Study on the Comprehensive Capacity of Tourism Development in Twin Cities Economic Circle of Chengdu-Chongqing Region

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Abstract: The article evaluates the total tourism development capacity of each region in the Chengdu-Chongqing twin-city economic circle from the aspects of tourism economic benefits and tourism industry conditions and measures the global and local spatial aggregation degree of comprehensive tourism development capacity within the financial process, and finds that Chengdu and Chongqing are the two core tourism development belts. The areas near the core have relatively higher total tourism development capacity. The analysis of geographic detectors reveals that each economic and social level factor has a greater degree of spatial correlation with the entire tourism development capacity. Different influencing factors also positively impact the full tourism development capacity.

Keywords: comprehensive tourism development capacity; comprehensive evaluation; spatial autocorrelation; geographic probe.

1   Introduction

With the rapid development of the social economy, per capita income is gradually increasing, people's demand for living standards is getting higher and higher, and the development of the domestic and international tourism industry is surging. According to the National Bureau of Statistics data report, in 2019, China's single domestic tourism trips exceeded 6 billion. The annual tourism revenue accumulated to 6.63 trillion. The number of imports increased by 2.9% year-on-year to 145.31 million. In 2020 and 2021, although the tourism industry will be affected by the epidemic, the number of people keen on tourism will still be significant when the epidemic situation turns better, and tourism consumption may become an important growth point for the sluggish consumption affected by the epidemic. In this case, tourism development has become an inevitable trend everywhere. The level of tourism development and tourism development potential of a region can reflect the comprehensive ability of the local tourism industry and reflect the competitiveness of the tourism industry. The Chengdu-Chongqing region is home to many famous historical and cultural cities, with beautiful scenery, food, and

cultural attractions. In the background of the strategic development of the construction of the twin-city economic circle in Chengdu and Chongqing, the neighboring areas of Sichuan and Chongqing should seize the historical opportunity of tourism development in time to vigorously develop the regional economy.

2   Literature review

There is a wealth of empirical research on the total capacity of tourism development in China, and scholars have established evaluation index systems from different perspectives. This article (Wu Tong and Jiang Wen 2022[4]) used the entropy value method to evaluate the quality of tourism development in the western region from four aspects: development efficiency, environmental quality, transportation infrastructure, and public services, and used the barrier degree diagnostic analysis method to analyze the influencing factors of tourism development quality in the western region. This paper (Hou Dingran and Ma Huiqiang 2021[2]) used the set-pair analysis method to evaluate the total capacity of tourism development in each province of China from five aspects: tourism resource endowment, tourism infrastructure, tourism reception capacity, tourism development status, and tourism environment carrying capacity, and established a multiple regression model to study the influencing factors of the comprehensive ability of tourism development. The article (Wang Wei and Zhang Jiaying 2019[5]) assessed the tourism development potential of each province in China in terms of market demand potential, regional supply potential, guaranteed development potential, and economic support potential, and used multiple regression methods to screen the key factors affecting the tourism development potential index. This research (Melingonzie and Garcfalcn 2021[1]) argue that tourism competitiveness is affected by tourism facilities, such as location, weather, airport location, and terminal location. This article (Divisekera 2003[3]) developed a tourism demand model based on tourism activity data from several countries, including Australia, New Zealand, and the United Kingdom. The results show that tourists' tourism demand and preferences affect the competitiveness of a region's total tourism development capacity.

3   Data sources and methods

3.1 Study scope and sample size

This part takes the districts (cities) and counties under each municipality of the twin-city economic circle in the Chengdu-Chongqing region as the spatial sample for the study. It examines the total capacity of tourism development within the financial process. Among them are 113 districts (cities) and counties in Sichuan Province and 29 districts (cities) and counties in Chongqing, totaling 142 districts (cities) and counties.

Based on the planning of the scope of the Chengdu-Chongqing urban agglomeration in the Outline of the Chengdu-Chongqing Regional Twin-City Economic Circle Construction Plan, there are some districts (cities) and counties under the jurisdiction of cities and states that are not within the planning scope of the Chengdu-Chongqing Regional Twin-City Economic Circle, such as Mianyang City except Beichuan County and Pingwu County, Dazhou City except Wanyuan City, Ya'an City except Tianquan County and Baoxing County, and parts of Kaizhou

District and Yunyang County in Chongqing City. Considering the availability of data and the sustainability of the study, this section collects comprehensive data for the whole area of Kaizhou District and Yunyang County in Chongqing City, which is not delineated as specific areas.

3.2 Data sources

This article collects research data for 2019 from the China Statistical Yearbook, the Sichuan Statistical Yearbook, the Chongqing Statistical Yearbook, and relevant tourism and statistical bulletins for each district (city) and county. At the same time, some of the data refer to data from the Ministry of Culture and Tourism of the People's Republic of China, the Sichuan Provincial Department of Culture and Tourism, and relevant policy documents of the Chongqing Municipal Commission of Culture and Tourism Development. In terms of geospatial data, this paper uses DEM data as geoelectric topographic data ASTER GDEM, whose essential grid has a cell size of 30m×30m and a basic scale of roughly 1:100,000.

3.3 Data processing

The tourism-related data of 142 districts (cities) and counties in the twin-city economic circle of the Chengdu-Chongqing region are standardized, and the standardization method selects the extreme value processing method to calculate the comprehensive tourism development index. The computed results and spatial data are connected and synthesized.

4 Comprehensive capacity analysis of tourism development

4.1 The selection of indicators and the construction of the indicator system

In establishing the index system, this paper follows the principles of scientificity, representativeness, and accessibility of index selection from the tourism industry itself. It constructs a comprehensive capacity index system of tourism development in the twin-city economic circle of the Chengdu-Chongqing region from two dimensions tourism economic benefits and tourism industry conditions. The final established index system is shown in Table 1.

Table 1. Comprehensive capacity index system

Tier 1 Indicators	Secondary indicators
Tourism Economic Benefits	Total tourism revenue (B1)
	Number of travelers (B2)
Tourism industry conditions	Number of travel agencies (B3)
	Number of scenic spots 3A and above (B4)

4.2 Tourism composite index weighting determination

Hierarchical analysis method: The scale of hierarchical analysis is generally divided into five levels: one represents two factors that are equally important compared to each other, three indicates that one factor is slightly more important than the other one compared to both elements, five demonstrates that one factor is significantly more important than the other one, seven indicates that one factor is much more important than the other one, nine suggests that one factor is significant than the other one.

Calculate the maximum characteristic roots of the matrix in question and the corresponding normalized eigenvectors, and to take a one-time test of it, that is, to introduce the opposing average of the remaining characteristic roots other than the maximum distinct roots of the judgment matrix, as a measure of the judgment matrix deviation from the one-time indicator, noted as CI, the calculation results are shown in Table 2; when its matrix order is greater than 2, the consistency indicator CI of the judgment matrix and the same order The ratio of the average random consistency index RI, which is the arbitrary one-time ratio, is denoted as CR. When the random one-time ratio CR <0.1, the results of its ranking weights were considered to pass the consistency test. The relevant formula are equation (1) and equation (2).

$$CI = \frac{\lambda \max - n}{n - 1} \tag{1}$$

$$CR = \frac{CI}{RI} \tag{2}$$

Table 1. Random consistency test RI

Number of steps	RI value
1	0
2	0
3	0.52
4	0.89
5	1.12
6	1.26
7	1.36
8	1.41
9	1.46
10	0.49
11	0.52
12	1.54
13	1.56
14	1.58
15	1.59

Entropy power method: The entropy method is a method to determine the weight of an indicator based on mathematical theory and can also be used to determine the dispersion of a hand. The smaller the value of entropy, the greater the amount of information it contains, the smaller the corresponding uncertainty, and the greater its weight; on the contrary, the larger the value of entropy, the smaller the amount of information it contains, the greater the corresponding uncertainty, and the smaller its weight; if the indicators are equal, then the hand does not work in the comprehensive evaluation.

First of all, to effectively avoid the interplay of different units between indicators in the entropy weighting process, R′ has to be standardized to obtain each hand's standardization matrix and standardize the data. To ensure that the data processing is meaningful, it is, therefore, necessary to eliminate its zero values and negative values. Thus, the standardized data are subjected to an overall shift. To ensure the intrinsic connection and regularity of the initial data and retain the original data features to a greater extent, the value must be as small as possible, and in this paper, we take the weight of 0.0001 for the panning.

Finally, the weights calculated by the AHP method and the entropy weight method are multiplied together to calculate each index's total weight and obtain the comprehensive index of tourism development comprehensive ability of each district (city) and county in the twin-city economic circle of Chengdu-Chongqing region.

4.3 Calculation results of the comprehensive index of tourism development

According to the comprehensive development index and the distribution of AAA-grade and above scenic spots in each area of the twin-city economic circle of Chengdu and Chongqing region, there is a relationship between the total capacity of tourism development and the grade of scenic spots. The top five with the highest scores are Yuzhong District of Chongqing, Qingyang District of Chengdu, Wuhou District of Chengdu, Jinniu District of Chengdu, and Nanan District of Chongqing in that order; the next three with the lowest scores are Ebian Yi Autonomous County, Mabian Yi Autonomous County and Jinkouhe District of Leshan City.

The distribution of AAA-level and above scenic spots in the districts (cities) and counties under the jurisdiction of Chengdu and the central city of Chongqing is relatively dense. Whether it is the number of tourist attractions or tourism development total capacity, the economic circle is presented within the two-pole cities of Chengdu and Chongqing as the leader; Second, the belt tourism development belt is obvious. Chengdu and Chongqing region, the twin-city economic circle, presents two respectively to Chengdu and Chongqing as the core of the north-south ribbon tourism golden development belt. In this development belt, the districts (cities) and counties, by relying on all levels of tourism attractions, continue to advance in the direction of continuous development. While some areas represented by Ebian Yi Autonomous County and Mabian Yi Autonomous County have a relatively low capacity for tourism development due to their distance from core cities and geographically related factors; Third, the lack of effective transition between the two belt tourism development belt. The towns between the two development belts have a significantly lower total tourism development capacity compared to the cities in the development belts.

4.4 Results of spatial autocorrelation test

The global spatial autocorrelation analysis shows that there is a high correlation (I=0.243, p<0.01) between the comprehensive tourism development ability of each district (city) and county within the twin-city economic circle, and the overall shows a significant positive spatial correlation, and the comprehensive tourism development index tends to be spatially aggregated. It indicates that from within the twin-city economic circle of the Chengdu-Chongqing region, the districts (cities) and counties with high scores on the tourism development comprehensive index are adjacent to each other, and those with low scores and those with low scores are adjacent to each other.

After the local spatial autocorrelation analysis of the study area, the LISA clustering distribution of tourism integrated capacity was mapped by ArcGIS 10.6 software. From the results, most regions belonging to the central urban areas of Chengdu and Chongqing are in HH type; some areas belonging to Leshan, Ya'an, and Nanchong are in LL type. Some areas near the main urban area of Chengdu and the central metropolitan area of Chongqing, such as Jinyang City, Jintang County, and Tongliang District, show LH type; Guang'an District, Emeishan City, and Xuzhou District are in HL type. The correlation characteristics of other districts (cities) and counties are not significant.

5 Analysis of factors influencing the comprehensive capacity of tourism development

5.1 Selection of influencing factors

Combine the characteristics of tourism development in the Chengdu-Chongqing region and the availability of relevant data. This paper selects six indicators, GDP per capita (X1), the gross value of tertiary industry (X2), nearest distance to the airport (X3), urbanization rate of population (X4), altitude (X5), and topographic relief (X6) to serve as the Chengdu-Chongqing twin-city economic circle explanatory variables for the total tourism development capacity (Y), as shown in Table 3. This section uses a geographic probe to analyze the factors influencing the full tourism development capacity of the Chengdu-Chongqing twin-city economic capacity.

Table 3. Indicator system for impact factor detection

Influencing Factors	Representative Indicators	Factors
Economic Development Level	GDP per capita	X1
Industrial Structure	Tertiary Industry Gross Domestic Product	X2
Traffic Factor	Nearest Distance to Airport	X3
Urbanization rate	Population urbanization rate	X4
Meteorological factors	Elevation	X5
Geographical location	Topographic relief	X6

5.2 Factor detection analysis

As shown in Table 4, all six influencing factors are spatially related to the total capacity of tourism development within the Chengdu-Chongqing twin-city economic circle. According to

the magnitude of the determining power q of each aspect, the gross value of tertiary industry (X2), the urbanization rate of population (X4), and GDP per capita (X1) have the most significant influence on the spatial differentiation of the total capacity of tourism development, and the determining power is above 0.5.

Table 4. Factor detection results

	X1	X2	X3	X4	X5	X6
q-value	0.53	0.72	0.29	0.55	0.12	0.24

5.3 Interaction detection analysis

The interaction detector model is used to identify the size of the influence of different influencing factors together on the comprehensive capacity of tourism development in the twin-city economic circle of Chengdu-Chongqing region, as shown in Table 5. By the results of the interaction detection of the influence factors and the influence of the individual role of the influence factors, the type of interaction of different influence factors can be obtained, and the detection results are shown in Figure 1. [1].

The results show that GDP per capita (X1), gross value of tertiary industry (X2), closest distance to the airport (X3), population urbanization rate (X4), and topographic relief (X6) all show a two-factor enhancement when interacted with each other, which intensifies the effect on the total capacity of tourism development in Chengdu-Chongqing twin-city economic circle. Although the impact of elevation (X5) on the integrated ability of tourism development is small, it shows a non-linear enhancement result when it interacts with the closest distance to the airport (X3) and the topographic relief (X6).

Table 5. Interaction detection results of impact factors

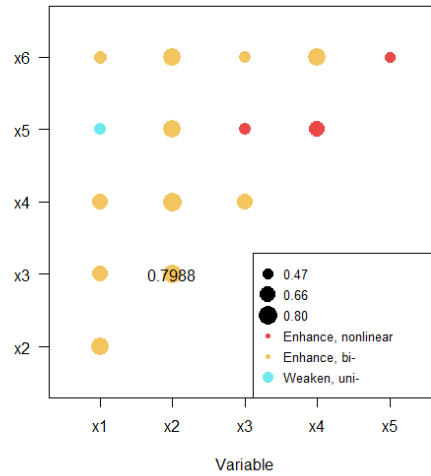|	X1	X2	X3	X4	X5	X6
X1	NA	NA	NA	NA	NA	NA
X2	0.74	NA	NA	NA	NA	NA
X3	0.67	0.80	NA	NA	NA	NA
X4	0.68	0.78	0.66	NA	NA	NA
X5	0.52	0.77	0.51	0.68	NA	NA
X6	0.55	0.76	0.51	0.73	0.47	NA

Fig. 1. Impact factor interaction detection results

6   Conclusions

Overall, Chengdu-Chongqing twin-city economic circle has formed a north-south tourism development belt with Chengdu and Chongqing as the two cores, and the areas near the cores have relatively higher total tourism development capacity. At the same time, tourism A-class scenic spots positively impact the tourism development comprehensive ability index. The more the number of scenic spots, the higher the grade of the district (city) county and the more tourism complete ability is also relatively high. In addition, the total capacity of tourism development in the south and north Sichuan is LL type, which is since the region is far away from the two-pole cities and is subject to the economic and social radiation of the pole cities, and the layout of the tourism industry is relatively lagging. Although in the distribution of scenic tourism spots, these regions have more scenic spots above 3A, the scenic resources have less impact on the surrounding districts (cities) and counties and have not yet formed a tourism integrated development situation.

The core factors influencing the total capacity of tourism development in 2019 are gross tertiary industry, population urbanization rate, and GDP per capita, indicating that regional economic growth is essential in enhancing tourism competitiveness. In addition, the high topographic relief and unique landscape of Chongqing in the twin-city economic circle of the Chengdu-Chongqing region can drive the increase of tourist arrivals, which also has a particular influence on its comprehensive tourism development capacity. From the interaction of factors, the exchange of GDP per capita, the gross domestic product of tertiary industry, nearest distance to the airport, urbanization rate of population, and topography undulation can strengthen the influence on the total capacity of tourism development in Chengdu-Chongqing twin-city economic circle. When altitude interacts with the nearest distance to the airport and topography undulation, it can effectively enhance its influence on the total capacity of tourism development.

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