rural tourism pattern of Chengdu-Chongqing urban agglomeration roughly presents a spatial pattern of "two big and three small".

As shown in Figure 1, the rural tourism enterprise density is divided into four levels by using the natural discontinuity method to divide the threshold, including the lowest level, lower level, higher level and highest level. The spatial pattern of rural tourism in Chengdu-Chongqing urban agglomeration has the following characteristic: on the whole, it presents the spatial pattern of "two big and three small". The "two big" refers to the two highest-density agglomeration areas of the main city of Chongqing and suburbs, and the main city of Chengdu and suburbs; the "three small" refers to three higher-density agglomeration areas of the southern Sichuan area (Luzhou-Yibin...
agglomeration area), the northeastern Sichuan area (Nanchong agglomeration area) and the northern Sichuan area (Dazhou agglomeration area). Among them, Chengdu's main urban area and suburban counties and Chongqing's main urban and suburban counties cover more districts and counties. This mega-urban area and its suburbs have the highest level of rural tourism development, such as Wuhou District, Jinjiang District, Chongzhou City, Qionglai City in Chengdu City and Yuzhong District, Nan'an District and Jiulongpo District of Chongqing City. There are relatively sparse areas between the two core areas of Chengdu and Chongqing, namely, the central Sichuan area, mainly including Yanjiang District, Lezhi county, Anyue County, Zizhong County, etc. There are contiguous sparse areas between Dawan area and the main city of Chongqing; there are also large sparse areas in Southwest Sichuan, mainly including the districts and counties of Ya'an City and Leshan City.

4. Analysis on the Driving Force of Rural Tourism Spatial Pattern

4.1. Influencing Factors of the Spatial Pattern of Rural Tourism

4.1.1. The Spatial Structure of Urban Agglomerations and the Spatial Pattern of Rural Tourism

In this study, the hierarchy of districts and counties in Chengdu-Chongqing urban agglomeration is represented by the concept of structural ranking. The structural ranking can be roughly divided into five categories: mega-urban area, mega-urban suburban county, metropolitan area, metropolitan suburban county and other counties (as shown in Figure 2).

The mega-urban areas mainly include Jinjiang District, Wuhou District, Yubei District, Yuzhong District, etc. They are the main urban areas of Chengdu and Chongqing.

Mega-urban suburban counties refer to districts and counties within 50km from mega-urban areas (At least one-half of the area of the district/county is in the mega-urban area Within 50km buffer zone), including Chongzhou, Dayi County, Dujiangyan, Bishan District, Hechuan District, Jiangjin District, etc.

Metropolitan areas mainly include urban areas such as Nanchong, Luzhou, Yibin, and Mianyang. Metropolitans refer to cities with a population of more than 4 million.

Metropolitan suburban counties refer to the districts and counties within 50km from metropolitan areas (at least one-half of the area within the 50km buffer zone of the metropolitan area), mainly including Jingyang District, Wusheng County, Yuechi County, Lu County, Peng'an County, Xichong County, Gao County, Jiang'an County, Fushun County, Yantan District etc.
4.1.2. Other Factors Affecting the Spatial Pattern of Rural Tourism

After a comprehensive analysis of the relevant research literature on the factors affecting the development of rural tourism\textsuperscript{[12-20]}, it is generally believed that temperature, transportation, vegetation, agricultural development level, population size, economic development level, tourism development level, the scale and distance of major tourist source cities are important factors affecting the development of rural tourism.

Therefore, this study selects the indicators listed in Table 1 and analyzes the impact of each indicator on the spatial pattern of rural tourism in the Chengdu-Chongqing urban agglomerations by using geographic detector.
Table 1. Influencing factors of rural tourism spatial pattern in Chengdu-Chongqing urban agglomeration.

| Influencing factor                      | Indicator                                                                 | Indicator interpretation                                                                 |
|-----------------------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Temperature                             | X₁: Maximum average temperature in January                                 | Districts and counties have the highest average temperature in January throughout the year |
|                                         | X₂: The highest average temperature in July                                | Districts and counties have the highest average temperature in July throughout the year   |
| Transportation                          | X₃: Number of highways                                                    | As of 2018, the number of expressways passing through the district and county (excluding those under planning and construction) |
|                                         | X₄: Is there a high-speed rail station                                    | As of 2018, whether there is a high-speed rail station (excluding train and express) in the district or county |
| Natural environment                     | X₅: Average altitude                                                      | Average altitude of multi-point sampling in districts and counties                       |
|                                         | X₆: Vegetation coverage                                                   | Vegetation coverage of district and county in 2018                                       |
| Agricultural development level          | X₇: The proportion of agricultural output value in GDP                     | The proportion of the district/county's agricultural output value in the GDP in 2018     |
| Population size                         | X₈: Population                                                            | Number of permanent residents in district and county in 2018                            |
| Economic development level              | X₉: The level of economic development                                      | GDP of district and county in 2018                                                      |
|                                         | X₁₀: Tourism income                                                       | Tourism income of district and county in 2018                                           |
| Tourism development level               | X₁₁: Number of scenic spots above 4A level                                | The sum of the number of scenic spots above 4A in the district and county                 |
| The scale and distance of major tourist source cities | X₁₂: Structural ranking of urban agglomerations                           | The Structural ranking of district and county in urban agglomerations                     |

4.2. Impact Strength Analysis of Factors

Table 2. Detector results of factors affecting the spatial pattern of rural tourism in Chengdu-Chongqing urban agglomeration.

|                         | X₁ | X₂ | X₃ | X₄ | X₅ | X₆ | X₇ | X₈ | X₉ | X₁₀ | X₁₁ | X₁₂ |
|-------------------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|
| Q-statistic             | 0.028 | 0.005 | 0.016 | 0.009 | 0.030 | 0.048 | 0.397 | 0.083 | 0.348 | 0.183 | 0.092 | 0.506 |
| p value                 | 0.183 | 0.837 | 0.971 | 0.311 | 0.999 | 0.499 | 0.000 | 0.099 | 0.000 | 0.007 | 0.058 | 0.000 |

The factor detector is mainly used to judge the explanatory power of the influence factor to a certain phenomenon. As shown in Table 2, the structural ranking of urban agglomeration, agricultural development level and economic development level are important factors in the formation of the rural tourism spatial pattern of the Chengdu-Chongqing urban agglomerations. The q value of the geographic detector is as follows:
Structural ranking of urban agglomerations(0.506) > The proportion of agricultural output value in GDP(0.397) > Economic development level(0.348) > Tourism income(0.183) > Number of scenic spots above 4A level(0.092) > Population(0.083) > Vegetation coverage(0.048) > Average altitude (0.030) > Maximum average temperature in January(0.028) > Number of highways(0.016) > Is there a high-speed rail station(0.009) > The highest average temperature in July(0.005). It can be summarized as follows:

1) The structural ranking of county (district) in urban agglomerations has the most obvious impact on the development of rural tourism.

2) The level of agricultural development and economic development are of secondary importance to the explanatory power of rural tourism development.

3) Compared with the above influencing factors, the explanatory power of temperature, average altitude, vegetation coverage, transportation, etc. on the level of rural tourism development is weak, indicating that the agglomeration effect of temperature, traffic conditions and natural environment factors on the rural tourism space of Chengdu-Chongqing urban agglomeration is not obvious.

The results show that the structural ranking of urban agglomerations is the core influencing factor affecting the spatial distribution of rural tourism, followed by agricultural development level, economic development level, population and tourism income. The influence of these factors on the development of rural tourism is far greater than the resource endowment and infrastructure conditions of rural tourism itself. The level of urban development is the most important driving force for the development of rural tourism.

5. Conclusion and Discussion

5.1. Conclusion

1) The spatial distribution of rural tourism in Chengdu-Chongqing urban agglomeration shows obvious agglomeration characteristics. It is mainly composed of Chengdu mega-urban area and Chongqing mega-urban area, and Yibin-Luzhou agglomeration area; meanwhile, Nanchong and Dazhou districts and counties also show obvious agglomeration characteristics.

2) There is a large sparse area between the two high concentration areas of Chengdu and Chongqing. It shows that there is a clear gap between the two core economic belts of Chengdu and Chongqing.

3) The structural rank of districts and counties in urban agglomerations is the most important factor affecting the level of rural tourism development. It shows that the level of urban development is the most important driving force for the development of rural tourism, and the construction of cities plays a vital role in rural tourism and even rural development.

4) The level of agricultural development, the overall level of economic development and the level of tourism development are also important factors affecting the development of rural tourism in districts and counties.

5) Traffic conditions, climate, natural environment and other resource endowments and infrastructure conditions have no obvious impact on the development of rural tourism in districts and counties.
5.2. Discussion

1) In this study, the number of rural tourism enterprises in districts and counties represents the development level of rural tourism, and the output value and scale of rural tourism enterprises are not taken into account. In the later study, the development level of rural tourism in a district or county should be comprehensively analyzed in combination with the scale and output value.

2) Tourism is the basic need of people and rural tourism is one of the main leisure travel methods for urban people. Therefore, whether the rural tourism resource endowment in the general sense around the city is good enough or not, it does not affect people’s rural tourism behavior. So the development of rural tourism is closely related to the city. The rural tourism development level of the districts and counties in the Chengdu-Chongqing urban agglomeration is also closely related to the urban development level of the district and county.

3) The development of rural tourism should not be limited to the countryside itself, but should be considered from the overall perspective of the urban agglomeration. As long as the development level of urban agglomerations is improved, rural tourism as a kind of rigid demand will become an inevitable development.

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