

Research on the Efficiency of the Integrated Development of Health Care Tourism Industry Based on DEA Model: Taking Miyi County as an Example

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Abstract: At present, the health care tourism industry in Miyi County is in the initial stage of development. Research on the efficiency of the integration of health industry and tourism industry to maximize the benefits of the input and output of the industry, which promotes the development of the health tourism industry in Miyi County has great significance. Based on the data envelopment analysis method and the 2003-2018 input-output data of Miyi County, this paper establishes an efficiency evaluation system for the integrated development of the industry, using the DEA-BCC model to analyze comprehensive efficiency, pure technical efficiency and scale efficiency. This study has shown that the average comprehensive technical efficiency of Miyi County is 0.834, the average pure technical efficiency is 0.900, and the average scale efficiency is 0.919, indicating that the overall level of technical efficiency and scale efficiency is relatively high. But, in order to achieve greater benefits for the integrated development of the industry, this article can be a reference date for the diversified health care tourism industry, technical management and innovation, and training of high-quality talents.

1 INTRODUCTION

With the continuous improvement of per capita income, the improvement of people's living standards and the increase of consumer demand, more and more people are pursuing health and recuperation tourism. On the one hand, sub-health groups are more willing to enjoy high-quality tourism to relax themselves, health care and tourism is gradually becoming a popular choice (Xu, Zhai, Zhang 2020). On the other hand, China has entered a moderately aging society, and healthy elderly care is beginning to be chose of many elderly people. It can be seen that health care tourism is in great demand in today's society, and the social market is very impressive.

In order to promote the development of the health tourism industry, Panzhihua formulated a series of policies as a guide for the development of the industry. In the "China Sunshine Health Tourism City Development Plan (2012-2020)" compiled by

Panzhihua City in 2012, Miyi County created the health tourism brand "Zhuan Xu's Hometown Sunshine Miyi" (Tang, Wu, Zhang 2016). In the "Thirteenth Five-Year Development Plan of Panxi Economic Zone", one of the development orientations of Panzhihua region is "a nationally well-known sunshine health and wellness tourist resort. With the sunshine health care industry as the leader, we will actively develop elderly care services and health care, tourism and leisure, sports, medical services and other related industries." Today, the health care industry in Miyi County is booming, and the service system is also sound and perfect. The "Sunshine Miyi" health care brand is well-known throughout the country (Han 2018).

In addition, good local climate resources, geological resources and cultural resources are also very benefit to promote the development of the health care industry and expand the economic benefits of tourism (Huang 2014, Ren 2019). Whether it is the

social demand for the health care industry or the support of government policies, the future development of the health care industry in Miyi County is very objective. The health care industry in Miyi County is still in the development stage, which is of great significance to its research on the development efficiency of the integration of the health care industry.

2 MATERIAL AND METHODS

2.1 Construction of the Evaluation Model of the Integration Efficiency of the Tourism Industry

If there are N independent and homogeneous decision-making units in an industrial system, which are represented by DMU_j (j=1, 2...n). The input and output vectors are expressed as X_{ij}=(X_{1j}, X_{2j}... X_{nj})^k and Y_{ij}=(Y_{1j}, Y_{2j}... Y_{nj})^k, respectively. λ_i represents the index combination coefficient of the decision-making unit. ε represents the effective value of the decision-making unit, and also means the utilization efficiency of input and output. s⁻, s⁺ is a slack variable that represents the slackness of the input and output of health care tourism industry (Li 2019).

The DEA - BCC model is as follows:

$$\min \varepsilon \tag{1}$$

$$\sum_{i=1}^n \lambda_i X_i + s^- = \varepsilon X_i \tag{2}$$

$$\sum_{i=1}^n \lambda_i Y_i - s^+ = Y_i \tag{3}$$

$$\lambda_i \geq 0, s^- \geq 0, s^+ \geq 0 \tag{4}$$

$$\sum_{i=1}^n \lambda_i = 1 \tag{5}$$

In the BCC model, the overall efficiency is equal to the product of pure technical efficiency and scale efficiency. The overall efficiency is the production efficiency of the decision-making unit at a certain input, and the comprehensive evaluation of the decision-making unit's resource allocation ability and resource utilization efficiency. Pure technical efficiency is brought about by the system and management level, and the efficiency of production is under the influence of management and technical factors. Scale efficiency refers to the difference between the current scale and the target scale are under the conditions of a certain system and management level. An efficiency value equals to 1 that indicates the decision-making unit is effective. If an efficiency value less than 1, then we can analyze the situation of increasing scale benefit, constant scale benefit or diminishing scale benefit by these data.

2.2 Evaluation Index System

The efficiency evaluation system of the integrated development of health tourism industry is a three-level index system. On the basis of the collection and

Table 1: The efficiency evaluation system of the integrated development of health tourism industry.

Indicator type	First-level index	Indicator description
input indicators	Fiscal expenditure	The development of agriculture is conducive to the development of health and tourism and agriculture model
		The advancement of science and technology is conducive to the high-quality development of health tourism and the innovation of industrial technology
		Cultivating compound talents in health tourism is benefit to the sustainable development of health tourism industry
		Medical and health construction is conducive to the development of health care and tourism and medical development model
		The protection of the ecological environment is conducive to the development of the model of health and tourism and health preservation
Investment promotion	Foreign investment attraction	The sustainable economic development capability of the tourism industry
		The influence and popularity of the health tourism brand
		The government's support and importance
Output indicators	Fixed asset investment in the whole society	Capital construction investment reflects the development foundation of health tourism industry
	Total tourism revenue	The scale of economic benefits
	Total number of travelers	Scale of development

arrangement of the index system and its concrete indexes in the relevant literature, the larger indexes related to the research of this paper are retained, and the index system of this paper is constructed after consulting relevant experts. the first level of indicators for input indicators and output indicators, the second level of indicators consists of 5 indicators, and there are 12 indicators in the third level.

2.3 Index Description

2.3.1 Explanation of Input Indicators

Capital is an important element that affects the development of the health care tourism industry, and also the total driving force for the economic development of the tourism industry (Zhang, Huang 2014). In addition to infrastructure investment, investment in agriculture, industry, ecology, cultural and sports development, medical and health, science and technology, ecological environment, talent training and other related industries are also important factors for the development of the global health industry and the expansion of health tourism benefits (Zhang 2017). The investment promotion situation reflects the attractiveness of the health care industry brand in the region and the government's investment support. Based on this, this article finally chooses the fixed asset investment, investment promotion and fiscal expenditure of the whole society as the input indicators from the perspective of capital.

2.3.2 Description of output indicators

The total tourism revenue and the number of tourists received can directly reflect the development of health tourism in the region. Not only can it best represent the true output of the development of health tourism, but also reflect the comprehensive capacity of tourism development.

3 RESULT & DISCUSSION

3.1 Source of Data

The data in this article comes from "Miyi Statistical Yearbook", "Miyi County National Economic and Social Development Statistical Bulletin" and the official website of Miyi County People's Government. The input-output indicator datas of Miyi County from 2003 to 2018 as follows.

3.2 Data Analysis

3.2.1 Analysis of Raw Output Data

As shown in Table 2, the number of tourists received and the annual tourism income of Miyi County from 2003 to 2018 have been increasing year by year, indicating that the scale and economic benefits of the development of the health tourism industry are very considerable. Investment promotion has achieved a leap from 686 million yuan to 61.361 billion yuan,

Table 2 Raw data of input-output indicators.

years	Output indicators			input indicators	
	Number of tourists received throughout the year/ten thousand	Annual tourism income/100million yuan	Total investment/100 million yuan	Local fiscal expenditure /ten thousand yuan	Total investment in fixed assets of the whole society/100 million
2003	3.02	0.48	6.86	17956	3.87
2004	16.89	0.73	27.24	27321	11.19
2005	33.12	1.31	31.86	38789	22.02
2006	76.22	2.81	26.89	49031	25.88
2007	129.59	4.50	73.52	62277	31.64
2008	135.13	4.70	110.12	88905	35.37
2009	137.26	5.51	39.32	111131	51.18
2010	142.76	6.31	51.89	118927	58.03
2011	152.00	7.30	63.88	146866	65.71
2012	171.10	10.04	65.05	177466	82.28
2013	224.28	16.51	77.25	209656	95.28
2014	257.90	24.60	91.00	220001	111.83
2015	306.14	33.00	216.48	223900	120.16
2016	397.60	39.81	162.77	179200	124.46
2017	428.95	46.02	220.84	224200	139.53
2018	531.84	62.98	613.61	314900	127.21

which shows that Miyi County's economic strength, ability to attract foreign investment, brand awareness and influence are increasing. The increase in financial expenditure is conducive to the development of a health-care agricultural tourism industry model and the construction of a new health-care tourism model; training professional composite talents in the health-care tourism industry, improving the industry's innovation and technical level, and contributing to the development of diversified health-care tourism. And the fixed asset investment of the whole society has increased from 387 million yuan to 12.721 billion yuan, which has improved the foundation for the development of the tourism industry.

3.2.2 Data Analysis of Index Evaluation System

According to the DEA method, the DEAP2.1 software analyzed these data. The selected model is the DEA - BCC model, and the selected analysis angle is the output angle. The result data as follows. It can be seen from Table 3 that from 2003 to 2018, the pure technical efficiency of Miyi County reached 1 in a total of 8 years, indicating that the pure technical efficiency of these years was effective. The pure technical efficiency in 2004 and 2005 was the lowest. It may be that the technology development and industrial management of the health tourism industry in the past two years have not been reformed and innovated, and the new management technology or new management model has not been properly utilized, and the resources have not been well configured and utilized. However, with the expansion of fiscal expenditure, social investment in fixed assets

and the expansion of foreign investment, the pure technical efficiency from 2006 to 2016 was greater than 0.8 or closed to 0.8, indicating that the technology and management system has been improved since then. The investment of resources was better utilized. After 2016, the pure technical efficiency was 1, which shows that Miyi County has become more mature in the use of technology and greatly improved its ability to use resources.

The economy of scale basically shows a trend of increasing first and then stabilizing. The scale efficiency in 2006, 2007, 2009, 2014, 2016, and 2018 were all 1, indicating that the decision-making unit in these years was effective, scale returns remained unchanged, and achieved the maximum benefit. From 2003 to 2006, 2008, and 2015, the efficiency of scale was less than 1, but the return of scale was increasing. From this, continuing to increase the input of the health care industry to maximize the benefits. From 2010 to 2013 and 2017, the scale efficiency is between 0.900 and 1. The decision-making unit is invalid but the scale return is diminishing, which indicating that the investment of resources is redundant and the utilization of resources is insufficient. The solution is that the scale of investment can be appropriately reduced, and finally achieving the greatest benefit.

The overall efficiency of Miyi County fluctuates greatly, from 0.362 in 2003 to 1 in 2018. Since the tourism industry in Miyi County was in the preparatory stage in 2003, the development of all aspects was not perfect, so the overall efficiency was low. However, with the investment of capital, the overall efficiency reached 1 in 2006, realizing the

Table 3: Analysis data of the development efficiency of the tourism industry.

firm	crste	vrste	scale	Economies of scale
1	0.362	1.000	0.362	irs
2	0.372	0.567	0.656	irs
3	0.453	0.563	0.805	irs
4	1.000	1.000	1.000	-
5	1.000	1.000	1.000	-
6	0.927	0.930	0.996	irs
7	1.000	1.000	1.000	-
8	0.878	0.878	0.999	drs
9	0.804	0.804	0.999	drs
10	0.814	0.867	0.939	drs
11	0.954	0.994	0.960	drs
12	1.000	1.000	1.000	-
13	0.797	0.798	0.999	irs
14	1.000	1.000	1.000	-
15	0.989	1.000	0.989	drs
16	1.000	1.000	1.000	-
mean	0.834	0.900	0.919	

overall efficiency and effectiveness. The overall efficiency fluctuated from 2007 to 2016, and its efficiency values were all greater than 0.8 or close to 0.8, indicating that the allocation and use of resources were still relatively good. By 2016-2018, the overall efficiency was 1. It shows that the resource input, in recent years, is basically close to the target benefit. However, the overall average efficiency is 0.834, indicating that there is still nearly 17% room for improvement in efficiency. It is necessary to strengthen the allocation and utilization of resources to achieve higher benefits.

4 CONCLUSIONS

This paper analyzes the efficiency of the input and output of the health care tourism industry in Miyi County from 2003 to 2018. The overall efficiency of the research and development of the integrated development of the health and tourism industry is relatively high, and the integrated development of the health and tourism industry has a good form.

From 2003 to 2015, there were phenomena such as input redundancy and output slack, indicating that the allocation of input resources and utilization capacity has uneven allocation of resources, and blind expansion of the scale of industrial development, etc.

From 2016 to 2018, the development efficiency of the industry was relatively high, and the overall efficiency, pure technical efficiency, and scale efficiency were relatively stable, basically close to 1. It shows that in order to promote the development of health tourism industry, Miyi County's gradually expanding capital investment has formed a good economic foundation, and the improvement of innovative technological capabilities and management capabilities has improved the development efficiency of the industry and the redundancy of resources.

From 2009 to 2011, there was a decline in technical efficiency, but the technical efficiency rose again from 2011 to 2013, indicating that Miyi County was developing the health tourism industry while also innovating and developing new industry development models and new technologies.

The economies of scale between 2003 and 2018 have increased and decreased. When economies of scale increase, the industrial structure should be adjusted in time, and the input of resources should be increased, but Miyi cannot be expanded blindly, otherwise it will cause slack in output.

According to the research on the efficiency of the integrated development of the health and health

industry in Miyi County, the prospects for the development of the health care industry are very good. However, in the development process, there are certain problems to promote the efficiency of industrial integration, so it is important to conduct related research on it. This article provides some ideas and theoretical basis for promoting the development of industrial integration and solving related problems.

The indicators involved in this study are not complete, only a BCC model is used for data analysis, and the results presented by the data cannot be explored further, so further research can be done in the future.

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