Spatial Mismatch of Tourism Resources and Tourism Economy in Guangxi, China

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Abstract. This study analyzed the spatial mismatch between tourism resources abundance and tourism economy development level in Guangxi, China. tourism resources abundance index, tourism economy development index, gravity model, and tourism spatial mismatch index were used. The results show that: (1) The spatial mismatch between tourism resources and tourism economy was obvious in Guangxi. The gravity center of tourism resources abundance was northeast-southwest, and the gravity center of tourism economy was southwest-northeast-southwest. (2) The degree of tourism spatial mismatch was different among the cities. The tourism spatial mismatch indexes in 3 cities had been consistently greater than 0, and they were always less than 0 in 4 cities. The other 7 cities were in a positive and negative alternating state. (3) The level of tourism spatial mismatch would change. There were a total of 6 cities that had basically remained in their original state, while the other cities had undergone certain changes.

Keywords: tourism resources; tourism economy; tourism spatial mismatch index; spatial mismatch;

1. Introduction

Usually, tourism resources and tourism economy have a significant internal relationship. The input status of tourism resources elements in a region has a significant impact on the development potential of tourism economy[1]. If some countermeasures can be proposed to optimize the spatial structure of tourism, it can facilitate the improvement of regional tourism economy, and promote the coordinated development of tourism space.

Spatial mismatch theory is a theoretical hypothesis put forward by John Kain in 1960s [2]. Spatial mismatch theory attracted scholars' attention, which was verified by empirical analysis[3,4]. Spatial mismatch theory had also been applied in planning, urban geography, economics, sociology and other fields[5,6,7,8]. Spatial mismatch theory provided a new theoretical guidance for the study of tourism spatial mismatch, and many scholars used spatial mismatch theory to analyze the phenomenon of tourism spatial mismatch. Some scholars analyzed the spatial mismatch of national and regional tourism-related elements from a macro scale[9], some scholars took provinces as research units to explore the dislocation between tourism resources and tourism economy[10], and some scholars discussed different types of tourism resources[11,12], tourism resources and network attention[13].

Generally speaking, the existing research mainly takes the country and province as the research unit, and mainly chooses a single time node or a short time in the time range. Gravity model and two-dimensional matrix are its common research methods. In the selection of indicators, scholars mostly use A-level scenic spots to characterize the abundance of regional tourism resources, and tourism income is used to characterize the development level of tourism economy. Therefore, it is of great theoretical significance and practical value to study the spatial mismatch for a long period
between tourism resources and tourism economy in Guangxi. It is urgent to carry out relevant research work.

2. Materials and Methods

2.1 Overview of The Study Area

Guangxi is a provincial administrative region inhabited by ethnic minorities in southern China. The region is rich in natural and cultural tourism resources and has a good foundation for development. It is an important tourism province in China. There are more than 660 A-level scenic spots all over the whole region. The 5A-level scenic spots are 8, the 4A-level scenic spots are 307, the 3A-level scenic spots are 335, and the 2A-level scenic spots are 11. In 2019, the comprehensive tourism income of the whole region reached 1.02 trillion CNY, with 876 million tourists from home and abroad. The development of tourism industry has been severely impacted since 2020 due to COVID-19. In new situations, it is necessary to analyze the spatial mismatch between tourism resources and tourism economy in Guangxi, China.

2.2 Methods

2.2.1 Tourism Resources Abundance Index

A-level scenic spots that assessed by China National Tourism Administration have the most comprehensive classification coverage for different types of tourism resources. So the number of scenic spots 1A~5A is adopted as the measurement index. The calculation formula is as follows:

\[ R_i = 5.00N_5 + 2.50N_4 + 1.75N_3 + 0.50N_2 + 0.25N_1 \]

\[ N_{ij} = \frac{D_{ij} - \min D_j}{\max D_i - \min D_j} \]

Among them, \( R_i \) is the tourism resources abundance index of \( i \) city. \( N_1 \), \( N_2 \), \( N_3 \), \( N_4 \), and \( N_5 \) are the number of 1A, 2A, 3A, 4A, and 5A scenic spots in \( i \) city respectively. 0.25, 0.50, 1.75, 2.50, and 5.00 are the weights of 1A~5A scenic spots respectively. \( N_{ij} \) represents the normalized value of the \( j \)-th (\( j=1, 2, 3, 4, 5 \)) level scenic spots in the \( i \) city, and \( D_{ij} \) represents the original number of the \( j \)-th level scenic spots in \( i \) city. \( \max D_j \) and \( \min D_j \) are the maximum and minimum values of the number of scenic spots in the \( j \)-th level respectively.

2.2.2 Tourism Economy Development Index

Tourism economy development index is an index to analyze the tourism economy level of each city. The total tourism income is used to measure the tourism economy development index of each city. The formula is as follows:

\[ I_i = \frac{x_i - x_{\text{min}}}{x_{\text{max}} - x_{\text{min}}} \times 100 \]

Among them, \( I_i \) is the tourism economy development index of \( i \) city. \( x_i \) is the total tourism income of \( i \) city. \( x_{\text{min}} \) and \( x_{\text{max}} \) are the minimum and maximum values of total tourism income of 14 cities in Guangxi.

2.2.3 Gravity Model

Gravity model can be used to calculate the gravity center of tourism resources and tourism economy in Guangxi. The formula is as follows:
When the development of tourism economy is significantly lagging behind, which results in a serious spatial mismatch in this area. When the absolute value of spatial mismatch index is greater than 1, there is a serious spatial mismatch phenomenon between things.

3. Results

3.1 Overall Spatial Mismatch

According to the above formulas, the indicators of A-level scenic spots and tourism revenue were collected from Guangxi Statistical Yearbook from 2012 to 2022, the tourism resources abundance index and tourism economy development index were calculated.

Overall, Guilin had the best abundance of tourism resources, far ahead of other cities. Nanning had relatively abundant tourism resources, followed by Liuzhou and Hechi. Other cities were relatively weaker. Especially the four cities of Fangchenggang, Guigang, Hezhou, and Laibin, tourism resources abundance indexes were less than 1, indicating that tourism resources were relatively scarce. Nanning had the best tourism economy development, with a much higher tourism economy development index than other cities. Guilin, as the world-renowned tourism city, lagged behind Nanning in terms of tourism economy development level. The development level of tourism economy in other cities was significantly lagging behind. Especially for Laibin and Fangchenggang, tourism economy was almost at a standstill and the development speed was very slow. Then tourism resources abundance index and tourism economy development index were brought into formulas of Gravity Model, respectively. The coordinate values of gravity center's longitude and
latitude of tourism resources abundance and tourism economy were calculated. After visual processing, the gravity center's evolution track map of tourism resources abundance and tourism economy from 2011 to 2021 was obtained (Fig.1).

![Gravity center's evolution track of tourism resources abundance and tourism economy](image)

**Fig.1 Gravity center's evolution track of tourism resources abundance and tourism economy**

It can be seen that there was an obvious spatial mismatch between the gravity center of tourism resources abundance and the gravity center of tourism economy. There was a certain regularity between the gravity center of tourism resources abundance and tourism economy with the change of time. The gravity center of tourism resources abundance was generally northeast-southwest, with the maximum gravity center shifting by 0.454 latitudes to the south and 0.287 longitudes to the west. The gravity center of tourism resources abundance shifted from Liujiang District in Liuzhou to Xingbin District in Laibin. The gravity center of tourism economy presented the southwest-northeast-southwest direction, which first revolved in the southwest direction, then migrated to the northeast direction, and then turned to the southwest direction. The gravity center moved eastward by 0.142 longitudes and northward by 0.087 latitudes, and the gravity center of tourism economy fell in Xingbin District, Laibin.

The gravity center of tourism resources abundance and tourism economic existed spatial mismatch phenomenon. They presented different evolution trajectory. The gravity center's evolution of tourism resources abundance was obviously larger. In 2012, their gravity center deviated the most, with longitude deviating by 0.224 units and latitude deviating by 0.601 units. In 2017, the gravity center of the two was the closest, and the latitude and longitude deviating by only 0.0350 and 0.143 units. Generally speaking, the spatial mismatch between tourism resources abundance and tourism economy had a weakening trend. But the spatial mismatch phenomenon still existed.

### 3.2 Micro Spatial Mismatch

The gravity model can only discriminate the spatial mismatch from the macroscopic. The spatial mismatch index is used to analyze the mismatch in the microscopic region. According to the needs of this study, the spatial mismatch index was further divided into the following grades: when SMI < -1, it is a highly reverse mismatch region (HRMR), the level of tourism economy development in this area is far lower than expected, the utilization rate of tourism resources is low. When SMI > 1, it is a highly positive mismatch region (HPMR), which indicates that the development level of tourism economy far exceeds expectations, and the utilization rate of tourism resources is high. When SMI ∈ [0,1], it is expresses as the general dislocation region, the negative number is the
general reverse mismatch region (GRMR) and the positive number is the general positive mismatch region (GPMR).

According to the formula of Spatial Mismatch Index, the tourism spatial mismatch index was calculated as shown in Table 3, and the microscopic tourism spatial mismatch was further analyzed.

Table 3. Tourism Spatial Mismatch Index

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>Nanning</td>
<td>-2.637</td>
<td>-2.716</td>
<td>-2.846</td>
<td>-2.075</td>
<td>-1.916</td>
<td>-1.641</td>
<td>-1.557</td>
<td>-1.366</td>
<td>-1.058</td>
<td>-1.131</td>
<td>-1.151</td>
<td>-1.827</td>
</tr>
<tr>
<td>Liuzhou</td>
<td>0.273</td>
<td>0.637</td>
<td>0.485</td>
<td>0.124</td>
<td>0.218</td>
<td>0.174</td>
<td>0.174</td>
<td>0.301</td>
<td>0.072</td>
<td>0.06</td>
<td>-0.047</td>
<td>0.225</td>
</tr>
<tr>
<td>Guilin</td>
<td>1.553</td>
<td>2.152</td>
<td>2.427</td>
<td>1.819</td>
<td>1.122</td>
<td>0.862</td>
<td>0.343</td>
<td>0.219</td>
<td>0.043</td>
<td>0.338</td>
<td>0.225</td>
<td>1.009</td>
</tr>
<tr>
<td>Wuzhou</td>
<td>-0.275</td>
<td>-0.208</td>
<td>-0.241</td>
<td>-0.144</td>
<td>-0.22</td>
<td>-0.128</td>
<td>0.149</td>
<td>-0.021</td>
<td>-0.043</td>
<td>0.003</td>
<td>0.015</td>
<td>-0.101</td>
</tr>
<tr>
<td>Beihai</td>
<td>-0.429</td>
<td>-0.485</td>
<td>-0.564</td>
<td>-0.425</td>
<td>-0.378</td>
<td>-0.346</td>
<td>-0.161</td>
<td>-0.368</td>
<td>-0.415</td>
<td>-0.193</td>
<td>-0.116</td>
<td>-0.353</td>
</tr>
<tr>
<td>Fangchenggang</td>
<td>0.237</td>
<td>0.192</td>
<td>0.344</td>
<td>0.296</td>
<td>0.165</td>
<td>0.150</td>
<td>0.124</td>
<td>0.030</td>
<td>0.016</td>
<td>0.011</td>
<td>0.019</td>
<td>0.139</td>
</tr>
<tr>
<td>Qinzhou</td>
<td>0.311</td>
<td>0.176</td>
<td>0.165</td>
<td>0.321</td>
<td>0.429</td>
<td>0.274</td>
<td>0.225</td>
<td>0.089</td>
<td>-0.039</td>
<td>-0.151</td>
<td>-0.06</td>
<td>0.158</td>
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<tr>
<td>Guigang</td>
<td>-0.244</td>
<td>-0.291</td>
<td>-0.226</td>
<td>-0.248</td>
<td>-0.037</td>
<td>-0.175</td>
<td>-0.114</td>
<td>-0.095</td>
<td>0.302</td>
<td>0.173</td>
<td>0.254</td>
<td>-0.064</td>
</tr>
<tr>
<td>Yulin</td>
<td>-0.149</td>
<td>-0.173</td>
<td>-0.253</td>
<td>-0.189</td>
<td>-0.13</td>
<td>-0.057</td>
<td>-0.163</td>
<td>-0.325</td>
<td>-0.447</td>
<td>-0.575</td>
<td>-0.598</td>
<td>-0.278</td>
</tr>
<tr>
<td>Baise</td>
<td>0.280</td>
<td>0.259</td>
<td>0.162</td>
<td>-0.053</td>
<td>-0.152</td>
<td>-0.114</td>
<td>-0.04</td>
<td>0.045</td>
<td>0.316</td>
<td>0.304</td>
<td>0.333</td>
<td>0.122</td>
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<tr>
<td>Hezhou</td>
<td>-0.019</td>
<td>-0.101</td>
<td>-0.165</td>
<td>-0.158</td>
<td>-0.113</td>
<td>-0.147</td>
<td>-0.12</td>
<td>-0.222</td>
<td>-0.105</td>
<td>-0.193</td>
<td>-0.18</td>
<td>-0.138</td>
</tr>
<tr>
<td>Hechi</td>
<td>0.746</td>
<td>0.428</td>
<td>0.497</td>
<td>0.431</td>
<td>0.421</td>
<td>0.379</td>
<td>0.271</td>
<td>0.320</td>
<td>0.300</td>
<td>0.358</td>
<td>0.347</td>
<td>0.409</td>
</tr>
<tr>
<td>Laibin</td>
<td>0.489</td>
<td>0.316</td>
<td>0.22</td>
<td>0.352</td>
<td>0.477</td>
<td>0.339</td>
<td>0.389</td>
<td>0.391</td>
<td>0.372</td>
<td>0.310</td>
<td>0.351</td>
<td>0.364</td>
</tr>
<tr>
<td>Chongzuo</td>
<td>-0.136</td>
<td>-0.187</td>
<td>-0.004</td>
<td>-0.050</td>
<td>0.114</td>
<td>0.430</td>
<td>0.480</td>
<td>1.001</td>
<td>0.687</td>
<td>0.708</td>
<td>0.644</td>
<td>0.335</td>
</tr>
</tbody>
</table>

From the average perspective, Guilin was the only one, which had a tourism spatial mismatch index greater than 1, while the tourism spatial mismatch indices of other cities were all between [-1, 1]. The spatial mismatch indexes of Guilin, Hechi and Laibin were always greater than 0, and the development level of tourism economy brought by tourism resources in these three cities was higher than expected. Especially in the early stage of Guilin, the tourism spatial mismatch index was greater than 1. The tourism spatial mismatch indexes of Nanning, Beihai, Yulin and Hezhou were always less than 0, and the promotion of tourism resources in these 4 cities to tourism economy development was lower than expected. Especially, the tourism spatial mismatch index of Nanning was less than -1. The spatial mismatch indexes of Liuzhou, Fangchenggang, Qinzhou, Baise and Chongzuo were greater than 0 in a long period of time, and in some years which were less than 0. The spatial mismatch indexes of Wuzhou and Guigang were less than 0 for a long time.

According to the calculation results of tourism spatial mismatch index, the number of tourism spatial mismatch grades was counted. Generally speaking, the number of cities in the positive mismatch region was basically equal to that in the reverse mismatch region, and the number of cities in the positive mismatch region had a slight advantage from 2017 to 2020. It was worth mentioning that the number of cities in highly positive mismatch region was 0 after 2016.

3.3 Spatial Mismatch Pattern Evolution

The tourism spatial dislocation types at 2011, 2016, and 2021 were shown in Table 4.

We can see that there was a certain evolution trend of tourism spatial mismatch level. The type of HPMR gradually reduced, such as in Guilin. Nanning maintained the type of HRMR. Liuzhou, Qinzhou and Fangchenggang changed from GPMR to GRMR. Hechi and Laibin always belong to
Generally speaking, the tourism spatial mismatch level of 6 cities did not change, while that of 8 cities changed. Except Guilin, which shifted from high positive dislocation region to general positive dislocation region, the other 7 cities all moved between GPMR and GRMR.

<table>
<thead>
<tr>
<th>Type</th>
<th>2011</th>
<th>2016</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPMR</td>
<td>Guilin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPMR</td>
<td>Liuzhou Qinzhou Baise Hechi Laibin Fangchenggang</td>
<td>Liuzhou Guilin Qinzhou Hechi Laibin Chongzuo Fangchenggang</td>
<td>Guilin Wuzhou Guigang Baise Hechi Laibin Chongzuo</td>
</tr>
<tr>
<td>GRMR</td>
<td>Wuzhou Beihai Guigang Yulin Hezhou Chongzuo</td>
<td>Wuzhou Beihai Guigang Yulin Baise Hezhou</td>
<td>Liuzhou Beihai Qinzhou Yulin Hezhou Fangchenggang</td>
</tr>
<tr>
<td>HRMR</td>
<td>Nanning</td>
<td>Nanning</td>
<td>Nanning</td>
</tr>
</tbody>
</table>

### 4. Discussion

This study can help government departments formulate targeted measures and accurately allocate various resource elements.

1. The gravity center of tourism resources and tourism economy was dislocated in space, and their gravity center moved in a regular pattern. The development of tourism resources in Nanning, Beihai, Baise and Chongzuo obtained great achievements, the number of 5A-level scenic spots reached 4 by 2021, which was equal to Guilin, leading to the migration of the gravity center of tourism resources abundance from northeast to southwest. Nanning's tourism economic development level was higher than that of other regions from 2011 to 2017, while Guilin's tourism economic development level was higher from 2018 to 2021, which caused the tourism economy gravity center to shift from southwest to northeast. At the same time, the development level of tourism economy in Liuzhou, Beihai and Yulin increased year by year, and the gravity center of tourism economy shifted to the southwest again.

2. There were obvious differences in tourism spatial mismatch among the cities. The number of cities in the positive mismatch region was basically equal to that in the reverse mismatch region. The utilization efficiency of tourism resources was improved by the cities, the development of tourism economy was promoted. However, the change in the number of cities with spatial mismatch was not significant. The positive mismatch region and reverse mismatch region were staggered, the degree of coordinated development of tourism industry among cities was not high. The driving force of tourism resources on the development of tourism economy was not strong in Guangxi.

3. There was a possibility of development and evolution of tourism spatial mismatch grade in each city. It is a famous tourist destination for Guangxi in China, where is rich in natural and cultural tourism resources. However, the distribution of tourism resources is unbalanced, and the ability of tourism resources to promote the tourism economy development is quite different, which leads to the change of tourism spatial mismatch level in different cities.
5. Conclusions

The study draws the following conclusions:

(1) The spatial mismatch between tourism resources and tourism economy in Guangxi was obvious. The gravity center of tourism resources abundance was generally northeast-southwest with the maximum gravity center moving 0.454 latitudes southward and 0.287 longitudes westward. The gravity center of tourism economy showed the direction of southwest-northeast-southwest. And the gravity center of tourism economy first whirled in the southwest, then migrated to the northeast, and then turned to the southwest.

(2) The degree of tourism spatial mismatch in different cities was inconsistent. The tourism spatial mismatch indexes of Guilin, Hechi, and Laibin were always greater than 0, while the tourism spatial mismatch indexes of Nanning, Beihai, Yulin, and Hezhou were always less than 0, and the tourism spatial mismatch indexes of other 7 cities were in a positive and negative alternating state.

(3) The mismatch grade of tourism space could change. Guilin was the only one city in HPMR, which also slipped into the GPMR with the passage of time. A total of 8 cities experienced a shift in their tourism spatial misalignment levels.

This paper measured the tourism resources abundance and tourism economic development level by selecting A-level scenic spots and total tourism revenue, which are highly representative. In the future, the promotion of tourism resources abundance to tourism economy development could be deeply analyzed by constructing an evaluation index system, this is an important research topic.

References


