

Research on agglomeration performance and competition situation of tourism industry based on PVAR model

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Abstract: This paper takes 14 cities and states in Hunan Province as an example, and uses the location quotient index and performance growth index to measure the agglomeration performance and changing trend of tourism industry clusters in each city and state; At the same time, by constructing a comparative model of the competition situation of regional tourism industry clusters in Hunan Province, four regional quadrants are divided into strong areas, potential areas, weak areas and strength areas. The results show that there are large internal differences in the performance of tourism industry agglomeration among cities and states in Hunan Province. And it has obvious spatial differentiation characteristics, which is mainly reflected in the poor agglomeration performance of the northern remote cities and states, and the high growth index of the agglomeration performance of the central and western and southern cities and states, and the great development potential. In the future, we should provide direction guidance for the development of tourism industry clusters on the basis of in-depth understanding of the competitiveness of tourism industry clusters in cities and states.

1. Introduction

Industrial cluster is the result of geographical agglomeration due to the pursuit of external economy. This concept was first proposed by economist Marshall in the book [1]. At present, tourism industry clusters are increasingly becoming the focus of attention from academic circles and government departments. In order to enhance tourism competitiveness, it is inevitable to accelerate the integration of industry clusters. This study mainly uses the entropy method to give weights, adopts the PVAR model and the improved evaluation system of tourism industry competitiveness indicators, and quantitatively and empirically studies the competitiveness of tourism industry clusters in Hunan Province, in order to provide a theoretical basis for subsequent tourism planning and industrial layout.

2. Research methods

2.1 Comprehensive location quotient index

Location Quotient (LQ) is a commonly used indicator in economics to analyze regional industrial advantages. Haggett first applied this indicator to location analysis in 1996[2]. Using the method of location quotient to measure the performance of tourism industry agglomeration in the destination, the measurement results can be used to judge whether there is a tourism industry cluster phenomenon in the region and its stage[3]. This paper uses the location quotient of tourism revenue to measure the agglomeration performance of tourism industry clusters in 14 cities and prefectures in Hunan Province. The calculation formula is as follows.

$$LQ_i = \frac{e_{ij}}{e_i} / \frac{E_{ij}}{E_i} \quad (1)$$

Among them: e_{ij} represents the total revenue of the tourism industry in i city; e_i represents the GDP of the i city; E_{ij} represents the total tourism industry revenue of Hunan Province; E_i represents the GDP of Hunan Province. LQ is the location quotient of the city-state, which refers to the ratio of the total

tourism industry revenue of a city-state to the GDP of the city-state to the ratio of the total tourism revenue of Hunan Province to the GDP of the whole province. If the LQ value is greater than 1, it indicates that the specialization level of the tourism industry in the city is higher than the average level of the province, the existing agglomeration scale is large, the clustering trend is more obvious, or a tourism industry cluster has been formed. Otherwise, if the LQ value is less than 1, it means that the agglomeration scale of the city or state is smaller than the provincial average, and the clustering trend is less obvious.

2.2 PVAR model

This paper takes the regional economic index $\ln\text{GDP}$, the tourism industry location quotient index TI , the travel community location quotient index TA , and the star hotel location quotient index SH as the endogenous variables of the PVAR model. Considering the AIC, SC criteria and the unity of the three regional models, the lag order is set to 2[4]. The PVAR model is constructed with $\ln\text{GDP}$, TI , TA and SH as the explained variables in turn, and the model with $\ln\text{GDP}$ as the explained variable is as follows:

$$\ln\text{GDP}_t = \beta_1 \ln\text{GDP}_{t-1} + \beta_2 \ln\text{GDP}_{t-2} + \beta_3 \text{TI}_{t-1} + \beta_4 \text{TI}_{t-2} + \beta_5 \text{TA}_{t-1} + \beta_6 \text{TA}_{t-2} + \beta_7 \text{SH}_{t-1} + \beta_8 \text{SH}_{t-2} \quad (2)$$

In the formula, t represents the t -th year, and β represents the lag order.

2.3 Indicator selection and data sources

Taking into account the availability and accuracy of data, this paper uses GDP as an indicator to measure the level of regional economic growth, and uses total tourism revenue and tourist arrivals as a measure of location quotient. The calculated location quotient represents the degree of industrial agglomeration. Among them, the GDP, employment, tourism industry income, number of travel communities, and number of star-rated hotels in each city are from the "China Statistical Yearbook" and the Hunan Provincial Statistical Yearbook (2010-2021).

3. Research on tourism industry cluster in Hunan Province

3.1 Overview of Tourism Development in Hunan Province

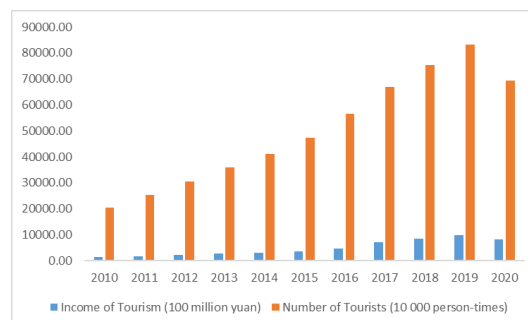


Figure 1. The total revenue and total number of tourists in Hunan Province over the years by cities and states

Since the reform and opening up, the development of tourism industry in Hunan Province has made outstanding achievements, and tourism has become a pillar industry for the development of the national economy in Hunan Province. According to the "Hunan Statistical Yearbook 2021" data, as of 2020, despite the impact of the epidemic, Hunan has received a total of 693 million foreign tourists, a year-on-year increase of -16.62%, and the total tourism revenue reached 826.195 billion yuan, a year-on-year increase- 15.37%. However, compared with a year-on-year increase of -510.50% in the total number of tourists in the country and a year-on-year increase of -61.07% in the total tourism revenue, Hunan has performed well in terms of the number of tourists and the total tourism revenue obtained. See Figure 1 for the total revenue and total number of tourists in various cities and states over the years.

In general, the tourism industry in Hunan Province is developing rapidly and the growth trend is good. While the pace of economic development is accelerating, the tourism market is also becoming increasingly mature and has considerable competitive strength.

3.2 Cluster Agglomeration Performance Measure.

In order to clarify the degree of tourism industry cluster development in Hunan Province, this paper calculates the location quotient index of tourism industry in various cities in Hunan Province. In order to ensure the consistency and validity of the data sources of location quotient, the location quotient and the performance growth index P of the 14 cities and prefectures in Hunan Province calculated from the “Hunan Statistical Yearbook” (2010-2021) in tourism revenue and GDP data.

The 2010-2020 tourism revenue location quotient index of 14 cities in Hunan Province is shown in Table 1. The central location quotient of the 14 cities in Hunan Province is continuously greater than 1, including Xiangtan, Zhangjiajie, Chenzhou, Huaihua and Xiangxi. The development trend is also more obvious. Among them, Zhangjiajie has the highest agglomeration performance, which has an average location quotient of 4.91 in the past 10 years. The location quotient of Changsha and Yiyang shows a trend of fluctuation and decline, and the degree of industrial agglomeration is getting lower and lower, which is not conducive to the large-scale development of the tourism industry; The location quotient of Zhuzhou, Hengyang, Shaoyang, Yueyang, Yongzhou and Loudi has a fluctuating and rising trend, indicating that these cities and states are very likely to form industrial clusters in the future. The location quotient of Changde City has been kept in a stable state at a low level, the specialization level and degree of the tourism industry are low, and the formation of industrial clusters is difficult.

Table 1 The location quotient of tourism revenue in 14 cities and states in Hunan Province from 2010 to 2020

(unit: 100 million yuan)

City /State	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Changsha	0.99	0.90	0.81	0.80	0.78	0.75	0.71	0.77	0.70	0.69	0.69
Zhuzhou	0.64	0.81	0.78	0.83	0.82	0.85	1.06	1.01	1.00	0.85	0.94
Xiangtan	1.13	1.12	1.08	1.03	1.08	1.12	1.15	1.32	1.22	1.41	1.15
Hengyang	0.67	0.76	0.78	0.79	0.78	0.81	0.85	0.92	0.92	0.80	0.83
Shaoyang	0.64	0.68	0.68	0.68	0.71	0.78	0.71	0.96	1.07	0.97	0.95
Yueyang	0.75	0.80	0.78	0.89	0.92	0.86	0.89	0.65	0.71	0.69	0.73
Changde	0.63	0.64	0.66	0.69	0.68	0.66	0.64	0.55	0.56	0.57	0.65
Zhangjiajie	5.18	5.07	4.77	4.57	4.63	4.39	5.71	4.62	4.28	5.58	5.17
Yiyang	1.12	1.13	1.07	1.01	0.91	0.84	0.66	0.76	0.71	0.85	0.93
Chenzhou	1.16	1.12	1.09	1.20	1.20	1.17	1.00	1.16	1.18	1.28	1.28
Yongzhou	0.83	0.83	0.95	0.92	0.86	0.86	0.70	1.16	0.88	1.07	1.25
Huaihua	1.22	1.21	1.25	1.22	1.33	1.39	1.44	1.33	1.34	1.33	1.42
Loudi	0.89	0.84	0.89	0.95	1.01	1.03	1.07	0.84	0.94	1.10	1.28
Xiangxi	2.68	2.50	2.73	2.83	2.89	2.80	2.53	2.87	3.15	2.98	3.33

(Data source: Hunan Statistical Yearbook 2011-2020)

In addition, taking the LQ value of the two time sections in 2010 and 2020 as a reference and 2010 as the base period, the performance growth index P of the tourism industry cluster between these two time sections can be calculated according to the following formula to reflect the overall change trend of the performance of tourism industry agglomeration in various regions in the time dimension[5]. The results are shown in Table 2.

$$P_i = \frac{LQ_{it} - LQ_{i0}}{LQ_{i0}} \quad (3)$$

Among them: LQ_{it} is the agglomeration performance value of i city state in year t ; LQ_{i0} is the agglomeration performance value of city state base period; P is the industrial cluster performance growth index. If $P \geq 0$, the agglomeration degree of the tourism industry in the city and state has been continuously improved or maintained, and the competitive advantage of the industrial cluster has been enhanced or continued to be stable; The cluster's competitive advantage is not obvious.

Table 2 The agglomeration of tourism industry clusters in cities in Hunan Province

City /State	2010	2020	P	overall trend
Changsha	0.99	0.69	-0.30	↓
Zhuzhou	0.64	0.94	0.47	↑
Xiangtan	1.13	1.15	0.02	↑
Hengyang	0.67	0.83	0.23	↑
Shaoyang	0.64	0.95	0.48	↑
Yueyang	0.75	0.73	-0.02	↓
Changde	0.63	0.65	0.03	↑
Zhangjiajie	5.18	5.17	0.00	→
Yiyang	1.12	0.93	-0.17	↓
Chenzhou	1.16	1.28	0.10	↑
Yongzhou	0.83	1.25	0.50	↑
Huaihua	1.22	1.42	0.17	↑
Loudi	0.89	1.28	0.44	↑
Xiangxi	2.68	3.33	0.24	↑

According to Table 2, among the 14 cities in Hunan Province, the P values of Changsha, Yueyang, and Yiyang are less than 0, and their tourism industry agglomeration is shrinking, and measures need to be taken to curb the downward trend. The degree of agglomeration of tourism industry in Zhangjiajie has not changed. The cluster performance growth index $P > 0$ of Zhuzhou, Xiangtan, Hengyang, Shaoyang, Chenzhou, Yongzhou, Huaihua, Loudi, Yiyang and Xiangxi indicates that the agglomeration degree of regional tourism industry in these cities is increasing. In the future, it is likely to form an industrial cluster or further expand the scale of its existing industrial cluster, thereby enhancing the overall strength of the development of the tourism industry in the region. It is worth noting that the changes in the performance growth index P of the tourism industry clusters in Xiangtan, Yueyang and Changde are small, indicating that the level of tourism industry clusters in these cities has remained stable in the past ten years. In the future, efforts should be made to increase industrial cooperation and strive to form industrial clusters as soon as possible or expand their existing scale and scope.

4. Analysis of the competitive situation of tourism industry clusters

According to the performance value LQ and performance growth index P obtained above, the current LQ value (that is, the value in 2020) is used as a static indicator in the spatial dimension (horizontal axis), and the P value is used as a dynamic indicator in the time dimension (vertical axis). Taking 0 and 1 as the critical values, the cities in Hunan Province were divided into four quadrants: strong area, potential area, weak area and strong area (see Figure 2), and constructed a PVAR model for comparing the competitive situation of regional tourism industry clusters. Through this model, we can analyze the competition situation of tourism industry clusters in 14 cities in Hunan Province, and on this basis, provide direction guidance for the future development of tourism industry clusters in each city.

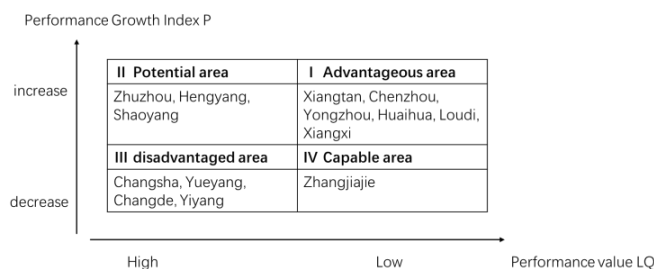


Figure 2. Comparing Model of Regional Tourism Industry Cluster Competition Situation

4.1 PVAR model test

The unit root test was carried out on the economic indicators lnGDP, the tourism industry location quotient index TI, the travel community location quotient index TA, and the star hotel location quotient index SH in the four quadrant regions respectively. It can be seen from the PVAR regression results that the coefficients of most variables are positive, indicating that the agglomeration of the tourism industry can promote regional economic growth. Comparing different regions, it is found that most of the coefficients of disadvantaged areas are smaller than those of advantaged areas, potential areas, and strength areas, indicating that the agglomeration and development of tourism industry in this area has reached a certain level.

Table 3 PVAR estimation results

Explanatory Variables	Advantage Area		Potential Area		Disadvantaged Area		Capable Area	
	Coefficient	T Value	Coefficient	T Value	Coefficient	T Value	Coefficient	T Value
Ingdp(-1)	1.10	14.43	1.54	15.73	1.64	0.63	1.00	15.73
Ingdp(-2)	1.52	3.00	2.00	0.16	1.60	0.80	1.32	0.30
TI(-1)	0.02	1.75	0.01	3.18	0.02	0.92	0.26	0.14
TI(-2)	0.03	2.51	0.02	2.33	0.03	1.44	0.03	1.88
TA(-1)	0.01	0.13	0.06	0.79	0.00	1.26	0.01	0.43
TA(-2)	0.00	0.72	0.02	0.31	0.04	2.50	0.01	1.44
SH(-1)	0.01	0.36	0.01	0.03	0.01	3.44	0.01	0.41
SH(-2)	0.06	3.01	0.04	1.76	0.15	4.23	0.08	2.99
C	0.22	6.29	0.08	2.20	0.14	4.17	0.05	1.44

4.2 Impulse response

Considering the purpose of this study, this paper focuses on analyzing the impact of tourism industry agglomeration, travel agency agglomeration, and star-rated hotel agglomeration on GDP growth. Figure 3 is the corresponding impulse response function diagram of the four-quadrant region. The horizontal axis represents the lag period of the shock effect, the vertical axis represents the response of GDP to each variable, the middle curve represents the response function curve, and the two outer curves represent the confidence interval of twice the standard deviation.

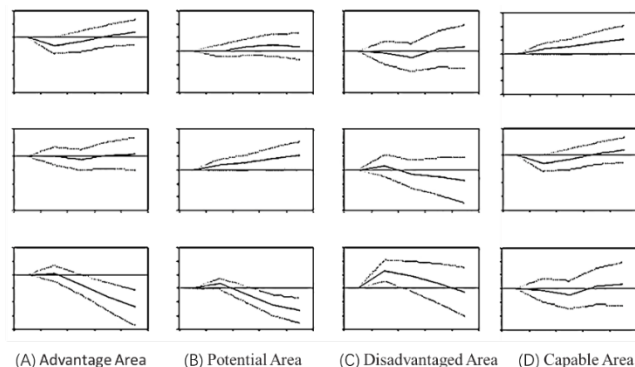


Figure 3. Impulse response plot

The following conclusions can be drawn from the impulse response diagram:

Cities located in strong areas have realized the optimization of the spatial distribution of productivity, effectively integrated tourism resources, exerted certain competitive advantages, and formed tourism industry clusters.

Although the current level of tourism industry agglomeration is low, the cities located in the potential areas have a good future development trend and have the advantageous conditions to form a tourism industry cluster, and their competitive advantages need to be explored.

The overall tourism competitiveness of cities located in vulnerable areas is weak, and the scale of the tourism industry is lower than the average level of Hunan Province, and will even continue to

decline in the future.

Cities located in powerful regions have quite strong competitiveness, but the competitive advantages of the city's tourism industry clusters have fluctuated.

4.3 Variance decomposition results

It can be seen from the variance decomposition results that most of the factors affecting the regional GDP come from itself. The contribution of the four types of regions in each period basically exceeds 90%, while the other parts come from the influence of tourism industry agglomeration. The impact of regional tourism industry agglomeration on the regional economy is still weak. In the whole province, the impact ratio of star-rated hotels in each period is greater than that of travel agencies, indicating that its effect on the regional economy is more obvious.

Table 4 Variance decomposition results

Region	Variance	lnGDP	Tourism industry	Travel agency	Star hotels
Advantage area	0.04	1.52	0.95	0.15	1.09
Potential area	0.06	1.99	0.79	0.12	4.54
Disadvantaged area	0.07	1.60	0.69	0.12	0.92
Capable area	0.42	1.32	0.47	0.45	1.45

5. Conclusion

This paper uses the comprehensive location quotient index to measure the level of tourism industry agglomeration, selects the panel data of 14 cities and states in Hunan Province from 2010 to 2020, and uses the PVAR model to study the tourism industry agglomeration performance and competition situation. The empirical results show that the agglomeration performance of the tourism industry clusters of cities and states in Hunan Province is quite different, with obvious spatial differentiation characteristics. At the same time, through the construction of the regional tourism industry cluster competition situation comparison model, the 14 cities and states in Hunan Province were divided into four regional quadrants: strong area, potential area, weak area and strength area. Make recommendations for its future development.

References

- [1] RV Andrienko. The role of an industrial cluster in increasing economic competitiveness of Rostov Region. 2020.
- [2] Haggett P. Locational Methods[J]. Locational Analysis in Human Geography, 1977.
- [3] Chen Y, Nie H, Chen J, et al. Regional industrial synergy: Potential and path crossing the "environmental mountain"[J]. Science of The Total Environment, 2020, 765(3):142714.
- [4] Andrei D M. New Companies€ Formation In Romania. A Pvar Model Approach[J]. Internal Auditing and Risk Management, 2021, 62.
- [5] D Jiang, Zhang H, Xian S, et al. Effect of Coal Blending on Gasification Performance and Agglomeration[J]. Energy And Fuels, 2020, 34(3):2772-2780.