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Analysis of the evolution of temporal and spatial characteristics of inbound tourism flow since the western development drive

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Abstract: *Based on the relevant data of inbound tourism of China and various provinces from 2000 to 2019, using the network density, centrality, structure hole and other indicators to study the evolution principle of inbound tourism in western China. Especially, the study was carried out from the perspective of macro and medium, and enrich the research results. According to the research results, the development pace of inbound tourism in western China had maintained a high rate and exceeded domestic average level in 2008; Shaanxi Province plays a vital role in western region. It is the destination and transfer station of inbound tourism. It also plays an important role as a hub in the development of inbound tourism in the entire northwest region, and promotes the development of entire region.*

Keywords: *Inbound tourism; Social network; Tourism flow; Western region in China*

1. Introduction

Inbound tourism is an important part of the development of tourism and a key indicator to measure the development level of tourism industry. It plays an important role in regional and national economic development, regional tourism cooperation and foreign trade. Since 2000, the country has implemented the western development strategy, aiming to use the remaining economic capacity of the eastern coastal region to help the economic and social development of the western region. The western region has rich tourism resources and is an important advantage in economic development. Under the implementation of the western development strategy, the inbound tourism in the western region has developed rapidly, and the development scale has gradually expanded, becoming an important part of China's inbound tourism. The activity connection and correlation state of inbound tourists between different provinces constitute the spatial structure framework of macro-inbound tourism, and this spatial effect will also affect the overall development of inbound tourism in related regions.

2. Research review

Tourism flow is a concept of tourism geography with spatial attributes, which is the nerve center of the tourism system. Using tourism flow to study inbound tourism can broaden the research scope of tourists' spatial behavior, enrich the theoretical system of tourism space economy, provide ideas for the resource allocation and marketing of tourism destinations and the development of tourism products, and help the development of regional tourism economy. Since the 1960s, scholars at home and abroad have conducted extensive research on tourism flow, involving multidisciplinary theories and methods, such as spatial GIS method, metrological statistics, regional economics, etc. The research results mainly focus on the temporal and spatial distribution characteristics of tourism flow [1,2], flow effect [3], influencing factor [4], driving mechanism [5] and other aspects.

Scholars have also shown a positive research enthusiasm for inbound tourism in western China. Zhang [6], Yang [7] and other scholars have used ESDA method to study the tourism flow. The results found that the distribution of inbound tourism flow in China has significant spatial autocorrelation characteristics, and reflected the strong spatial dependence and spillover effect. Tang Rui used DEA-panel Tobit method to study the efficiency of inbound tourism market in the five northwest provinces (regions) from 2000 to 2014, and found that the increase of inbound tourists and the improvement of industrial structure had different degrees of promoting [8].Liu Junsheng and Ma Yaofeng used the transfer data of inbound tourists from western provinces and regions from 1996 to 2010, used the transfer model and matrix of inbound tourists to analyze the spatial transfer situation of inbound tourists from western

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provinces and regions, and believed that western provinces and regions are important destinations of tourism flow diffusion and agglomeration[9-10].

At present, in the research on western inbound tourism, the research scale is mostly based on the macro, medium and micro level, with few nested measures. In terms of research methods, there are also few complex network relationship studies, generally for individual cities or provinces, and the whole area is less studied as the research object. Based on this, according to the inbound tourism data from 2000 to 2019, this paper studies the inbound tourism network of China and western China from both macro and Chinese scales, and systematically summarizes the development of inbound tourism in western China since the development of western China.

3. Data sources and research methods

3.1. Data source

In this paper, we obtain the data of China Tourism Statistical Yearbook (2000-2019) and 2000-2019) (2000-2019), To conduct a time-long study on the development of inbound tourism in the eastern and western regions since the development of western China; next, Through the Sample Survey Report of inbound Tourists (2003,2010,2014,2020), To build a spatial network of four time sections of China and the western region inbound tourism in 2002,2009,2013 and 2019, The spatial correlation pattern and characteristic change in the western region were also analyzed.

3.2. Analysis method

The Social Network Analysis (SNA) method began in the 1930s, and was developed on the basis of the social measurement method proposed by the American social psychologist Moreno, to study the relationship between actors[11].In the 1990s, foreign scholars began to apply this method to in the field of tourism research[12-14], which is widely used in the study of tourism flow space structure and tourism system space.

3.2.1. Matrix design

According to the tourism statistical yearbook and the sampling data of inbound tourists, the number of inbound tourists in four time sections of each province is calculated and the database was established. A matrix X of 31 lines and 31 columns is built for 31 provincial destinations. The element Xij in the matrix represents the number of tourists flowing from node province i to node province j. Then, the binary matrix is established according to the initial assignment matrix. For example, the flow direction relationship between Beijing and Tianjin is generated, and the breakpoint value of 5,000 is selected. When the flow direction number is more than 5,000, the corresponding unit of the matrix is recorded as 1 and less than 50,000 as 0. Finally, the multi-valued directed relationship matrix of 3131 is obtained, and then we study the network characteristics of the travel flow according to the social network analysis method. According to the same principle, when constructing the inbound tourism flow network in the western region, only the data of 12 western provinces are selected for network construction, and the directed relationship matrix of 1212 is obtained. The Ucinet software is used to measure the relevant indicators.

3.2.2. Index system

Travel flow network density. Network density refers to the ratio between the number of relationships actually existing at a tourist destination and the maximum number of theoretically possible relationships. The higher the network density of the tourist destination is, the more nodes are connected in the network is, and the more perfect the function of the tourist network is. Center degree model. Node centrality is an important position index of tourism network node structure, which is divided into degree centrality, proximity centrality and intermediary centrality. Degree centrality is a measure of which nodes have important centers in the tourist destination network, meaning how many travel flow links between a node and other nodes. Approity centrality is a measure of the distance between a travel network node and other nodes. The closer the centrality is, the closer the node is to other nodes. Intermediary centrality is a measure of the ability of travel network nodes to act as intermediaries. The higher the degree of intermediary center, the more opportunities for tourism flow and "intermediary benefits". Structural hole model.Structural holes refer to the places between nodes of the travel network are disconnected. A node has a large number of structural holes, and the more it can "mediate" the tourism flow between other tourism node pairs, thus occupying an irreplaceable position; on the other hand, the lack of alternative

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nodes and routes will also cause the bottleneck of tourism flow.

4. Classification and analysis of inbound tourism stages

A comparative analysis of the inbound tourists and income of inbound tourists in China and western China found that the change trend is highly consistent. The western region is rich in tourism resources, such as "Cultural Shaanxi, Landscape and Qinling Mountains", "Panda Hometown, Tianfu Sichuan", "Ridge of the World, Magic Tibet" and other brands can have a certain tourism attraction to international tourists. According to the statistical results, the development of inbound tourism in western China from 2000 to 2019 can be divided into four stages, namely, the initial stage, the steady development stage, the rapid growth stage and the new normal stage.

4.1. Starting stage: 2000-2002

Since 2000, China began to implement the strategy of western development. At this stage, the inbound tourism in western China has developed steadily. The revenue of inbound tourism increased from 1.585 billion yuan in 2000 to 1.955 billion yuan in 2002, and the number of inbound tourists increased from 4.906,500 million in 2000 to 6.017,200 million in 2002, achieving a steady growth of inbound tourism. At this stage, the main work is infrastructure construction and related policies. The entire Qinghai-Tibet Railway, which started in 2001 and completed in 2002, has become an important channel between Tibet, Qinghai and the mainland, and an important part of the road network framework in the western hinterland, which provides convenient transportation for tourists to travel between western provinces. The tourism construction of Shaanxi Province focuses on tourism brand building and marketing, product design, tourism infrastructure construction and service management, such as adjusting the construction of tourism products, to build leisure products such as Cuihua Mountain and Datang Furong Garden; Xi'an Xianyang Airport opened overseas routes to Japan and other countries to strengthen inbound tourism reception services in Shaanxi.

4.2. Rapid Development stage: 2003-2009

In 2003, SARS swept the world. Affected by this, the inbound tourism market in the western region shrank, and the number and income of inbound tourists declined. After that, it has recovered rapidly and gradually entered the stage of stable development. According to statistics, the number of inbound tourists during this period increased from 3.641,400 in 2003 to 10,621,600,100 in 2009, an increase of 192%; the inbound tourism revenue increased from 1.227 billion in 2003 to 4.328 billion in 2009, an increase of 253%.At this stage, the market forces gradually play a dominant role, and the government pays more and more attention to the changes of market demand, and adopts a series of methods such as optimizing the structure of tourism products and innovating the tourism publicity methods to promote the development of inbound tourism in western China. For example, Shaanxi province has developed and built the Tang Hua Qing Palace and other hot spring tourism products.

4.3. Stable development stage: 2010-2013

In this stage, the income of inbound tourism in western China increased from 5.265 billion in 2010 to 9.603 billion in 2013, with a growth rate of 82.4%. The number of inbound tourists increased from 13.1341 million in 2010 to 15.7859 million in 2013, with a growth rate of 20.2%. However, the growth rate decreased significantly compared with the previous stage. In 2010, a number of major projects were set up under the guidance of the national strategy. In terms of airport construction, the construction of Xi'an Xianyang International Airport has been started, and a regional aviation network centered on Chengdu Shuangliu Airport, Kunming Wujiaba Airport, Lanzhou Zhongchuan Airport and Urumqi Airport has been built, gradually forming a wheel-type regional air transport network with a major hub airport as the center.

4.4. New normal stage: 2014-2019

Due to the impact of the global economic crisis in 2014, the development of inbound tourism in western China showed a brief decline. In 2015, it returned to the growth trend and maintained a rapid growth in the following five years.By 2019, the total inbound tourism revenue in western China had reached 19.155 billion yuan, and the number of inbound tourists had reached 29.1222 million, a record

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high. Under the background of the major opportunity of the national "cultural and tourism integration" and the "Belt and Road" initiative, the western provinces should give full play to their own resource advantages and take measures to promote the sound and rapid development of tourism. For example, Shaanxi Province has determined the tourism image of "Cultural Shaanxi, Discover China", launched the inbound tourism market slogan of "the starting point of the Silk Road, the hometown of the Terracotta Warriors and Horses", and actively promoted the establishment of an international tourism hub and an international first-class cultural tourism center. By holding a series of activities such as "Shaanxi Towards the World" tourism promotion meeting, Shaanxi has significantly enhanced the brand influence and popularity of inbound tourism.

5. Network feature analysis

5.1. Network density

Nationwide, there were 378 actual connections in 2002, and the network density was 0.4065, the maximum in four years, indicating that the closest connections between provinces had better accessibility in 2002.For four years of network density comparison found that network density is slowly declining, that the provinces inbound tourism economic growth correlation coordination is low, the highest only 40% of the provinces between more than 5000 inbound tourist flow relationship, network overall structure is loose, inbound tourism development island effect exists for a long time, the cooperation between the provinces have larger development space.

By region, the tourism flow between provinces in eastern regions is relatively dense, and that in central and western provinces is relatively sparse. In Beijing, Shanghai, Guangdong, Jiangsu and other eastern provinces of the closest network, and the eastern region developed economy, superior geographical location, perfect infrastructure advantages, shows the eastern provinces interval of inbound tourist passenger interaction, close regional cooperation, keep above a high level of contact. Central tourism cooperation development starting point, after development, great progress in inbound tourism, more than 5000 people tourism flow scale increased significantly, the main reason is that only eight provinces and autonomous regions in central China, close space distance, relatively convenient transportation, tourism resources type, easy to form a unified brand through marketing. The western region, rich in tourism resources and differences, can reach in the early stage of tourism development a relatively ideal value, but far space distance, low level of economic development makes the provinces on inbound tourism cooperation is insufficient, not closely associated with the eastern provinces, and many provinces in the edge position.

Table 1: National and East-Midwest network density

Year	Nationwide	East	Central	West
2002	0.4065	0.5894	0.2903	0.2796
2009	0.3946	0.5103	0.3629	0.2715
2013	0.3778	0.4194	0.4032	0.2911
2019	0.3731	0.5191	0.4274	0.2177

5.2. Center degree

5.2.1. Degree of centrality

Under the four time sections, the degree of centrality is the eastern central> central central> western central, indicating that the eastern region has always been in the center of China's inbound tourism, occupying the core position in the inbound tourism network, for the inbound tourism import and export channel and the national inbound tourism flow distribution center. The reason is that the eastern region has many advantages, such as Beijing has numerous tourism resources and superior political, culture, technology, location and other conditions; Shanghai as the eastern and western cultural integration city, the world famous economic metropolis, has good economic, location advantages, so the eastern region of the highest average center. However, there is a large gap between eastern provinces. The degree of centralization in 2002,2009,2013 and 2019 was 20,20,20 and 17, respectively, indicating that the status of eastern provinces in the inbound tourism network varies greatly. Except for 2013, the outward center of the eastern region is higher than that of the inward center, which may be impacted by the global economic downturn in 2013, affecting the household income, and reducing the flow of inbound tourists from the eastern destinations to other provinces, making the radiation function decrease. Secondly,

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Shaanxi, Sichuan and other provinces in the west have a higher degree of degree center, but because the Ningxia and Qinghai provinces are lower, the average value is smaller than that in the central region. Especially the degree of shaanxi center is higher, and its outward degree centrality than introverted degree centrality has greater advantage, that shaanxi province for inbound tourism flow distribution function is strong, but the tourism flow diffusion more dominant, belongs to the tourist route "beginning" city, namely the inbound tourists will shaanxi as the first or second destination, after visiting shaanxi to spread to other key provinces.

5.2.2. Close centrality

From the results of inward close centrality and outward close centrality, the highest overall mean is in the eastern region, with the central and western regions being equal, and the gap between the eastern and western regions is small. The eastern province has a high proximity to the center, and is in the gateway position of inbound tourism.In the eastern provinces, Beijing and Shanghai perform well. Due to the accessibility and popularity of these two nodes, many inbound tourists will include these two cities, becoming the "star" cities in the inbound tourist routes. Among the central and western provinces, Shanxi, Hubei, Shaanxi, Sichuan and other provinces also have high proximity centrality, especially Shaanxi has high outward centrality, indicating that Shaanxi has a good geographical advantage of "undertaking east and west, connecting north and south", so that its inbound tourism flow can easily reach other node provinces in the network.

5.2.3. Intermediary centrality

East Midwest intermediary center degree is larger, the eastern region has a high intermediary center, much higher than the central and western regions, that the eastern province is a key middle node in a pair of other node provinces of tourist routes, occupy the node on the important position on the shortcut, is beneficial to get more tourism opportunities, get "intermediary interests".

Table 2: Comparison of the eastern, central and western centers

		Degree Centrality		Closeness Centrality		Between Centrality
		Outdegree	Indegree	Outcloseness	Incloseness	
2002	East	18.36	15.36	40.91	42.91	3.91
	Central	9	10.375	37.98	37.59	0.26
	West	8.67	10.5	35.97	34.69	0.16
2009	East	16.55	17.64	23.24	70.34	3.81
	Central	11.25	9.5	21.82	61.78	0.54
	West	7.92	8.08	23.65	46.43	0.77
2013	East	13	16.36	16.45	57.51	3.54
	Central	12.5	8.875	15.3	63.44	0.88
	West	9	8.33	15.9	48.97	0.74
2019	East	15.09	15.55	19.09	63.09	3.28
	Central	13.25	8.875	17.92	64.01	1.69
	West	6.25	8.75	18.7	80.49	1.12

5.3. Characteristics of western network structure

5.3.1. Western Network Density

The network density in 2002,2009,2013, and 2019 was 0.2796,0.2715,0.2911, and 0.2177, respectively, for that the network density was low, indicating that the tourism links between the western provinces are not close. Shaanxi, Sichuan and Chongqing have the most dense tourism flow, which is closely related to the advantages of tourism resources endowment, location advantages, transportation accessibility, economic development level and opening degree of these provinces. However, most provinces' inbound tourism starts late and starts low, and the number of tourism flow in the entry direction is small, which is on the edge or periphery of the network. The density of inbound tourism flow network in the western region fluctuates between 0.2 and 0.3, indicating that the tourism cooperation in the region has encountered a bottleneck, the number of relations is difficult, and the coordinated development between regions is insufficient.

5.3.2. Structural holes

Among the 12 western provinces, the node efficiency size and efficiency of Shaanxi province are much higher than that of other provinces, with the lowest constraint, indicating that Shaanxi province is

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in the structural hole position in the western network. In the west, Shaanxi Province has become the secondary core of Chinese inbound tourism and the gateway of western China with its superior geographical location and rich tourism resources. It has both the functions of tourism agglomeration, transit and diffusion, and its advantages are gradually obvious. Secondly, the level of structural holes in Guizhou, Yunnan and Guangxi is also relatively high, indicating that the tourism flow connection can involve different node urban agglomerations, and it has the opportunity to mediate the inbound tourism flow between other nodes. However, because these nodes that occupy the position of structural holes may cause a serious bottleneck of inbound tourism flow, so the transportation function of tourism flow should be strengthened. In addition, these node cities occupy a key position in the structural hole, making it very likely for them to have an absolute advantage in the government's external publicity and resource allocation.

Table 3: Structural holes of the western provinces

	2002			2009			2013			2019		
	Effsize	Efficie	Constraint	Effsize	Efficie	Constraint	Effsize	Efficie	Constraint	Effsize	Efficie	Constraint
Sichuan	5.964	0.331	0.18	4.636	0.331	0.186	8.194	0.41	0.165	5.964	0.331	0.18
Shaanxi	12.62	0.526	0.152	10.99	0.499	0.157	12.49	0.52	0.156	12.622	0.526	0.152
Gansu	3.583	0.448	0.256	2.688	0.448	0.273	3.5	0.438	0.245	3.583	0.448	0.256
Qinghai	1	0.333	0.483	2.333	0.778	0.355	2.813	0.469	0.301	1	0.333	0.483
Yunnan	6.438	0.358	0.175	10.17	0.462	0.162	5.933	0.396	0.175	6.438	0.358	0.175
Guizhou	1.167	0.233	0.31	5.417	0.339	0.183	16.03	0.573	0.147	1.167	0.233	0.31
Chongqing	4.519	0.282	0.188	4.2	0.28	0.195	5.875	0.367	0.183	4.519	0.282	0.188
Guangxi	9.191	0.418	0.169	4.7	0.294	0.187	4.950	0.33	0.185	9.191	0.418	0.169
Neimenggu	4.3	0.478	0.21	2.875	0.287	0.214	6.375	0.455	0.171	4.3	0.478	0.21
Ningxia	0	0	0	1	0.5	0.592	1.750	0.35	0.297	0	0	0
Xinjiang	5.188	0.399	0.191	1.667	0.556	0.429	1	0.5	0.542	5.188	0.399	0.191
Xizang	4.976	0.383	0.186	3.5	0.583	0.226	2.667	0.444	0.261	4.976	0.383	0.186

6. Conclusion

The complex network of inbound tourism flow in China is a sparse network, with low overall density and uneven distribution. Regional tourism cooperation has great room for improvement. The eastern region is the region with the best inbound tourism development in China, with remarkable spatial agglomeration characteristics. The foundation of tourism development in the western region is good, but in recent years, the development speed has slowed down. Inbound tourism in the central region has developed relatively rapidly, and the proportion of inbound tourists in the whole country has gradually increased.

From 2000 to 2019, the inbound tourism in western China grew stronger along with the rapid development of China's inbound tourism, and has maintained a high growth rate. In the western region, Shaanxi has always been an important inbound tourism destination and transit place in the western region, and is the most important gateway and hub of inbound tourism in northwest China, with a huge radiation and driving role in the whole region. However, the development of inbound tourism in other western provinces is relatively slow and is in a marginal position. Most of the provinces in the core region are concentrated in the eastern coastal areas of China. For example, Beijing, as the political center of China, and the economic center of Shanghai, have good tourism resources and high international visibility, and plays the role of the inbound tourism import and export channel and the national inbound tourism distribution center. The "trickle-down utility" of core regional provinces to marginal regional provinces is limited.

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