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Tourism Competitiveness Evaluation and Spatio-temporal Characteristics of Chinese Border Counties

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Abstract: Under the current government strategy of building a Silk Road economic belt, tourism in Chinese border counties has becoming increasingly popular. Studying tourism competitiveness in Chinese border counties is of sizable theoretical and practical importance, as there are several notable factors involved. In this study, we constructed a tourism competitiveness evaluation model based on eight factors: natural environment, tourism resource, location and transportation, social environment, tourism service facility, border port, tourism industrial cluster and tourism market. We then analyzed the spatial characteristics of tourism competitiveness in border counties and identified five types of border counties: resource advantage type (RA), border-port advantage type (PA), location advantage type (LA), agglomeration advantage type (AA), and relative balance type (RB), and examined the correlation between tourism market competitiveness and interior competitiveness factors in the counties from 2006 to 2011. Results showed that tourism resource, location and transportation, and tourism service facility are the most important competition factors for RA border counties during the study period. Competition factors in PA counties transferred from tourism resource, social environment and tourism service facility to border port and tourism industrial cluster; competition factors in LA counties transferred from natural environment and tourism resource to tourism service facility and tourism industrial cluster and border port. Competition factors in AA counties transferred from tourism service facility to tourism resource. Tourism industrial cluster, tourism service facility and tourism resource proved to be important competition factors in RB counties. The findings of this study can be used to target tourism strategies according to different county types.

Keywords: border counties; tourism competiveness; spatio-temporal characteristics; type classification

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1 Introduction

Alongside Chinese president Xi Jinping′s strategic approach to building a Silk Road economic belt, implemented in 2013, tourism development in border areas has garnered a great deal of attention. Because border tourism can promote the establishment of the tourism-centered industry clusters in border areas and connect the domestic tourism market with the international tourism market (Chen, 2004), in the Silk Road economic belt and surrounding areas represent a very interesting tourism geography research topic. Border tourism, begging in earnest in 1980 in China, has developed rapidly and well, along with establishment of ′open′ border cities and the economic cooperation zone (Shi *et al*., 2014). Border tourism competition is now characterized by myriad factors (e.g., scenic and historical areas) as opposed to competition among cities or regions.

A competitive tourism destination is able to maintain advantages in the products and services it provides

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(Dwyer *et al*., 2000) while staying economically, ecologically, culturally, and politically sustainable (Ritchie and Crouch, 1999). The formation and development of tourism competitiveness is a process of access, innovation, and integration of tourism competence factors (Cao and Li, 2010). To ensure comparative advantage, exclusive local resources must be optimized as the source of tourism development; these resources can then be managed effectively to turn comparative advantage into economic advantage. As the structure of the tourism industry changes, technological innovation and industry clustering can be managed to ensure successful resource utilization and transformation from monopolistic tourism resources to tourism products that can be openly marketed. These resources then continue to develop into a fully functional tourism supply system, at which point differential tourism resource exploitation (including strategies for updating the products) is necessary. Tourism competitiveness gradually transfers from resource competition to capital, technology and talent competition. Border tourism research has shown that according to the relationships among them, border tourism areas can be divided into alienated borders, co-existent borders, interdependent borders, and integrated borders (Martinez, 1994). According to its purpose, border tourism can be divided into trade-driven, sightseeing-driven, and shopping-driven categories (Zhang, 1997). Many factors can affect tourism competitiveness in border areas, including tourist demand, government responsibilities, private sector factors, intangible factors, external economic factors, and external political and health-related factors (Bruce, 2005).

Most current research on border tourism is focused on characteristics (Yao, 1998) and regional cooperation and management (Timothy, 1999; Lovelock and Boyd, 2006). Current border tourism analysis methods are typically more concerned with qualitative analysis, and generally do not include quantitative analysis. Tourism competitiveness is mainly studied according to static evaluation indexes (Timothy, 1995; Dwyer *et al*., 2000; Enright and Newton, 2005), while variations in influencing factors of tourism competitiveness with location and time are ignored. In this study, we constructed a research model of tourism competitiveness with border counties in China as the basic units and used it to evaluate eight tourism competitiveness factors, as well as the spatio-temporal characteristics of tourism competitiveness from a geographical perspective. The study period we examined was from 2006 to 2011. Border counties were classified into five distinct types, and the correlation between exterior competitiveness factors and interior competitiveness factors of border counties by type were investigated at length. The results presented here expand the theoretical research of border tourism in China and abroad, and provides a reference for establishing empirical strategies for analyzing tourism development.

2 Materials and Methods

2.1 Study area

The Chinese borderlands begin at the Yalu River in Dandong City, Liaoning Province, and extend to Beibu Gulf in Fangchenggang City, Guangxi Province, at about 22 000 km in total area (21°09′–53°33′N, 73°40′–135°02′E) and including 134 border counties and 14 neighboring countries. Among these border counties, the Mongolian Autonomous County of Subei in Gansu Province is divided into two parts by the Hexi Corridor. For convenience, the land not connected to the borderline was also included in this study area (Fig. 1).

2.2 Model construction

2.2.1 Logical relationship of indicators and framework design

Various visible and invisible resources constitute the internal foundation of tourism competitiveness, and externalized comprehensive efficiencies (e.g., market share) constitute external tourism competitiveness. By following scientific, systematic, and practical principles, we constructed a model that accounts for both exterior and interior competitiveness in border counties. Exterior competitiveness, further, is the ultimate indicator of tourism performance and can be measured by tourism arrivals and revenue, interior competitiveness is one determinant factor of exterior competitiveness, in essence, which reflects tourism competitiveness in a more specific manner (Fig. 2).

2.2.2 Index selection and evaluation methods

In the above research framework, it is difficult to quantify government support competitiveness, tourism culture competitiveness, and travel technology innovation competitiveness at the county level. For this reason, we selected the other eight competitiveness factors for

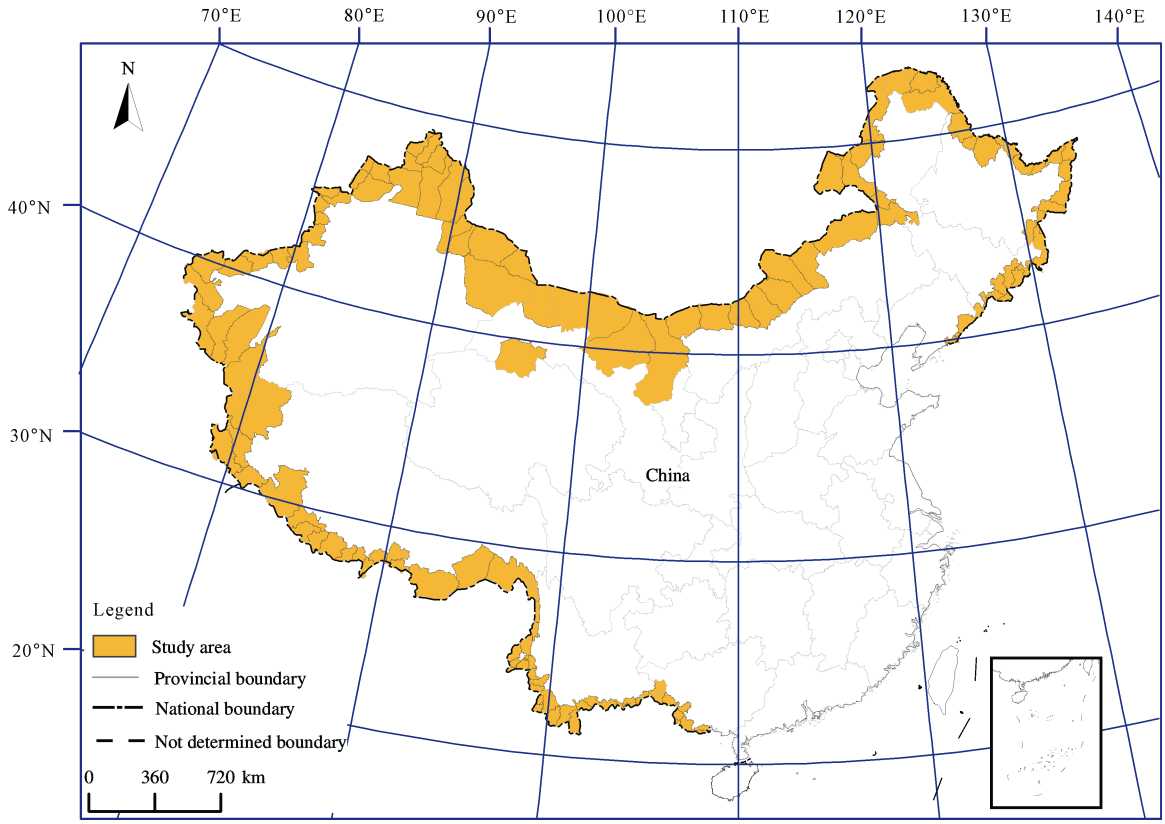

Fig. 1 Location of study area

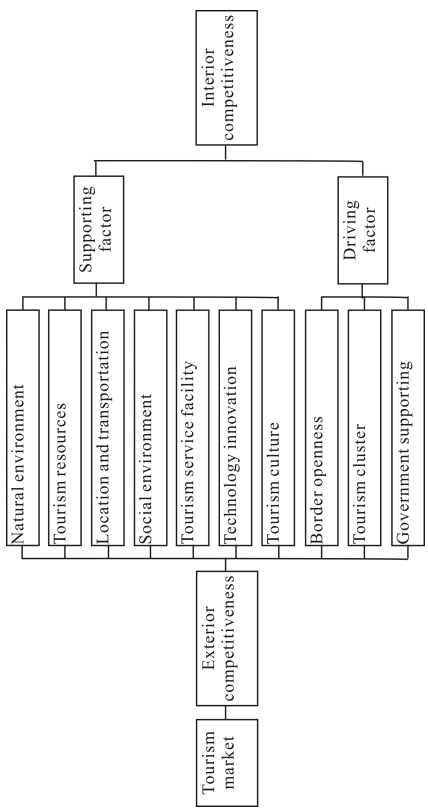

Fig. 2 Research framework of tourism competitiveness in border counties

subsequent analysis. We applied the following weighted mean method to calculate the tourism competitiveness factors in border counties:

$$Q = \sum_{i=1}^{n} X_i P_i \tag{1}$$

where Q is the index of tourism competitiveness factors; X_i is the normalized parameter of the ith index; P_i is the weight of the ith index; and n is the number of index. The weights of each index were determined according to the analytic hierarchy process (AHP) and the expert scoring method. Below, we will examine each separately.

(1) Natural environment competitiveness. The natural environment, which includes climate and geomorphologic landscape, constitutes the important part of tourism competitiveness and is directly experienced by tourists. Temperature-humidity index (THI) and wind chill index (K) encompass important climate-related comfort features, for example. Relief degree of land surface (RDLS), which can reflect the characteristics of regional topography, was also selected here to evaluate tourism topographic suitability (Feng *et al*., 2007).

$$THI = 1.8t + 32 - 0.55(1 - f)(1.8t - 26) \quad (2)$$

$$K = -(10\sqrt{v} + 10.45 - v)(33 - t) + 8.55s \quad (3)$$

$$RDLS = ALT_{\text{average}}/1000 + \left\{\left[\text{Max}(H) - \text{Min}(H)\right]\left[1 - P(A)/A\right]\right\}/500 \quad (4)$$

where t, f, v and s refer to temperature (℃), relative air humidity (%), air speed (m/s), and sunshine duration (h/d) respectively. ALT_{average} is the average altitude of a region (m), Max (H) and Min (H) refer to the highest and lowest altitude of a region (m), respectively; P (A) is the flat area of the region (km^2); and A is the total area of the region (km^2), 25 km^2 in our case. The weights of *THI*, *K*, and *RDLS* are 0.2705, 0.4856, and 0.2439, respectively.

(2) Tourism resource competitiveness. Identifying and managing tourism resources in border counties is the key factor in enhancing tourism competitiveness. More unique tourism resources mean stronger competitiveness. High-quality tourism resources directly affect tourists′ travel plans and travel-ralated decisions (Li and Zheng, 2006), so we conducted an arrangement analysis and expert scoring analysis to determine 20 tourism resource types used to evaluate tourism resource competitiveness in border counties.

Based on the literature (Li, 2006), indexes and weights are determined as follows: world geological parks (0.1143), national key scenic spots (0.0714), national 5A-level scenic spots (0.0714), world network of biosphere reserves (0.0571), international important wetland protectorate (0.0571), national 4A-level scenic spots (0.0571), Chinese outstanding tour cities (0.0571), historical and cultural cities in China (0.0571), strong tourism counties in China (0.0571), Chinese town with historic and cultural significance (0.0429), national patriotism education & demonstration bases (0.0429), industrial and agricultural tourism demonstration (0.0429), national natural reserves (0.0429), national forest parks (0.0429), national geological parks (0.0429), national water scenic areas (0.0429), key national cultural protection sites (0.0286), provincial nature reserves (0.0286), border ports (0.0286), Chinese intangible cultural heritage sites (0.0143).

(3) Location and transportation competitiveness. Location and transportation factors can determine the position, function, time sequence and the level of tourism development (Dong *et al*., 2009). Superior location and transportation resources can reduce the effort and expense it takes for tourists to arrive at the destination and enhance the exchange capacity of materials, energy, and information, thus improving tourism competitiveness. By evaluating transportation superiority by region, we built location and transportation competitiveness evaluation indexes according to transport network density, degree of influence of transport lines, and convenience of location (Jin *et al*., 2008).

(4) Social environment competitiveness. Social environment is an important supporting factor of tourism development in border counties which determines the scale and level of tourism-related consumption. GDP, per capita GDP, and the proportion of third industries were used to evaluate social environment competitiveness. The weights of these three factors were 0.2851, 0.5753, and 0.1396, respectively.

(5) Tourism service facility competitiveness. Whether border counties have satisfactory accommodations is an important consideration made by tourists when selecting their destination, so we used the quantity and quality of hotels to evaluate tourism service facility competitiveness. See the following equation:

$$F_e = H_e \times \sum N_k / N \quad (5)$$

where F_e is tourism service facility competitiveness index; H_e is the number of hotel rooms in county e; N_k is the rank of the hotel k (k = 1, 2, 3, …, N); and N is the number of hotels.

(6) Border port competitiveness. Border trade boosts economic ties between two neighboring countries and economic ties facilitate personnel exchange, forming a direct impetus for tourism development (Sun *et al*., 2011). To this effect, we used the number of cross-border tourists to evaluate border port competitiveness in border counties.

(7) Tourism industrial cluster competitiveness. The aggregation of tourism enterprises in a large region can not only effect economic scale, but also help to differentiate the region′s competitive advantage. The location entropy index method was used to measure agglomeration conditions:

$$LQ = (E_{ef}/E_e)/(E_{qf}/E_q) \quad (6)$$

where LQ is location quotient index, and E_{ef}, E_e, E_{qf}, and E_q denote tourism revenues at the county level, tourism revenue at the province level, GDP at the county level,

and GDP at the province level, respectively.

(8) Tourism market competitiveness. Overall tourism market competitiveness in border counties was measured according to total tourist arrivals and tourism revenues. The weights of these two factors were 0.3975 and 0.6025, respectively.

2.3 Methodology

2.3.1 Principal component analysis

By turning relevant interior tourism competitiveness factors into independent variables via principal component analysis (PCA), we were able to empirically analyze the correlation between exterior tourism competitiveness and interior competitiveness in border counties. SPSS software was employed to process the data (Liu *et al*., 2002; Wang, 2004).

2.3.2 Pearson correlation analysis

Pearson correlation was used to analyze the relevance between exterior and interior competitiveness. The range of coefficients was from –1 to 1, where the larger the absolute value, the higher the relevance. See the following:

$$r = \frac{N\sum XY - \sum X\sum Y}{\sqrt{N\sum X^2 - (\sum X)^2}\sqrt{N\sum Y^2 - (\sum Y)^2}} \quad (7)$$

where r is correlation coefficient; X, Y are indices of exterior and interior tourism competitiveness, respectively; and N is the number of border counties. According to the absolute value of r, we divided the correlation into the following five levels: distinct correlation (0.8–1.0), strong correlation (0.6–0.8), moderate correlation (0.4–0.6), weak correlation (0.2–0.4), and very small or no correlation (0.0–0.2).

2.4 Data sources

The data on tourism revenues and tourist arrivals in border counties/provinces came from the National Economy and Society Developed Statistical Bulletin, Government Work Report and Statistical Review of Tourism (NTA, 2007; 2012). A few counties lacking statistics were estimated according to their regional statistics. Meteorological data came from the National Weather Agency (http://cdc.nmic.cn/) and topographic data from the Geodata Sharing Network (http://www.geodata.cn/). Tourism resources in border counties were collected from authorized figures released by UNESCO (http://en.unesco.org/), the National Tourism Administration (http://www.cnta.gov.cn/), the National Heritage Board (http://www.sach.gov.cn/), ministery of Environmental Protection (http://www.zhb.gov.cn/), and Ministry of Water Resources (http://www.mwr.gov.cn/). The data on roads, border ports, and airports were extracted from the China Traffic Map through map vectorization or acquired from annual statistics of Chinese Ports of Entry (ED, 2007; 2012) and Civil Airport Network Planning. Socio-economic data came from annual statistics of Chinese Regional Economic Data (NECSD and RSSNBS, 2007; 2012) and annual statistics of Chinese Urban Economic Data (USESO, 2007; 2012). Hotel data came from the Ctrip website (http://www.ctrip.com/).

3 Results and Analysis

3.1 Spatial characteristics of tourism competitiveness in border counties

Because tourism competitiveness in border counties is the result of the interaction among many factors, we utilized the hierarchical clustering method in ArcGIS to obtain spatial matching results of exterior and interior competitiveness factors in 2011 to evaluate the data (Fig. 3).

We found that the eastern part of the northeast border is the core region of international cooperation in Northeast Asia and is advantaged considerably by its location, transportation and tourism resources in addition to higher exterior tourism competitiveness. Dandong City is its important land passage which connects the Korean Peninsula with Europe and Asia. Hunchun City has unique geographical location among the borders of Russia, North Korea and China, and Suifenhe City is called the golden passageway to the Asia-Pacific region linked to Northeast Asia. Tourism development in the northern part of northeast border is constrained by its relatively unfavorable climate, socio-economic level, and weak tourism service facilities, which create lower exterior tourism competitiveness compared to the eastern part.

The southwestern border facing Southeast Asia is the link between the economic circles of the southern China, southwestern China, and ASEAN. Due to its complex topography and diverse climate, this border area has abundant tourism resources, including tropical rainforests, canyons, and karst landforms, as well as numerous border ports and a high level of tourism agglomerations, thus forming high exterior tourism com-

petitiveness. Dongxing City is a unique port city in the area that links China to ASEAN countries through both sea and land passages, and Pingxiang City is the biggest and most convenient land passage to Vietnam and Southeast Asia. Jinghong City is a significant port city for foreign communication.

The China-Mongolia Border has a relatively high socio-economic level and has focused a great deal on tourism in recent years, so border counties in this area have rather abundant tourism resources in addition to favorable natural environment; thus, they show high local exterior tourism competitiveness.

Although the western part of the Xinjiang border has a good natural environment, its tourism development is constrained by tourism resources, location and transportation, and socio-economic level. Border counties in Tibet have particularly fragile ecosystems and economic bases as well as poor infrastructure, which severely limit local tourism development so exterior tourism competitiveness in these areas is relatively low.

Finally, we also found that the relationships between China and its surrounding countries influence the tourism development in border counties. Border counties adjacent to North Korea, Laos, Myanmar, Vietnam, Russia, and Mongolia have higher exterior tourism competitiveness than those adjacent to Central Asia, India, or Nepal.

3.2 Classification and temporal characteristics of border counties

The correlation between exterior and interior tourism competitiveness differed by county. Based on the ranking of competitiveness factors, we divided the counties into five types via cluster analysis method: resource advantage type, border-port advantage type, location

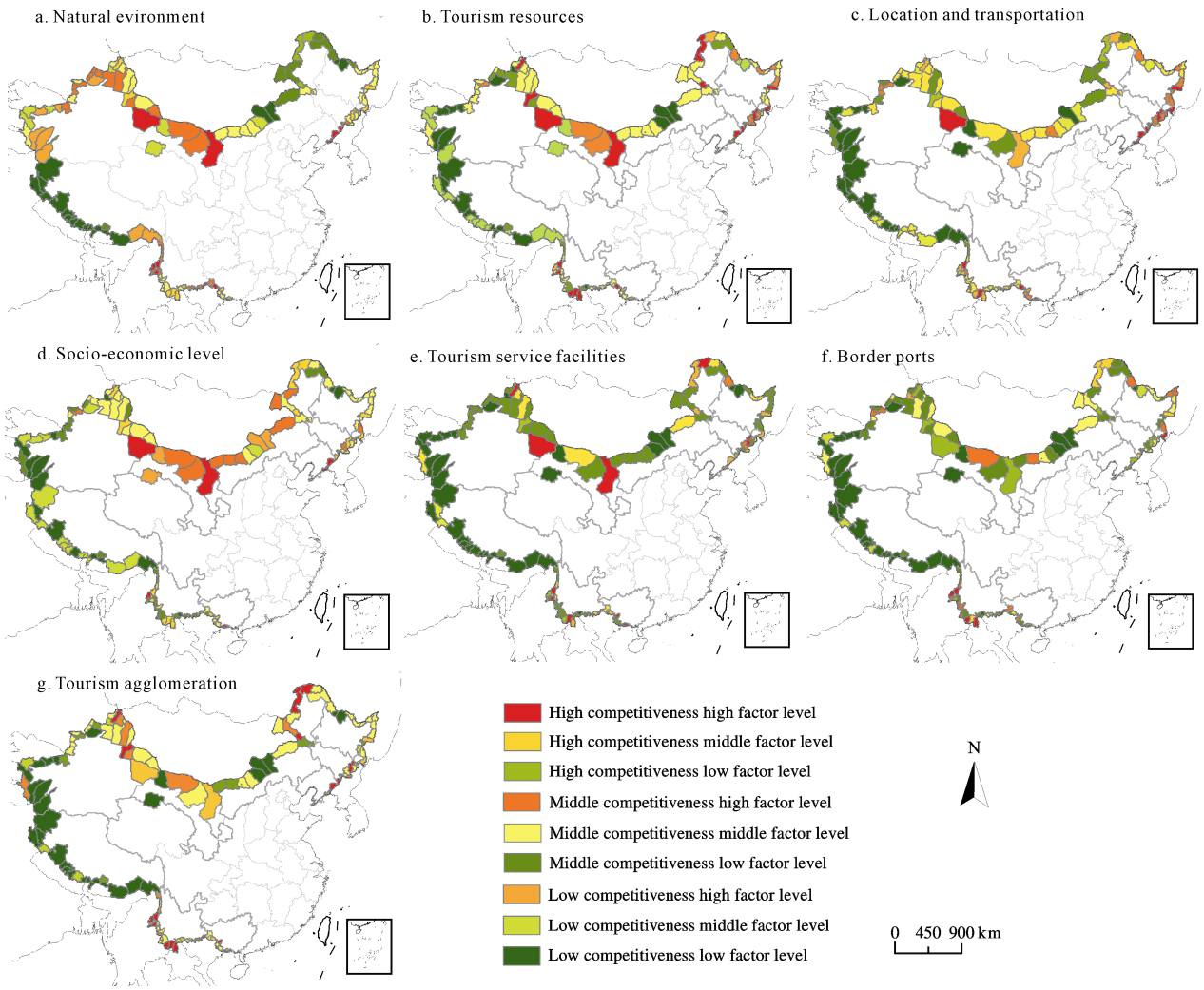

Fig. 3 Spatial matching distribution of exterior and interior tourism competitiveness levels in 2011

advantage type, agglomeration advantage type, and relative balance types (Fig. 4). SPSS was applied to calculate the coefficient matrix of interior factors of five types of border counties and PCA method is applied to convert correlated interior factors into independent composite indexes. The correlations between exterior and interior tourism competitiveness of the five types of counties were then analyzed separately as discussed below.

3.2.1 Resource advantage type (RA)

PCA results of the resource advantage type showed that in 2006 and 2011, Eigenvalues of the first, second, and third principal components were greater than one; the accumulative contribution rates were 68.52% and 72.98% for 2006 and 2011. This suggests that these three principal components contain the most information of the seven influencing factors, therefore, according to the principal component load matrix (Table 1), the contribution rates of the first principal component in 2006 and 2011were respectively 32.58% and 35.05%. The interior factors which had strong correlation with the first principal component in 2006 and 2011 include tourism resource, location and transportation, and tour-principal component were 18.70% for 2006 and 20.78% for 2011, and strongly correlated interior factors were tourism industrial cluster and natural environment in 2006 and natural environment and social environment in 2011. Contribution rates of the third principal component were respectively 17.24% and 17.15% and strongly correlated interior factors were border port and social environment in 2006 and border port in 2011.

According to the correlation analysis between tourism market competitiveness and the three principal components, the first principal component (resource-location-facility factor) had the most significant positive correlation with tourism market competitiveness ($P < 0.01$) in both 2006 and 2011 though the correlation degree declined over the five years. The second principal component (cluster-environment in 2006 and environment-social factor in 2011) had no correlation with tourism market competitiveness. The third principal component (port-social factor in 2006) had weak positive correlation with tourism market competitiveness, and port factor in 2011, was not significantly related to tourism market competitiveness (Table 2). The results ism service facility. Contribution rates of the second show that tourism resources, location and transportation and service facilities were important competition factors of border counties of the RA type in the five years from 2006 to 2011.

The RA type counties have abundant tourism resources, suggesting that tourism can be developed rapidly driven by government guidance and promotion. Transportation, tourism service facilities, and capital often become obstructive factors that hinder tourism

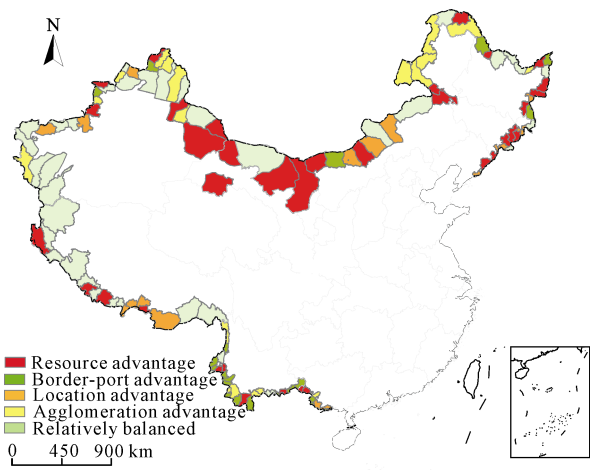

Fig. 4 Classification of border tourism competitiveness

Table 1 Principal component load matrix of RA type border counties

	2006			2011		
	PC 1	PC 2	PC 3	PC 1	PC 2	PC 3
Natural environment	0.326	0.749	0.287	0.437	0.735	–0.047
Tourism resource	0.865	–0.163	0.019	0.907	–0.104	0.132
Location and transportation	0.717	0.300	–0.428	0.768	–0.069	–0.407
Social environment	0.437	0.131	0.644	0.369	0.664	0.353
Tourism service facility	0.705	–0.144	0.085	0.708	–0.232	0.265
Border port	0.303	0.022	–0.697	0.372	–0.257	–0.701
Tourism industrial cluster	0.364	–0.770	0.182	0.274	–0.581	0.574

Note: PC, principal component

Table 2 Correlation analysis RA type border counties

	2006			2011		
	R-L-F	C-E	P-S	R-L-F	E-S	P
Tourism market competitiveness	0.774**	0.040	0.262	0.663**	–0.174	0.195

Notes: R-L-F, resource-location-facility factor; C-E, cluster-environment factor; P-S, port-social factor; E-S, environment-social factor; P, port factor; **, correlated significantly on 0.01 level

development. Border counties of this type should focus on integrating and transforming cities with better developed tourism industries.

3.2.2 Border-port advantage type (PA)

According to PCA results of the border-port advantage type, in 2006 and 2011, the Eigenvalues of the first, second, and third principal components are more than one. The accumulative contribution rates were 75.86% and 78.05% for 2006 and 2011, respectively, suggesting that principal components contained a great deal of information regarding the seven influencing factors. The contribution rates of the first principal component in 2006 and 2011 were 39.47% and 39.29%, and the interior factors which had strong correlation with the first principal component were social environment, location and transportation and tourism service facility in 2006, and location and transportation, tourism industrial cluster, and border port in 2011, according to the principal component load matrix (Table 3). Contribution rates of the second principal component were 20.00% for 2006 and 22.71% for 2011, and the interior factors, strongly correlated with the second principal component were tourism resource in 2006 and natural environment and tourism resource in 2011. Contribution rates of the third principal component were 16.39% for 2006 and 16.05% for 2011, and interior factors strongly correlated with the third principal component were border port and natural environment in 2006 and social environment in 2011.

In 2006, the first principal component (social-location-facility) and second principal component (resource factor) were significantly positively correlated with tourism market competitiveness ($P < 0.01$). The third principal component, port-environment, had no correlation with tourism market competitiveness. In 2011, the first principal component, location-cluster-port factor, had significant positive correlation with tourism market competitiveness ($P < 0.01$), and the second principal component (environment-resource factor) and the third principal component (social factor) had weak correlation with tourism market competitiveness (Table 4). These results imply that the key competition factors of PA type border counties transferred from tourism resource, social environment, and tourism service facility to border port and tourism industrial cluster during the study period.

Table 3 Principal component load matrix of PA type border counties

	2006			2011		
	PC 1	PC 2	PC 3	PC 1	PC 2	PC 3
Natural environment	–0.404	0.550	0.613	–0.426	0.720	0.378
Tourism resource	–0.157	–0.704	0.251	0.283	–0.725	0.385
Location and transportation	0.797	0.108	–0.071	0.880	0.181	–0.167
Social environment	0.812	–0.185	–0.205	0.615	0.025	–0.682
Tourism service facility	0.730	–0.406	0.354	0.638	–0.382	0.420
Border port	0.626	0.185	0.674	0.677	0.402	0.380
Tourism industrial cluster	0.595	0.598	–0.286	0.685	0.452	0.137

Notes: PC: principal component

Table 4 Correlation analysis of PA type border counties

	2006			2011		
	SLF	R	PE	LCP	ER	S
Tourism market competitiveness	0.624**	0.580**	–0.047	0.679**	0.252	0.365

Notes: SLF, social-location-facility factor; R: resource factor; PE, port-environment factor; LCP, location-cluster-port factor; ER, environment-resource factor; S, social factor; **, correlated significantly on 0.01 level

The PA type counties often develop port-centered cross border tourism industries via border trade. Border tourism related to shopping and culture in these areas tend to be quite popular. The entry-exit convenience of ports, tourism infrastructure construction, interaction between neighboring countries, and prevalence of transportation routes may hinder tourism development, however. Border counties of this type should unite surrounding tourism cities and gradually extend tourism routes to the inland areas of neighboring countries such as Vietnam, North Korea, and Russia.

3.2.3 Location advantage type (LA)

The Eigenvalues of the first, second, and third principal components of LA type border counties in 2006 and of the first and second principal components in 2011 are more than one, according to the PCA results. The Eigenvalue of the third principal component in 2011 was 0.879, and the accumulative contribution rates were 77.56% for 2006 and 77.74% for 2011, suggesting that principal components contained valuable information regarding the seven interior factors. According to the principal component load matrix (Table 5), contribution rates of the first principal component in 2006 and 2011 were 42.37% and 45.37%, respectively, and the interior factors strongly correlation with the first principal component, are location and transportation in 2006 and tourism industrial cluster and location and transportation in 2011. Contribution rates of the second principal component were 19.09% for 2006 and 19.82% for 2011, respectively, and the interior factors strongly correlated with the second principal component, were tourism service facility in 2006 and tourism service facility and border ports in 2011. The contribution rates of the third principal component were 16.11% for 2006 and 12.55% for 2011, and the interior factors, strongly correlated with the third principal component were natural environment and tourism resource in 2006 and natural environment and social environment in 2011.

In 2006, the first principal component (location) and the third principal component (environment-resource) had significant positive correlation with tourism market competitiveness ($P < 0.05$). The second principal component, facility, had no correlation with tourism market competitiveness. In 2011, the first principal component, cluster-location, had significant positive correlation with tourism market competitiveness ($P < 0.01$) and the second principal component, facility, likewise had significant positive correlation with tourism market competitiveness ($P < 0.05$). The third principal component, environment-social factor, had no correlation with tourism market competitiveness (Table 6). The key competition factors of border counties of the LA type transferred from natural environment and tourism resource to tourism service facility, tourism industrial cluster, and border port during the study period.

Table 5 Principal components load matrix of LA type border counties

	2006			2011		
	PC 1	PC 2	PC 3	PC 1	PC 2	PC 3
Natural environment	0.609	0.022	0.561	0.639	0.072	–0.587
Tourism resource	0.709	0.102	–0.517	0.675	–0.442	–0.160
Location and transportation	0.840	0.076	–0.209	0.816	–0.139	–0.015
Social environment	0.637	0.312	0.394	0.651	0.406	0.495
Tourism service facility	0.320	0.872	–0.153	0.534	0.742	0.125
Border port	0.623	–0.531	–0.426	0.483	–0.671	0.475
Tourism industrial cluster	0.700	–0.424	0.376	0.838	0.036	–0.148

Note: PC, principal components

Table 6 Correlation analysis of LA type border counties

	2006			2011		
	L	F	E-R	C-L	F-P	E-S
Tourism market competitiveness	0.567*	0.145	0.581*	0.655**	0.575*	0.011

Notes: L, location factor; F, facility factor; E-R, environment-resource factor; C-L, cluster-location factor; F-P, facility-port factor; E-S, environment-social factor; **, correlated significantly on 0.01 level; *, correlated significantly on 0.05 level

Location advantage type counties possess excellent geographic conditions, and tourism development in these areas tends to be driven by entertainment, commercial trade, man-made landscapes, and environmental beautification initiatives. Publicity, innovation, and maintenance should be the focus of tourism industries in these areas.

3.2.4 Agglomeration advantage type (*AA*)

According to PCA results of the AA type border counties, the Eigenvalues of the first and second principal components in 2006 and 2011 are more than one. The accumulative contribution rates were 74.20% and 72.56% for 2006 and 2011, respectively, suggesting that principal components contained most available information regarding the seven interior factors. According to the principal component load matrix (Table 7), contribution rates of the first principal component in 2006 and 2011 were 44.32% and 39.39%, respectively, and the interior factors strongly correlated with the first principal component were tourism resource, border port, location and transportation, social environment, and natural environment in 2006 and tourism resource and tourism industrial cluster in 2011. Contribution rates of the second principal component were 29.88% and 33.17% and the interior factors strongly correlated with the second principal component were tourism industrial cluster and tourism service facility in 2006, and location and transportation and tourism service facility in 2011.

In 2006, the first principal component, resource-port-location-social-environment, had weak correlation with tourism market competitiveness. The second principal component, cluster-facility, did have significant positive correlation with tourism market competitiveness ($P < 0.01$). In 2011, the first principal component, the resource-cluster, had significant positive correlation with tourism market competitiveness ($P < 0.01$) and the second principal component, location-facility, had the moderate correlation with tourism market competitiveness (Table 8). These results indicate that the key competition factors of AA type border counties transferred from tourism service facility to tourism resource during the study period, though location and transportation also proved important.

The AA type counties play a leading role in tourism development throughout the entire study region, tourism is generally a primary industry in these counties, and self-development is particularly important. It should be noted that lack of financial capital and tourism infrastructure or facilities are factors hindering tourism development in these areas.

Table 7 Principal components load matrix of AA type border counties

	2006		2011	
	PC 1	PC 2	PC 1	PC 2
Natural environment	–0.725	0.254	–0.591	0.565
Tourism resource	0.803	0.192	0.890	0.314
Location and transportation	–0.759	0.309	–0.241	0.744
Social environment	0.749	–0.064	0.488	–0.582
Tourism service facility	0.306	0.946	0.639	0.705
Border port	0.763	–0.388	0.644	–0.480
Tourism industrial cluster	0.346	0.920	0.705	0.533

Note: PC, principal component

Table 8 Correlation analysis of AA type border counties

	2006		2011	
	R-P-L-S-E	C-F	R-C	L-F
Tourism market competitiveness	0.334	0.810**	0.596**	0.430

Notes: R-P-L-S-E, resource-port-location-social-environment factor; C-F, cluster-facility factor; R-C, resource-cluster factor; L-F, location-facility factor; **, correlated significantly on 0.01 level

3.3 Relative balance type (RB)

According to PCA results of RB type, the Eigenvalues of the first and second principal components in 2006 and 2011 were more than one. The accumulative contribution rates were 69.22% for 2006 and 65.00% for 2011, suggesting that principal components contained a large amount of information regarding the seven interior

factors. The contribution rates of the first principal component in 2006 and 2011 were 52.81% and 48.51%, respectively, and the interior factors strongly correlated with the first principal component were, tourism industrial cluster, tourism service facility, and tourism resource in 2006 and 2011, according to the principal component load matrix (Table 9). Contribution rates of the second principal component were 16.41% and 16.49% and the interior factor strongly correlated with the second principal component was the natural environment.

Correlation analysis between tourism market competitiveness and the two principal components demonstrated that the first principal component, cluster-facility-resource, had significant positive correlation with the tourism market competitiveness ($P < 0.01$) in 2006 and 2011 and that the degree of correlation grew during the five-year study period. The second principal component, natural environment, had a weak correlation with tourism market competitiveness in 2006 and no correlation in 2011 (Table 10). These results show that tourism industrial cluster, tourism service facility, and tourism resource are important competition factors in RB type border counties.

Border counties of the RB type show relatively equal development among competition factors in both highly developed and less developed areas. The former have more sophisticated resources and infrastructures, and can promote tourism development in less advantaged surrounding areas.

Table 9 Principal component load matrix of RB type border counties

	2006		2011	
	PC 1	PC 2	PC 1	PC 2
Natural environment	0.095	0.790	0.178	0.819
Tourism resource	0.813	0.175	0.906	0.102
Location and transportation	0.670	0.491	0.686	0.412
Social environment	0.717	0.138	0.576	0.103
Tourism service facility	0.880	–0.201	0.820	–0.049
Border port	0.645	–0.362	0.553	–0.393
Tourism industrial cluster	0.934	–0.250	0.874	–0.368

Note: PC, principal component

Table 10 Correlation analysis of RB type border counties

	2006		2011	
	C-F-R	E	C-F-R	E
Tourism market competitiveness	0.790**	0.202	0.797**	0.128

Notes: C-F-R: cluster-facility-resource factor; E: environment factor; **: correlated significantly on 0.01 level

4 Conclusions and Suggestions

In this study, border counties in China were divided into five types and the tourism competitiveness of each were investigated at length. Tourism resource, location and transportation, and tourism service facility proved to be the most important competition factors of RA type counties from 2006 to 2011, and competition factors of PA type counties transferred from tourism resource, social environment, and tourism service facility to border port and tourism industrial cluster during the study period. Competition factors of LA type counties transferred from natural environment and tourism resource to tourism service facility, tourism industrial cluster, and border port, and competition factors of AA type counties transferred from tourism service facility to tourism resource. Tourism industrial cluster, tourism service facility, and tourism resource proved to be important competition factors of RB border counties during the study period.

Different strategies should be established according to county type and specific phases of tourism development. For RA counties, which are in the primary stage of development, tourism resources should be investigated and utilized scientifically and in the most eco-friendly manner possible, the construction of tourism service facilities including transportation, hotels, and dining need strengthening. In the middle stages of tourism development, the industry should be optimized and readjusted to create diversified and comprehensive tourism products. In later stages of tourism development, resources should be integrated and regional-level tourism projects created to allow nearby cities to work together to strengthen and share tourism industries. Tourism developments in PA counties are often driven by border trade. In order to develop primary tourism resources, PA counties should strengthen trade exchange and cooperate with neighboring countries, enhance the convenience of border access, strive to develop special tourism products such as border shopping tours and gradually extend travel routes to tourism hinterlands both domestic and international. LA counties have favorable location and transportation conditions, plus well-established cities and cultural festivals that tend to

attract tourists. AA counties represent a potential source of support for regional tourism development in neighboring areas. Some RB counties already enjoy a relatively sophisticated level of tourism industry, and as such can also stimulate tourism industry development in surrounding areas, less developed RB counties may require further analysis to fully understand how they can benefit from tourism initiatives. Tourism in border counties inextricably involves a highly sensitive political environment. Future research is necessary to better understand the economic and tourism development levels of neighboring countries, and the manner in which interacting with them through tourism affects China′s tourism industry. It is also important to consider the ways in which national policy and unexpected incidents impact tourism development in border counties, which also should be explored through future research.

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