

Evaluation of Development Efficiency of Cultural Tourism in China's Coastal Areas— Based on DEA-Malmquist Model

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Abstract: This paper uses the data envelopment analysis method to construct the evaluation model of cultural tourism development efficiency. And combined with the DEA-Malmquist index model, this paper evaluates the development efficiency of cultural tourism in eleven provinces (cities and autonomous regions) in coastal areas from 2010 to 2019. The research shows that from 2010 to 2019, the overall development trend of cultural tourism in eleven provinces (cities and autonomous regions) in coastal areas was optimistic. The main reasons for the non-DEA effectiveness in a few provinces and cities were redundant input and insufficient output.

Keywords: Cultural Tourism; DEA Model; Malmquist Index Model; Efficiency Evaluation; Principal Component Analysis

1. Preface

The "14th Five-Year Plan" clearly pointed out that "the prosperity and development of cultural undertakings and cultural industries, and the enhancement of national cultural soft power". Cultural tourism is not only an important guarantee for satisfying people's diverse material and cultural life, spiritual and cultural needs, but also an important driving force for cultivating new momentum for high-quality economic development, accelerating economic and social transformation and upgrading, and promoting innovation and entrepreneurship. The research about development efficiency of cultural tourism has become an urgent need for various provinces and cities to optimize the industrial structure.

2. Indicator selection and data sorting

This paper follows the principles of comparability, availability and scientificity of the selection of indicators, and at the same time takes into account the operability of the later statistical work. The input indicators select cultural tourism resources and economic development level, and the output indicators select the total tourism revenue and total number of tourist reception.

2.1 Selection of indicators

In order to ensure the overall effectiveness evaluation, the evaluation index system of cultural tourism development efficiency in China's coastal areas was constructed, as shown in Table 1.

Table 1 Evaluation index system for the development efficiency of cultural tourism in coastal areas

	input indicator	output indicator
input of cultural resources	Number of cultural industry institutions (X_1)	Total tourism revenue (Y_1)
	Number of employees in the cultural industry (X_2)	
	Fixed investment in culture and other industries (X_3)	
Investment in tourism resources	Number of tourist agencies (X_4)	

	Number of employees in the tourism industry (X_5)	
The level of economic development	GDP per capita (X_6)	Total tourist reception (Y_2)

This paper uses the number of libraries, museums and cultural centers to represent the number of cultural industry institutions, and the number of cultural industry practitioners. Represented by the number of employees in the cultural and real estate industry; the number of star-rated hotels, travel agencies and A-level scenic spots is used to represent the number of tourism agencies, and the number of star-rated hotels, travel agencies and A-level scenic spots is used to represent the number of employees in the tourism industry.

2.2 Data Organizing

In order to study the development law of the efficiency of cultural tourism in coastal areas, while taking into account the availability of data, this paper selects the cultural tourism of eleven provinces (cities and autonomous regions) in coastal areas from 2010 to 2019 as the research object, namely Hebei and Liaoning, Tianjin, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi and Hainan.

2.3 Principal Component Analysis

In order to eliminate the difference in magnitude and dimension of different variables, the original data is first standardized to obtain the correlation coefficient matrix of the standardized data, and then the eigenvalues and cumulative variance contribution rate corresponding to the relative coefficient matrix are obtained.

Since the cumulative variance contribution rate of the first two principal components exceeds 85%, *Comp.1* and *Comp.2* are selected as new comprehensive variables.

By calculating we can get the expressions of *Comp.1* and *Comp.2*:

$$\begin{aligned} \text{Comp.1} &= 0.457X_1 + 0.4649X_2 + 0.4033X_3 + 0.4643X_4 + 0.4337X_5 + 0.093X_6 \\ \text{Comp.2} &= -0.0968X_1 - 0.0414X_2 - 0.0586X_3 + 0.0261X_4 - 0.0397X_5 + 0.9916X_6 \end{aligned}$$

3. DEA model design and empirical analysis

3.1 Indexing of data

Based on the *DEA* method, this paper adopts the *CCR* model and the *BCC* model, and uses the *DEAP 2.1* software to evaluate the efficiency of the indexed data, and calculates the comprehensive efficiency, technical efficiency and scale efficiency of each decision-making unit from 2010 to 2019.

3.2 Static efficiency evaluation based on DEA model

By using *DEAP 2.1* software for efficiency evaluation, the efficiency value of cultural tourism input and output in eleven provinces (cities and autonomous regions) in coastal areas from 2010 to 2019 was obtained.

From 2010 to 2019, the comprehensive efficiency of eleven provinces (cities and autonomous regions) in coastal areas is shown in Table 2.

Table 2 Comprehensive efficiency of coastal areas from 2010 to 2019

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean
Fujian	0.667	0.622	0.541	0.553	0.528	0.602	0.539	0.489	0.314	0.214	0.507
Guangdong	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.842	0.984
Guangxi	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hainan	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.553	0.955
Hebei	0.701	0.638	0.504	0.464	0.496	0.434	0.547	0.780	0.982	0.861	0.641
Jiangsu	0.919	0.857	0.539	0.441	0.408	0.308	0.494	0.440	0.389	0.266	0.506
Liaoning	1.000	1.000	1.000	1.000	0.900	0.772	0.796	0.610	0.493	0.395	0.797

Shandong	0.915	0.840	0.704	0.654	0.701	0.645	0.813	1.000	1.000	0.880	0.815
Shanghai	0.385	0.373	0.391	0.337	0.309	0.291	0.256	0.280	0.255	0.148	0.302
Tianjin	0.973	0.913	0.937	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.982
Zhejiang	0.629	0.598	0.490	0.428	0.494	0.347	0.432	0.332	0.251	0.148	0.415
Mean	0.885	0.851	0.867	0.864	0.830	0.836	0.876	0.920	0.943	0.799	

It can be seen from Table 2 that from 2010 to 2019, Guangdong, Guangxi, Hainan, Liaoning, Shandong and Tianjin have maintained relatively high comprehensive efficiency. The comprehensive efficiency of Jiangsu and Jiangsu is at the average level, and only the comprehensive efficiency of Shanghai and Zhejiang is lower than 0.5. This shows that during the period from 2010 to 2019, the cultural tourism development efficiency of Shanghai and Zhejiang among the eleven provinces (cities and autonomous regions) in the coastal area was low, and they failed to give full play to their potential tourism advantages and cultural tourism characteristics. The utilization rate of cultural tourism in Zhejiang is relatively low; the cultural tourism industry in Zhejiang still has great development potential and room for improvement; in contrast, the utilization rate of cultural tourism resources in Guangdong and other provinces and cities is relatively high, the resource allocation is better, and the management model is more reasonable.

3.5 Dynamic Efficiency Evaluation Based on Malmquist Exponential Model

In order to further dynamically evaluate the development efficiency of cultural tourism in coastal areas, the Malmquist index and its decomposition of eleven provinces (cities and autonomous regions) in coastal areas from 2010 to 2019 were calculated based on the Malmquist index model, as shown in Table 3.

Table 3 Malmquist index and decomposition of the development efficiency of cultural tourism in coastal

decision unit	technical efficiency change index	skill improved change index	pure technical efficiency change index	scale efficiency change index	full factors production rate change index
Fujian	0.881	1.109	0.853	1.033	0.977
Guangdong	0.981	1.176	1.000	0.981	1.154
Guangxi	1.000	1.209	1.000	1.000	1.209
Hainan	0.936	1.018	1.000	0.936	0.953
Hebei	1.023	1.158	1.019	1.004	1.184
Jiangsu	0.871	1.201	1.000	0.871	1.046
Liaoning	0.902	1.246	0.967	0.933	1.124
Shandong	0.996	1.209	1.007	0.989	1.204
Shanghai	0.899	1.021	0.815	1.104	0.918
Tianjin	1.003	1.068	1.000	1.003	1.071
Zhejiang	0.852	1.179	0.850	1.002	1.004
Mean	0.939	1.142	0.953	0.985	1.072

We can see from Table 3 that the average total factor productivity change index of eleven provinces (municipalities and autonomous regions) in the coastal area from 2010 to 2019 was 1.072, and the total factor productivity change index of all decision-making units was greater than 1, indicating that the culture of coastal areas from 2010 to 2019 The total factor productivity of tourism development efficiency is increasing. Since the change index of technological progress is slightly larger than the change index of technical efficiency, technological progress is the main driving force for the growth of total factor productivity in the development efficiency of cultural tourism in coastal areas.

4. Conclusions and recommendations

This paper uses the *DEA* method to analyze the technical efficiency and scale efficiency of cultural tourism in coastal areas from 2010 to 2019. Generally speaking, the development trend of cultural tourism in most provinces (cities and

autonomous regions) in coastal areas is relatively optimistic, and the utilization rate of resources is relatively low. However, some provinces (cities and autonomous regions) still have certain problems, such as the low utilization rate of cultural tourism resources in Fujian, Jiangsu, Shanghai and Zhejiang, and the problem of redundant investment. and management methods still need to be improved, the following suggestions are put forward in this paper.

(1) Optimizing resource allocation and rationalizing investment scale

The increase of cultural tourism resources input will have a positive effect on the improvement of cultural tourism efficiency to a certain extent, but due to technical constraints, the input elements of cultural tourism have an optimal investment relationship. The excessive increase of cultural tourism investment in the region will limit the improvement of the development efficiency of cultural tourism.

(2) Strengthen the attractiveness and profitability of cultural tourism

The coastal areas have an advantage in terms of location. Therefore, coastal areas should pay more attention to the design and innovation of cultural tourism products, improve the concept and level of modern services, build a modern marketing service system, improve the market value of cultural tourism resources, and use modern business operation methods to increase output.

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