Measurement and Index System of Urban Tourism Function

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Abstract: With the development of tourism, it is generally indicated that urban tourism functions have been strengthened. However, there is still no excellent empirical study on how to evaluate urban tourism functions quantitatively in urban systems. Based on the previous studies, this paper proposes a conceptual model of urban tourism function evaluation. The conceptual model includes five dimensions which are tourism function properties, function level, function scale, function intensity and function status. Using statistical data from 287 cities in China as samples making empirical studies of the function of tourist destinations and giving quantitative assessment of each dimension.

1. Introduction

Nowadays, tourism functions have become a common function in most cities from the world. Almost all cities receive a certain number of foreign tourists, and some of the cities which are rely on the world-class tourism resources and location conditions, attracting a large number of the international tourists and become the internationally influential tourist destinations, such as London, Paris, Rome, New York etc., All these cities are not only the political, economic and cultural centers, but also the center of global tourism activities in the world. The tourist reception scale in some small and medium-sized cities are not big enough, but their tourism function maintains the prominent position, and even become the leading function.

The tourism industry development of China started from the main cities. After 30 years developed, the tourism function in some cities keep the prominent status and they play an important role in the urban system. However, there are some differences among the different kinds of cities, such as type, scale, level, intensity and the status in tourism function. In this context, it has the important theoretical and practical significance to conduct China's urban tourism function from different dimensions deeply.

2. Literature Review

The earliest study of the urban tourism function started from the foreign urban geography, and the study results had already reflected in some research. In Zhou Yixing's "Urban Geography"[1], several western pioneers' results were introduced, such as M. Auronsseau (1921), he divided urban functions into six categories including defense, administration, culture, production, transportation, and entertainment, and classified tourism cities. C.D. Harris (1943) based on the census data in US from 1930 and 1935, divided 605 cities and towns with more than 10,000 people into 10 categories. In his study, tourism cities were classified as recreational cities. H.J. Nelson (1955) used mean and standard deviation to measure urban function, and J.W. Webb (1959) proposed a city function index. J.W. Maxwel (1965) broke through the single-element frame and adopted multiple indicators, which are compatible with various methods such as minimum requirements, mean & standard deviation and specialization index. These studies have obtained a number of theoretical and empirical research results, and constantly promoted the maturing and perfecting of urban function theory. By the 1990s, the study of the function and classification in urban area had passed in western. because most of these theories are based on the urban industrial and commercial function, the relevant

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indicators and measurement methods are difficult to apply to measure tourism functions, and the empirical research results are also very unsatisfactory.

Scholars have carried out some preliminary discussions on the function of urban tourism. Gui Lohmann, Douglas G. Pearce (2010)[2] proposed a conceptual model about tourism function,taking Wellington and Picton in New Zealand as the empirical study examples. He divided the city's tourism functions into Origins, Destinations, Gateways, Hubs and Stopovers. Ewa Szyma ska (2011)[3] pointed out the current obstacles on the study of urban tourism functions, and proposed the tourism function index. Moreover he established the urban tourism function evaluation index system based on three dimensions including tourism activities, tourism characteristics and tourism benefits, and in order to support his model, taking the empirical study in Mazuvia.

In China, since the 1980s, based on the theory of urban function, some researchers have studied the domestic urban tourism function. Zhang Wenkui, Liu Jisheng, and Wang Li (1990)[4] classified Chinese urban functions by using the statistical data. Gu Chaolin (1992)[5] in his book “China's Urban System” summarized 24 cities into five functions, among these cities they share same positions in tourism and science functions and belong to cultural functions city. Based on the data of the fifth censu in 2000, Xu Feng and Zhou Yixing (2008)[6]used the Ward's Method to classify the urban functions from 649 cities in China. With the accumulation of tourism statistics, some researchers have begun to try to analyze the urban tourism function quantitatively. Zang Guanrong (2005)[7] constructed an evaluation index system for urban tourism functions, and used Shanghai as an example to study the tourism function intensity of metropolises. Jin Shisheng and Wang Yuming (2008)[8] suggested that the tourism functions in metropolitan should be defined from a broad scope, including tourism destination function, tourist source function and tourism transit function. Yang Chuankai, Wang Yuming, Yang Mudan (2012)[9] established the comprehensive evaluation index system to measure the intensity of urban tourism functions, which based on the perspective of the city as tourist source destination and transit function.

3. Measurement models and indicators of urban tourism functions

3.1 Dimensions of urban tourism service functions

The research on the classification of urban functions started relatively late in domestic. Zhou Yixing (1988)[10]proposed the theory of “three elements of urban functions”, which measures urban functions from three dimensions including specialized department, functional intensity and functional scale. Sun Zhigang (1998)[11] measured the urban tourism functions from “functional properties “ ,”functional level” and “functional status”; Zhang Fuming and Guo Wenzhao (1999)[12] are based on spatial and structural attributes, revealing the three characteristics in city function including grade characteristics, quantity characteristics, year-on-year characteristics, which also can be demonstrated by functional level, functional scale and functional intensity. The conceptual framework of urban functions established by Fan Fuzhuo (2009)[13], it is include functional scale, functional status, functional intensity, functional power, and functional division coefficient.

Based on the above theories, this paper measures the urban tourism function from the following five dimensions.

1) Functional properties of urban tourism. According to the different roles played in tourism activities, there are three functions in cities include tourist source, tourism transit, and tourism destination. Any city has these three functions, but different cities have different level in the urban functions. among which the most prominent and dominant functions determine the properties of the city in tourism activities. A city with a strong transit function is a tourism distribution center, a destination with strong functions is a tourist destination. The level of the three functions is changing. As time goes by, the scale and intensity of different functional types will have many changes, and eventually may lead to qualitative changes.

In order to identify the properties of the city and reflect the importance of these three functions in urban system, the study introduce city destination index, tourist source index and distribution center index. The following variables are included: total tourist number (TT), total passenger turnover

(TP), urban resident population (TR), urban resident travel rate (R), and "i" means a specific city.

Destination Index $DI = \frac{TTi}{\sum TTi} * 100$;

Passenger Index $PI = \frac{TPi}{\sum TPi} * 100$;

Origin Index $OI = \frac{TRi*Ri}{\sum TRi*Ri} * 100$

The city destination index is the total number of tourist receptions in the city "i" divide by the total number of receptions in the urban system. The passenger index is the total turnover of urban passengers divide by the total turnover of the urban system. The origin index is the number of permanent residents multiply by the travel rate of residents and divide by the total number of tourists generated. Then compare the DI, PI and OI respectively, and the function with the largest index value is the property of urban tourism function.

2) Functional scale of urban tourism. Functional scale of urban tourism reflects the function of urban tourism from perspective of an absolute number. According to the scale, it can be divided into three categories: large, medium and small, which are relative concept show that the relative scale in an urban system. The tourist source function, transit function, and destination function have indicators representing the scale respectively in urban area. This paper only deeply studies the destination function of the city. The function scale can be showed based on the data collection situation, using the total number of total tourist receptions (TT) or tourism income (TI), generally these two indicators are highly correlated. For the measurement in the scale of the function, the traditional mean and standard deviation methods can be adopted. In this study, the total tourist receptions of mean can be demonstrated as $\overline{X}_{TT}$, the standard deviation is σ_{TT}. In practice, we find that in urban system, the sample values of the scale are skewed distribution, so the scale of reception in most cities is smaller than the average. Therefore, the scale of urban tourism functions is defined as follows:

$$TTi = \begin{cases} \text{Small} & TTi < \overline{X}_{TT} \\ \text{Middle} & \overline{X}_{TT} < TTi < \overline{X}_{TT} + \sigma_{TT} \\ \text{Large} & TTi > \overline{X}_{TT} + \sigma_{TT} \end{cases}$$

3) Functional level of urban tourism. It can reflect the scope and influence of urban tourism functions on the entire urban system. There is strong correlation between functional level and functional scale, but the content of measurement in these two aspects is different. Some cities with large tourism functions, not mean their functional level higher than scale. For example, in terms of the scale of urban tourism reception, many cities in China and India have a large number of domestic tourists, and own a large scale of tourism functions, but they are relatively low in the global urban system. According to the radiation range and influence, the functional level can be divided into global level, continent level, international level, domestic level and regional level. Under the international system, the measurement of the city level mainly adopts the number of international tourist reception indicators. According to indicator, the functional level in urban system can be divided into global, continental and international level.

4) Functional intensity of urban tourism functions. Functional intensity is a relative concept, that is, the scale of urban tourism relative to the size of the city. For example, if receiving the same number of tourists, the city with a small size has a high tourism intensity, while the city with a large size has a low tourism strength. This paper uses the number of urban permanent residents to represent the city scale. The tourism functional intensity is the total number of urban tourism reception divide by the resident population. The tourism functional intensity is divided into high, medium and low, according to the mean and standard deviation. Tourism functional intensity is also demonstrate as skewed-distribution. In this paper we define the range of tourism functional strength as follows:

Total Residents (TR_i),Total Tourist (TT_i),Tourism Strength $TPi = {}^{TTi}/_{TRi}$

$$TPi = \begin{cases} \text{High intensity} & TPi < \overline{X}_{TP} \\ \text{Middle intensity} & \overline{X}_{TP} < TPi < \overline{X}_{TP} + \sigma_{TP} \\ \text{Low intensity} & TPi > \overline{X}_{TP} + \sigma_{TP} \end{cases}$$

5) Functional status of urban tourism. Functional status reflects the relative importance of urban tourism functions in city's functions. Taking city A and B as examples, even if there are the same in functional scale, functional level, and functional intensity, but other functions in city A(such as industry and commerce) are stronger, while other functions of city B are weaker, then the status of tourism function in city B is higher than the other functions. the function of tourism function in B city The status is higher in the composition. The proportion of tourism employment in urban employment can be used to measure the status of tourism functions in many functions of city. However, in reality, the statistics of tourism employment are difficult to obtain, therefor it can be replaced by the ratio of tourism income to GDP. Based on the mean and standard deviation, we define the status of the tourism function as follows.

City i GDP_i, Tourism Income TI_i, Tourism Status $TSi = {}^{TIi}/_{GDPi}$

$$TSi = \begin{cases} \text{High status} & TSi < \overline{X}_{TS} \\ \text{Middle status} & \overline{X}_{TS} < TSi < \overline{X}_{TS} + \sigma_{TS} \\ \text{Low status} & TSi > \overline{X}_{TS} + \sigma_{TS} \end{cases}$$

4. Empirical Research: Analysis of Tourism Destinations Function in China

Based on the above five dimensional evaluation model, this paper conducts an empirical study on the tourism functions of 287 cities which are above the prefecture-leve cities in China. The data of urban population and GDP are derived from the China Urban Statistical Yearbook. The indicators of domestic tourist receptions, inbound overnight tourist, and tourism income are derived from Bulletin of Urban Statistics. The statistics of foreign cities are derived from the Euro Monitor Database.

According to the three dimensions of the function scale, function intensity and functional status of tourism, 27 combinations can be generated, such as medium scale-high intensity-high status, large scale-high intensity-medium status. The specific distribution is as follow Table

Tab.1 cross-tab of tourism function by 3 dimensions

Tourism Scale			Tourism status			Total
			Low status	Middle status	High status	
Small-scale	Tourism intensity	Low intensity	136	29	1	166
		Middle intensity	10	14	4	28
		High intensity	1	1	2	4
	Total		147	44	7	198
Medium-scale	Tourism intensity	Low intensity	15	5	0	20
		Middle intensity	8	18	1	27
		High intensity	2	11	8	21
	Total		25	34	9	68
Large-scale	Tourism intensity	Middle intensity		8		8
		High intensity		11		11
	Total			19		19

The results show that there are 136 cities are small scale-low intensity-low status, accounting for 47.7% of the total sample. In addition, there are 54 cities with "double low-middle", accounting for 18.9%. the total number of two kinds of city are 190, accounted for 66.7%, indicating that there are two-thirds of are weak in cities tourism functions currently. In another one-third of cities, their tourism functions are relatively high in a certain dimension or in all dimensions, they are belong to

the strong tourism function cities.

There are 19 large-scale tourist cities, all of which have medium-function status, and the tourism function intensity is also medium-high level, and there is no low-intensity large-scale city. It can show that tourism function is one of the important functions for large cities, but due to the diversities of urban functions, tourism functions have a certain status in many functions, but they are not dominant. These cities are all comprehensive cities including Beijing, Shanghai, Nanjing, Hangzhou, Tianjin, Wuhan, Luoyang, Wuxi, Ningbo, Suzhou, Shenyang, Zhengzhou, Xi'an, Guangzhou, Chongqing, Chengdu, Harbin, Qingdao and Changsha.

There are 16 cities with high tourism function status, all of which are small and medium-sized cities, moreover the intensity of tourism functions in these cities is generally high, including Huangshan, Zhangjiajie, Guilin, Sanya, Chizhou, Lijiang, Anshun, Lhasa, Nanping, Guiyang, Dandong, Zhoushan, Fushun, Benxi. Most of these cities are in backward areas,economy is underdeveloped, and the city's GDP is relatively low. However all these cities obtain a high tourism functional status among the urban functions.Meanwhile, compare to the small sized city, its tourism function is stronger than others.

There are 36 cities with high tourism function intensity, 88% of them belong to the large and medium-size, and their status is generally medium and high. Apart from the above-mentioned comprehensive large cities, some second- and third-tier cities like Xiamen, Zhuhai, Liaoyang, Zhenjiang, Lishui, Huzhou, Panjin, Jiaxing, Changzhou, Shaoxing, Weihai, etc. Leshan, Qinhuangdao, Jinzhou, Kaifeng, Yangzhou, Jinhua, Kunming, Nanning, Taiyuan, Quzhou, Tai'an, Rizhao, Jiaozuo, Wenzhou, Taizhou, Dalian, Xiangtan and Zhaoqing. Generally, the intensity of tourism functions in small cities is low, in total 198 small-scale tourism cities, 3% of them are low-intensity.

5. Summary and shortage

Based on the previous studies, this paper proposes a conceptual model of urban tourism function evaluation, which measures urban tourism functions from five dimensions: tourism functional properties, functional scale, functional level, functional intensity and functional status. On the basis of the conceptual model, the empirical study of the tourism destination function of Chinese cities is carried out by using the statistical data of 285 prefecture-level cities in China, and quantitatively evaluate the each dimensions. Moreover the cross-tab method is adopted by analyzing the functional scale, functional intensity and functional statues, according to the results, the basic characteristics of strong tourism function city can be concluded.

However, the research in this paper is based on static analysis. The conclusion can only reflect the current level and it cannot measure the dynamic evolution process of tourism functions in each city. Due to the rapid development of tourism, the tourism function in urban area is constantly evolving and changing. Time series analysis and research on this change process will help us to understand the rules of the generation, development and evolution of urban tourism functions, so that we can look forward to future.

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