Coordinated Development and Spatial Differentiation of China's Commercial Circulation Industry and Cultural Tourism Industry

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ABSTRACT: The commercial circulation industry is an important support and guarantee for promoting the optimization and upgrading of the industrial structure of the cultural tourism industry. In order to understand the coordinated development of the commercial circulation industry and the cultural tourism industry, this paper uses the entropy method and the coupling coordination model to analyze the comprehensive development level of China 's commercial circulation industry and the cultural tourism industry and the degree of mutual coordination of the system from 2010 to 2019, and uses the spatial autocorrelation method to explore the spatial correlation of the coupling and coordinated development status of the dual system between provinces. The results show that the comprehensive development level of commercial circulation industry and cultural tourism industry in 2010-2019 is in a low state ; in 2019, the overall development of China 's commercial circulation industry and cultural tourism industry system is in a relatively weak coordination state, and the eastern region is better than the central and western regions, and the coastal region is better than the inland ; there is a positive correlation between the coupling coordination degree of commercial circulation industry and cultural tourism system in space, and the provinces with better or worse coupling coordination are more likely to gather in space. This research has great reference significance for promoting the integrated development of culture and tourism and the optimization and upgrading of tourism industry in the future.

I. INTRODUCTION

With the continuous advancement of China's process of building a well-off society in an all-round way, China's tourism industry has ushered in a major development opportunity. According to statistics, in the past ten years, domestic tourism revenue has increased by 15%, and international foreign exchange income has increased by 170%. Tourism radiates many related industries, and the commercial circulation industry occupies the main part of the tertiary industry statistics[1]. The commercial circulation industry provides services for the circulation of commodities, including accommodation and catering, wholesale and retail, etc. With the integration and development of culture and tourism, the relationship between cultural tourism and commercial circulation industry has become increasingly close. On the one hand, the efficient development of cultural tourism industry promotes the prosperity of commercial circulation industry. On the other hand, the high-quality development of commercial circulation industry is an important support and guarantee to promote the optimization and upgrading of cultural tourism industry. At present, the academic circles have conducted relevant research on the coupling and coordinated development relationship between commercial circulation industry and cultural tourism industry.The scholars have analyzed the coordinated relationship between commercial circulation industry and economic growth, exhibition industry and logistics industry respectively[2]. The other scholars have respectively discussed the coordination relationship between cultural tourism and urban tourism flow, ecology and regional economy, but there is no research result on the coupling empirical analysis of commercial circulation industry and cultural tourism industry[3]. Therefore, this paper studies the coupling and coordinated development of China's commercial circulation industry and cultural tourism industry from 2010 to 2019, as well as the spatial correlation, in order to provide countermeasures and suggestions for the high-quality development of cultural tourism industry.

Compared with the existing studies, the marginal contributions of this paper are as follows: First, the cultural tourism industry is a combination of culture and tourism industry, and the correlation between them is very high. When constructing the index

system, this paper introduces the relevant indicators of cultural industry, which enriches the scope of system coupling research. Secondly, on the basis of the research on the coupling coordination of commercial circulation industry and cultural tourism industry, the global and local spatial autocorrelation is introduced to explore the spatial correlation of the coupling coordination development state of inter-regional system.

II.   INDEX SELECTION AND RESEARCH METHOD

A. Index system

This paper is based on the existing research[4], following the principles of systematicness, scientificity, operability and quantification, selected relevant indicators to construct the index system for the coordinated development of China's commercial circulation industry and cultural tourism industry (see Table 1). Draw lessons from many scholars[5], accommodation and catering industry, wholesale and retail industry and transportation and warehousing industry are included in the research scope of commercial circulation industry. Due to the lack of some data in Tibet, Tibet will not be included in the scope of systematic analysis for the time being.

Table 1 Index System of Coupling and Coordinated Development of Commercial Circulation Industry and Cultural Tourism Industry

System layer	Criterion layer	Indicator layer	Weight
Commercial circulation industry	Scale of investment	Length of transport line/10,000 km	0.092
		Employees of commercial circulation industry/10,000 persons	0.127
		Number of legal person enterprises of wholesale and retail trade above designated size/unit	0.181
		Number of legal person enterprise units of accommodation and catering industry above designated size/unit	0.146
		Freight volume/10,000 tons	0.121
	Development benefits	Total retail sales of consumer goods/100 million yuan	0.150
		Added value of commercial circulation industry/100 million yuan	0.157
		Proportion of added value of commercial circulation industry in added value of tertiary industry/%	0.026
Culture and tourism	Scale of resources	Number of museum institutions/unit	0.080
		Number of travel agencies/unit	0.077
		Number of A-level tourist attractions/No.	0.076
		Number of star-rated hotels/unit	0.066
		College students/10,000	0.067
	Develop support	Per capita cultural and tourism expenses/yuan	0.095
		Number of employees in culture, sports and entertainment industry/10,000 persons	0.087
	Development performance	Foreign exchange earnings from international tourism/million USD	0.193
		Business income of star-rated hotels/100 million yuan	0.125
		Business income of tourist attractions/100 million yuan	0.134

Note: Data are from China Statistical Yearbook (2011-2020), China Tourism Statistical Yearbook (2011-2018), China Cultural Relics and Tourism Statistical Yearbook 2020, and the annual national statistical survey report of the Ministry of Culture and Tourism.

B. Research methods

1) Entropy method

Because the comprehensive development level of commercial circulation industry and cultural tourism industry in the coupling model needs to determine the index weight in advance, in order to prevent the influence of subjective deviation, this paper uses the entropy method [6] to determine the index weight of each subsystem. The calculation process is as follows:

Step1. The extreme value processing method [7] was used to standardize the original data to eliminate the dimensional difference of indicators.

It is assumed that there are m Provinces, n Indicators, s Annual data, if indicator x_{tij} Is a positive indicator

Then:

$$X_{tij} = \left(\frac{x_{tij} - \min x_j}{\max x_j - \min x_j} \right)$$

If the indicator x_{tij} Is the inverse indicator, then:

$$X_{tij} = \left(\frac{\max x_j - x_{tij}}{\max x_j - \min x_j} \right)$$

Among, x_{tij} Is the original indicator value $\left(t = 1, 2, ..., s; \ i = 1, 2, ..., m; \ j = 1, ..., n \right)$, $\min x_j$ And $\max x_j$ For each subsystem, respectively. j The minimum value and maximum value of the item index (in order to ensure the non-zero value, the translation treatment is made in this paper).

Step2. Proportion of index value:

$$P_{tij} = \frac{X_{tij}}{\sum_{t=1}^{y} \sum_{i=1}^{m} X_{tij}}$$

Step3. Index entropy value:

$$E_j = -\frac{1}{\ln(sm)} \times \sum_{t=1}^{y} \sum_{i=1}^{m} P_{tij} \ln P_{tij}, \quad E_j \in [0,1]$$

Step4. Index difference coefficient:

$$D_j = 1 - E_j$$

Step5. Indicator weight:

$$W_j = \frac{D_j}{\sum_{j=1}^{n} D_j}, \quad \sum_{j=1}^{n} W_j = 1$$

Step6. System comprehensive score:

$$U = \sum_{j=1}^{n} W_j X_{pij}$$

The index weights of each subsystem of commercial circulation industry and cultural tourism industry are obtained by the above entropy method, as shown in Table 1.

2) Coupling coordination degree model

Based on the above entropy method, this study calculates the comprehensive development level of the commercial circulation industry. U_1 And the comprehensive development level of the cultural tourism industry (expressed by U_2 Furthermore, the coupling coordination model is used to describe the degree of interaction between the two systems. The model approach is borrowed from [8]. Coupling the coordination value with the D Is divided into the following phases (see Table 2).

Table 2 Coupling coordination degree D The value divides the categories

Phases	D Value	Phases	D Value
Extremely maladjusted	$0 < D < 0.1$	Barely coordinated	$0.5 \leq D < 0.6$
Severe maladjustment	$0.1 \leq D < 0.2$	Primary coordination	$0.6 \leq D < 0.7$
Moderate disorder	$0.2 \leq D < 0.3$	Intermediate coordination	$0.7 \leq D < 0.8$
Mild disorder	$0.3 \leq D < 0.4$	Good coordination	$0.8 \leq D < 0.9$
On the verge of disorder	$0.4 \leq D < 0.5$	Quality coordination	$0.9 \leq D < 1$

3) Spatial autocorrelation analysis

In view of the spatial correlation between provinces in China, this paper uses the spatial autocorrelation method to analyze its impact on the agglomeration degree of system coupling effect, and analyzes the spatial correlation of the system coupling coordination degree of commercial circulation industry and cultural tourism industry from both global and local aspects. The global spatial autocorrelation uses Moran index (Moran's I) to measure the spatial distribution characteristics of system coupling coordination degree, which reflects the similarity of attribute values between adjacent provinces. Local spatial autocorrelation studies the difference of spatial autocorrelation between different provinces, which is expressed by Moran's I scatter diagram. The analysis method is based on the practice of Wang Shaohua scholar[9].

III.   EMPIRICAL ANALYSIS

A. Comprehensive Development Level Analysis

By measuring the comprehensive development level of each subsystem of commercial circulation industry and cultural tourism industry, we can clearly understand the development status of each system and their relative development level, and at the same time, we can effectively analyze the contribution of each subsystem to the coupling coordination model [10]. Through the above formula, the comprehensive development level of each subsystem of China's commercial circulation industry and cultural tourism industry from 2010 to 2019 is calculated (see Table 3).

Table 3 Comprehensive Development Level of Commercial Circulation Industry and Cultural Tourism Industry

Year	U_1			U_2		
	East	Central	The West	East	Central	The West
2010	0.257	0.171	0.091	0.244	0.126	0.084
2011	0.284	0.185	0.101	0.260	0.138	0.080
2012	0.304	0.201	0.109	0.278	0.147	0.088
2013	0.334	0.218	0.119	0.284	0.150	0.094
2014	0.347	0.229	0.125	0.278	0.144	0.094
2015	0.352	0.231	0.127	0.293	0.161	0.105
2016	0.363	0.243	0.133	0.299	0.168	0.109
2017	0.377	0.253	0.140	0.316	0.175	0.117
2018	0.392	0.259	0.146	0.319	0.183	0.125
2019	0.416	0.265	0.149	0.332	0.189	0.136

It can be seen from Table 3 that the comprehensive development level of commercial circulation industry and cultural tourism industry is in a low state, and the overall comprehensive development level of cultural tourism industry is lower than that of commercial circulation industry. However, from the perspective of years, all regions as a whole show a slight upward trend year by year. Among them, the comprehensive development level of commercial circulation industry in the eastern region increased from 0.257 in 2010 to 0.416 in 2019, an increase of 0.159, compared with other regions, the eastern region increased the most.

B. Analysis of coupling coordination

Through the above coupling coordination degree model, the relevant data of China's commercial circulation industry and cultural tourism industry system from 2010 to 2019 are calculated, and the relevant values of the coupling coordination degree of commercial circulation industry and cultural tourism industry are shown in Table 4.

Table 4 Coupling coordination degree of commercial circulation industry and cultural tourism industry system

Year	Coupling coordination index T	Coupling coordination value D	Coupling coordination level
2010	0.208	0.425	On the verge of disorder
2011	0.225	0.443	On the verge of disorder
2012	0.244	0.464	On the verge of disorder
2013	0.260	0.480	On the verge of disorder
2014	0.263	0.484	On the verge of disorder
2015	0.278	0.497	On the verge of disorder
2016	0.289	0.507	Barely coordinated
2017	0.306	0.522	Barely coordinated
2018	0.317	0.531	Barely coordinated
2019	0.334	0.543	Barely coordinated

It can be seen from Table 4 that the coupling coordination degree of China's commercial circulation industry and cultural tourism industry system is increasing year by year, but the growth rate is relatively small. It has improved from the state of being on the verge of disorder in 2010 to the state of being barely coordinated year by year. In 2016, the coupling coordination

value exceeded 0.5, reaching the state of barely coordination, and remained in the state of barely coordination until 2019. From Table 3 and Table 4, it can be found that the comprehensive development trend of the subsystem of the commercial circulation industry is basically consistent with the coupling and coordination development trend of the commercial circulation industry and the cultural tourism industry system, and the coupling and coordination of the two systems are increasing with the increase of the comprehensive development level of the subsystem of the commercial distribution industry. It shows that the subsystem of commercial circulation industry has a significant boosting effect on the increase of the coordination degree of the whole system. To sum up, up to now, the development of China's commercial circulation industry and cultural tourism industry system is still in a relatively reluctant state of coordination, and the development of the commercial circulation industry subsystem, namely the wholesale and retail industries above the quota, plays an important role in the process of coupling and coordinated development of the commercial circulation industry and cultural tourism industry system.

C. Provincial Analysis of Coupling Coordination

In order to more intuitively reflect the current provincial coupling coordination status of China's commercial circulation industry and cultural tourism industry system, the data of 30 provinces, autonomous regions and municipalities in China in 2019 are selected for analysis, and the characteristics of the coupling coordination status of China's commercial circulation industry and cultural tourism industry system in 30 provinces, autonomous regions and municipalities are analyzed, and the radar map is drawn (Fig. 1).
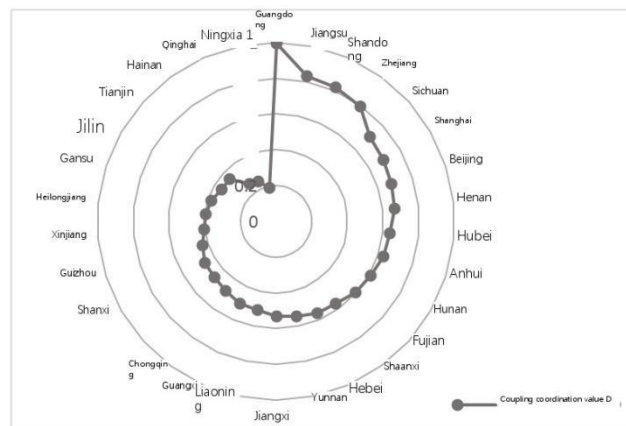

Fig.1 In 2019, China's Commercial Circulation Industry and Cultural Tourism Industry System Coupled and Coordinated Provincial Distribution

It can be seen from Figure 1 that there are regional differences in the coupling and coordinated development of China's commercial circulation industry and cultural tourism industry system, and the overall situation in 2019 is that the east is high and the west is low, and the coastal area is better than the inland area. The following is a detailed analysis of the eastern, central and western regions (as shown in Table 5, Table 6 and Table 7).

Table 5 Coupling coordination degree and grade of double systems in the eastern region

Area	U_1	U_2	Coupling coordination value D	Coupling coordination level
Guangdong	0.94	0.627	0.995	Quality coordination
Jiangsu	0.672	0.436	0.829	Good coordination

Shandong	0.607	0.46	0.82	Good coordination
Zhejiang	0.553	0.453	0.796	Intermediate coordination
Shanghai	0.387	0.38	0.691	Primary coordination
Beijing	0.3	0.455	0.677	Primary coordination
Fujian	0.368	0.228	0.593	Barely coordinated
Hebei	0.314	0.217	0.56	Barely coordinated
Liaoning	0.238	0.198	0.506	Barely coordinated
Tianjin	0.13	0.109	0.353	Mild disorder
Hainan	0.064	0.092	0.258	Moderate disorder
Guangdong	0.94	0.627	0.995	Quality coordination
East	0.416	0.332	0.643	Primary coordination

Table 5 shows the coordinated development of system coupling in the eastern region. The degree of coupling coordination in the eastern region is relatively high, which is in the primary coordination state, but the polarization of the coordination state in the eastern region is serious. Among them, Guangdong, Jiangsu, Shandong and Zhejiang provinces have the best coupling coordination degree, which is higher than 0.7, and are in the intermediate and above coordination state. In addition, Shanghai and Beijing are in a state of primary coordination. The coupling coordination of Fujian, Hebei and Liaoning is also relatively good, which is in a state of reluctant coordination. The remaining two eastern provinces are in a state of negative coordination. Except for Beijing and Hainan, which are the lagging type of commercial circulation industry, the other nine provinces are the lagging type of cultural tourism industry.

Table 6 Coupling Coordination Degree and Grade of Double Systems in Central China

Area	U_1	U_2	Coupling coordination value D	Coupling coordination level
Henan	0.464	0.282	0.669	Primary coordination
Hubei	0.423	0.262	0.64	Primary coordination

Anhui	0.408	0.253	0.628	Primary coordination
Hunan	0.375	0.243	0.607	Primary coordination
Jiangxi	0.254	0.217	0.529	Barely coordinated
Shanxi	0.21	0.162	0.46	On the verge of disorder
Heilongjiang	0.14	0.151	0.400	Mild disorder
Jilin	0.11	0.133	0.356	Mild disorder
Central	0.265	0.189	0.536	Barely coordinated

Table 6 shows the status of the commercial circulation industry and cultural tourism industry in the central region. On the whole, the coupling coordination status is lower than that in the eastern region, and the coupling coordination value is 0.536, which is in a barely coordinated state. From the perspective of each province, the coupling coordination state of Heilongjiang and Jilin is the worst, which is in a mild state of imbalance, while the other six provinces are in a positive state of coordination. Among them, Heilongjiang and Jilin are the lagging type of commercial circulation industry, while the other six provinces are the lagging type of cultural tourism industry.

Table 7 Coupling coordination degree and grade of double systems in the western region

Area	U_1	U_2	Coupling coordination value D	Coupling coordination level
Szechwan	0.433	0.368	0.706	Intermediate coordination
Shaanxi	0.284	0.250	0.567	Barely coordinated
Yunnan	0.261	0.234	0.544	Barely coordinated
Guangxi	0.218	0.213	0.503	Barely coordinated
Chongqing	0.254	0.157	0.481	On the verge of disorder
Inner Mongolia	0.211	0.172	0.469	On the verge of disorder
Guizhou	0.199	0.142	0.435	On the verge of disorder

Xinjiang	0.211	0.172	0.409	On the verge of disorder
Gansu	0.127	0.144	0.382	Mild disorder
Qinghai	0.046	0.131	0.246	Moderate disorder
Ningxia	0.043	0.072	0.191	Severe maladjustment
The West	0.149	0.136	0.411	On the verge of disorder

Table 7 shows the system coupling coordination in the western region. On the whole, the coupling status of the western commercial circulation industry and the cultural tourism industry system is on the verge of imbalance. Among them, the coupling coordination degree of Sichuan is the highest in the western region, with a value of 0.706, which is in the intermediate coordination state. Except for Gansu, Qinghai and Ningxia, the coupling coordination values of other provinces, autonomous regions and municipalities are all higher than 0.4, which is in a positive coordination state. Among them, Gansu, Qinghai and Ningxia are the lagging type of commercial circulation industry, while the other eight provinces are the lagging type of cultural tourism industry.

Based on the comprehensive comparison and analysis of the coupling coordination development state of the three regions and the comprehensive development level of each subsystem, the following conclusions are drawn: First, the coupling coordination of the commercial circulation industry and the cultural tourism industry system in the eastern and central regions of China is basically in a positive coordination development state, while the system coordination in the western region is on the verge of imbalance. Secondly, in 2019, the coordinated development of provincial dual-system coupling in China showed normal distribution characteristics, that is, more in the middle and less on both sides. Thirdly, the subsystem of commercial circulation industry has a significant impact on the degree of coupling and coordination of provincial system.

D. Spatial autocorrelation analysis

By using STATA 15. 1, the global and local spatial autocorrelation analysis of the coupling degree of commercial circulation industry and cultural tourism industry in 30 provinces in China from 2010 to 2019 is carried out to explore the spatial correlation of the coordinated development of regional system coupling.

Table 8 Moran's I of global spatial autocorrelation in China from 2010 to 2019

Variables	I	z	$p-value^{*}$
D_2010	0.166	1.812	0.035
D_2011	0.220	2.308	0.011
D_2012	0.222	2.322	0.010
D_2013	0.219	2.301	0.011
D_2014	0.217	2.285	0.011
D_2015	0.236	2.458	0.007
D_2016	0.245	2.542	0.006
D_2017	0.242	2.519	0.006
D_2018	0.245	2.539	0.006
D_2019	0.247	2.558	0.005

From the global spatial autocorrelation index (as shown in Table 8), the Moran's I values of the system coupling coordination degree of all provinces, autonomous regions and municipalities in China from 2010 to 2019 are all greater than 0, and $p < 0.05$

Through the significance test, that is, there is a positive spatial correlation between the coupling coordination degree of commercial circulation industry and cultural tourism industry, but the Moran's I value of all years is not higher than 0.5, which indicates that the correlation between the coupling coordination degree of commercial circulation industry and cultural tourism industry in China is not strong. The reason may be that the spatial agglomeration effect is not significant due to the local uniqueness of the development of cultural tourism industry in the central and western regions of China.

From the perspective of local spatial autocorrelation, the provinces in the first and third quadrants are significantly more than those in the second and fourth quadrants, indicating that the provinces with "high-high" and "low-low" aggregation are more likely to aggregate in space than those with "high-low" and "low-high" aggregation, and that the provinces with better or worse coupling coordination between commercial circulation industry and cultural tourism industry are more likely to aggregate in space. From the perspective of difference, the number of provinces with "high-high" and "low-low" agglomeration is relatively large, indicating that the spatial difference of provinces, autonomous regions and municipalities in China is relatively small in 2019.

IV.   CONCLUSIONS AND RECOMMENDATIONS

A.   Conclusion of the study

This paper uses the coupling coordination model and the spatial autocorrelation model to analyze the coupling coordination relationship between China's commercial circulation industry and cultural tourism industry, and the spatial correlation of provincial coupling coordination development. The main conclusions are as follows: Firstly, the coupling coordination state of commercial circulation industry and cultural tourism industry is increasing year by year, but the increase is small, and the comprehensive development level of commercial circulation industry is better than that of cultural tourism industry. Secondly, the system coupling coordination in the eastern and central regions is basically in a positive coordinated development state, while the western region is on the verge of imbalance. Thirdly, the coordinated development of the commercial circulation industry and the cultural tourism industry system shows the characteristics of primary and reluctant coordination as the main body, and only in a few years, the regional system is in serious imbalance and high-quality coordination. Fourth, there is a positive spatial autocorrelation in the system coupling coordination between the commercial circulation industry and the cultural tourism industry, but the correlation is not strong, and the provinces with similar coordination status are more likely to gather in space.

B.   Research recommendations

First, we should give full play to the local characteristic culture and promote the high-quality development of the cultural and tourism industry. In view of the fact that the development level of cultural tourism in the eastern, central and western regions of China lags behind that of the commercial circulation industry as a whole, it is suggested that the relevant government departments should issue relevant policies for tourist attractions with local characteristics, strengthen the comprehensive coordination functions of relevant local authorities, develop cultural tourism according to local conditions, develop tourism resources with national characteristics, and promote the professional and high-quality development of cultural tourism.

Second, we should strengthen regional exchanges and organize relevant special activities. It is suggested that the western region should strengthen exchanges with the eastern and central regions, and jointly organize special tourism promotion meetings, local characteristic product exhibitions and other activities.

Third, break down administrative barriers and realize the interconnection between provinces. Shanghai, Jiangsu, Shandong, Zhejiang and other "high-high" agglomeration areas have industrial and location advantages, so they should strengthen the promotion of industrial chain value and promote the local influence of industries in surrounding provinces, regions and cities. Tianjin, Guangxi, Chongqing and other "low-high" agglomeration areas should set up tourism resources with local characteristics and culture, avoid industrial competition with surrounding provinces, regions and cities, and effectively utilize the spillover effect of surrounding high-value provinces, regions and cities. Ningxia, Qinghai, Jilin and other "low-low" gathering areas should constantly explore the advantages of local resources and cultural characteristics according to the actual situation, so as to promote the highly coordinated development of commercial circulation and cultural tourism.

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