

Retraction

Retracted: Modeling and Empirical Analysis of Regional Tourism Competitiveness Based on Niche Theory

Discrete Dynamics in Nature and Society

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] Y. Yang, Y. Wu, and H. Hu, "Modeling and Empirical Analysis of Regional Tourism Competitiveness Based on Niche Theory," *Discrete Dynamics in Nature and Society*, vol. 2021, Article ID 8384964, 11 pages, 2021.

Research Article

Modeling and Empirical Analysis of Regional Tourism Competitiveness Based on Niche Theory

Yingjuan Yang ^{1,2}, Yanxia Wu,¹ and Haiqing Hu¹

¹School of Economic and Management, Xi'an University of Technology, Xi'an 710058, China

²Faculty of Economics and Management, Shangluo University, Shangluo 726000, China

Correspondence should be addressed to Yingjuan Yang; 234029@slxy.edu.cn

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The fierce competition in tourism has brought a string of problems, such as the homogeneous development of regional tourism resources and the escalation of regional competition. One key issue in urban tourism today is how to identify competitors, recognize own advantageous resources, and clarify the direction of development. This paper evaluates the competitiveness of regional tourism in three steps: setting up an evaluation system, calculating niche and niche overlap, and conducting synthesis and cluster analysis. Firstly, a comprehensive evaluation system of urban tourism niche was established, which includes such four dimensions as tourism resources, tourism market, social economy, and eco-environment, and the weight of each index was calculated by entropy method. Next, regional niche and niche overlap were computed by niche theory. Taking the mean of niche overlap and that of composite niche as the references, the authors drew an overall distribution map of regional tourism niche. After that, a cluster analysis was carried out with the four-dimensional niche and composite niche of regional tourism. Finally, an empirical analysis was performed on the tourism competitiveness in ten prefectures of Shaanxi Province, using the data in 2010–2018. The results show that the prefectures differed greatly in tourism development and competed fiercely against each other.

1. Introduction

The fierce competition in tourism has brought a string of problems, such as the homogeneous development of regional tourism resources, and the escalation of regional competition. One key issue in urban tourism today is how to identify competitors, recognize own advantageous resources, and clarify the direction of development.

Niche was first proposed by Johnson in 1910 to study community relationship and biodiversity and interspecific relationship [1]. Zhang and Xie [2] proposed and improved the multidimensional hypervolume niche theory, which provided a method for studying niche theory. Niche theory has become an effective tool of social research since the 1950s. In the field of tourism, however, only a few foreign scholars have applied niche theory to analyze the factors affecting urban tourism development, select relevant evaluation indices, and construct an evaluation index system. Li et al. held that the development of urban tourism is affected

by tourism resources, urban environment, social development, and economic strength and built up an evaluation index system for urban tourism to measure the size of urban niche [3–5]. Domestically, niche theory was initially adopted by natural scientists and gradually employed by tourism researchers. Huang was the first to apply the theory in tourism [6]. After that, scholars had deepened the concept of tourism niche. For example, Qi et al. believed that tourism niche includes the sum of the relationship between tourists, operators, local residents, and the natural environment and social environment of the tourism destination [7]. Zou et al. believed that tourism niche emphasizes the living position, specific functions, and group benefits of the tourism destination in the regional space [8]. Meng and Lu pointed out that tourism niche refers to the functional positioning and market positioning formed by tourism destinations in the process of participating in the division and cooperation system of tourism destination communities under the background of specific location and tourism resources and

environment [9]. Later, tourism niche has been studied by various methods from different angles. Wang [10], Wang and Yu [11], Wang et al. [12], and Zhou et al. [13] defined the dimensions of niche measurement; some other scholars empirically analyzed regional tourism niche in the light of the actual situation of regional tourism, and Xiang put forward tourism development strategies based on niche theory [14]. Su et al. relied on niche theory to derive a development strategy for Kunming international tourism area in central Yunnan Province [15]. Drawing on niche theory, Wang examined the relationship between tourism competitiveness of 18 cities in Henan Province and optimized the spatial allocation of tourism resources [16]. Li and Guo studied city-scale regional tourism in Zhangzhou, Fujian Province, by niche theory [17]. Chen and Yan constructed the tourism niche evaluation system of the Pearl River Xijiang economic belt and put forward corresponding development strategies for the region [18]. Some other scholars had studied the tourism spatial structure based on niche theory. For example, Li et al. divided the tourism comprehensive competitiveness of cities in Shandong Province into five levels: high, high, medium, low, and low [19]. Wang and Yin divided tourism cities in Guizhou Province into four categories: core city, node city, network city, and marginal City [20]. In addition, He et al. combined niche and vulnerability to explore the spatial pattern distribution of urban niche vulnerability values in Hunan Province [21–23], which provided a new perspective for the application of niche theory in tourism industry.

Despite the above results on tourism niche, there is not yet a unified measurement model for tourism niche. Based on niche theory, this paper sets up an evaluation index system for regional tourism niche. The theories on niche situation and niche overlap were introduced to regional tourism, enriching the theoretical results on tourism, and providing a useful reference for the sustainable development of tourism.

2. Methodology

This paper evaluates the competitiveness of regional tourism in three steps: setting up an evaluation system, calculating niche and niche overlap, and conducting synthesis and cluster analysis. Firstly, a comprehensive evaluation system of urban tourism niche was established, which includes such four dimensions as tourism resources, tourism market, social economy, and eco-environment, and the weight of each index was calculated by entropy method. Next, regional niche and niche overlap were computed by niche theory. Taking the mean of niche overlap and that of composite niche as the references, the authors drew an overall distribution map of regional tourism niche. After that, a cluster analysis was carried out with the four-dimensional niche and composite niche of regional tourism.

2.1. Evaluation Index System. The development of urban tourism, a comprehensive industry, is limited by economy, resources, environment, infrastructure, and many other

factors. Referring to existing research at home and abroad, this paper selects a total of 20 indices for regional tourism development, which are evenly distributed across 4 dimensions. Hence, our evaluation index system encompasses the following dimensions: tourism resources (C_1 – C_5), tourism market (C_6 – C_{10}), social economy (C_{11} – C_{15}), and eco-environment (C_{16} – C_{20}). All the indices are listed in Table 1, where each plus sign means the corresponding index has a positive correlation with tourism niche, and each minus sign means the corresponding index has a negative correlation with tourism niche, as shown in Table 1. Specifically, the dimension of tourism resources reflects the quantity and quality of regional tourism resources, both of which are critical to regional tourism development. The dimension of tourism market characterizes the direct business performance of economic activities in tourism, which embodies the vitality of urban tourism development. The dimension of social economy lays the basis for regional tourism activities. The dimension of eco-environment also exerts a major impact on tourism activities: without a good eco-environment, a region cannot leave tourists a good impression, not to mention attracting new tourists.

2.2. Index Weighting. Entropy method is an objective way to compute the dispersion degree of an index. The greater the dispersion degree, the more important the index is to comprehensive evaluation. As an objective weighting method, entropy method is not affected by personal subjective feelings. Therefore, entropy method to determine the weight of regional tourism niche evaluation index is used in this paper. Index weighting by entropy method covers the following steps.

2.2.1. Nondimensionalization. In the original data, different indices have dimensional differences. Thus, the direct use of the original data would distort the subsequent calculations and results analysis. To obtain authentic and intuitive results, the original data should be nondimensionalized, i.e., standardized by the following:

Positive indices:

$$S_1 = \frac{(X_1 - X_{\min})}{(X_{\max} - X_{\min})}, \quad (1)$$

Negative indices:

$$S_1 = \frac{(X_{\max} - X_1)}{(X_{\max} - X_{\min})}, \quad (2)$$

2.2.2. Proportion Calculation. The proportion P_{ij} of region i should be calculated under each index j :

$$P_{ij} = \frac{X'_{ij}}{\sum_{i=1}^n X'_{ij}}, \quad (i = 1, 2, \dots, n, j = 1, 2, \dots, m), \quad (3)$$

where X'_{ij} is the standardized value of index j of region i .

TABLE 1: Composite niche system of urban tourism and index weights.

Target layer (A)	System layer (B)	Weight	Indicator layer (C)	Index attribute	Weight
A: regional tourism comprehensive niche	B ₁ : tourism resources	0.040	C ₁ : national 3A or above tourist attractions (points)	+	0.0043
			C ₂ : world heritage and national intangible cultural heritage (points)	+	0.0078
			C ₃ : national cultural relics protection unit (points)	+	0.0066
			C ₄ : national famous historical and cultural cities, towns, and villages (points)	+	0.0075
			C ₅ : national forest park (points)	+	0.0144
			C ₆ : total number of tourists (10000 person-times)	+	0.0610
			C ₇ : total tourism revenue (100 million yuan)	+	0.0671
			C ₈ : number of star hotels (PCs)	+	0.0956
	B ₂ : tourism market	0.397	C ₉ : passenger transport turnover (10000 person-kilometers)	+	0.1003
			C ₁₀ : total number of travel agencies (PCs)	+	0.0735
			C ₁₁ : per capita GDP (yuan)	+	0.0430
			C ₁₂ : total value of tertiary industry (100 million yuan)	+	0.0573
	B ₃ : economic and social	0.260	C ₁₃ : total retail sales of social consumption (100 million yuan)	+	0.0568
			C ₁₄ : per capita disposable income of urban residents (yuan)	+	0.0383
			C ₁₅ : natural population growth rate (one thousandth)	+	0.0648
			C ₁₆ : days with excellent ambient air quality (days)	+	0.0541
			C ₁₇ : comprehensive utilization of solid waste (10000 tons)	+	0.0595
			C ₁₈ : urban wastewater treatment capacity (10000 tons)	+	0.0558
	B ₄ : ecological environment	0.301	C ₁₉ : sulfur dioxide emission (ton)	-	0.0616
			C ₂₀ : per capita park green space area (M ²)	+	0.0698

2.2.3. Entropy Calculation. The entropy e_{ij} of index j can be calculated by

$$e_{ij} = -k \sum_{i=1}^n P_{ij} \ln P_{ij}, \quad j = 1, 2, \dots, m, \quad e_{ij} \in [0, 1], \quad (4)$$

where $k = (1/\ln n)$ is the adjustment coefficient; P_{ij} is the proportion of X_{ij}' .

2.2.4. Difference Calculation. The difference coefficient g_j of index j can be calculated by

$$g_j = 1 - e_j, \quad j = 1, 2, \dots, m. \quad (5)$$

The difference coefficient is positively correlated with the importance of index j , and the impact of the index on the evaluation system, but negatively with the entropy of index j .

2.2.5. Weight Calculation. The weight W_j of X_{ij}' can be calculated by

$$W_j = \frac{g_j}{\sum_{j=1}^m g_j} = \frac{1 - e_j}{\sum_{j=1}^m (1 - e_j)}, \quad j = 1, 2, \dots, m. \quad (6)$$

2.3. Niche and Niche Overlap. According to theories on niche situation theory [22], as well as niche overlap and competitive exclusion [23], this paper sets up a niche-based judgment framework of competitive relationship in regional tourism.

2.3.1. Niche. Niche situation theory holds that biological units are the result of situation interaction. State and potential are two key concepts in this theory. State refers to the outcome of the past development of biological units, reflecting the existing strength and results of organisms. Potential stands for the future trend and development speed of organisms, and helps to forecast the future situation of organisms. To analyze the development of biological units, the past situation and future trend should be combined with a clear understanding of the current situation. The niche can be calculated in the following steps:

(1) Niche situation model:

Proposed by Zhu [22], the niche situation theory describes the niche N_i of region I as follows:

$$N_i = \frac{(S_i + A_i P_i)}{\sum_{j=1}^n (S_j + A_j P_j)}, \quad (7)$$

where S_i is the state of region i ; P_i is the potential of region i ; S_j is the state of region j ; P_j is the potential of region j ; A_i and A_j are dimensional conversion coefficients; and $S_i + A_i P_i$ is the absolute niche of region i ; $i, j = 1, 2, 3, \dots, n$. The status of regional tourism niche is the data of regional tourism indicators, which reflects the results of tourism development in the region before; Potential is the annual growth of regional tourism indicators, reflecting the growth and future development potential of tourism development in the region.

(2) Composite niche:

The composite niche of region i can be calculated by

$$M_i = \frac{\sum_{i=1}^n N_i W_i}{\sum_{i=1}^n W_i}, \quad (8)$$

where N_i is the niche of each index of region i ; W_i is the weight of each index; and n is the number of indices. Both the niche of each index and the composite niche should fall within $(0, 1)$. If the composite niche is close to 0, the regional tourism is not competitive; if the composite niche is close to 1, the regional tourism is competitive.

2.3.2. Niche Overlap. Scholars like Hurlbert [24] and Zhao [25] expounded the concept and understanding of niche overlap differently. In a fixed regional system, niche overlap occurs when two or more biological units share the same environment or resources. Niche overlap is directly proportional to the intensity of subsequent competition, especially in the case of limited environment or resources. When resources are lacking, the most intense competition will follow, if niche overlap occurs in all dimensions. When resources are sufficient, niche overlap in a few dimensions will not lead to competition, but result in symbiosis and niche development among biological units. Through the competition, the fittest will survive, or the biological units will coexist.

Niche overlap theory is applicable to the analysis of regional tourism. In the tourism system of a region, the regional cities inevitably interact with each other in politics, economy, and culture. The interactions, coupled with their similarities in urban construction and tourism resources, evoke resource competition and sharing among regional tourism industries. The overlap of regional tourism niche will ensue. When resources are lacking, two or more cities with niche overlap in the same tourism system will compete fiercely with each other. When resources are sufficient, no competition will take place between these cities.

Niche overlap of tourism represents the competitive relationship in the development of regional tourism. Hurlbert [24], Zhao [25], Pianka [26], Yu and Orlóci [27], and others elaborated the concept and calculation formula of niche overlap from different angles. Among the various formulas of niche overlap, Pianka [26] formula is the most widely used function. Drawing on this formula, niche overlap can be calculated in the following steps. Single-dimensional niche overlap of urban tourism:

(1) The niche overlap between region i and region j

$$Q_{ij} = \frac{\sum_{a=1}^r P_{ia} P_{ja}}{\sqrt{[\sum_{a=1}^r P_{ia}^2][\sum_{a=1}^r P_{ja}^2]}} \quad (9)$$

where P_{ia} and P_{ja} are indicator utilizations by region i and region j , respectively, $a = 1, 2, \dots, n$. Niche overlap falls in the interval of $[0, 1]$: 0 means complete niche separation, and 1 means complete niche overlap. The single-dimensional niche overlap formula objectively reflects the overlap of tourism niche indicators utilization among cities. The calculation is simple, objective, and practical.

(2) Multidimensional niche overlap of urban tourism:

Extended from single-dimensional niche overlap, multidimensional niche overlap refers to the niche overlap between multiple dimensions affecting urban tourism development. It is an intuitive and effective indicator of the performance of cities in multiple dimensions and helps to understand the overall overlap of tourism niche between two or more cities. The multidimensional niche overlap of urban tourism between region i and region j can be calculated by

$$\alpha_{ij}^p = \prod_{k=1}^k \alpha_{ij}(A_k), \quad (10)$$

where $\alpha_{ij}(A_k)$ is the overlap between region i and region j on the k th index A .

2.4. Niche Synthesis and Cluster Analysis. This paper draws an overall distribution map of regional tourism niche, with niche overlap as horizontal coordinate, composite niche as vertical coordinate, and the means of the two indices as reference axes. According to the reference axis, regional tourism niche was divided into four quadrants: high niche and low overlap (HNLO), high niche and high overlap (HNHO), low niche and low overlap (LNLO), and low niche and high overlap (LNHO). The overall distribution of regional tourism niche can be observed from the map.

Cluster analysis is a multivariate statistical analysis on the individual features of objects. However, regional tourism niche covers multiple dimensions, and tourism development in different regions faces similar conditions in the same system. If there are many regions, it would be tiresome and repetitive to analyze the regions one by one. Therefore, regional tourism niche was classified to yield clearer analysis results, after combining the four-dimensional regional niche with composite niche.

3. Empirical Analysis

3.1. Tourism in Shaanxi Province. Located in the middle reaches of the Yellow River, Shaanxi, is an inland province in northwestern China, and a junction of eastern, central, northwest, and southwest regions of the country. Both the

Yellow River and the Yangtze River flow through the province. The basins of the two rivers within Shaanxi are roughly divided by the magnificent Qinling Mountains. There are ten prefectures in the province, namely, Xi'an, Xianyang, Baoji, Shangluo, Ankang, Hanzhong, Weinan, Tongchuan, Yan'an, and Yulin. The province is rich in natural landscape tourism resources, including the northern scenery of the Yellow River Basin, the southern scenery of the Yangtze River Basin, the beautiful natural landscape of 800 Li Qinchuan and Qinling Mountains. At the same time, Shaanxi is one of the birthplaces of the Chinese culture. Brilliant Chinese dynasties like Qin, Han, and Tang all set up their capitals in this ancient province. Ancient walls, terracotta warriors, and Wild Goose Pagoda are among the countless historical and cultural relics across the province. In total, there are 49,058 cultural relics sites, 253 museums, 79 world heritages and national intangible cultural heritages, and 51 national historical and cultural cities, towns, and villages.

The profound historical and cultural heritage is enlivened by beautiful natural scenery. Shaanxi has long been a major tourism province. Nowadays, tourism is the pillar industry of the province, making up a large portion of the national economy. As of December 2018, there were 502 scenic spots across Shaanxi, including 11 5A scenic spots, 131 4A scenic spots, and 318 3A scenic spots. In addition, 22 national forest parks scatter around the province.

By virtue of its abundant tourism resources and large tourism scale, Shaanxi has witnessed a strong growth of tourism economy in terms of both quality and efficiency. According to the report on the development of tourism industry in Shaanxi Province in 2018, Shaanxi received 630 million domestic and foreign tourists, an increase of 20.5% over the previous year. The tourism revenue totaled 599.466 billion yuan, up by 24.5% from that in 2017. The good momentum of tourism development is further fueled by China's promotion of global tourism, as part of the Belt and Road Initiative.

Nevertheless, tourism development in Shaanxi is strongly imbalanced between cities. Most tourists visit cities with famous scenic spots, such as terracotta warriors and Hukou Waterfall. The intercity imbalance of tourism development is partly attributable to the varied levels of economic development and resource endowment between cities. To realize coordinated and sustainable development of tourism, Shaanxi must clarify the reasons for the imbalance of tourism development and put forward pertinent countermeasures.

3.2. Data Sources and Data Processing. The research data were collected from Statistical Yearbooks of Shaanxi Province (2010–2018), National Development and Statistical Bulletins of each prefecture in Shaanxi Province (2010–2018), Shaanxi Provincial Department of Culture and Tourism, Shaanxi Provincial Bureau of Statistics, as well as the official websites of prefectural governments. To solve data inconsistency, the data from higher-level government departments or the latest statistical yearbooks were reserved.

The data as of December 2018 were adopted for the indices of tourism resources (C_1 – C_5), the number of star hotels (C_8), and the number of travel agencies (C_{10}). The five indices of tourism resources, namely, national 3A scenic spots or above (C_1), world heritages and national intangible cultural heritages (C_2), national key cultural relics protection units (C_3), national historical and cultural cities, towns, and villages (C_4), and national forest parks (C_5), were rated against the following criteria:

10 points for 5A scenic spots, 7 points for 4A scenic spots, and 4 points for 3A scenic spots

10 points for world heritages, 4 points for national intangible cultural heritages

4 points for national cultural relics protection units

10 points for national historical and cultural cities, 7 points for national historical and cultural towns, and 4 points for national historical villages

8 points for national forest parks

Considering the various index attributes, the index data were nondimensionalized by formulas (1) and (2), and the weight of each index was determined by formulas (3)–(6).

3.3. Calculation and Analysis of Tourism Niche

3.3.1. Estimation of Tourism Niche. Some of the data on tourism resources 2010–2017 are missing. Thus, this paper only computes the tourism niche of Shaanxi in 2018. The nondimensionalized data on each index in 2018 was taken as state, and the mean growth of the nondimensionalized data on each index 2010–2018 was treated as potential. Then, the annual mean growth was adopted as the measuring scale; that is, the dimensional transformation coefficient was set to 1. Using the niche situation model, the niche of each index in each prefecture was calculated by formula (7). Next, the niche of each factor in each prefecture was computed by formula (8). Finally, the niche of each dimension and the composite niche of all ten prefectures were obtained by formula (8) (Table 2). Since the index data about tourism resources were obtained through rating, the potential of tourism resources does not change, when the niche situation model is used. Hence, $N_i = (X_i / \sum X_i)$ was used to introduce to calculate the niche of each index.

3.3.2. Measurement and Analysis of Niche Overlap. As mentioned before, some of the data on tourism resources 2010–2017 are missing. Besides, the relevant data changed little from 2010 to 2018. Therefore, the niche overlap matrix of tourism resources in Shaanxi was calculated based on the 2018 data on tourism resources. The data of 2010–2018 were adopted for the other three dimensions. The original data on each dimension were substituted into formulas (9) and (10), resulting in the niche overlap matrix and composite niche overlap matrix of each dimension for each prefecture in Shaanxi (Table 3).

TABLE 2: Composite niche and ranking of prefectures, 2018.

Region	Tourism resource dimension		Tourism market dimension		Economic and social dimension		Ecological environment dimension		Tourism comprehensive niche	
	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking
Xi'an	0.0436	1	0.3466	1	0.3032	1	0.1372	2	0.2475	1
Tongchuan	0.0123	10	0.0295	10	0.0627	10	0.0637	8	0.0359	10
Baoji	0.0153	8	0.0911	3	0.0892	3	0.0746	7	0.0655	4
Xianyang	0.0160	9	0.0747	5	0.0876	4	0.0765	6	0.0591	6
Weinan	0.0345	2	0.1018	2	0.0797	5	0.1364	3	0.0620	3
Yan'an	0.0342	3	0.0882	4	0.0688	8	0.0793	5	0.0836	5
Hanzhong	0.0249	4	0.0707	7	0.0648	9	0.0884	4	0.0576	7
Yulin	0.0247	5	0.0729	6	0.1029	2	0.2262	1	0.0665	2
Ankang	0.0247	6	0.069	8	0.0723	6	0.059	9	0.0562	8
Shangluo	0.0205	7	0.0554	9	0.0688	7	0.0587	10	0.0465	9

TABLE 3: Composite niche overlap matrix of prefectures in Shaanxi.

Region	Xi'an	Tongchuan	Baoji	Xianyang	Weinan	Yan'an	Hanzhong	Yulin	Ankang	Shangluo
Xi'an	1.0000									
Tongchuan	0.2138	1.0000								
Baoji	0.5783	0.4861	1.0000							
Xianyang	0.5776	0.6168	0.7959	1.0000						
Weinan	0.4149	0.4402	0.6875	0.6926	1.0000					
Yan'an	0.2993	0.8483	0.6251	0.6975	0.6219	1.0000				
Hanzhong	0.4650	0.7109	0.6684	0.5767	0.7470	0.7537	1.0000			
Yulin	0.2337	0.3699	0.4020	0.3650	0.4358	0.2865	0.3739	1.0000		
Ankang	0.3737	0.6221	0.5339	0.4251	0.1935	0.4857	0.9116	0.1990	1.0000	
Shangluo	0.2638	0.5052	0.6537	0.6005	0.4936	0.2708	0.6964	0.3276	0.7093	1.0000

- (1) By the niche overlap with Xi'an, the other nine prefectures can be ranked as follows: Baoji > Xianyang > Hanzhong > Weinan > Ankang > Yan'an > Shangluo > Yulin > Tongchuan. Baoji had the largest niche overlap (0.5783) with Xi'an, followed by Xianyang (0.5776) and Hanzhong (0.4650). Tongchuan had the smallest niche overlap (0.2138) with Xi'an.
- (2) By the niche overlap with Tongchuan, the other nine prefectures can be ranked as follows: Yan'an > Hanzhong > Ankang > Xianyang > Shangluo > Baoji > Weinan > Yulin > Xi'an. Yan'an had the largest niche overlap (0.8483) with Tongchuan, followed by Yulin (0.7109) and Ankang (0.6221). Xi'an had the smallest niche overlap with Tongchuan.
- (3) By the niche overlap with Baoji, the other nine prefectures can be ranked as follows: Xianyang > Weinan > Hanzhong > Shangluo > Yan'an > Tongchuan > Xi'an > Ankang > Yulin. Xianyang had the largest niche overlap (0.7959) with Baoji, followed by Weinan (0.6875) and Hanzhong (0.6684). Yulin had the smallest niche overlap (0.4020) with Baoji.
- (4) By the niche overlap with Xianyang, the other nine prefectures can be ranked as follows: Baoji > Yan'an > Weinan > Tongchuan > Shangluo > Xi'an > Hanzhong > Ankang > Yulin. Baoji had the largest niche overlap (0.7959) with Xianyang, followed by Yan'an (0.6975) and Weinan (0.6926). Yulin had the smallest niche overlap (0.3650) with Xianyang.
- (5) By the niche overlap with Weinan, the other nine prefectures can be ranked as follows: Hanzhong > Xianyang > Baoji > Yan'an > Shangluo > Yulin > Tongchuan > Xi'an > Ankang. Hanzhong had the largest niche overlap (0.8549) with Weinan, followed by Baoji (0.6926) and Yan'an (0.6875). Ankang had the smallest niche overlap (0.1935) with Weinan.
- (6) By the niche overlap with Yan'an, the other nine prefectures can be ranked as follows: Tongchuan > Hanzhong > Xianyang > Baoji > Weinan > Ankang > Xi'an > Yulin > Shangluo. Tongchuan had the largest niche overlap (0.8483) with Yan'an, followed by Hanzhong (0.7535) and Xianyang (0.6975). Shangluo had the smallest niche overlap (0.2708) with Yan'an.
- (7) By the niche overlap with Hanzhong, the other nine prefectures can be ranked as follows: Ankang > Yan'an > Weinan > Tongchuan > Shangluo > Baoji > Xianyang > Xi'an > Yulin. Ankang had the largest niche overlap (0.9116) with Hanzhong, followed by Yan'an (0.7535) and Weinan (0.7407). Yulin had the smallest niche overlap (0.3739) with Hanzhong.

- (8) By the niche overlap with Yulin, the other nine prefectures can be ranked as follows: Weinan > Baoji > Hanzhong > Tongchuan > Xianyang > Shangluo > Yan'an > Xi'an > Ankang. Weinan had the largest niche overlap (0.4358) with Yulin, followed by Baoji (0.7236) and Hanzhong (0.6357). Ankang had the smallest niche overlap (0.2862) with Yulin.
- (9) By the niche overlap with Ankang, the other nine prefectures can be ranked as follows: Hanzhong > Shangluo > Tongchuan > Baoji > Yan'an > Xianyang > Xi'an > Weinan > Yulin. Hanzhong had the largest niche overlap (0.9116) with Ankang, followed by Shangluo (0.7093) and Tongchuan (0.6221). Yulin had the smallest niche overlap (0.1990) with Ankang.
- (10) By the niche overlap with Shangluo, the other nine prefectures can be ranked as follows: Ankang > Hanzhong > Baoji > Xianyang > Tongchuan > Weinan > Yulin > Yan'an > Xi'an. Ankang had the largest niche overlap (0.7093) with Shangluo, followed by Hanzhong (0.6964) and Baoji (0.6537). Xi'an had the smallest niche overlap (0.2638) with Shangluo.

3.3.3. Comprehensive Analysis of Tourism Niche in Shaanxi. The overall distribution map of tourism niche in Shaanxi was drawn with niche overlap and composite niche as horizontal and vertical coordinates, respectively, and the means of the two indices (0.5650 and 0.078) as reference axes. The tourism niche of Shaanxi was divided into four quadrants by the two reference axes: HNHO, HNLO, LNLO, and LNHO. Specifically, Xi'an fell in HNLO, Yan'an fell in HNHO, Yulin, Ankang, and Shangluo fell in LNLO, and Weinan, Baoji, Xianyang, Hanzhong, and Tongchuan fell in LNHO. Overall, 80% of prefectures in Shaanxi belong to low niche quadrants (i.e., lack competitiveness in tourism); 60% belong to high niche quadrants (i.e., being competitive in urban tourism) (Figure 1).

3.4. Classification of Urban Tourism. This paper uses the systematic clustering method and the European distance method to grasp the useful characteristics in the data and makes a cluster analysis on the four-dimensional niche and tourism comprehensive niche of ten cities in Shaanxi. The clustering results are displayed in Figure 2.

The ten prefectures were divided into five classes by tourism competitiveness.

3.4.1. Class 1: Xi'an. Xi'an ranked the first in composite niche. As the capital of Shaanxi Province, Xi'an achieved the highest results on tourism resources, tourism market, and social economy but came the last on eco-environment. Overall, Xi'an occupies the core position of tourism in the province.

Xi'an is a cradle of the Chinese nation and a mirror of Chinese culture. It is among the first cities announced by the

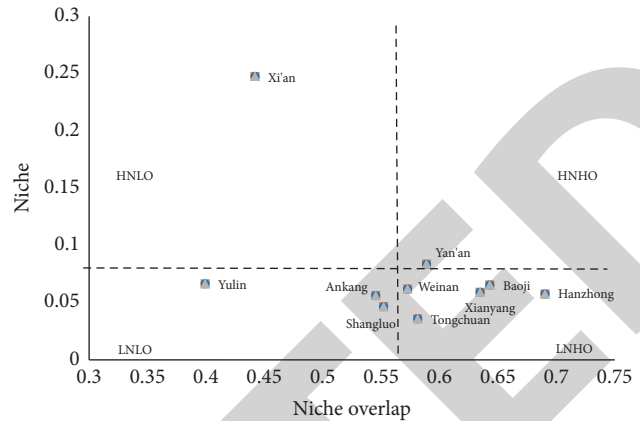


FIGURE 1: Overall distribution of tourism niche in Shaanxi.

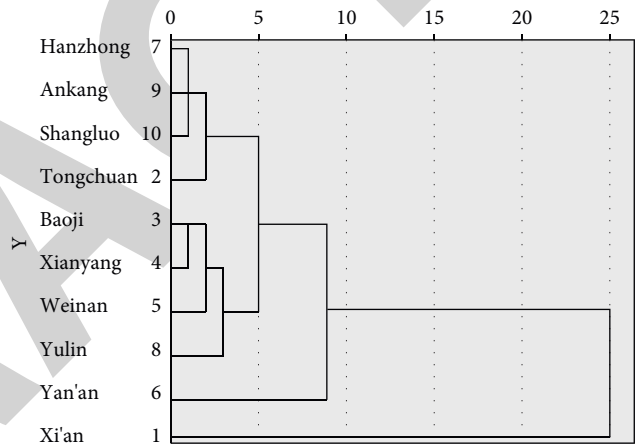


FIGURE 2: Clustering results.

State Council of China as of national historical and cultural cities and world-famous tourist attractions. The city has many cultural places of interest but lacks natural scenic spots.

Baoji had the highest niche overlap with Xi'an, but the overlap degree was not that high. Besides, Baoji possessed a moderate composite niche. Compared with Xi'an, Baoji is not very competitive in terms of tourism resources.

In addition, the location in HNHO quadrant suggests that Xi'an far exceeds the other prefectures in tourism competitiveness and carries distinctive features.

To sum up, Xi'an should improve urban eco-environment by stepping up eco-environment governance and expand the scope of influence through cooperation with surrounding prefectures. By liaising with other prefectures, Xi'an could lead tourism development of the entire province.

3.4.2. Class 2: Yan'an. This holy land of revolution boasts many red cultural scenic spots. Yan'an is also a birthplace of Chinese culture. The fabled Yellow Emperor used to live here. The natural beatification of the Yellow River and the unique environment of the Loess Plateau add color to tourism in Yan'an.

In recent years, Yan'an has been vigorously promoting tourism with culture at the core. The prefecture is recognized as a national highland for the dissemination of red culture and the preferred destination for first-class red tourism. Thanks to the top-ranking eco-environment, the composite niche of Yan'an ranked the second, although the prefecture ranked the third in tourism resources, fourth in tourism market, and sixth in social economy. The excellence of eco-environment mainly comes from the effective utilization of industrial solid waste. Hence, Yan'an should try to narrow the gap in social economy with other prefectures.

The location in HNHO quadrant suggests that, despite strong competitiveness, Yan'an faces a huge potential competitive pressure. For example, Yan'an faces fierce competition against Tongchuan, which had the highest niche overlap with the prefecture. The two prefectures are situated to the north of Xi'an, and they are similar in geographical location. Like Yan'an, Tongchuan has placed culture at the core of tourism development and developed many red scenic spots (e.g., Zhaojin and Yaozhou). The similar development strategy exerts a huge competitive pressure on Yan'an. Both Yan'an and Tongchuan need to develop red tourism with local features.

3.4.3. Class 3: Yulin. The northern prefecture of Yulin is at junction between the Loess Plateau and Mu Us sandy land. The northern frontier scenery is both magnificent and refreshing. Yulin ranked the third in terms of composite niche and appeared in the lower half of the ranking in tourism resources (fifth), tourism market (eighth), and eco-environment (sixth). Notably, the prefecture ranked as high as second, only behind Xi'an, in social economy. That is why Yulin managed to occupy the third place in composite niche. Due to the weak performance in tourism market, Yulin should fully exploit its natural tourism resources, further develop the existing tourist attractions, and publicize them to more potential tourists.

Moreover, Yulin belonged to the LNLO quadrant. The composite niche of the prefecture was close to the mean value, and the competitiveness was on the moderate level. The prefecture has the lowest competitive pressure in the province. Weinan had the largest niche overlap with Yulin. However, the competition between the two is of medium intensity, owing to the long geographical distance and disparity in tourism resources. As a result, there is a small competitive pressure between them.

3.4.4. Class 4: Baoji, Weinan, and Xianyang

(1) *Baoji.* The unique tourism resources have won Baoji many nicknames, such as the hometown of Emperor Yan, the holy land of Buddhist bones, the hometown of bronzes, and the hometown of Chinese folk arts and crafts. There are many cultural landscapes (e.g., Duke Zhou's Temple, Xiaozhai Temple, and Chinese Stone Drum Garden) and lots of beautiful natural landscapes (e.g., Tongtian River National Forest Park, Red River Valley, and Guanshan Grassland).

In spite of the rich resources, tourism in Baoji has not been developed fully, leaving a huge potential of growth. Baoji ranked the fourth in composite niche. The prefecture performed poorly in tourism resources and eco-environment but did well in tourism market (second) and social economy (fourth). Therefore, Baoji should emphasize the development of tourism resources and the protection of eco-environment. Specific measures include excavating history and culture deeply, developing creative tourism products with local features, improving the existing tourism resources and scenic spots, and investing more in publicity.

Baoji fell in the LNHO quadrant. The close-to-average niche indicates a general competitiveness. The second highest niche overlap signifies an immense competitive pressure. Xianyang is the main competitor of Baoji, as evidenced by its highest niche overlap with the prefecture.

(2) *Xianyang.* Like Baoji, Xianyang is located in the west of the Central Shaanxi Plain. The prefecture ranked the third in social economy, ninth in tourism resources, fifth in tourism market, eighth in eco-environment, and sixth in composite niche.

The bottom-ranking tourism resources is attributable to the following reasons: as the second largest city in Shaanxi, Xianyang is right next to the provincial capital, Xi'an. There is no 5A scenic spot in this prefecture. Most of the various cultural relics protection units are imperial tombs, which have not been excavated. What is worse, some scenic spots are not well publicized and have low popularity. Of course, the proximity to Xi'an means it is convenient for tourists to Xi'an to travel to Xianyang. This explains the middle ranking of Xianyang in tourism market. The low ranking in eco-environment mainly results from the poor air quality and heavy emissions of sulfur dioxide. Overall, Xianyang borne a high resemblance with Baoji in tourism niche, falling in LNHO quadrant. That is, the prefecture has a general competitiveness and faces a huge competitive pressure.

To make the best out of its profound historical and cultural heritages, Xianyang must deeply exploit its tourism resources (e.g., the Qian Mausoleum and Yuanjia Village), publicize its scenic spots and historical celebrities to global audience, develop creative cultural products, and improve tourist services. Furthermore, Xianyang needs to optimize the transportation infrastructure for tourists (e.g., opening special lines between scenic spots) and strengthen the monitoring of air quality.

(3) *Weinan.* In the east of the Central Shaanxi Plain, Weinan is a gateway on the passage from northwestern China to central and eastern China. The hometown of the three saints (Cang Jie: founder of Chinese writing system; Du Kang: inventor of Chinese Baijiu; and Sima Qian: father of Chinese historiography) boasts 179 national and provincial key cultural relics protection sites, ranging from tombs, ancestral halls, temples, and monuments to pagodas. The prefecture occupies a vintage point in the tourism industry chain. As a result, Weinan ranked the second in tourism resources.

Lying next to Xi'an, Weinan enjoys a large source market, excellent transportation, and good economic

potential. The prefecture ranked the third in tourism market and fifth in social economy. But the ranking of composite niche (fifth) was dragged down by the poor eco-environment performance (ninth). Albeit its abundance of cultural and natural landscape resources, Weinan has encountered many lasting problems in tourism: Mountain Huashan overshadows other scenic spots; the prefecture is not popular among urban tourists; the local tourism remains on a small scale, to name but a few.

To solve the above problems, Weinan should drive tourism through economic development and take full advantage of its location advantages: a section of the New Eurasian Continental Bridge and a starting point of the Silk Road Economic Belt. Besides, Weinan should contact and cooperate with surrounding prefectures to develop tourism resources and products with local features.

Finally, Weinan was close to the critical point of the LNHO quadrant, having general competitiveness and competitive pressure. Hanzhong, the prefecture with the greatest niche overlap, is far from Weinan and has very different focuses in tourism development.

3.4.5. Class 5: Hanzhong, Ankang, Shangluo, and Tongchuan. Hanzhong, Ankang, Shangluo, and Tongchuan ranked the seventh, eighth, ninth, and tenth, respectively, in terms of composite niche, i.e., the middle and lower segments of the ranking. Ankang and Shangluo belong to the LNLO quadrant, yet close to the mean of niche overlap. Hence, the two prefectures have low tourism competitiveness and medium competitive pressure. Hanzhong and Tongchuan belong to the LNHO quadrant, indicating the low tourism competitiveness of the two prefectures. Meanwhile, Tongchuan was near the mean of niche overlap and had a general competitive pressure. However, Hanzhong had the greatest competitive pressure in Shaanxi, as evidenced by its highest niche overlap.

Hanzhong has many cultural and historical attractions, such as Zhang Qian's Tomb and the Memorial Hall of Sichuan-Shaanxi Revolutionary Base. Many of its towns are recognized as provincial famous cultural tourism destinations, due to the popularity of the Hanzhong Rapeseed Flower Festival. Ankang not only boasts many historical sites (e.g., ancient cave temples and cliff stone carvings), but also features the unique natural landscape called Qinba Hanshui, a collective name for Qinling Mountains, Bashan Mountain, and Hanjiang River. Shangluo has a well-established rural tourism industry, which organically integrates mountains, rivers, fields, and forests. The quality of tourism is reflected by high-quality scenic spots, characteristic towns, and beautiful villages.

Located in southern Shaanxi, Hanzhong, Ankang, and Shangluo share similar geographical locations and ecological resources. There is a relatively large competition among them in tourism. The niche overlap between Hanzhong and Ankang exceeded 0.9, making them the most competitive pair in Shaanxi. The niche overlap between Ankang and Shangluo stood at 0.7093, and that between Hanzhong and Shangluo was as high as 0.6764.

In tourism resources, Hanzhong ranked the fourth, Ankang ranked sixth, and Shangluo ranked seventh. In tourism market, Hanzhong ranked the sixth, Ankang ranked seventh, and Shangluo ranked ninth. In social economy, Hanzhong ranked the seventh, Ankang ranked eighth, and Shangluo ranked ninth. In eco-environment, Hanzhong ranked the third, Ankang ranked second, and Shangluo ranked fourth.

Therefore, Hanzhong and Ankang are very similar in all four dimensions of tourism niche. Ankang has the upper hand in tourism resources and eco-environment, while Hanzhong does better in the other two dimensions. Shangluo is weaker than Hanzhong and Ankang in all four dimensions and has a poor competitiveness.

Overall, the above three prefectures perform the best in eco-environment. They should work together to plan attractive routes and design unique products, aiming to maximize the benefits of the famous tourism brand of "Qinling Mountains." Facing the disadvantage of weak social economy, the three prefectures must develop social economy by attracting external investment and speeding up infrastructure construction. In this way, a good economic basis could be laid for tourism development.

Ranking the fifth in eco-environment, Tongchuan appeared at the bottom in all the other three dimensions and composite niche. The tourism competitiveness of Tongchuan is weaker than that of any other prefecture in the province. This resource-based prefecture could attract enthusiasts about industrial culture and create craft ornaments and commemorative medals with industrial waste. Traditional Chinese medicine (TCM) tourism is also a promising field for the prefecture, because Tongchuan is home to Sun Simiao, the Sage of TCM. Of course, economy and tourism should be developed without sacrificing eco-environmental quality.

4. Conclusions

The following conclusions can be drawn from the above results:

- (1) In 2018, most of the ten prefectures in Shaanxi achieved a composite niche 0.09854 above the average. Meanwhile, the composite niches of Xi'an, Yulin, and Weinan were below the average. Therefore, there is a huge gap between prefectures in tourism development.
- (2) In 2018, the niche overlaps of the ten prefectures fell in the range of [0.1949, 0.91156], with an average of 0.5650. The niche overlaps of 18 pairs of prefectures (38.18%) surpassed the average, a sign of the fierce tourism competition among the prefectures in Shaanxi. The most fierce competition exists between Hanzhong and Ankang, Tongchuan and Yan'an, Weinan and Yulin, and Yan'an and Hanzhong, as their niche overlaps were greater than 0.8.
- (3) On the overall distribution map of tourism niche, one prefecture fell in the HNLO quadrant, 1 in the HNHO quadrant, 3 in the LNLO quadrant, and 5 in

the LNHO quadrant. Overall, 80% of all prefectures belong to low niche quadrants (i.e., lack competitiveness in tourism); 60% belong to high niche quadrants (i.e., being competitive in urban tourism).

- (4) Through cluster analysis, the ten prefectures were divided into five classes in descending order of tourism niche: the first class contains Xi'an, the second contains Yan'an, the third contains Yulin, the fourth contains Baoji, Weinan, and Xianyang, and the fifth contains Hanzhong, Ankang, Shangluo, and Tongchuan.
- (5) Our niche evaluation model for regional tourism was developed in three steps: setting up an evaluation system, calculating niche and niche overlap, and conducting synthesis and cluster analysis. The empirical results on the ten prefectures in Shaanxi demonstrate that our model is reasonable and operable, as its outcomes are consistent with the actual situation.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding the publication of this paper.

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