Research on Spatial Pattern of Chinese Characteristic Towns

Wen Chen[a], Yexi Zhong[b, *], Yi Luo[c]

Jiangxi Economic Development Research Institute/School of Geography and Environment, Nanchang 330022, Jiangxi, China

[a]2219406040@qq.com, [b]zhongyexi@126.com, [c]1153468167@qq.com

Keywords: characteristic towns, spatial distribution, Kernel density

Abstract: Selecting 403 national characteristic towns as research samples, then according to their functions and properties, all the national characteristic towns are divided into four types: historical and cultural, characteristic industry, leisure tourism and resource endowment type. The spatial distribution types, equilibrium degree and spatial agglomeration areas of various types of Characteristic Towns in China are studied by using the nearest neighbor index, geographic concentration index and kernel density, and exploring the spatial distribution rule of different types of characteristic towns, in order to provide reference for the classification and construction of regional characteristic towns.

Characteristic towns are innovative and entrepreneurial platforms that gather characteristic industries on several square kilometers of land, integrate production and living ecological space, and are different from administrative towns and industrial parks[1]. Since it came into public view, characteristic towns have gradually risen to a national strategy. On July 1, 2016, the Ministry of Housing and Construction and other three ministries jointly issued the Notice on Developing the Cultivation of Characteristic Towns, and decided to carry out the cultivation of characteristic towns throughout the country. In October of the same year and July of the next year, a total of 403 national construction lists of characteristic towns were published. It plays an important role in transforming the development model, promoting the transformation and upgrading of resource-based economy and promoting the construction of new urbanization [2-3]. Therefore, it has important theoretical and practical significance to study the characteristic towns.

With the warming up of the construction of characteristic towns, some underdeveloped areas are divorced from their own reality, blindly copying the construction mode of small towns with the characteristics in Zhejiang, resulting in frequent chaos of "one side of a thousand towns". Classification study of characteristic towns is helpful for local authorities to identify their own characteristics and then select suitable construction models of characteristic towns, which can effectively avoid the chaos of "one side of a thousand towns". Quantitative characterization of spatial distribution characteristics of different types of characteristic towns is helpful to discover the internal distribution rule of different types of characteristic towns, and then point out the mode selection and cultivation and construction direction of Characteristic Towns in different regions. In view of this, on the basis of previous studies and existing policy documents, this study divides 403 national characteristic towns into different types, and quantitatively characterizes the spatial distribution characteristics of different types of Characteristic Towns in China by using the nearest neighbor index, geographic concentration index and nuclear density, with a view to providing reference for the cultivation and construction of Characteristic Towns in various provinces or regions.

1. Data sources and research methods

1.1 Data Source and Processing

The study took 403 national characteristic towns as samples up to the end of August 2017. The research scope did not include Hong Kong, Macao and Taiwan. Relevant data of characteristic

towns mainly come from official data published by the Ministry of Housing and Urban-Rural Construction. Spatial data come from the map database of the National Basic Geographic Information Center. The research uses 1:4 million vector maps of China, uses Google Earth to acquire the spatial attributes of 403 national characteristic towns, and using ARCGIS 10.2 to construct the spatial attributes database of characteristic towns.

Referring to the previous research results and combining with the actual situation of the construction of Characteristic Towns in China [4-6], 403 characteristic towns are divided into four types according to their functions and properties: historical and cultural type, characteristic industry type, leisure tourism type and resource endowment type. The classification system is shown in Table 1.

Tab.1 Categories and Proportions of Characteristic Towns

category	Subdivision category	Proportion
Historical and Cultural Type	Historic towns, cultural continuity, inheritance of skills, relics, etc.	35.24%
Characteristic industry type	Traditional Industry, High-end Manufacturing and Emerging Industry	26.30%
Leisure tourism type	Eco-tourism, recreation and leisure	19.85%
Resource endowment type	Cash crops, aquatic resources, mineral ores	18.61%

1.2 Research methods

1.2.1 Nearest Neighbor Index

Nearest Neighbor Index (NNI) is a method based on spatial distance. Its principle is to select any point in the actual data, and compare the average distance from the nearest point with the expected nearest neighbor distance under the random distribution mode, so as to judge the spatial aggregation of characteristic towns by its ratio. The formula is [7]:

$$NNI = \sum_{i=1}^{n} \frac{\min(d_{ij})}{N} \bigg/ 0.5\sqrt{(A/N)} \qquad (1)$$

In the formula: mind (d_{ij}) is the distance between any characteristic town i and its nearest neighbor characteristic town j; N is the total number of characteristic towns; A is the total area of the study area. And NNI < 0.5 is aggregated distribution, NNI < 1 is random distribution, if 0.5 < NNI < 1 is aggregation-random distribution.

1.2.2 Geographical Concentration Index

It is used to measure the concentration of characteristic towns between provinces. The formula is [8]:

$$E = 100 \times \sqrt{\sum_{i=1}^{n}(p_i/S)^2} \qquad (2)$$

In the formula, E is the geographic concentration index, P_i is the number of characteristic towns in i province, S is the total number of characteristic towns, n is the number of provincial and urban areas, that is, n=31. The larger the E value, the more concentrated the distribution of characteristic towns.

1.2.3 Kernel density

Kernel density analysis is a non-parametric estimation method commonly used in spatial point analysis method. It is a method that uses kernel function to fit points or lines to get smooth conical surface and calculate its neighborhood density. This method can reflect the degree of spatial aggregation and concentration of element points. The calculation formula is as follows[9]:

$$g(x) = \frac{1}{nh} \sum_{i=1}^{n} k\left(\frac{x-X_i}{h}\right) \qquad (3)$$

In the formula, k is the kernel function, H > 0 is the bandwidth, and (x-Xi) is the distance from the valuation point x to the event Xi.

2. Results and Analysis

2.1 Spatial Distribution Types

From Table 2, we can see that the NNI values of the nearest neighbor index of all types of characteristic towns are within the range of 0.5 to 1, and the Z and P test values are highly significant, so all types of characteristic towns are aggregated-random distribution. Among them, the characteristic industry towns have the strongest aggregation, the NNI index is 0.6, while the leisure tourism towns have the weakest aggregation, and the NNI index is 0.79.

Tab.2 Nearest neighbor index of national characteristic towns

category	NNI	Distribution type	Z value	P value
Historical and Cultural Type	0.72	Aggregated-Random	-4.57	0.000005
Characteristic industry type	0.64	Aggregated-Random	-8.72	0
Leisure Tourism type	0.79	Aggregated-Random	-3.57	0.0004
Resource endowment type	0.60	Aggregated-Random	-7.8	0

2.2 Equilibrium of Spatial Distribution

The result shows that the geographic concentration index of resource endowment towns is the highest, reaching 23.74, while that of leisure tourism towns is the lowest, reaching 19.84. The geographic concentration index of all types of towns is within the range of [19.84, 23.74]. If all types of towns are evenly distributed in all provinces and regions, then E_0 is 17.96. the actual measurement results are greater than this value, which shows that the spatial distribution of all types of Characteristic Towns in China is not balanced at the provincial level, and they all show a centralized distribution trend.

2.3 Spatial Aggregated Region

From Figure 1, we can see that there are significant differences in the distribution density of different types of Characteristic Towns in China. The distribution of leisure tourism towns is relatively scattered, and there are many high density areas, higher density areas and medium-density areas, mainly at the junction of Beijing, Tianjin and Hebei, Sichuan and Chongqing, the Yangtze River Delta region and Guixi. To a certain extent, this shows that our country is rich in natural resources, parks, scenic areas and so on; and the distribution of the other three types of characteristic towns is more concentrated. they are mainly concentrated in the Yangtze River Delta region. As the pioneer of economic development in China, the Yangtze River Delta region plays a leading role in the process of urbanization. Over the years, the development of the Yangtze River Delta region has formed a number of lumpy economies with distinct industrial color and obvious regional advantages. In addition, as the pioneer of the development of characteristic towns, The Yangtze River Delta region has certain advantages in terms of cultural heritage and resource endowment mining. Generally speaking, the comprehensive advantages of Developing Characteristic Towns in the Yangtze River Delta region are more obvious than those in other regions, and the experience of Developing Characteristic Towns in the Yangtze River Delta region deserves to be popularized and used for reference.
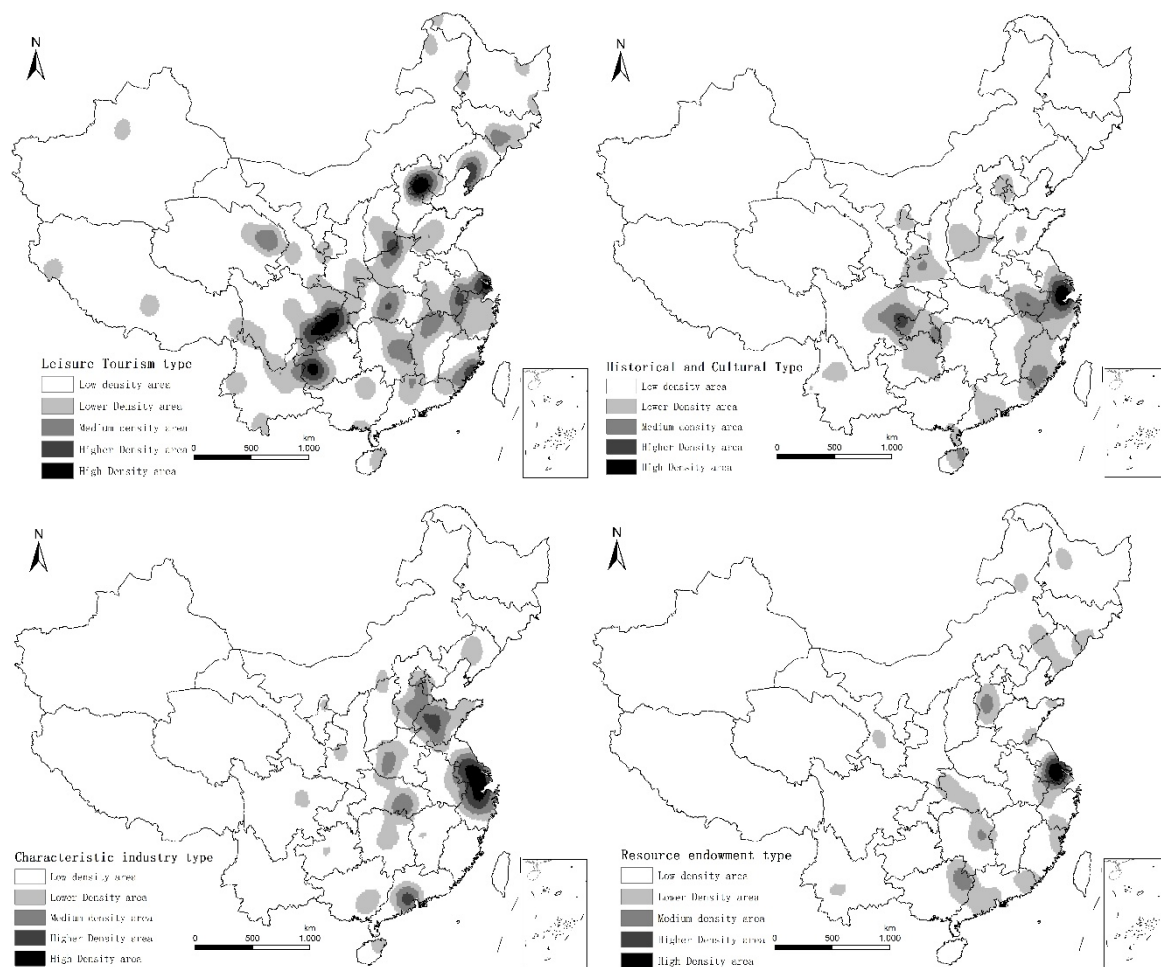
Fig.1 Kernel density of various characteristic towns

3. Conclusions

This paper digs out the functions and properties of characteristic towns, and quantitatively characterizes the spatial distribution characteristics of each type of characteristic towns by using the nearest neighbor index, geographic concentration index and kernel density. The main conclusions are as follows:

According to the function and nature of characteristic towns, 403 Characteristic Towns in China can be divided into four types: historical and cultural type, characteristic industry type, leisure tourism type and resource endowment type.

The spatial distribution types of historic and cultural towns, characteristic industry towns, leisure tourism towns and resource endowment towns are Aggregated-random distribution, and the spatial distribution is unbalanced, showing a centralized distribution trend.

The distribution of characteristic towns of leisure tourism type is relatively scattered, mainly distributed in Beijing-Tianjin-Hebei region, the junction of Sichuan-Chongqing, the Yangtze River Delta region and Guixi. Historical and cultural, characteristic industry and resource endowment characteristic towns are mainly distributed in the Yangtze River Delta region. The comprehensive advantages of Developing Characteristic Towns in the Yangtze River Delta region are more obvious than those in other regions of China. The development experience of characteristic towns is worth popularizing and drawing lessons from.

Acknowledgements

References

[1] National Development and Reform Commission, Ministry of Land and Resources, Ministry of Environmental Protection and Ministry of Housing and Urban-Rural Construction. Some Opinions on Standardizing the Construction of Characteristic Towns and Characteristic small Towns[EB/OL]. http://www.ndrc.gov.cn/gzdt/201712/t20171205_869709.html,2017-12-4.

[2] Jiang Zeng, Feng Ci. Construction of Characteristic Towns under the Background of New Urbanization [J]. Macroeconomic management, 2016(12):51-56.

[3] Hui Yang. Investigation and Consideration on the Construction of Characteristic Towns in Ganzhou City [J]. Finance and Economy, 2018(02):93-96.

[4] Xiaodong Fu, Yawei Jiang. Discussion on the Development Model of Small Towns with Chinese Characteristics from the Ground-based Perspective [J]. China SoftScience, 2017(08):102-111.

[5] Ministry of Housing and Urban-Rural Construction. Circular of the Ministry of Housing, Urban and Rural Construction on Publishing the List of the First Batch of Towns with Chinese Characteristics [EB/OL]. http://www.mohurd.gov.cn/wjfb/201610/t20161014_229170.html,2016-10-11.

[6] Ministry of Housing and Urban-Rural Construction. Circular of the Ministry of Housing, Urban and Rural Construction on Publishing the List of the Second Batch of Towns with Chinese Characteristics [EB/OL]. http://www.mohurd.gov.cn/wjfb/201708/t20170828_233078.html,2017-08-22.

[7] Meijuan Hu, Zaijun Li, Guolin Hou, Tao Li. Spatial pattern and multi-scale characteristics of rural tourist attractions in Jiangsu Province [J]. Economic Geography, 2015, 35(06):202-208.

[8] Huaifei Shen, Jinggang Zheng, Fengpei Tang and Guoxi Wu. Spatial distribution characteristics of A-level tourist attractions in Henan Province [J]. Economic geography, 2013, 33(02):179-183.

[9] Shaoqi Pan,i Yating L, Jianhua Gao. Spatial Pattern of Economic Linkages Network in Central Plains Economic Area [J]. Progress in Geographic Science, 2014, 33(01):92-101.