Dynamic Technical Performance Measurement in Rural Tourism: An Empirical Study From China

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ABSTRACT

With the characteristic of low carbon emission and sustainability, the development of rural tourism becomes one of the key parts to achieve mutual carbon target in Chinese tourism industry. However, previous research on China’s rural tourism has largely ignored the quantitative examination of rural tourism initiatives. This paper aims to quantify and measure the efficiency as well as efficiency variation of rural tourism in 25 provinces of China using data envelopment analysis (DEA) and Malmquist productivity index (MPI). The results reveal that the overall efficiency of rural tourism in China is still low, and there exists an obvious regional difference in rural tourism in China. The result not only identify the leading and following regions in Chinese rural tourism, but also reveal how their position in the group changes over time. This is valuable information for managers having to take strategic and tactical decisions to better achieve the low-carbon and sustainable development of China’s tourism industry.

KEYWORDS

China, Dynamic Technical Performance, Rural Tourism, Sustainability, Technology

INTRODUCTION

The continuous increasing and diversified development in the tourism sector has transformed it into one of the fastest growing economic sectors internationally (UNWTO, 2017). According to UNWTO (2017), the global tourism industry accounts for 10 percent of the world’s total jobs and the total Gross Domestic Product (GDP) and is predicted to nearly double in 2019. In spite of the widespread success of the global travel industry, poverty as well as economic recession still prevail in many rural areas of developed and developing countries (Petersen, 2010). In recent years, both national and regional policies in China have placed a strong emphasis on achieving sustainable rural development, placing sustainability at the center of rural policy (Liu, 2018). However, it seems that
the idea of sustainability has just been connected with the tourism industry and the unique problems that this sector presents for rural communities. By concentrating on the technical performance of rural tourism, plans are being devised to draw tourists to rural areas (including, for example, what marketing methods to employ and what range of activities need to be given) rather than addressing their likely influence on the area as a whole after they arrive. Rural tourism in China is implemented consciously, aiming to alleviate poverty, improve environmental preservation to meet the carbon-neutral target, and promote sustainable development in underdeveloped areas. Xie (2015) noted that China’s vast land resources, rich natural scenery, agricultural resources, and mass customs offer favorable preconditions for rural tourism development.

However, the development of the rural tourism industry is still in its infancy in China. China has just begun to develop its rural tourism industry in the early 1980s (Wang, 1999). By contrast, nations in North America and Europe have histories of rural tourism stretching back more than a century. People’s income levels and living standards have been continuously improved, largely thanks to the reform and opening-up policy as well as the development of market economy in China. Moreover, because of the stressful rhythm of life, urban residents have a strong desire to return to nature and are becoming less attracted to projects that revolve around conventional urban tourism (Xie, 2015). Local entrepreneurs were the first responders to the growing demands and influxes of tourists (Wang, 1999). Agri-tourism started to form as small family-run businesses, usually developed by farmers, began to flourish in provinces like Sichuan, Shan- dong, and Chongqing.

Investors saw the opportunities of commercial tourism in certain rural regions. As a consequence, an increasing number of groups and developers poured funding into the development of rural tourism. In addition, the Chinese government recognized how effectively rural tourism promotes rural economy. This led to the establishment of poverty alleviation by launching a travel project in the early 1980s, which advocated and facilitated the development of rural tourism in China (Liu et al., 2017). Later on, from 2009 to 2015, the government ran the National Rural Tourism Development Program, and effectively carried out its strategy in the nation. In conjunction, agencies specialized in the management of rural tourism were established by many tourism administration departments. The tourism departments of numerous regions and provinces formed their own rural tourism management offices. These agencies are responsible for different aspects of rural tourism, such as supervision, marketing, overall planning, and preferential policy implementation. These duties aim toward the promotion and development of rural tourism in respective areas of jurisdiction (Wang, 1999). From 2014 to 2017, Chinese governments emphasized the development of rural tourism and established relevant policies as well (Ma, 2016; Zhong, 2017). The focus of these policies is to strengthen the precise poverty alleviation of rural tourism, and to take the unique advantages of rural material and non-material resources to promote in-depth integration of agriculture and tourism, education and culture industries. The National Development and Reform Commission (NDRC) and the National Tourism Administration (NTA) are responsible for supervising the implementation of these two key tasks. During the process of developing Chinese rural tourism, it can be easily noticed that all levels of government have played crucial roles.

There are currently myriad types of rural tourism in China after around 30 years of the industry’s development. The most prevalent type of rural tourism in China is Agri-tourism, which has been noticed to made significant growth in the last 20 years (Su, 2011). The appeal of Agri-tourism increased rapidly due to various trends, such as the shifting desires of Chinese travelers (Dong et al., 2007) and the proliferation of private vehicle ownership. According to the Chinese Academy of Social Science (2017), by the end of 2015, there were 100,000 villages in China that provided Agri-tourism activities which included 2.9 million Agri-tourism operators and more than 2 million participating farmhouses. By 2017, the number of nationwide farmhouses involved in Agri-tourism had increased to 2.2 million. Presently, there are 388 counties (cities/districts) with national agricultural and rural tourism demonstrations and 560 scenic leisure villages in China (Ministry of Culture and Tourism of China). In addition, the quantity of Agri-tourism workers in China has been increasing over the
past three years. In 2015, 8.45 million people were employed in China’s Agri-tourism sector and this number had increased to 9 million in 2017 (Ministry of Culture and Tourism of China). The revenue generated from Agri-tourism exceeded 740 billion yuan, thereby immensely benefiting over 7 million farmers apart from other stakeholders. Due to such rapid development, many relevant research studies have been conducted in the country. They primarily focused on certain aspects such as the characteristics and current state of China’s rural tourism (Su, 2010), the economic benefits originating from rural tourism (Lu et al., 2017), and rural tourism development issues (Li et al., 2019). However, less priority has been given to unifying the definition of China’s rural tourism and, more importantly, employing more quantitative measurements for evaluating the efficiency of China’s rural tourism. Luo and Qian (2017) believed that tourism efficiency evaluation could reflect the utilization level of regional tourism resources, and proper performance evaluation is important to any organization and industry. However, the importance of efficiency evaluation has been neglected in the past rural tourism studies. Thus, the paper primarily aims to supplement the current rural tourism literature by defining China’s rural tourism and offering insights into rural tourism performance evaluation. This paper will address the following questions: How to define the rural tourism in China exactly? What is the relative efficiency of rural tourism in the sampled provinces? What are the efficiency changes in rural tourism from 2015 to 2017?

To answer above questions, the structure of this paper is as follows. Section 2 critically analyzes current rural tourism concepts to unify the proper definition of rural tourism in China. Section 3 presents the existing relevant domestic and foreign literature. The methodology as well as the variables utilized are depicted in the Section 4. Section 5 presents the results of the empirical studies. Finally, Section 6 discusses the study limitations, conclusions, and implications.

DEFINITIONS OF RURAL TOURISM

With the rapid advancement of tourism in rural areas globally, there are various definitions of rural tourism. International organizations or regional-level organizations, such as the Organization of Economic Cooperation and Development (OECD), the World Tourism Organization (WTO), and individual scholars all have developed different definitions for rural tourism. For instance, OECD defines it as tourism taking place in the rural area, where fewer than 10,000 habitats settle with the land mainly used for farming, forestry and natural areas. According to WTO, village tourism is defined as an experience-oriented practice which aims to motivate tourists to leave cities and travel to rural areas, in order to experience and enjoy the products as well as services of the rural regions (Aref and Gill, 2009). Additionally, scholars from developing and developed countries have also proposed different concepts of rural tourism. For example, in the UK, Gilbert (1990) stated that the rural tourism is a type of tourism where local farmers offer board and lodging to visitors who come to participate in all kinds of recreational activities in typical rural environments, such as farms and pastures. In addition to the definitions of rural tourism mentioned above, several researchers in developing countries have slightly different views on this concept. Researchers in Sub Saharan Africa, Holland, etc., (2003) contended that the rural tourism occurs in village areas, which is composed of Agri–tourism, history-themed travel, ecological travel, natural resource–based travel, environment–protection travel, cultural travel and alternative travel. In India, defined as rurally–located tourism, it involves vocations based on farm, traveling activities such as go fishing, walking, climbing mountains, as well as riding, educational travel, arts, and culture relics (Kapur, 2016). Furthermore, through the content analysis of various concepts and terms in existing published literature, Nair, et al. (2015) summarized that to define rural tourism comprehensively, five key typical dimensions should be involved. They are ‘location characteristics’, ‘purpose of visit’, ‘attractions/activities’, ‘sustainability’ and ‘stakeholders (tourists, local community and government)’.

When it comes to the topic of how to define rural tourism, abundant research was carried out in China up to now. Nevertheless, no consensus has been reached on it, thereby making it
essential to propose a unified appropriate concept of rural tourism in China. According to the 5 key dimensions, the present limitations exist in defining rural tourism in China can be identified, and more comprehensive definition will be proposed subsequently. Chinese scholar Xiong (1999) suggested that rural tourism, serving as a specific concept, refers to a kind of tourism happening in non-urban communities, integrating natural scenery and local lifestyles. Du and Xiang (1999) noted that it was a means of tourism occurring in the countryside since people from cities find scenery and activities in rural areas very attractive. It targets the urban population, satisfying the needs of tourists to study, enjoy and be close to nature. According to the definition of Wang (1999), rural tourism is a type of travel employing agriculture, natural landscapes, agricultural and cultural activities to attract tourists, thereby providing them with the opportunities of sightseeing, studying and relaxing. Wu and Cai (2002) believed that it was a new tourism style where local farmers provide food and accommodation for visitors who would like to experience a range of activities in the local rural space. Through Table 1, it can be seen that the concepts of rural tourism proposed by different Chinese scholars do not fully reflect the five dimensions.

In this paper, we summarize the previous definitions and try to give a more comprehensive and proper definition of rural tourism as follows:

Located at non-urban areas, rural tourism makes it possible for the inhabitants in the city to study, experience and enjoy agricultural, natural, cultural and custom scenic spots and activities offered by the locals and local environments, with the joint efforts of the government and business to protect the environment and create socio-economic benefits in rural areas.

The differences between this definition and the previous definition are as follows: 1) it is more comprehensive and covers five key dimensions; 2) More detailed activities of Chinese rural tourism are added; 3) In addition to the suppliers and consumers of rural tourism, the definition also emphasizes the importance of the government in developing rural tourism.

LITERATURE REVIEW

Research on Rural Tourism

Current research on the field of rural tourism tends to emphasize the following aspects:

Table 1. Dimensions of rural tourism definitions in China

| Location characteristics | Purpose of visit | Attractions | Sustainability | Stakeholders |
|--------------------------|-----------------|-------------|----------------|--------------|
| Xiong (1999)             | Rural            | Lifestyle and rural scenery | NA            | NA           |
| Du and Xiang (1999)      | Countryside     | Study, Enjoyment and Closeness to the nature | Rural scenery and activities | NA | Urban population |
| Wang (1999)              | Agricultural and natural landscapes | Entertainment, Sightseeing, Study and Relaxation | Agricultural and cultural activities | NA | Tourists |
| Wu and Cai (2002)        | Rural space     | NA          | NA             | Local farmers and Visitors |
| Hong (2005)              | Rural area      | Architecture, rural scenery, culture, and folk customs | Preservation of natural resources | NA |
1. The motivations for rural tourism entrepreneurship;
2. Significance of rural tourism advancement.

*The Motivations for Rural Tourism Entrepreneurship*

Many researchers have conducted studies on the motivation of the rural tourism operators involved in tourism activities. However, the most prevalent reason for promoting rural tourism is the economic potential of this sector (Mcgehee and Kim, 2004; Barbieri, 2010; Moraru et al., 2016). In the United States, Mcgehee and Kim (2004) examined the motivations for rural tourism entrepreneurship among family-owned and operated farms in Virginia by employing the theory of formal and substantive rationality proposed by Weber. They found that “currently participating Agri-tourism businesses in Virginia indicated the desire to gain additional income, to realize resource optimization and to educate the consumers of Agri-products on farm operations as their primary motivators.” Even more, based on wide inquiry in the farms from Montana state, Moraru et al. (2016) came to the conclusion that the economic causes serve a determining part in the inclusion of farmers in rural tourism. In Canada, Barbieri (2010) pointed out that additional income is identified as the most important entrepreneurial factor in Canada’s rural tourism in the context of importance-performance analysis (IPA). Rural tourism has increased in popularity, thereby resulting in an increase in the number of service providers such as farmers and ranchers.

*Significance of Rural Tourism Advancement*

Guaita Martinez, et al., (2019) stated that rural tourism is a new-type as well as an effective catalyst that stimulates the advancement of less-developed rural regions economically, environmentally and socially. From an economic point of view, Guaita Martinez, et al., (2019) also pointed out that rural tourism is regarded as a catalyst for poor reduction. By reasonably as well as thoroughly utilizing the agricultural resources, rural tourism can meet the need of local government and residents by raising revenue, accelerating the development of related industries and expanding labor employment. Furthermore, Zhang (2018) constructed a performance evaluation system to effectively measure and evaluate the poverty alleviation of rural tourism in Henan Province. The result showed that the poverty-stricken households had a poverty-relief rate of 60.61%, which had proved the obvious effect of rural tourism development on poverty alleviation. In addition to the benefits, which includes the improvement in agricultural income and profits as well as the increase in employment opportunities for the family members working on the farm etc., the benefits can also be extended to the surrounding areas through local employment opportunities (Brandth and Haugen, 2007; Brown and Reeder, 2005; Hegarty and Przezborska, 2005). A study by Barbieri (2010) concluded that rural tourism is able to create the greatest positive impact on farm profitability and employment in comparison to other farm entrepreneurial activities in the United States. In France, Barbieri and Mshenga (2008) and Nilsson (2002) made identical conclusions that rural tourism was able to boost the local economy with the increase in gross income from farms and household income, as well as the decrease in the unemployment rate. In addition, from the environmental point of view, Martinez et al., (2019) believed that rural tourism is an effective method to improve the quality of the ecological environment. Compared with other intensive industries that use a great amount of natural resource (mining, construction etc.), rural tourism does not require excessive investments in infrastructure and supra-structure facilities. Moreover, local residents will be more motivated to protect and manage the environment due to the economic benefits generated by rural tourism. Huo (2016) claimed that the progress of rural tourism in Hebei province had exerted positive external influence on ecology. In Yanshi of Hebei Province, stakeholders in rural tourism, such as local companies and residents, have realized that only environmentally-friendly tourism attractions can bring over a large number of tourists, which will generate larger economic benefits. Therefore, based on its unique natural characteristics, this village reduced large-scale renovation projects and effectively combined tourism
development with ecological protection. In the end, from the social point of view, Martinez et al., (2019) believed that rural tourism strengthened social relationships in rural societies and created opportunities for urban-rural cultural exchange. Li et al., (2019) focused on a rural ethnic community, Jiabang, in Southwest China and concluded that through traveling in rural areas, tourists are enabled to learn about traditional culture and local lifestyles. Rural residents also benefit from tourism activities. On the one hand, they can enhance their pride in cultural customs and living environment. On the other hand, they are allowed to learn urban knowledge and ideas brought by tourists.

**Efficiency Measurement in Tourism Sector**

Although there are few efficiency measurements in rural tourism-related research, the performance of an industry evaluated by productivity and efficiency has been a common subject in tourism studies. Current literature mostly focuses on the micro level, such as restaurants, tourism enterprises and hotels. Data Envelopment Analysis (DEA) has been widely applied in the empirical literature on the efficiency of tourism business. One of the initial research projects using DEA in the travel sector was carried out by Banker and Morey (1986). Specifically, after evaluating the technical and scale efficiencies of sixty fast food restaurants, they concluded that these restaurants were different in terms of efficiency. In addition, Anderson et al. (2000) used DEA method to make a measurement of the efficiency of 48 hotels in America, finding that the hotel sector was very inefficient, as its average efficiency at large was around 42%. Hwang and Chang (2003) employed DEA as well as Malmquist index to make a measurement of efficiency variations within the period of 5 years of 45 hotels and found that there exist differences on efficiency changes on these hotels. More recent literature applied DEA or the DEA-based methods to assess the tourism efficiency in China: Luo, Yang and Law (2014), Yang et al., (2015), Luo and Qian (2017). Luo, Yang and Law (2014) applied the DEA model to measure the efficiency of major cities’ hotel sector in China ranging between 2001 and 2011, with the results indicating that the hotel sector in several eastern regions, including Xiamen, Fuzhou and Hangzhou had experienced the increase in efficiency, and the reason behind it was technical efficiency change. Another study, by Yang et al. (2015), applied DEA as well as super-efficiency DEA to assess the hotel sector efficiency in thirty-one provinces in China in 2012, finding that economically developed regions such as Beijing, Tianjin, Shanghai, and Guangdong had efficiently developed their hotel industry. Luo and Qian (2017) calculated the tourism efficiency of 30 provinces by applying the Super-SBM DEA model. The finding indicated that although tourism in China had developed rapidly in recent years, the overall efficiency level of it remained low. It was also found that obvious regional differences existed, as the efficiency degree in the eastern parts was much larger than that in the western areas. Walheer and Zhang (2018), Walheer et al., (2019) have applied a multiactivity based DEA model on Chinese star-rated hotels, and found out that different star hotels performed differently for different activities. Dong et al., (2019) have adopted a two stage DEA model to study the influence of environmental variables on the hotels’ performance.

Furthermore, dynamic aspects has been also investigated to reflect productivity changes over time and the sources of changes. The Malmquist productivity index (MPI) is widely used in evaluating productivity changes. Caves, Christensen and Diewert (1982) introduced this index and Fa‘re et al. (1994) extended it. MPI is widely used on dynamic analysis of hotel benchmarking. For example, Hwang and Chang (2003) used MPI method to measure the managerial performance of 45 twain hotels in 1998 and the efficiency change of 45 Hotels from 1994 to 1998. The results revealed that there was a significant difference in efficiency change due to differences in sources of customers and management styles. Barros and Alves (2004), Barros (2005) applied MPI method on the hotels industry in Portugal. Cho and Wang (2017) adopted a cost meta frontier Malmquist productivity index model on Taiwan hotel industries and concluded that the international chain hotel is significantly superior to independent hotels. Cordero et al., (2017) applied the MPI approach to two main sun and
sand tourism markets in Spain. They found that the economic downturn had major negative effects on hotel productivity for two years (2008 and 2009). Please refer to Chatzimichael and Liasidou (2019), Kerstens et al., (2022) for more references.

From the existing literature on rural tourism, it can be seen that most scholars use qualitative analysis and case study methods to study rural tourism. Hardly any empirical analysis was conducted on it, and mathematical or statistical methods were also rarely used. The shortage of quantitative statistics support helps explain that it is not easy to ensure the applicability of the conclusions about rural tourism research. In addition, even though measuring tourism efficiency and productivity has become the subject of plenty of research over recent years, there have been few studies on the efficiency of rural tourism. Therefore, the paper’s objective is to address some imitations included in the literature.

METHODOLOGY

A vast majority of previous research has examined performance in tourism sector, such as revenue management, lodging index and cost-volume-profit indicator for hotels (Fay, Rhoads and Rosenblatt, 1971; Van Dore and Gustke, 1982; Wassenaar and Stafford, 1991;) and risk-return efficiency for tourist destinations (Zhang et al., 2016; Botti et al., 2019). However, those traditional methods cannot investigate productivity changes over time and the sources of changes. To investigate the dynamics of tourism efficiency, the Malmquist Productivity Index (MPI) is adopted. The MPI, introduced by Caves, Christensen, and Diewert (1982) and developed by Fare et al. (1994), is superior in evaluating the variability of efficiency across time. Fare et al. (1994) showed that it is possible to decompose the Malmquist productivity index into two components: an index of the change in efficiency and an index of technological change for period $t = 1 \ldots T$. Inspired by the potential usefulness of this method, MPI has been used extensively for the tourism sector. We refer to Peypoch et al., (2021) and Walheer and Zhang, (2022) for their literature reviews.

In order to build our model, we firstly define our technology by the following notations: The production technology transforms inputs $x$ in outputs $y$. Let $x = (x_1, \ldots, x_m) \subseteq \mathbb{R}^m$ an input vector and $y = (y_1, \ldots, y_q) \subseteq \mathbb{R}^q$ an output vector. The technology set can be defined as:

$$T = \{(x, y) : x \geq 0; y \geq 0; x \text{ can be used to produce } y\}$$  \hspace{1cm} (1)

The output set and can be defined accordingly:\n
$$P(x) = \{y : (x, y) \in T\}$$  \hspace{1cm} (2)

Then the technology can be substantially defined by the following distance function:

$$D_o(x, y) = \inf \{\theta > 0 : \theta y \in P(x)\}$$  \hspace{1cm} (3)

where $\theta$ is the efficiency measure proposed by Farrell (1957). The output-oriented Malmquist productivity index based on the unconstrained technology set $D^*(x, y)$ is defined by:
\[ MPI = \left( \frac{D_t^*(x_{t+1}, y_{t+1})}{D_t^*(x_t, y_t)} \right) \times \frac{D_{t+1}^*(x_{t+1}, y_{t+1})}{D_t^*(x_t, y_t)} \times \frac{D_{t+1}^*(x_{t+1}, y_{t+1})}{D_{t+1}^*(x_t, y_t)} \]

\[ = EC^* \times TC^* \quad (4) \]

where \( EC^* \) and \( TC^* \) are efficiency change and technology change measured. \( EC^* > 1 \) means efficiency progress from period \( t \) to \( t+1 \). Similarly, \( TC^* \) denotes the technology movement over the period. Consequently, \( TC^* \) can be used to demonstrate technology progress if \( TC^* > 1 \). If the MPI value is greater than 1, the Decision-Making Unit (DMU) is more productive in the second year than in the first year.

With input and output data, distance functions can be constructed using the DEA method. Regarding the special characteristics of the tourism industry, which is composed of various inputs and outputs, the DEA model would be appropriate to measure productivity. The DEA method is a typical way of solving for the efficient frontier of a DMU by calculating the ratio of total weighted outputs to total weighted inputs. The variable return to scale model with output orientation is chosen in this study considering the high initial investment (Haugland, Myrtevit, and Nygaard, 2007) and dispersion of input and output variables (Keh, Chu, and Xu, 2006). To construct the model, similar assumptions are made that \( m \) types of inputs, denoted by \( x_i \), \( i = 1, 2, \ldots, m \), are used to produce a vector of \( q \) types of outputs, denoted by \( y_r \), \( r = 1, 2, \ldots, q \). To construct the variable return to scale model with respect to output orientation, the following linear programming is used to calculate \( D_t^*(x_t, y_t) \):

\[ D_t^*(x_t, y_t) = \min_\theta \left\{ \sum_{j=1}^m \lambda_j x_j^i \leq x_{i0}, \forall i = 1, \ldots, m; \sum_{j=1}^n \lambda_j y_j^i \geq \theta y_{r0}, \right\} \]

\[ \forall r = 1, \ldots, q; \sum_{j=0}^n \lambda_j = 1; \lambda_j \geq 0, \forall j = 1, \ldots, n \quad (5) \]

Also, in order to examine whether or not any frontier shift occurs among observed periods, the non-parametric Kruskal-Wallis rank test (1952) is adopted (Sueyoshi and Aoki, 2001). The statistic \( KW \) is calculated by:

\[ KW = \frac{12}{N(N + 1)} \sum_{i=1}^t \frac{R_i^2}{N_i} - 3(N + 1) \quad (6) \]

where \( N_i \) is the number of DMU of each period \( i \), \( R_i^2 \) is the square of the sum of the ranks of each period \( i \) and \( t \) is the number of periods. Under null hypothesis \( H_0 \) (see below), \( KW \) is approximately distributed as the \( \chi^2 \) with \( (t - 1) \) degrees of freedom.

\( H_0 \): A frontier shift does not occur among the observed periods.

**EMPIRICAL INVESTIGATION**

This study applies the MPI method to Chinese Rural tourism sectors on the provincial level. The input-output data of 2015 and 2017 was collected through various resources. Data set of the variables
is obtained from both official and unofficial accesses. Data from official accesses include information from governmental authorities such as the Chinese Ministry of Agriculture and the National Tourism Administration, provincial government annual reports and tourism statistics yearbooks. Unofficial accesses mainly refer to local news reports, and only two years’ data are available for now. To our knowledge, this is the first time in the literature that relevant data on rural tourism in China are used for quantitative analysis.

Variable Selection and Descriptive Statistics

Table 2 indicates the input/output variables employed to measure the efficiency of rural tourism in 25 provinces in China: Beijing, Shandong, Zhejiang, Fujian, Guangxi, Liaoning Jiangsu, Guangdong, Hainan Hebei, Henan, Shanxi, Anhui, Heilongjiang, Jiangxi, Jilin, Inner Mongolia, Tibet, Guizhou, Yunnan, Sichuan, Chongqing, Ningxia, Gansu, and Shaanxi. In 2017, China’s total rural tourism revenue exceeded 1.4 trillion yuan. According to the available data, the 25 provinces in our sample account for more than 90% of China’s total rural tourism revenue. Additionally, these data covering all demonstration counties and sites from those provinces are aggregated at provincial level. Furthermore, to better capture the five dimensions of rural tourism defined in our paper, we have carefully selected the variables used in our model. Input indexes, including the number of demonstration places of domestic agriculture/rural tourism (location, attractions, purpose), government spending (sustainability) and employees (stakeholders), are able to indicate the investment size of rural tourism and resource abundance. Output indexes consisting of rural tourism revenue (stakeholders) as well as the number of tourists (purpose, stakeholders), serve as vital indicators to assess the progress achieved in rural tourism. The choice of inputs and outputs in tourism production technologies follows recent studies on this topic (Liu et al., 2017; Luo and Qian, 2017). Descriptive statistics of variables used in the first step are represented in Table 3.

RESULTS

The data were analyzed by the output-oriented DEA method and MPI was used for determining the changes between 2015 and 2017 under the assumption of constant return to scale, as the objective is to deploy the resources endowment from an efficient way in order to maximize the results (Assaf and Josiassen, 2016; Dong et al., 2019). We start by presenting the output-oriented DEA efficiency scores in table 4. Next, we investigate dynamic change in Chinese rural tourism during the study period in table 5.

Efficiency Scores: Table 4 indicates that if we compare the three different regions in China, the average rural tourism efficiency (0.83) in the eastern region ranked first. Average efficiency

Table 2. Input and output variables

| Variables                      | Data Source                                           |
|--------------------------------|-------------------------------------------------------|
| Outputs                        |                                                       |
| O1-Rural tourism revenue       | Report from Ministry of Agriculture and Rural Affairs |
| O2-The number of tourists      | Report from Ministry of Culture and Tourism           |
| Inputs                         |                                                       |
| I1-The number of demonstration counties and sites | Provincial tourism statistics yearbooks               |
| I2-Government spending         | Provincial government annual reports                   |
| I3-Employee                    | Provincial tourism statistics yearbooks               |
scores seem to stay at the same level during the research period. Among the 10 provinces in the eastern region, there were 5 provinces, namely Beijing, Shandong, Zhejiang, Fujian and Guangxi, whose efficiency score was 1 in both years. In fact, only 7 out of 25 sampled provinces achieved an efficiency value of 1 in 2015 and 2017, and 5 of them are located in the eastern region. This can be explained by the fact that these areas are the provinces that promote rural tourism the most. Since the areas listed above are all relatively economically developed regions, it seems that the efficiency of rural tourism has a certain correlation with the economy (Xie, 2015). As a consequence, the lease economic development province, such as Hebei was the region that maintained the lowest rural tourism efficiency score (0.35).

The average rural tourism efficiency (0.65) in the western region ranked second in China. Efficiency level on average had decreased from 0.66 to 0.63 during the research period. Among these provinces and cities, Tibet and Shaanxi had the highest and lowest rural tourism efficiency respectively. The efficiency of rural tourism in Tibet was effective in 2015 and 2017, while that in Yunnan was only effective in 2015, and that in Guizhou was only effective in 2017. In addition, the efficiency of the remaining provinces was at a low level during the research period. The average rural tourism efficiency (0.64) of in the central region was the lowest in China. The average rural tourism efficiency score declined from 0.66 to 0.62 between 2015 and 2017. Among these provinces and regions, Henan had the highest rural tourism efficiency, which was always effective during 2015–2017. The rural tourism efficiency of the Inner Mongolia (0.12) was not only the lowest in the central region but also the lowest in the 25 sampled provinces and autonomous regions.

The above analysis revealing the advancement of Chinese rural tourism shows an obvious inequity. The eastern region shows the largest rural tourism efficiency compared with central as well as western parts, however, with less disparity between the central and Western areas. Bi, Luo and Liang (2011) believed that it is mainly attributed to the travel resources distribute in an unbalanced manner in diverse areas in China. When it comes to the economy, compared with the central and western regions, the eastern coastal areas such as Beijing, Jiangsu, and Zhejiang are densely populated, with developed economies and prosperous tourism. Additionally, in terms of rural tourism resource abundance, the rural tourism patterns in the eastern region are more diversified. For example, like Wang, et al. (2013) mentioned, the popular pastoral agriculture tourism, which includes rural tourism, garden travel and farming experience travel in rural areas, are mostly situated in the suburbs of large cities like Beijing and Shanghai. Moreover, the major style of this tourism is weekend travel, generally lasting for one day or two. Also, the village and township tourism based on modern rural buildings, residential courtyards and street patterns, is mostly located in the eastern provinces. Typical examples are Han Cunhe in Beijing and Hua Xicun in Jiangsu province. Therefore, high economic level and

| Variables | N | Mean | Min | Max | Std |
|-----------|---|------|-----|-----|-----|
| Inputs    | I1(Unit) | 50 | 10.08 | 3.00 | 20.00 | 3.96 |
|           | I2(CNY 100 million) | 50 | 47.82 | 7.30 | 231.10 | 50.96 |
|           | I3(10 000 persons) | 50 | 41.13 | 1.00 | 122.00 | 31.82 |
| Outputs   | O1(CNY 100 million) | 50 | 602.59 | 3.60 | 2549.00 | 639.95 |
|           | O2(10 000 persons) | 50 | 1.63 | 0.06 | 4.45 | 1.13 |
Rich tourism resources ensure the eastern regions have a leading position in the country regarding to rural tourism efficiency. This finding once again proves that geographical location has a direct impact on the development of rural tourism, which has been mentioned in the previous literature review on factors affecting rural tourism.

- **Dynamic Analysis:** As discussed previously in this paper, Malmquist Productivity Index is applied to investigate the efficiency variation of rural tourism development in 25 Chinese provinces and cities between 2015 and 2017. Total factor productivity indicate by Malmquist index is split into

| DMU     | Efficiency (2015) | Efficiency (2017) | Average |
|---------|-------------------|-------------------|---------|
| Beijing | 1.00              | 1.00              | 1.00    |
| Shandong| 1.00              | 1.00              | 1.00    |
| Zhejiang| 1.00              | 1.00              | 1.00    |
| Fujian  | 1.00              | 1.00              | 1.00    |
| Guangxi | 1.00              | 1.00              | 1.00    |
| Liaoning| 1.00              | 0.94              | 0.97    |
| Jiangsu | 0.88              | 1.00              | 0.94    |
| Guangdong| 0.63             | 0.67              | 0.65    |
| Hainan  | 0.36              | 0.40              | 0.38    |
| Hebei   | 0.37              | 0.33              | 0.35    |
| Average | 0.82              | 0.83              | 0.83    |
| Henan   | 1.00              | 1.00              | 1.00    |
| Shanxi  | 0.86              | 0.76              | 0.80    |
| Anhui   | 0.93              | 0.68              | 0.79    |
| Heilongjiang | 0.68      | 0.78              | 0.73    |
| Jiangxi | 0.67              | 0.68              | 0.68    |
| Jilin   | 0.38              | 0.35              | 0.37    |
| Inner Mongolia | 0.11     | 0.13              | 0.12    |
| Average | 0.66              | 0.63              | 0.64    |
| Tibet   | 1.00              | 1.00              | 1.00    |
| Guizhou | 0.96              | 1.00              | 0.98    |
| Yunnan  | 1.00              | 0.86              | 0.93    |
| Sichuan | 0.85              | 0.80              | 0.83    |
| Chongqing| 0.53             | 0.44              | 0.48    |
| Ningxia | 0.34              | 0.40              | 0.37    |
| Gansu   | 0.35              | 0.37              | 0.36    |
| Shaanxi | 0.25              | 0.23              | 0.24    |
| Average | 0.66              | 0.64              | 0.65    |
| China   | Total Average     | 0.64              | 0.63    | 0.64    |
efficiency change (EC) and technological change (TC). The efficiency change is related to the optimal use of disposal resources, while the technological change is prone to represent the spread of optimal–practiced technology in managing the activity.

We begin by running the $K - W$ test to examine whether or not any frontier shift/efficiency change occur among observed periods in table 5. As it showed, the efficiency change and the technological change are both significant. This means there is indeed dynamic evolution for Chinese rural tourism during the study period.

Then, we present the result of MPI in table 6. Firstly, we observed that the EC was smaller than 1 from 2015 to 2017, which means that there was a decline in technical efficiency in most regions and that best practice techniques had not been effectively mastered or disseminated in the rural tourism industry.

Secondly, the TE score is smaller than 1 as well. This implies there is insufficient investment in newly emerging technologies including techniques and approaches and procedures or equivalent skill upgrades in rural tourism sector, since the introduction of newly emerging technology in rural tourism development is mostly responsible for technological reform.

Thirdly, we have observed variations in technical, technological and total efficiency among all provinces. Indeed, 9 provinces show a MPI larger than 1, suggesting the improvement of rural tourism development productivity in Jiangsu, Beijing, Guizhou, Inner Mongolia, Jilin, Gansu, Guangxi, Hainan and Tibet over the past 2 years. Particularly, Jiangsu had the fastest pace of progress with a record of 1.28. Xu and Pan (2017) mentioned that this achievement is attributed to the fact that in recent years, Jiangsu Province has focused on the development of differentiated product systems in the process of developing rural tourism. At present, a number of characteristic rural tourist sites such as Xinghua have been established, which has improved the competitiveness of rural tourism in the province. Nevertheless, although it is found that efficiency improved in those 9 provinces in the rural tourism sector from 2015 to 2017, their improvement of efficiency was stimulated by various elements. For example, the TE dominated the efficiency improvement in Beijing, Guizhou, Jilin and Guangxi, while it played a key role in increasing total efficiency in the remaining five provinces. Additionally, there were 16 provinces with n deterioration on MPI, indicating that a larger proportion of provinces didn’t achieve total productivity improvement in the rural tourism industry and that Zhejiang had the minimum record of 0.74. Yang (2018) pointed out that due to the lack of overall arrangement and planning for rural tourism in Zhejiang Province, there are many similar rural tourism sites in the same area. This makes the market disordered and the operators unprofitable, thus reducing the service quality and development efficiency. In addition, many rural tourism projects in Zhejiang province are managed independently by local farmers. The lack of professional knowledge of rural tourism development and management leads to poor service quality and chaotic management, which restricts the development of rural tourism and affects the improvement of tourism efficiency (Yang, 2018).

**DISCUSSION AND POLICY IMPLICATIONS**

Overall, by combing technical efficiency and technological change, the status quo of rural tourism development in different regions can be categorized into three types:

**Table 5. Kruskal–Wallis test Result**

| Kruskal–Wallis test | EC      | TC      | MPI     |
|---------------------|---------|---------|---------|
| Period              | 1.71*   | 18.69***| N.A     |

Note: *, **, *** indicate respectively significance at 10%, 5% and 1% level.
Provinces with improvement in efficiency and technology level. These include 5 provinces: Beijing, Guizhou, Guangxi, Jiangsu and Tibet. They were best–performers in terms of the development of rural tourism. They promoted the employment of inputs (low funds spending, low quantity of employees), the level of outputs application (high amount of revenue, high number of tourists) and the relationship between inputs and outputs. They also showed the technological progress in rural tourism. This result signified that rural tourism development in these provinces was on the right track. Therefore, these provinces should be encouraged to insist on their current management modes and development strategies.

Provinces with improvement in efficiency but a decrease in technology level. These include 11 provinces: Zhejiang, Fujian, Jiangxi, Guangdong, Hainan, Gansu, Ningxia, Inner Mongolia, Henan, Shandong and Heilongjiang. Rural tourism in these provinces would experience a significant breakthrough if they adopted new technologies in the process of rural tourism development. Therefore, these provinces should maintain their strengths in terms of the

Table 6. MPI Result of rural tourism in China between 2015–2017

| Rank | DMU         | EC  | TC  | MPI |
|------|-------------|-----|-----|-----|
| 1    | Jiangsu     | 1.13| 1.13| 1.28|
| 2    | Beijing     | 1.00| 1.18| 1.18|
| 3    | Guizhou     | 1.04| 1.07| 1.11|
| 4    | Inner Mongolia | 1.21| 0.87| 1.06|
| 5    | Jilin       | 0.92| 1.14| 1.05|
| 6    | Gansu       | 1.05| 1.00| 1.05|
| 7    | Guangxi     | 1.00| 1.02| 1.02|
| 8    | Hainan      | 1.13| 0.89| 1.01|
| 9    | Tibet       | 1.00| 1.00| 1.00|
| 10   | Liaoning    | 0.94| 1.05| 0.99|
| 11   | Shandong    | 1.00| 0.98| 0.98|
| 12   | Sichuan     | 0.94| 1.03| 0.97|
| 13   | Guangdong   | 1.06| 0.91| 0.97|
| 14   | Heilongjiang| 1.14| 0.84| 0.96|
| 15   | Fujian      | 1.00| 0.95| 0.95|
| 16   | Shaanxi     | 0.92| 1.02| 0.93|
| 17   | Shanxi      | 0.88| 1.03| 0.91|
| 18   | Jiangxi     | 1.02| 0.90| 0.91|
| 19   | Yunnan      | 0.86| 1.05| 0.91|
| 20   | Hebei       | 0.89| 1.00| 0.89|
| 21   | Chongqing   | 0.83| 1.07| 0.89|
| 22   | Henan       | 1.00| 0.83| 0.83|
| 23   | Anhui       | 0.73| 1.13| 0.83|
| 24   | Ningxia     | 1.18| 0.70| 0.82|
| 25   | Zhejiang    | 1.00| 0.74| 0.74|
|      | Average     | 0.99| 0.97| 0.96|
balanced application of inputs versus outputs, and at the same time make a larger in- vestment in new development techniques, approaches and procedures such as rural tourism e-commerce network (RTECS) in order to achieve better performance in the rural tourism industry. According to Wang, et al. (2013), a rural tourism e-commerce network is an Internet-based platform which achieves the integration of tourism-related information service, e-commerce and travel sector management. As a new tourism business model, RTECS will certainly further improve the future progress of rural tourism. In addition, it is recommended to make full use of the Internet, information technology and new media, such as Weibo and WeChat for rural tourism promotion, so as to expand the tourism market and increase its popularity.

- Provinces with deteriorating in efficiency but improvement in technology level. These consist of 9 provinces: Anhui, Chongqing, Hebei, Jilin, Liaoning, Shaanxi, Shanxi, Sichuan and Yunnan. These provinces bet on new technologies to promote rural tourism development, but they failed to make the application of inputs versus outputs balanced. The whole process is conflicting. Xie (2015) pointed out that a common problem in such provinces is the lack of overall planning for the advancement of rural tourism, which had resulted in repeated construction, waste of resources, single form and other issues. Therefore, they should pay extra efforts to make a profound investigation in resources tourist scenic spots, tourist sources, market size in order to find the best development mode. In the planning, it is suggested that the overall planning should be carried out before the commencement of the development so as to avoid waste of resources, and that product positioning should be arranged to highlight the characteristics of relevant tourist destinations.

In conclusion, the above assessment results show that almost all the major provinces mentioned above can be further adjusted to achieve the optimal-practiced mode for better development of rural tourism.

CONCLUSION

To conclude, this paper has made two main contributions. The first one is to redefine China’s rural tourism based on the five core dimensions: The government and businesses make joint effort to protect the environment and create socio-economic benefits in rural areas, thereby making it possible for the inhabitants in the city to study, experience and enjoy agricultural, natural, cultural and custom scenic spots and activities offered by the locals and local environments. Secondly, this paper employs CCR output-oriented DEA model as well as the Malmquist Productivity Index to evaluate the efficiency and efficiency change of rural tourism in major Chinese 25 provinces during the time period between 2015 and 2017. Efficient scores revealed that the overall development of rural tourism in China was inefficient, and its efficiency level was still low. It can also be seen that there exists an obvious regional difference in the advancement of rural tourism in China.

Besides, based on the results of the Malmquist productivity index, only 9 provinces achieved total productivity improvements in the rural tourism, and Jiangsu province had the maximum record of 1.28. The total-productivity index on average denoted that rural tourism didn’t grow, apart from a small portion of provinces. Even more, by breaking down the total productivity change into efficient and technological variation, the status quo of rural tourism development in different provinces can be categorized into three types. Provinces that achieved improvement in technical efficiency and technology level, already have an edge in managing and developing rural tourism. Therefore, it is necessary for them to continue their current management mode and development strategy so as to maintain their advantages as well as to attain higher improvement in the future. For provinces having made improvement in technical efficiency but not in technological variation, adding more investment in new development methods, procedures and techniques are necessary for increasing their total productivity efficiency. For provinces that have achieved technological change improvement but not
technical efficiency, extra efforts should be paid to make overall arrangement and planning for the advancement of rural tourism, to find the best-practice mode.

The rural tourism is one of the key sectors in the sustainable and low-carbon development of tourism industry. The paper’s conclusion identifies where Chinese provinces stand in terms of technological efficiency for rural tourism. The conclusion found here may give some valuable insight to governments in different providences to take strategic and tactical decisions in their further stages.

Some limitations may temper the generalizability of our results. First and foremost, our data only covered three years; rural tourism-related data continued to be updated. Estimation and conclusions may vary based on data for a longer period. Second, we tested rural tourism performance based on aggregate level data, future micro-level insights could be intriguing. Third, COVID-19 has had a severe impact on China’s tourism industry, so with the development of the pandemic, how the development of rural tourism will evolve will be a place of great interest for future study. Therefore, we call for future studies to collect data for a more extended period and via surveys and experiments with individual tourists. Relevant findings could shed further light on COVID-19’s impact on rural tourism development in China.

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**ENDNOTE**

1 The input set and input-oriented distance function can be defined in a similar way: 

\[ L(y) = \{ x : (x,y) \in T \}; \]

\[ D_i (x,y) = \sup_{\theta > 0} \left\{ x : (\theta x) \in L(x) \right\}. \]
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