Analysis of Coordinated Development of Tourism and New Urbanization in Anhui Province based on Entropy Weight-TOPSIS

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Abstract: Taking the data of tourism industry and new urbanization in Anhui Province from 2006 to 2018 as the research object, this paper calculates the comprehensive development index by entropy weight-TOPSIS, and analyzes the coupling coordination relationship between tourism and new urbanization combined with coupling coordination degree model. The results show that the comprehensive development level of tourism and new urbanization in Anhui Province has been significantly improved from 2006 to 2018, with fluctuations in individual years.There is a strong coupling effect between the two, and the degree of coupling coordination is increasing year by year, from mild imbalance to good coordination, and the degree of development from the lag of new urbanization to the lag of tourism, which indicates that the two are gradually penetrating, but the promotion relationship of integration and coordinated development has not been fully established.

1 INTRODUCTION

Since the 70th anniversary of the founding of the People's Republic of China, the scale and speed of urbanization in China have reached a record high. However, in the process of traditional urbanization, problems such as excessive expansion of scale, shrinking environmental resources, lack of public facilities and decline of traditional culture have become increasingly prominent (Dou 2015). Therefore, the 18th CPC National Congress in 2012 proposed to "take the new path of urbanization with Chinese characteristics", promoting the coordinated development of large, medium and small cities and towns, and the integration of industries and towns. In this context, tourism, as an industry with strong relevance, is one of the most important new driving forces in promoting the construction of new urbanization. However, since the relationship between the development elements of urbanization and urban tourism is not always one-way or positive effect, the coupling and coordinated development relationship between the two is a problem that the local government must pay attention to and consider.

Based on the literature review, the research methods of domestic scholars on the relationship between tourism development and new urbanization are mostly qualitative research and logical reasoning, and the content mainly focuses on the interaction between rural tourism, regional tourism, tourism-related industries and new urbanization construction. In recent years, more and more scholars have begun to demonstrate the coupling mode and coordination relationship between the two from different research perspectives, such as industry generation cycle, spatio-temporal difference (Fu 2017) and industry-city integration (Zhang 2016), combining TOPSIS (Luo 2008), entropy method, coupling coordination model (Pang 2014) and other quantitative analysis methods.

2 STUDY AREA AND RESEARCH METHODS

2.1 Overview of the Study Area

Anhui Province is located in central China, straddling the Yangtze River and Huaihe River, covering an area of 139,400 square kilometers, accounting for 1.45% of the country (Liu 2013). Since the "12th Five-Year Plan", the urbanization level of Anhui Province has been rapidly and continuously improved, and has begun to enter the city-led society, the network urban

system has basically formed, and the ability of urban sustainable development has been significantly improved. The local tourism resources have unique advantages, especially since the government formulated the tourism development strategy, the comprehensive strength of tourism has risen substantially. Transportation infrastructure and reception service facilities have been significantly improved, tourism economic income and the number of tourists have been increasing, and the benefits of tourism people's livelihood have been significantly improved.

However, there is a relative lack of discussion on the coupled and coordinated development of tourism and new urbanization in Anhui Province, and there is still room for in-depth research.

2.2 Research Methods

2.2.1 Entropy Weight-TOPSIS Method

Entropy weight-TOPSIS is an improvement of the traditional TOPSIS evaluation method, which involves entropy weight method and TOPSIS respectively, but its core lies in TOPSIS. Specifically, the entropy weight method is firstly used to determine the weight of each evaluation index, and then TOPSIS is used to obtain the approximate program value of each evaluation object, which is used to judge and measure the ranking of the evaluation object.

2.2.2 Coupling Coordination Degree Model

Due to the differences in the development level of the two subsystems of tourism and new urbanization, the development level of the two subsystems will be low, but the coupling degree will be high. In order to avoid this illusion, the coordination degree model of tourism and new urbanization is introduced to objectively reflect the coordinated development degree of the two subsystems (Gao 2013), calculated as follows:

$$C = \sqrt{\frac{C_1 \times C_2}{(C_1 + C_2)^2}}, D = \sqrt{C \times T}, T = \alpha C_1 + \beta C_2 \qquad (1)$$

Where C is the coupling degree of the two subsystems; C1 and C2 are the comprehensive evaluation indexes of new urbanization and tourism respectively. D is the coupling coordination degree; α and β reflect the importance of the two subsystems. According to previous research experience, they are set to 0.5 respectively. According to D value, the degree and type of system coupling coordination degree are divided into 10 grades (Liao 1999) (Table 1):

Table 1: Classification Types of Coupling Coordination Degree.

Coordination(D)	Coordination Grade	Coordination Type
(0.0,0.1)	Extremely maladjusted	
[0.1,0.2)	Severe maladjustment	A phase of dissonance and decay
[0.2,0.3)	Moderate disorder	
[0.3,0.4)	Mild disorder	
[0.4,0.5)	On the verge of disorder	Transitional stage of development
[0.5,0.6)	Barely coordinated	
[0.6,0.7)	Primary coordination	
[0.7,0.8)	Intermediate coordination	Coordinated development stage
[0.8,0.9)	Good coordination	
[0.9,1.0)	Quality coordination	

3 INDEX SYSTEM CONSTRUCTION AND DATA SOURCES

3.1 Construction of Evaluation Index System

Due to the complexity of tourism and new urbanization, it is necessary to construct multiple index systems to evaluate the comprehensive development level of these two systems (Zhang 2017). Following the principles of scientificity, representativeness and accessibility, this paper constructs a tourism evaluation index system from four aspects of tourism revenue, tourism market, tourism industry and tourism supporting environment. The evaluation index system of new urbanization is constructed from seven aspects, including population, economy, space, society, ecology, urban and rural areas, and scientific research innovation, with 46 specific indicators in the criterion layer (Table 2).

Table 2: Index System for Tourism and New Urbanization.

Target Layer	Criterion Layer	Indicator Layer	Indicator Properties
Tourism Economic System	Tourism Revenue	Domestic tourism income (10,000 yuan)	+
		Foreign exchange income from international tourism (USD 10,000)	+
		Proportion of total tourism revenue to GDP (%)	+
		Growth rate of total tourism revenue (%)	+
	Tourism Market	Number of domestic tourists	+
		Number of inbound tourists received	+
		Growth rate of domestic tourists (%)	+
		Growth rate of inbound tourists (%)	+
	Tourism Industry	Number of A-level and above tourist attractions	+
		Number of travel agencies	+
		Number of tourism star hotels	+
		Total number of employees in the tourism industry	+
	Tourism Supporting Environment	Number of graduates from secondary vocational tourism schools	+
		Passenger transport turnover (100 million person-km)	+
		Number of National Nature Reserves	+
New Urbanization System	Population Urbanization	Proportion of urban population (%)	+
		Urban employment	+
		Number of college students per 10,000 population	+
		Proportion of employees in secondary and tertiary industries (%)	+
	Spatial Urbanization	Urban built-up area (km^2)	+
		Per capita park green area (m^2/person)	+
		Per capita living space of urban residents (m^2/person)	+
		Urban per capita road area (m^2/person)	+
	Economic Urbanization	Per capita GDP (yuan)	+
		Proportion of output value of secondary and tertiary industries (%)	+
		Investment in fixed assets (10,000 yuan)	+
		Average wage of staff and workers in urban units (yuan)	+
	Social Urbanization	National financial education funds (10,000 yuan)	+
		Number of people with professional health skills per 10,000 people	+
		Number of beds in medical and health institutions per 1,000 people	+
		Number of cultural station institutions	+
		Number of public transport vehicles per 10,000 urban residents	+
		Number of urban basic medical insurance participants (10,000 persons)	+
	Ecological Urbanization	Centralized treatment rate of urban sewage treatment plant (%)	+
		Comprehensive utilization rate of industrial solid waste (%)	+
		Cleaning area of urban roads (10,000 m^2)	+
		Green coverage rate of built-up area (%)	+
		Equal value of energy consumption per unit GDP (ton of standard coal/10,000 yuan)	-
		Proportion of investment in environmental pollution control to GDP (%)	+
	Urban-Rural Integration	Ratio of per capita consumption level in rural and urban areas (%)	+
		Ratio of rural to urban Engel coefficient (%)	-
		Ratio of rural disposable income to urban disposable income (%)	+
	Research and Innovation Urbanization	Proportion of R&D expenditure to GDP (%)	+
		Number of teachers and students of institutions of higher learning in the city	+
		Number of technological institutions of large and medium-sized industrial enterprises	+
		Number of patents authorized	+

3.2 Data Resource

The data used in this study are from the 2006-2019 Statistical Yearbook of China and Anhui Province. Some unattainable data were assigned by linear fitting and growth trend prediction.

4 RESULTS AND DISCUSSION

4.1 Analysis on the Comprehensive Development Level

From Figure 1, the comprehensive development level of new urbanization in Anhui Province has gradually improved from 2006 to 2018, and its comprehensive evaluation index has increased from 0.148 in 2006 to 0.898 in 2018, an increase of about 5.07 times, indicating that the development of new urbanization in Anhui Province has been greatly improved. The figure shows that the level of new urbanization in Anhui Province declined slightly from 2006 to 2009. 2007-2018, the index rose rapidly and steadily. Especially after the promulgation of the New Urbanization Development Plan of Anhui Province (2016-2025) issued in 2017, the index showed a slight acceleration trend, and began to slow down in 2018, but it has reached a high level in the research period.
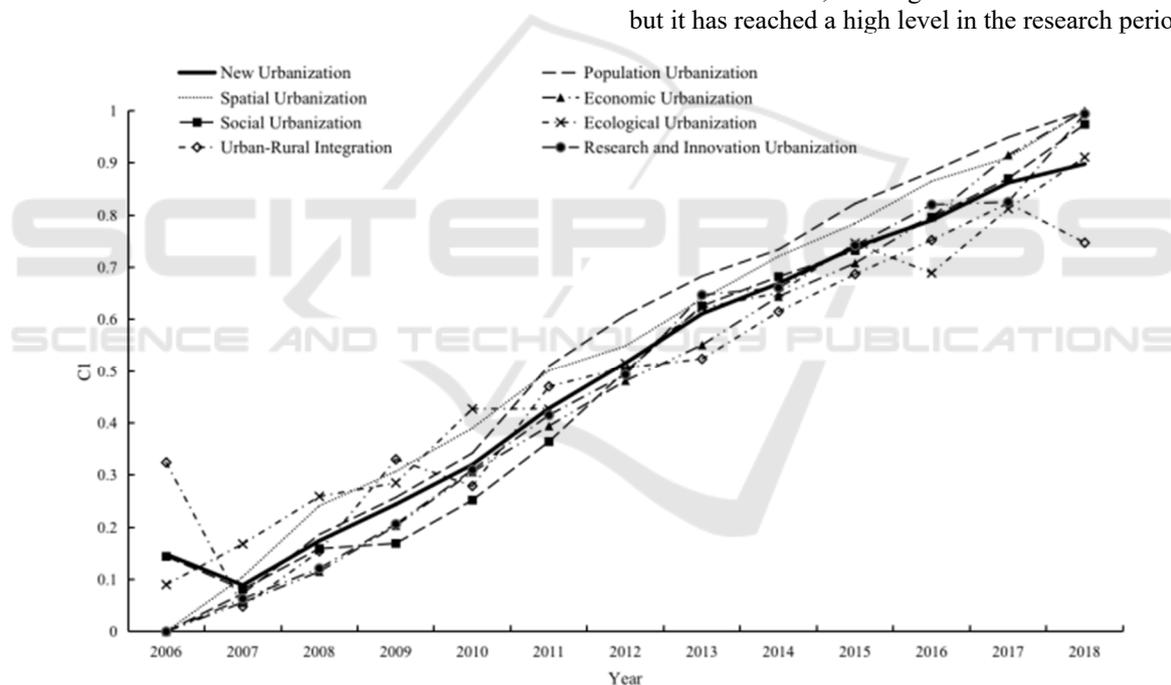

Figure 1: Comprehensive Development Level of New Urbanization.

As shown in Figure 2, the tourism comprehensive evaluation index of Anhui Province showed an overall upward trend from 2006 to 2018, but the increase was not large, from 0.276(2006) to 0.56(2018), and the tourism development index increased by about 1.03 times. During the study period, the development of tourism in Anhui Province experienced two significant increases: from 0.206 to 0.271 from 2009 to 2011, and from 0.428 to 0.576 from 2012 to 2017. This shows that the overall level of tourism economic development in Anhui province has been greatly improved, and the tourism industry continues to mature, which also plays a certain role in promoting the construction of urbanization.
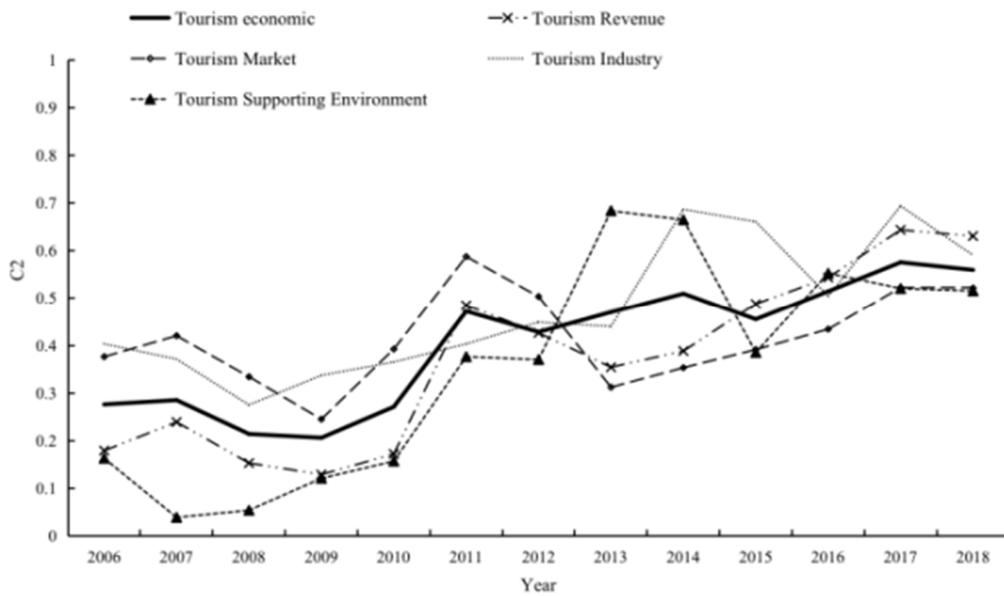
Figure 2: Comprehensive Development Level of Tourism.

4.2 Analysis on Coupling Coordination Degree

From Table 3, the coupling degree of tourism and new urbanization in Anhui Province from 2006 to 2018 is above 0.8, which is a high-level coupling. During the study period, the comprehensive coordination index between tourism and new urbanization is increasing, and the coupling

coordination degree between them is also increasing. Except for a slight decline in 2007, the overall experience of 6 stages is as follows: Mild dissonance (2007), near dissonance (2006, 2008-2009), barely coordinated (2010), primary coordination (2011-2012), intermediate coordination (2013-2016) and good coordination (2017-2018) are above the average level. However, there is still a certain gap from high-quality coordination, and there is still room for improvement (Table 3).

Table 3: Coupling Coordination between Tourism and New Urbanization in Anhui Province from 2006 to 2018.

Year	C1	C2	C	T	D	Coordination level	Coupling coordination type
2006	0.148	0.276	0.953	0.212	0.450	On the verge of disorder	New urbanization development lags behind
2007	0.089	0.285	0.852	0.187	0.399	Mild disorder	New urbanization development lags behind
2008	0.174	0.214	0.995	0.194	0.439	On the verge of disorder	New urbanization development lags behind
2009	0.244	0.206	0.996	0.225	0.473	On the verge of disorder	Tourism development lags behind
2010	0.320	0.271	0.997	0.295	0.543	Barely coordinated	Tourism development lags behind
2011	0.428	0.472	0.999	0.450	0.670	Primary coordination	Development is basically synchronized
2012	0.516	0.428	0.996	0.472	0.686	Primary coordination	Tourism development lags behind
2013	0.611	0.470	0.991	0.540	0.732	Intermediate coordination	Tourism development lags behind
2014	0.669	0.510	0.991	0.59	0.764	Intermediate coordination	Tourism development lags behind
2015	0.739	0.4550	0.971	0.597	0.761	Intermediate coordination	Tourism development lags behind
2016	0.790	0.515	0.978	0.653	0.799	Intermediate coordination	Tourism development lags behind
2017	0.862	0.576	0.980	0.719	0.839	Good coordination	Tourism development lags behind
2018	0.898	0.560	0.973	0.729	0.842	Good coordination	Tourism development lags behind

a. C1: New Urbanization Development Index; C2: Tourism Development Index; C: Coupling degree; T: Comprehensive Coordination Index; D: Comprehensive Coordination Index.

5 CONCLUSIONS

In this paper, the index evaluation system for tourism and new urbanization is proposed. The entropy weight-TOPSIS and coupling coordination degree model is used in evaluation of the relationship between tourism industry and new urbanization. The main conclusions are as follows:

In terms of development trend, the coupling coordination between tourism and new urbanization in Anhui Province has been increasing, among which 2007 was in the dysfunctional recession stage, during which the development of new urbanization lagged behind the development of tourism, the level of town construction was still a certain distance from the goal of new urbanization planning, and the awareness of building a modern city with ecological livability was not strong enough; 2008-2010 was in the transitional development stage. In this period, the pace of new urbanization development accelerated, and the development of tourism industry lagged behind the development level of new urbanization in both 2009&2010, mainly due to the fact that tourism industry received greater impact from the economic downturn and lower tourism revenue; 2011-2018 was in the coordinated development stage, and the coupling coordination index of tourism industry and new urbanization was in a period of steady improvement in this period. In 2011, the development of tourism and new urbanization was basically synchronized, and then it changed to tourism development lagging behind new urbanization, and the gap has always existed, This is because the concept of developing tourism economy and the relative system and mechanism are not perfect enough, and the development space of tourism has not been fully explored; With the concept of "new urbanization" put forward in 2012, the attention and construction of new urbanization have been significantly enhanced, so the level of urbanization development has been improved. Overall, tourism economy coordinated development and new urbanization development is not yet implemented fusion, the promoting function of tourism development on the new urbanization has not been released in full. Therefore, the potential of tourism resources in Anhui Province needs to be further developed, and the relevant strategic measures should be strengthened in order to better realize the synergistic development of tourism and new urbanization (Table 3).

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