# Spatial Structure of Tourism Resources in Liaoning Province

**Hongna LI, Liang ZHAO***

School of Business Administration, University of Science and Technology Liaoning, Anshan 114051, China

**Abstract** Selecting fifty one 4A grade scenic spots in Liaoning Province as sample scenic spots, this paper analyzes spatial structure of tourism resources of Liaoning Province in quantitative and qualitative aspects by means of geographical and mathematical spatial analysis method. Results indicate that spatial distribution of resource type scenic spots is agglomerative, and the balance of regional distribution is not high; the degree of centralized distribution is relatively low, but it is still centralized distribution, the distribution uniformity is relatively low. Areas with high density of resource type scenic spot distribution include Shenyang, Dalian, and Dandong cities in Liaoning Province.

**Key words** Tourism resources, Spatial structure, Liaoning Province

## 1 Introduction

Spatial structure of tourism resources refers to the combination relationship between distribution, quality, and quantity of tourism resources in a region. It can directly bring about spatial behavior of tourists, and also plays an essential role in development speed, scale, benefits and temporal and spatial arrangement of tourism resources, thus it is of great significance to studying the spatial structure of tourism resources. At present, researches about spatial structure of tourism resources focus on evaluation of abundance of tourism resources at national level. For example, Huang Chenglin selected absolute quantity, per capita density, and per area density of 6 types of tourism resources, using the sequence scoring method, made a quantitative evaluation of major tourism resources[1]; Li Jinglong made a quantitative evaluation and grade division of tourism resources in provinces of China through selecting 19 major types of tourism resources[2]. Besides, Xu Xiantang *et al.*, Hou Xiaofei and Shao Xiuyun[4] studied spatial structure characteristics of tourism resources in Hubei Province and Shanxi Province. These studies provide new ideas for spatial structure of regional tourism resources, but they lack analysis about combination and relatively superior resources of regional tourism resources. Therefore, taking 14 prefecture level cities of Liaoning Province as research objects, we make a quantitative study on overall characteristics of spatial structure of tourism resources in cities of Liaoning Province.

In Liaoning Province, there are many objects of tourism resources. At present, there are 547 objects of tourism resources. According to *Classification, Investigation and Evaluation of Tourism Resources* (GB/TI8972 – 2003), there are 8 main types, 31 sub-types, and 155 fundamental types. In Liaoning Province, there are 8 main types, 31 sub-types, and 155 fundamental types. In other words, Liaoning Province has all of types specified in GB/TI8972 – 2003, accounting for 100%, 100% and 100% respectively. Since the scenic spots are numerous, we only make analysis of 4A and above scenic spots with point type distribution at the macro level. In this way, there are 51 objects of tourism resources, and the regional area is 148000 $km^2$.

## 2 Analysis on abundance of tourism resources

Using the sequence scoring method, we calculate absolute abundance index (A), relative abundance index (C) and total abundance (F) of tourism resources in city level of Liaoning Province. Values of A, C and F are listed in Table 1.

The calculation formula is as follows:

$$P_i = \frac{mn - \sum_{i=1}^{m} d_{ij}}{mn - n} \qquad F = \sqrt{A * C}$$

where $P_i$ is the overall index of tourism resource of the city $i$, $m$ is the number of cities (14 in this study), $n$ is types of resources (6 in this study), and $\sum_{j=1}^{m} d_{ij}$ denotes the sum of $m$ resources of the city $i$ into the whole province.

From Table 1, we can see that Dalian, Benxi, Dandong, and Shenyang cities have higher total abundance of tourism resources, while Liaoning, Panjin and Tieling have lower total abundance of tourism resources. The advantages of Liaoning Province in abundance of tourism resources are concentrated in southern, central and eastern regions, where there are many types of tourism resources and the abundance of tourism resources is high, favorable for organizing high density tourism industry, and forming fully developed tourism economic belt and tourism economic zones.

## 3 Measurement of spatial distribution types of tourism resources

With reference to researches of Wu Bihu and Tang Ziying[5] and Bian Xianhong *et al.*[6], we measured overall spatial distribution of tourism resources of fifty one 4A and above level scenic spots in 14 cities of Liaoning Province by the shortest distance formula.

The shortest distance is a geographical indicator reflecting mutual proximity degree of point objects in geographical space.

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* Corresponding author. E-mail: Lvyouxue1@163.com

We measured the distance $r$ between each point and the closest point, take the average value $\overline{r_1}$ to characterize the average shortest distance (the shortest distance, in short). When the point distribution in the region is random (Poisson distribution), the closest distance in theory can be expressed in $\overline{r_{1E}} = \frac{1}{2\sqrt{n/A}} = \frac{1}{2\sqrt{D}}$, where $\overline{r_{1E}}$ denotes the theoretical closest distance, $A$ is regional area, $n$ is number of points, and $D$ is the point density. In uniform distribution, random distribution, and agglomerative distribution, the uniform distribution has the highest closest distance, followed by the random distribution, and the lowest is agglomerative distribution.

**Table 1 Total abundance of tourism resources in cities of Liaoning Province**

| City | F value | Rank | A value | C value |
|---|---|---|---|---|
| Shenyang | 0.803 | 4 | 0.897 | 0.718 |
| Dalian | 0.877 | 1 | 0.923 | 0.833 |
| Anshan | 0.654 | 11 | 0.795 | 0.538 |
| Fushun | 0.773 | 6 | 0.833 | 0.718 |
| Benxi | 0.839 | 2 | 0.846 | 0.833 |
| Dandong | 0.82 | 3 | 0.859 | 0.782 |
| Jinzhou | 0.745 | 8 | 0.833 | 0.667 |
| Yingkou | 0.756 | 7 | 0.795 | 0.718 |
| Fuxin | 0.712 | 10 | 0.808 | 0.628 |
| Liaoyang | 0.651 | 12 | 0.769 | 0.551 |
| Panjin | 0.651 | 12 | 0.769 | 0.551 |
| Tieling | 0.62 | 14 | 0.769 | 0.500 |
| Chaoyang | 0.784 | 5 | 0.872 | 0.705 |
| Huludao | 0.745 | 8 | 0.833 | 0.667 |

The closest point index R is defined as the ratio of actual closest distance to theoretical closest distance: $R = \frac{\overline{r_1}}{\overline{r_{1E}}} = \sqrt[2]{D\overline{r_1}}$. When $R$ is 1, the point distribution is random; when $R$ is higher than 1, the point distribution tends to uniform distribution; when R is lower than 1, the point distribution tends to agglomerative distribution.

Using the formula, we calculate the closest distance of ideal random distribution of 4A level scenic spots in Liaoning Province: $\overline{r_1}$ = 26.9353 km. According to measured data of ArcGIS, we obtain the actual closest straight line distance $r_1$ between the closest sample scenic spots of each sample, and obtain the average closest distance $\overline{r_1}$ = 20.60 km. Then, we calculate $R = 20.60/26.9353 = 0.765 < 1$, indicating scenic spots of Liaoning Province take on agglomerative distribution, and the distribution of scenic spots is relatively agglomerative, and mainly distributed in Shenyang, Dalian, and Dandong cities. Therefore, it is required to pay special attention to consolidation of tourism resources, to integrate spatial structure of tourism resources in Liaoning Province.

## 4 Analysis on balance of spatial distribution of tourism resources

### 4.1 Concentration degree of the distribution of scenic spots

The geographical concentration index is an essential indicator measuring the concentration degree of research object. In this study, we use the geographical concentration index to measure the spatial distribution of resource type scenic spots in prefecture – level cities of Liaoning Province. The formula is as follows:

$$G = 100 \times \sqrt{\sum_{i=1}^{n}\left[\frac{x_i}{T}\right]^2}$$

where G refers to geographical concentration index of a scenic spot, $X_i$ signifies the number of scenic spots in the prefecture level city $i$, T is the total of scenic spots (51 in this study), and $n$ is the number of prefecture – level cities (14 in this study). G values are within the range of 0 – 100, the higher the G value, the more concentrated distribution scenic spots; the lower the G value, the more scattered distribution of scenic spots. Through calculation, the geographical concentration index of 4A level resource type scenic spots is 51.361. From the perspective of the city level, the distribution of resource type scenic spots is relatively concentrated.

### 4.2 The degree of balance in distribution of scenic spots

In geography, Gini coefficient is an important indicator for studying spatial distribution of discrete regions. It is used for comparison of differences between different research objects, to find out rules of changes in regional distribution. In this study, we use Gini coefficient to measure the spatial distribution of resource type scenic spots in main geographical regions of the whole province. The calculation formula for Gini coefficient is as follows:

$$H = -\sum_{i=1}^{n} P_i \ln P_i \quad H_m = \ln N \quad Gini = H/H_m \quad C = 1 - Gini$$

where $P_i$ signifies the proportion of the scenic spots in prefecture – level city $i$ to total scenic spots in the whole province, N is number of regions, and C is the uniformity of distribution. Gini coefficient remains in the range of 0 to 1, and the higher Gini coefficient means the higher concentration degree. We carry out Gini coefficient analysis on national level 4A grade scenic spots in 14 cities of Liaoning Province, to evaluate the distribution of scenic spots in Liaoning Province.

Through calculation, $H$ = 0.9264, $H_m$ = 1.1461, $Gini$ = 0.8083, and $C$ = 0.1917, thus $Gini$ coefficient is 0.8083, and the distribution uniformity C is 0.191687. Results indicate that national level 4A grade scenic spots of Liaoning Province takes on concentrated distribution, and the distribution uniformity is relatively low. Researches of Wu Bihu and Tang Ziying[5] indicate that Gini coefficient for 8 geographical regions of the first national level 4A grade scenic spots in central China is 0.8561, and the distribution uniformity is 0.1439; researches of Bian Xianhong show that Gini coefficient of national level 4A grade scenic spots in the Changjiang Delta is 0.8442, and the distribution uniformity is 0.1558[6]; researches of Wang Heng indicate that Gini coefficient for spatial structure of tourism system of Dalian City is 0.7985, and the distribution uniformity is 0.2015[7]. Comparison indicates that the concentrated distribution degree of scenic spots in Liaoning Province is relatively low, but still takes on concentrated distribution, and scenic spots are mainly distributed in Shenyang and Dalian.

**Table 2 Comparison of concentrated distribution and uniform distribution of 4A grade scenic spots in Liaoning Province**

| No. | City | Number of 4A grade scenic spots | % | Total % (A) | Concentrated distribution | Total % (M) | Uniform distribution | Total % (R) |
|---|---|---|---|---|---|---|---|---|
| 1 | Shenyang | 13 | 25.29 | 25.49 | 100 | 100 | 7.143 | 7.143 |
| 2 | Dalian | 10 | 19.60 | 45.09 | 0 | 100 | 7.143 | 14.286 |
| 3 | Anshan | 2 | 3.92 | 49.01 | 0 | 100 | 7.143 | 21.429 |
| 4 | Fushun | 3 | 5.88 | 54.89 | 0 | 100 | 7.143 | 35.715 |
| 5 | Benxi | 4 | 7.84 | 62.73 | 0 | 100 | 7.143 | 57.144 |
| 6 | Dandong | 6 | 11.76 | 74.49 | 0 | 100 | 7.143 | 92.859 |
| 7 | Jinzhou | 4 | 7.84 | 82.33 | 0 | 100 | 7.143 | 150.003 |
| 8 | Yingkou | 1 | 1.96 | 84.29 | 0 | 100 | 7.143 | 242.826 |
| 9 | Fuxin | 4 | 7.87 | 92.16 | 0 | 100 | 7.143 | 392.865 |
| 10 | Liaoyang | 3 | 5.88 | 98.04 | 0 | 100 | 7.143 | 635.727 |
| 11 | Panjin | 1 | 1.96 | 100 | 0 | 100 | 7.143 | 1 028.592 |
| 12 | Tieling | 0 | 0 | 100 | 0 | 100 | 7.143 | 1 664.319 |
| 13 | Chaoyang | 0 | 0 | 100 | 0 | 100 | 7.143 | 2 692.911 |
| 14 | Huludao | 0 | 0 | 100 | 0 | 100 | 7.143 | 4 387.230 |
| | Total | 51 | 100.00 | 1068.52 | 100 | 1400 | – | 7 050.141 |

## 5 Conclusions

From the above analysis, we arrive at the following conclusions: (i) Spatial distribution of resource type scenic spots is agglomerative, and the closest point index $R = 0.765 < 1$. (ii) The distribution of scenic spots in 14 prefecture-level cities of Liaoning Province is relatively concentrated, and the balance degree is relatively low; the geographical concentration index of fifty one 4A grade resource type scenic spots G = 51.361. (iii) Resource type scenic spots take on concentrated distribution in 14 prefecture-level cities of Liaoning Province, and the distribution uniformity is relatively low, while Gini coefficient is up to 0.80836. (iv) Shenyang, Dalian, and Dandong cities have higher density of distribution of resource type scenic spots.

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(From page 23)

entire national economy. Based on the cases about foreign capital M&A of China's agribusiness in recent years, this paper analyzes the change and current situation concerning the scale and industrial choice during the foreign capital M&A of China's agribusiness. There is a need to strengthen the survey and research in enterprises to obtain first-hand data and enhance reliability and scientificity of data, and carry out in-depth studies on the follow-up issues concerning foreign capital M&A of China's agribusiness.

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