Temporal and Spatial Distribution Characteristics of Inbound Tourism Flow in Guangxi, China

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**Abstract.** The D-Q model was used to analyze the temporal and spatial distribution characteristics of inbound tourism flow in Guangxi by collecting index data from 2011 to 2019. The results showed that the temporal and spatial distribution of inbound tourism flow presented obvious single-core agglomeration characteristics. The polarization was serious, and the phenomenon of "poverty trap" became more and more obvious. The regional imbalance was prominent. The quantity and quality coordination of inbound tourism flow was poor. The spatial dislocation phenomenon appeared. The overall distribution pattern of inbound tourism flow might remain stable, and the number of cities maintaining a stable state presented a relatively large proportion. Finally, some countermeasures were put forward to promote the development of inbound tourism in Guangxi.

**Keywords:** inbound tourism, D-Q model, distribution characteristics, Guangxi.

1. Introduction

The vigorous development of international tourism activities has become an important manifestation of the integration of countries all over the world. Inbound tourism is a bridge of friendly exchanges among peoples from all over the world. China's inbound tourism market has enormous potential and broad development prospects. However, COVID-19 has affected the global tourism economy since 2020. Tourism industry has been hit hard. Tourism industry was gradually recovering from 2023 in China. It is of great significance to analyze the temporal and spatial distribution characteristics of inbound tourism flow. It can find out the problems in the region and make up for the short board as soon as possible.

Inbound tourism research is widely interest to scholars and is done earlier abroad than in China. Foreign studies of inbound tourism focused mainly on the influencing factors [1,2], distribution characteristics [3], seasonal changes [4,5], poverty alleviation [6], economic effects [7]. Although the inbound tourism research started late in China, but the results were very significant. The research content involved many aspects, such as influencing factors [8], market structure and evolution [9,10], temporal and spatial characteristics[11], tourism flow [12,13], market expansion [14], market efficiency [15]. It mainly adopted empirical research method, flow quality model, SSM model, IPA analysis method, index of tourist density, index of tourism flow quality, spatial autocorrelation, DEA model, and other methods. As a bridgehead for China's opening up and cooperation in Southeast Asia, Guangxi is the only area of ethnic minority areas with sea access. Some scholars explored the development of inbound tourism in Guangxi [16, 17].

In conclusion, inbound tourism is the key field of tourism research and has received widespread attention from all sectors of society. Therefore, the D-Q model was used to analyze the temporal and spatial distribution characteristics of inbound tourism flow in Guangxi. The research can enrich inbound tourism evaluation methods, expand inbound tourism research vision, and provide guidance for the development of inbound tourism in Guangxi.
2. Materials and Methods

2.1 Study Area

Guangxi is located in the southern part of China. There are rich tourism resources. The natural wonder of the karst landform in Guilin is famous all over the world. The subtropical coastal scenery on Beihai silver beach is fascinating. The custom of China-Vietnam border represented by Chongzuo Detian is integrated. Especially the long history, culture, and unique national customs lay a solid foundation for the construction of Magnificent Guangxi. In 2019, 6.24 million inbound tourists were received, and the comprehensive tourism revenue was 3.51 billion US dollars. After COVID-19, China government made new arrangements for the development of inbound tourism and introduced a series of policies in 2023, which could usher in a new development opportunity for inbound tourism. Several policy measures had been issued by Guangxi government at the beginning of 2023. A series of tourism promotion activities were held one after another, and the influence of Guangxi tourism was expanded.

2.2 Data Sources

China’s inbound tourism almost stagnated during 2020-2022 due to the impact of COVID-19, recovered in 2023. Therefore, this study chose 2011-2019 as the research period. The indicators were collected, including total number of inbound tourists, total income of inbound tourism, total land area of administrative regions of Guangxi, tourism foreign exchange income, number of inbound tourists, land area of the administrative regions of 14 cities. The data comes from Guangxi Statistical Yearbook from 2012 to 2020. These data can meet research needs.

2.3 Research Methods

The D-Q model is a combination of two indicators based on tourist density (D) and flow quality (Q). Tourist density index and tourism flow quality index had been applied to analyze the spatial characteristics of inbound tourism flow [18]. The D-Q model is used to comprehensively analyze the quantity and quality of inbound tourism in one or more tourism destinations. The formula is as follows:

\[ D = \frac{M_i}{M} \times \frac{P_i}{P} \]

\( D \) represents the tourist density index of inbound tourism in a certain area. \( M_i \) is the number of inbound tourists received in region \( i \). \( M \) indicates the total number of tourists received in Guangxi. \( P_i \) represents the land area of region \( i \). \( P \) represents the total area of land at upper level of region \( i \).

The flow quality index adopts calculation method proposed by Li et al. [19]. The formula is as follows.

\[ Q = f(X_1, X_2, X_3, X_4, X_5, ...) \]

\( Q \) indicates the index of flow quality. \( X_1, X_2, X_3, X_4, \) and \( X_5 \), respectively, indicate capital flow, information flow, cultural flow, material flow, and energy flow. Since only capital flow can be quantified in existing statistics, capital flow quality is defined as the quality of economic meaning. That is, the ratio of capital flow scale and passenger flow scale caused by a specific scale of tourism flow.

The index of flow quality formula is expressed as follows.
Among them, \( Q \) represents the index of flow quality, \( a_i \) represents market share of foreign exchange earnings in region \( i \), \( b_i \) represents the market share of tourist reception in region \( i \). \( x_{it} \) represents the tourism income of foreign exchange of region \( i \) in year \( t \). \( y_{it} \) represents the number of tourists received of region \( i \) in year \( t \).

As shown in Figure 1, inbound tourist destinations can be divided into four categories. The four categories are high quality and high density (HH), high quality and low density (HL), low quality and low density (LL), and low quality and high density (LH).

HH is a state of "double high", showing that the coordination of tourist density and flow quality of inbound tourism reaches the best level. HL indicates that the quality of inbound tourism is relatively high, and that the economic returns are large, but the scale of passenger flow is relatively small. LH indicates that inbound tourism has poor quality and low economic returns, but the scale of passenger flow is relatively large. HL and LH belong to the "single high" state, which indicates that the development level of inbound tourism is low, the quantity and quality of inbound tourism flow are uncoordinated, and there is a phenomenon of spatial mismatch. LL is a "double low" state, that is the worst development state of inbound tourism, and the coordination of quantity and quality is low.

\[
Q = \frac{a_i}{b_i} = \frac{\sum_{t=1}^{n} x_{it}}{\sum_{t=1}^{n} y_{it}}
\]

Fig. 1 D-Q model

3. Results and Analysis

3.1 Calculation results

Tourist density index and flow quality index of inbound tourism of 14 cities in Guangxi were calculated. It can be summarized from the result of tourist density index. Tourist density of Guilin had been far ahead of other cities. The index of tourist density reaching 4.633 was the highest in 2011, the lowest point was 4.099 in 2015. The index of tourist density of Laibin was the smallest in 2019, it was just 0.076. The tourist density indexes of Beihai, Fangchenggang, Hezhou and Chongzuo were more than 1, indicating that the tourist density in these four cities was larger and the development of inbound tourism was better. After 2014, the tourist density indexes of Nanning entered into a sequence of more than 1, indicating that inbound tourism flow in Nanning entered into a period of rapid development. Tourist density indexes of other cities do not appear more than 1, indicating that the inbound tourism development of other cities was poor and the tourist scale was small. It can be seen from the results that the flow quality index of Guilin was greater than 1, indicating that the inbound tourism quality of Guilin was good, and the inbound tourism flow could bring higher economic returns. The inbound tourism flow quality indexes of Yulin and Laibin were generally high and remained greater than 1 in most years. In Nanning, Liuzhou, Baise, and Hechi, the indexes of flow quality were greater than 1 in a few years. These six cities had a good
foundation for the development of inbound tourism, and inbound tourism flow could basically bring corresponding economic benefits. Other cities' flow quality indexes were less than 1, inbound tourism flow quality was poor, and the economic income was low.

### 3.2 Spatial characteristics

The research time was divided into three time periods: 2011-2013, 2014-2016, and 2017-2019. It could provide a clearer analysis of the spatial changes in inbound tourism flow over different time periods. The average values of the index of tourist density and the index of flow quality were calculated. Taking 1 as the cardinality of both, the D-Q model for the distribution space of inbound tourism flow in Guangxi was built. The distribution of inbound tourism flow is divided into 4 states: HH, HL, LH and LL. The results are shown in Fig. 2, Fig. 3, and Fig. 4.

![Fig. 2 Distribution of inbound tourism flow in Guangxi (2011-2013)](image)

![Fig. 3 Distribution of inbound tourism flow in Guangxi (2014-2016)](image)

![Fig. 4 Distribution of inbound tourism flow in Guangxi (2017-2019)](image)

#### 3.2.1 Prominent single-core feature

Guilin is a typical destination with HH of inbound tourism in Guangxi. In the three periods, it was the only city in the state of “double high”, with the index of tourist density and the index of flow quality greater than 1. Guilin maintained an absolute advantage, indicating that the distribution of inbound tourism flow in Guangxi presented a prominent single-core concentration feature and Guilin was the main distribution destination of inbound tourism flow. Guilin is always the focus of inbound tourism in Guangxi. With its unique landscape, beautiful natural environment, strong ethnic customs, and other high-quality tourism resources, Guilin has become a popular tourism destination for inbound tourists. In recent years, tourism infrastructure has been improved more and
more, the level of tourism service is increasing, the tourism experience is improving and the ability to meet the needs of inbound tourists is strengthening in Guilin.

3.2.2 Imbalance spatiotemporal distribution

The distribution of inbound tourism flow in Guangxi presented a unique situation of Guilin. The development level of inbound tourism in other cities was different and the region development was obviously unbalanced and uncoordinated. From 2011 to 2013, Laibin, Yulin, Baise and Hechi were in a state of HL, accounting for 28.6%. Beihai, Fangchenggang, Hezhou, and Chongzuo were in the state of LH, with the same proportion of 28.6%. It showed that development of inbound tourism in most regions was unbalanced and the quantity and quality were not coordinated. Nanning, Liuzhou, Qinzhou, Wuzhou, and Guigang were in the state of LL, accounting for 35.7%, indicating that these five cities were in the state of "double low", the overall development level of inbound tourism was low, and the coordination of quality and quantity was poor. From 2014 to 2016, Guilin was still in the state of HH. The other cities did not reach the "double high" state. Only Laibin and Yulin were in the state of HL. Nevertheless Baise and Hechi were in the "double low" state, and the development of inbound tourism was further weakened. So far, the number of cities in the "double low" state reached 42.9%, and there might be a "poverty trap". Nanning's attraction to the inbound tourism market was gradually enhanced, and attracted more and more attention from inbound tourists. However, the tourism income of foreign exchange was relatively low. From 2017 to 2019, Laibin and Yulin entered the "double low" state. So far, the number of "double low" cities reached 8, accounting for 57.1%. The status of other cities did not change. It can be seen that the imbalance was very obvious, most of the cities were at a low level of development. The coordination of tourist density and flow quality in inbound tourism was poor, and the trend of "poverty trap" became more and more obvious.

3.2.3 Stable overall development pattern

Guilin always was in the state of HH, Liuzhou, Qinzhou, Wuzhou, and Guigang were always in the state of LL. While Beihai, Fangchenggang, Hezhou, and Chongzuo were always in the state of LH. The number of cities that maintaining a stable state reached 9, which represented 64.3%. Only Nanning, Hechi, Baise, Yulin, and Laibin changed their states, accounting for only 35.7%. Cities with changed states were basically stable at the level of LL, with low economic benefits and low tourist density, showing that the overall temporal and spatial distribution pattern of inbound tourism flow in Guangxi remained stable for a long period.

3.2.4 Weakened spatial dislocation trend

The "single high" states of HL and LH are obvious spatial mismatches. In 2011-2013, Laibin, Yulin, Baise, and Hechi were in the state of HL. Beihai, Fangchenggang, Hezhou, and Chongzuo were in the state of LH, and the number of cities with spatial dislocation reached 8. In 2014-2016, Laibin and Yulin were in the state of HL. Nanning, Beihai, Fangchenggang, Hezhou, and Chongzuo were in the state of LH. The number of cities with spatial dislocation was 7. In 2017-2019, Nanning, Beihai, Fangchenggang, Hezhou, and Chongzuo were still in LH. The proportion of cities without dislocation increased from 42.9% to 64.3%. Only Guilin had a high coordination of tourist density and flow quality, while others had a low coordination level. Overall, the number of cities with spatial dislocation decreased from 57.1% to 35.7%. Cities without dislocation were mainly concentrated in the state of LL. The coordination degree of tourist density and flow quality was very low, showing that the quantity and quality of inbound tourism in Guangxi should be improved.

4. Conclusions and Recommendations

The spatial and temporal distribution characteristics of the inbound tourism flow in Guangxi were analyzed through D-Q model. The following conclusions were drawn, and some countermeasures were proposed.
The spatial and temporal distribution of the inbound tourism flow showed obvious characteristics of a single-core agglomeration, and the polarization was serious. Guilin was the main destination for the distribution of inbound tourism for a long time and was the only area with "double high" state. Up to 57.1% of the cities were concentrated in the "double low" state of LL, and the development level was poor. There were great differences in the development level of inbound tourism among the cities in Guangxi. The number of cities in a low-level development state was more than half of the cities, which might lead to the phenomenon of "poverty trap". The "double high" city of HH had a high popularity of tourism brands and had a strong attraction to the inbound tourist market. The city should continue to maintain the current state, continuously expand the tourism industry chain, innovate design and development of tourism products, focus on improving tourism quality, realize connotative development, and provide assistance for the development of inbound tourism in other cities in the region. For example, Guilin should focus on improving the city's taste and quality in the process of building a world-class tourist city. The layout of new and old cities should continue to be optimized, the construction of infrastructure such as street landscapes, urban sculptures, and signage should be promoted. Direct flights from Guilin to ASEAN countries should be opened as soon as possible and the intercontinental passenger flights should be opened. The "double low" cities belong to low density and low quality, such as Liuzhou, Qinzhou, Wuzhou and Guigang. The tourism infrastructures should be improved in these cities, the development of tourism resources should be strengthened, the tourism product designs should be innovated, the tourism product systems should be enriched, the tourism attractiveness should be enhanced through various promotional methods, improving tourism income and promoting high-quality development of inbound tourism.

(2) The distribution imbalance of inbound tourism flow was prominent, and the phenomenon of spatial dislocation was obvious. Guilin was the only city in the "double high" state. The number of cities in the "single high" state accounted for at least 35.7%. The number of cities in the "double low" state increased from 35.7% to 57.1%. The distribution imbalance of inbound tourism flow was very prominent. The coordination degree of tourist density and flow quality was low. The level of inbound tourism varied greatly, and the regional difference was obvious. There was a significant spatial dislocation phenomenon. In "single high" cities of HL, the development of historical and cultural tourism resources with local characteristics should pay much attention, the tourism service facilities should be improved, and key marketing should be implemented on the main customer markets, improving tourism brand awareness, and attracting more inbound tourists. In "single high" cities of LH, the level of tourists experience should be improved, new tourism resources should be developed, the tourism service projects should be enriched, the supply structure of tourism products should be adjusted, the quality of tourism products should be improved, the scope of tourism consumption should be expanded, and the diversified spiritual and material needs of inbound tourists should be met.

(3) The overall distribution pattern of inbound tourism flow remained stable. The proportion of cities maintaining a stable state reached 64.3%. It laid the foundation for the development of overall pattern. The level of inbound tourism development in five cities was still low. The quality and scale did not reach the optimal state, and the existing development trend did not change. Therefore, all cities should carry out targeted marketing according to the development status of the market structure of foreign tourists. Market share should be expanded, the level of inbound tourism development should be improved. In particular, it is necessary to fully utilize national policies on developing inbound tourism, and targeted local measures should be formulated for the development of inbound tourism.

Reference


