



Research on the Supply Quality and Optimization of Tourism Public Service in China

Dongru Jiang, Dongling Xie

School of Geography and Environmental Science, Zhejiang Normal University, Jinhua, China
Email: 2457084283@qq.com

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Abstract

In the new era of booming all-for-one tourism development, tourism has increasingly become a key industry related to people's well-being. People put forward higher requirements for the equalization, comfort and convenience of tourism public services. Efficient supply of tourism public services is the internal requirement for tourism to enhance its core competitiveness and industry vitality, and it is also an inevitable choice for the development of global tourism. This paper uses DEA model, takes 31 provinces (autonomous regions and municipalities directly under the Central Government) in China as the research object, selects relevant variables according to the basic characteristics of tourism public services, and measures the supply efficiency of inter-provincial tourism public services from 2010 to 2020, and analyzes them from the overall, inter-provincial and regional levels. The results show that: on the whole, the improvement effect of comprehensive supply efficiency of tourism public services supply in this 10-year time series is not significant; In terms of pure technical efficiency, most regions actively carry out technological innovation and improve the quality and efficiency of tourism management level, and the decrease of return to scale is the crux of the slow improvement of comprehensive efficiency. From the inter-provincial point of view, the supply efficiency of tourism public service in individual provinces is low because of the blind investment, excessive investment and the low level of local economic development. From the regional point of view, China's three major economic zones supply comprehensive efficiency order: central region > eastern region > western region, the central 8 provinces are the most stable development. Therefore, this paper gives specific suggestions on optimizing the supply of tourism public services: give full play to the role of different supply subjects and explore diversified supply models; Actively technological innovation, the establishment of intelligent platform; Strengthen the resilience of enterprises, actively transform

and upgrade, and resist the uncertain risks of normalization of the epidemic. The purpose is to provide the reference of theory and practice for the sustainable and healthy development of China's tourism industry.

Subject Areas

Sociology

Keywords

Tourism Public Service, Supply Efficiency, DEA Model, Supply Optimization

1. Introduction

The report of the 19th National Congress of the Communist Party of China emphasized that people's sense of gain, happiness, and security should be more substantial and better guaranteed [1]. In the new era when all-for-one tourism (a comprehensive tourism development model that makes tourism the dominant industry and achieves organic integration of regional resources, industrial convergence, and social co-construction and sharing through systematic optimization of economic and social resources-particularly tourism resources, related industries, ecological environment, and public services within a region) is in full swing, the tourism industry has increasingly become a key industry related to people's well-being. People have put forward higher requirements for the equalization, comfort, and convenience of tourism public services (referring to a systematic service system led by the government, jointly participated in by the market and society, centered on meeting the public needs of tourists, including tourism infrastructure, public information, security guarantee, rights protection, etc.). At present, the contradiction between the people's growing tourism demands and the insufficient supply of tourism public services has emerged. For instance, the lack of public information in tourist destinations leads to mixed and confusing information that is difficult to distinguish; the absence of tourism protection mechanisms results in the inability to safeguard the rights and interests of individual tourists; the delayed availability of tourism-related products; and the recurring and persistent problems of one-day tours in various regions that have not been effectively resolved. These problems seem complex and unrelated, but in fact, they are all caused by the lack of tourism public service supply. Therefore, optimizing the supply quality of tourism public services is an important starting point for China to develop all-for-one tourism in the new stage. It is also the key to improving the quality and efficiency of the tourism industry, and it represents a profound and far-reaching transformation.

In 2017, the National Tourism Administration issued the "13th Five-Year Plan for National Tourism Public Services", which defined nine key tasks for the development of tourism public services during the "13th Five-Year Plan" period,

including improving infrastructure, optimizing the service system, and enhancing public information services. It also deployed 16 key projects for the future development of tourism public services, such as optimizing the 12301 service platform and building characteristic tourism service centers [2]. It provided an action guide to assist all regions in accelerating the construction of tourism public services. In 2018, the General Office of the State Council issued the “Guiding Opinions on Promoting the Development of All-for-One Tourism”, clearly putting forward the guiding ideology of strengthening infrastructure construction and releasing effective tourism supply, so that the development potential of more regions and more business forms could be unleashed [3].

In 2020, the novel coronavirus (COVID-19) rapidly swept across the country, causing a significant impact on various industries in China. People’s health and safety were severely threatened, and the cultural and tourism industry experienced even greater shocks. Faced with an unprecedented public health crisis, measures such as reducing mobility and avoiding gatherings severely affected the survival and development of major scenic spots, transportation, catering, and other sectors. Many tourism enterprises encountered issues such as tourist cancellations, insufficient revenue, suspension of production and operations, and cash flow difficulties. Therefore, under the pressure of economic downturn and the shadow of major epidemics, the resilience of the cultural and tourism industry has become a key factor determining its survival. The severe situation in the cultural and tourism sector has sounded an alarm for the supply of tourism public services and has also raised higher requirements. In the current era of normalized epidemic prevention, we must explore more channels and improve the quality and efficiency of tourism public service supply to actively promote the recovery of the tourism industry, enhance the resilience of the cultural and tourism industry, and provide a safer external environment and internal factors for the healthy and sustainable development of tourism.

Currently, after years of diligent efforts, China has initially established a tourism public service system. Research on tourism public services in China started relatively late, and both theoretical and practical achievements are limited. Local governments and cultural tourism management departments lack sufficient understanding of the demand, nature, and patterns of such services. During the exploration of construction, issues such as biased ideas and methods, and the frequent failure of mechanisms and functions, have inevitably emerged. Therefore, to maximize the effective supply of tourism public services, it is necessary to summarize domestic and international practical experiences, based on cross-sectional data from 31 provinces nationwide from 2010 to 2020, and use quantitative analysis methods to conduct both static and dynamic analyses of the supply efficiency of tourism public services. Find the problems that restrict development, and summarize general rules from multiple aspects, so as to provide effective practical guidance for optimizing the supply structure of China’s tourism public services and the healthy and sustainable development of the tourism industry.

2. Review of Domestic and International Literature

Research on tourism public services by foreign scholars began relatively early. Western countries have a high level of urbanization and a rapid development process, and they place greater emphasis on the construction of social public services. Their research on tourism public services has achieved substantial results, mostly focusing on specialized studies such as “tourist public transportation”, “tourist public information”, “tourist satisfaction”, and other specific branches of tourism public services. These studies emphasize the quality of tourism public services and tourist experience, with research methods primarily based on practical surveys. Foreign scholars often approach from the perspectives of tourists or tourist destinations. For example, Choi established a conceptual model and focused on the quality and frequency of information received by tourists as information recipients and its impact on their behavioral intentions and cognition. The results showed that there was a significant correlation between the two [4]; Woosnam examined the emotional connection degree of two popular tourist destinations on the Mexican border and pointed out that security guarantees are extremely important for tourists and the tourism industry. Tourists with high emotional connection have higher security [5]. Regarding the supply system, Albalade and Bel focused on the research on the importance of public transportation for urban tourism development. After long-term testing and practical validation, a mature and unified tourism public service system has been formed. As for the supply mechanism, most foreign scholars agree that it is divided into government entity, market entity, and social entity.

Domestic scholars started researching tourism public services relatively late. It wasn't until the early 21st century that there emerged complete and innovative discussions on tourism public services. Scholars mainly focused on aspects such as conceptual theory, system construction, spatio-temporal evolution, and satisfaction evaluation. Regarding the research on basic theories, Huang Yanling *et al.* studied the development of tourism public services from the perspective of supply-demand perception and analyzed its content, quality, system construction, and development expectations [6]. Xu Jufeng and Pan Yueran studied the theoretical cognition and practical judgment of tourism public services. They believed that as a public-welfare service, the supply mechanism of tourism public services is diversified, and its main content mainly includes three aspects: tourism infrastructure, tourism rights protection, and tourism destination promotion [7]. Wei Mingqiu creatively proposed the concept of value co-creation of tourism public services. Using the grounded theory, she analyzed the phenomenon of value co-creation of tourism public services participated by different tourism stakeholders at the international visiting points of social resources in Hangzhou, providing a theoretical tool for the development of public services in tourism destinations and the innovation of supply models [8]. Based on different disciplinary backgrounds, research scholars constructed different tourism public service systems. Wang Jiixin conducted a survey on the tourism supply-side and used the IPA research

method to construct a grid chart to analyze and evaluate the characteristics of tourism public service supply [9]. Ma Yaofeng *et al.* used the structural equation model to analyze the quality of public services for inbound tourism in Xi'an and its influencing mechanism [10]. Ma Huiqiang *et al.* extended the tourism public service system to an organism with richer connotations and comprehensively evaluated and analyzed the spatio-temporal evolution and influencing mechanism of the quality of China's tourism public services using the entropy method and GIS spatial analysis method [11]. Dou Yindi took Nanyue Town as a case and used the GIS spatial analysis and statistics method to study the spatial evolution law and characteristics of the elements of the tourism public service system and proposed targeted optimization strategies [12]. Lin Zhigang *et al.* conducted research on the development of the supply quality of ice-snow tourism public services in the Beijing-Tianjin-Hebei region promoted by the 2022 Beijing Winter Olympics. The synergy between the two is evident, and the ice-snow tourism public services continue to benefit [13].

3. Research Methods and Data Sources

3.1. Research Methods

1) Literature Research Method

This paper systematically analyzes the research progress of the supply system of tourism public services. It reviews the research content and connotations, and summarizes relevant research achievements on tourism public service supply and the tourism public service supply system using multiple databases such as CNKI and Wanfang. Based on the existing research results, this paper constructs its indicator system, innovates the research entry point of this study, and provides sufficient theoretical support and deeper research basis for the writing of this thesis.

2) Data Envelopment Analysis

Data Envelopment Analysis (DEA) is a novel systematic analysis method in the field of operations research, proposed by Charnes in 1978. It can evaluate the relative efficiency of decision-making units with multiple inputs and multiple outputs within similar research objects [14]. Depending on whether the scale returns are variable in the measurement, DEA models can be divided into the DEA-CRS model with constant returns to scale and the DEA-VRS model with variable returns to scale. In practical economic development, the actual production entities are not always in a rational state, and various factors in reality can lead to changes in scale returns. In the evaluation of tourism public service supply efficiency, for the supply side, controlling input quantity is a more effective approach. This is because government departments usually focus more on optimizing resource allocation within a given budget rather than simply pursuing maximum output. Therefore, in order to more accurately reflect the actual production frontier and achieve the optimal balance between minimizing input and maximizing output, this paper decides to adopt the variable-scale-effect model DEA-VRS and is oriented towards input. This can avoid the efficiency measurement deviation that the

CRS model may cause due to ignoring changes in scale returns, and is more in line with the management goal of the public sector “cost reduction and efficiency improvement”.

The comprehensive efficiency (TE) of tourism public service supply in this paper = pure technical efficiency (PTE) \times scale efficiency (SE). Assuming there are n independent decision-making units in the system (with multiple inputs and outputs), each decision-making unit DMU DMU_j ($j = 1, 2, \dots, n$) has m types of tourism public service supply input variables ($i = 1, 2, \dots, m$) and s types of tourism public service supply output variables ($r = 1, 2, \dots, s$) [15]. The i -th input amount is represented by x_{ij} , and y_{rj} is used to denote the j -th input amount in the r -th decision-making unit. The DEA-VRS model is expressed as [16]:

$$\min \left[\theta - \varepsilon \left(\sum_{i=1}^m s_i^- + \sum_{r=1}^s s_r^+ \right) \right] = v_d(\varepsilon)$$

$$\begin{cases} \sum_{j=1}^n x_{ij} \lambda_j + s_i^- = \theta x_{ij0} \\ \sum_{j=1}^n y_{rj} \lambda_j - s_r^+ = y_{rj0} \\ \sum_{j=1}^n \lambda_j = 1 \\ \lambda_j, s_i^-, s_i^+ \geq 0 \\ \lambda_j, s_i^-, s_i^+ \geq 0 \end{cases}$$

In Equation (1), x represents the input amount of factors of input and output, y represents the output amount, θ is the measured efficiency value of China's tourism public service supply (TE), λ_j ($\lambda_j \geq 0$) is the weight variable, S^- represents the slack variable, S^+ represents the residual variable, ε is a non-Archimedean infinitesimal. When $\theta = 1$ and $S^- = S^+ = 0$ are true, that is, when DMU lies on the boundary, it indicates that the tourism public service supply efficiency of the province is DEA effective; when $\theta = 1$ is true and S^- , S^+ are not all zero, it indicates that the tourism public service supply efficiency of the province is weakly DEA effective; when $\theta < 1$ is true, it indicates that the tourism public service supply efficiency of the province is non-DEA effective.

3.2. Data Sources

The input and output data of tourism public services in 31 provinces of China from 2010 to 2020, covering tourism infrastructure, public transportation, information consulting, safety assurance, and environmental services, are mainly sourced from the China Statistical Yearbook, the China Urban Construction Statistical Yearbook, and the China Tourism Statistical Yearbook, supplemented by provincial and municipal statistical bulletins. For the missing or untraceable items, the trend extrapolation method was used to fill in the blanks. Specifically, the linear interpolation method (applicable to single-year missing of continuous

variables) and the three-year moving average method (applicable to missing of starting/terminating years) were used. After statistics, the missing data accounted for 4.7% of the total sample size. Among them, the indicators of tourism information consultation had the highest missing rate (35.6%). After filling in the data, the test results showed no significant difference from the original data ($p > 0.1$).

4. Construction of the Tourism Public Service Indicator System

The study of the public service system in tourism focuses on efficiently integrating tourism resources and coordinating the organizational framework formed by multiple elements and departments within the tourism industry. The goal is to ensure the optimization of tourism public services [17]. As mentioned in the previous overview, many domestic researchers have conducted related studies on evaluation indicators for the tourism public service system. For example: Li Shuang and others believe that the supply of tourism public services is a dynamic process, primarily consisting of four categories: tourism infrastructure services (transportation facilities, recreational facilities), tourism industry guidance services (policies, regulations, public welfare services, planning and development), tourism public information services (networks, information consultation, interpretation), and tourism safety monitoring services (public safety, testing and assurance) [18]; Li Junpeng constructs the system from five aspects: tourism public information services, tourism public safety services, tourism public rescue services, tourism public environmental services, and tourism public transportation services [19]; Liu Changxue and Wang Degen select five observable variables—public information services, safety assurance services, administrative supervision services, convenient transportation services, recreational convenience services, and tourism reception services—to measure foreign tourists' satisfaction with tourism public services in Suzhou [20]; Cai Meng and Yang Chuankai propose five aspects—public infrastructure, public transportation services, public information services, public safety, and tourism talent development—to optimize the metropolitan tourism public service system [21]; Shang Yue assesses the current state of the entire service system construction in Hainan Province from five dimensions: tourism infrastructure, tourism public safety assurance services, tourism public information services, tourism monitoring and guarantee services, and tourism public information services [22].

4.1. Principles for Indicator Selection

The tourism public service system plays a crucial role in the tourism experience. Under the context of all-for-one tourism, the tourism and public service system increasingly emphasizes precise services, meeting individual needs, and providing comfortable leisure experiences. The integration of Internet+ has also introduced new concepts and technologies into the tourism public service system. Therefore, the construction of the tourism public service supply system must keep pace with

the times, adapt to trends, and change with circumstances. The indicator system selection in this study will adhere to the following principles.

1) Representativeness and Measurability

The representability of evaluation indicators refers to the ability to reasonably quantify and grade the indicators, making them practically feasible and measurable. When selecting indicators, one must consider their accessibility and their inherent characteristics. Indicators that are difficult to obtain can lead to data gaps, affecting the overall integrity of the research data; some indicators' characteristics are constantly changing, especially those related to tourism. Therefore, when choosing indicators, attention should be paid to the consistency of their scales, and the statistical standards and calculation methods should be unified. Indicators that are consistent overall, highly accessible, and have good micro-level detail can better serve scientific research.

2) Systematicity and Objectivity Principles

The evaluation of the tourism public service system needs to be conducted from multiple dimensions, with each dimension represented by several indicators. These indicators are characterized by being non-overlapping and mutually inclusive, forming a comprehensive evaluation indicator system. Therefore, when selecting indicators for the tourism public service system, it is necessary to consider the overall coordination, follow the principle of systematization, and determine appropriate scoring levels to form a relatively complete indicator system. The indicators are interconnected and mutually restrictive, capable of fully reflecting the entire supply system, thus enabling comprehensive and empirical evaluation. Additionally, the selection of the indicator system should respect the objectivity of China's tourism public service supply. The chosen indicators should be representative and objectively reflect the characteristics of public service supply efficiency in the research area, aiming to obtain more objective and authentic evaluation results.

3) Scientificity and Practicality Principles

The selection of each indicator should adhere to the principle of scientificity, which means that both theoretical basis and practical guidance are indispensable, rather than choosing indicators based on subjective guesses that cannot withstand theoretical and practical scrutiny. For the evaluation indicators in this paper, it is essential to follow objective realities and select indicators that can truly reflect and evaluate the situation to ensure the scientificity of the research. When designing indicators, the purpose is not only for research but also to guide practice. The indicators chosen in this paper aim to better improve and optimize the quality of China's tourism public service supply. Therefore, the evaluation indicators and the constructed indicator evaluation system must not only be capable of being investigated and sourced from data but also suitable for rigorous empirical analysis and evaluation.

4.2. Construction of the Indicator System

By extensively reviewing relevant literature, analyzing the reasons for selecting

various indicators in the tourism public service supply system and their scientific basis, and considering the availability of indicator data, as well as the compatibility with the research content of this paper and the DEA model, this study selected five criteria and fourteen indicators as input indicators, and two dimensions with four indicators as output indicators to evaluate the supply efficiency. Data from 31 provinces across the country from 2010 to 2020 were used, with these provinces' data serving as the basic decision-making units (DMUs) for measuring DEA efficiency values. The selection of input indicators is based on five fundamental aspects of tourism public services: tourism infrastructure, public transportation, information consulting, safety assurance, and environmental services. Starting from these five points, secondary indicators are established to measure the injection of tourism public service resources. Based on the characteristics of tourism public services, the output measurement indicators mainly include macro benefit data, which clearly reflect the direct effects of supply (See **Table 1**).

Table 1. Evaluation index system of China's tourism public service supply efficiency.

Indicator Category	Indicator Type	Indicator Name	Indicator Unit	Data Source	Processing Instruction
Input Indicator	Tourism Infrastructure	Number of Star-Rated Hotels	Units	The China Tourism Statistical Yearbook	Directly adopt the original data
		Number of Travel Agencies	Units	The China Tourism Statistical Yearbook	Directly adopt the original data
		Number of A-level Tourist Attractions	Units	The China Tourism Statistical Yearbook	Directly adopt the original data
		Number of Museums	Units	The China Tourism Statistical Yearbook	Directly adopt the original data
	Tourism Public Transportation	Public Library Floor Area per 10,000 People	Square meters per 10,000 people	The China Statistical Yearbook	Calculated based on the standardization of permanent residents population
		Public Bus and Taxi Vehicles per 10,000 People	Units	The China Statistical Yearbook	Directly adopt the original data
		Per Capita Urban Road Area	Square meters per person	the China Urban Construction Statistical Yearbook	Directly adopt the original data
		Number of Tourism Information Centers	Units	The China Tourism Statistical Yearbook	Directly adopt the original data
	Tourism Information Services	Annual Number of Tourism Policy Website Information Releases	Units	The China Tourism Statistical Yearbook	Directly adopt the original data
		Total Postal and Telecommunications Business Volume	Hundred Million Yuan	The China Statistical Yearbook	Directly adopt the original data

Continued

Output Indicators	Tourism Safety Assurance	Hospital Beds per Thousand People	Units per Thousand People	The China Statistical Yearbook	Calculated based on the standardization of permanent residents population
		Health Technicians per Thousand Population	Persons per Thousand People	The China Statistical Yearbook	Calculated based on the standardization of permanent residents population
	Tourism Environment Services	Per Capita Park Green Space Area	Square meters per person	the China Urban Construction Statistical Yearbook	Directly adopt the original data
		Number of Public Toilets per 10,000 People	Units per 10,000 People	the China Urban Construction Statistical Yearbook	Calculated based on the standardization of permanent residents population
	Tourist Scale	Domestic Tourism Numbers	Ten Thousand Person-Times	The China Tourism Statistical Yearbook	Directly adopt the original data
		Number of Inbound Tourists	Ten Thousand Person-Times	The China Tourism Statistical Yearbook	Directly adopt the original data
Tourism Revenue Level	Domestic Tourism Revenue	Hundred Million Yuan	The China Statistical Yearbook	Directly adopt the original data	
	Foreign Exchange Earnings from Tourism	Million USD	The China Statistical Yearbook	Directly adopt the original data	

5. Research Results and Analysis

5.1. DEA Measurement Results of Tourism Public Service Supply Efficiency

Table 2. Measurement results of China's tourism public service supply efficiency from 2010 to 2020.

Region	Provinces, Autonomous Regions, Direct-Controlled Municipalities	Comprehensive Efficiency (TE)			Pure Technical Efficiency (PTE)			Scale Efficiency (SE)		
		2020	2015	Decade Average	2020	2015	Decade Average	2020	2015	Decade Average
	Beijing	0.873	1.000	0.979	1.000	1.000	1.000	0.873	1.000	0.977
	Tianjin	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Hebei	0.777	0.794	0.873	1.000	1.000	0.968	0.777	0.794	0.864
	Liaoning	0.897	1.000	0.991	1.000	1.000	1.000	0.897	1.000	0.990
	Shanghai	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Jiangsu	1.000	1.000	0.971	1.000	1.000	0.986	1.000	1.000	0.986
East	Zhejiang	0.921	1.000	0.986	0.994	1.000	0.999	0.926	1.000	0.987
	Fujian	0.697	0.583	0.633	0.992	0.957	0.914	0.703	0.609	0.661
	Shandong	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Guangdong	1.000	1.000	0.942	1.000	1.000	0.987	1.000	1.000	0.947
	Hainan	0.432	0.307	0.372	1.000	1.000	0.922	0.432	0.307	0.366
	Eastern Average	0.872	0.880	0.886	0.999	0.990	0.980	0.873	0.883	0.889
	Shanxi	0.961	0.819	0.842	1.000	0.961	0.960	0.961	0.961	0.832

Continued

	Jilin	0.903	0.636	0.636	1.000	1.000	0.946	0.903	1.000	0.611
	Heilongjiang	0.868	1.000	0.606	1.000	1.000	0.976	0.258	1.000	0.618
	Anhui	0.980	0.906	0.907	1.000	1.000	0.968	0.980	1.000	0.898
	Jiangxi	0.940	0.742	0.810	1.000	1.000	0.951	0.940	1.000	0.796
Central	Henan	0.962	1.000	0.997	1.000	1.000	1.000	0.962	1.000	0.996
	Hubei	0.978	0.996	0.920	1.000	1.000	0.954	0.978	1.000	0.942
	Hunan	1.000	1.000	0.966	1.000	1.000	0.987	1.000	1.000	0.966
	Central Average	0.873	0.887	0.833	1.000	0.995	0.968	0.873	0.995	0.832
	Inner Mongolia	0.424	0.455	0.414	0.858	0.955	0.890	0.494	0.476	0.429
	Guangxi	1.000	0.762	0.876	1.000	1.000	0.980	1.000	0.762	0.865
	Chongqing	0.762	1.000	0.950	1.000	1.000	1.000	0.762	1.000	0.955
	Sichuan	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Guizhou	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Yunnan	1.000	0.736	0.802	1.000	0.977	0.945	1.000	0.753	0.816
	Tibet	0.619	0.962	0.600	1.000	1.000	0.963	0.619	0.962	0.598
West	Shaanxi	0.809	0.744	0.760	0.988	0.941	0.936	0.819	0.791	0.799
	Gansu	0.311	0.305	0.342	0.895	0.952	0.896	0.348	0.321	0.349
	Qinghai	0.177	0.169	0.171	0.912	1.000	0.908	0.194	0.169	0.171
	Ningxia	0.092	0.364	0.244	1.000	1.000	0.936	0.092	0.364	0.256
	Xinjiang	0.268	0.245	0.231	0.836	0.961	0.822	0.320	0.255	0.256
	Western Average	0.622	0.645	0.616	0.957	0.982	0.940	0.637	0.654	0.624
	National Average	0.775	0.791	0.773	0.983	0.990	0.994	0.782	0.797	0.777

This paper uses DEAP2.1 software to input the selected indicators of tourism public service supply inputs and outputs, then performs data decomposition and efficiency measurement over time series. The program calculates the comprehensive efficiency, pure technical efficiency, and scale efficiency of tourism public service supply for 31 provinces in China from 2010 to 2020. Due to space limitations, this paper only presents the average values of these three efficiency indices for across the mainland China's 31 provincial-level regions (autonomous regions, municipalities) in 2020, 2015, and the past 10 years in **Table 2**.

5.2. Empirical Analysis of the Efficiency of Tourism Public Service Supply

5.2.1. Overall Analysis

Between 2010 and 2020, the overall efficiency of China's tourism public service supply was generally low, with an average value of 0.773. The number of regions achieving effective tourism public service supply each year remained around 12, accounting for about 39% of the total study areas. Most regions did not achieve relatively effective comprehensive efficiency in tourism public service supply; however, the overall technical efficiency level of tourism public service supply was

relatively high compared to the comprehensive efficiency. During the study period, the mean technical efficiency across regions was 0.994. As of 2020, 87% of regions had technical efficiency values above the national average, and all regions in the central area achieved technical efficiency. Overall, there is a trend of “high in the southeast and low in the northwest,” with nearly half of the regions reaching relatively effective technical efficiency in tourism public service supply each year.

Since the comprehensive efficiency of supply (PE) = is composed of pure technical efficiency (PTE) \times and scale efficiency (SE), scale efficiency is the main reason for the relatively low comprehensive efficiency. The overall mean of scale efficiency in China’s tourism public service supply is 0.777. Among the provinces and cities, 25 regions have an average scale efficiency reaching the national average. There are significant differences in scale efficiency among provinces, especially in the western regions, where the mean (0.624) is far below the national average, and the fluctuations are large. This indicates that there are delays and deficiencies in tourism public service supply in the western regions. In other words, under a certain level of technical capacity, the service supply volume in these areas is below the optimal scale. The decline in comprehensive efficiency is caused by decreasing returns to scale and uncoordinated input-output ratios, leading to supply inefficiencies. The supply inputs of tourism public resources do not fully match the regional development needs. Overall, the growth rate of tourism public service supply efficiency during 2010-2020 was slow, and in recent years, there has even been a downward trend. Compared to 2015, all three efficiency indicators in 2020 were lower. On a national scale, the best period for comprehensive efficiency of tourism public service supply appears to be between 2014 and 2016.

5.2.2. Inter-Provincial Analysis

From a microscopic perspective analyzing data from various provinces, three regions in the country warrant attention. The first is Hainan Province, where its three supply efficiency values have long been at the bottom in the eastern region, lowering the average level of the eastern region. Reviewing ten years of data from this province, it is found that despite efforts to improve the technical efficiency of tourism public service supply, the scale efficiency remains difficult to break through and stays within a low range. The reasons for this are primarily that its economic strength and pillar industry capabilities are significantly less competitive than those of the eastern region and other developed provinces. Additionally, there may be a lack of clear and scientific planning in the investment in tourism public resources, with some blindness in the process, neglecting the characteristics of tourism public service demand and the coordination among supply departments, which can easily lead to blind or excessive investment [23]. Therefore, Hainan Province still has considerable potential and room for improvement in overall tourism public service input-output efficiency. As demonstrated by Han Fei’s research findings, Hainan Province needs to focus on details and human-centered care in improving its tourism information service sector and deepening conven-

ient and beneficial services. In the current context of Internet Plus, the service supply of smart tourism is particularly important and is also the core issue in Hainan's tourism development. Therefore, increasing precise investment in smart tourism supply is an effective quick measure to enhance Hainan's pure technical efficiency, which can not only improve tourists' travel experience but also stimulate local residents' enthusiasm for travel, thereby effectively increasing scale efficiency.

Two other regions that are quite representative and worthy of our attention are Ningxia and Qinghai. These two provinces have long ranked at the bottom in terms of the three supply efficiency values in the western region. The average comprehensive efficiency values of these two provinces over the past decade are both lower than 0.4, indicating that they have been in a low-level development range for a long time. A comprehensive analysis of the economic development level, local resource endowments, and industrial development driving forces of these two places shows that the low supply efficiency is mainly due to the relatively low levels of economic and social development, weak locational advantages and resource endowments, and an irrational input structure of tourism public service resources. Moreover, the tourism resources in these two provinces are relatively scattered, resulting in high costs for tourism public service supply. It is difficult to achieve agglomeration and scale effects, and a good industrial cluster cannot be formed. Therefore, the implementation effect of sharing tourism public service facilities is not optimistic, leading to low technical efficiency in the supply of basic public services. In short, there is no favorable external development environment, and the internal development model is extensive, with certain resource duplication and waste. Both of these two provinces are located in the Silk Road development belt. How to highlight the western culture by focusing on the Silk Road footprints and ethnic customs and create characteristic tourism brands is a question worthy of exploration in these two places. As typical examples in the west, the improvement of the scale efficiency in these two places can play a good exemplary role in breaking through the internal correlation of low-level development between provinces, absorbing the radiation effect of developed provinces, and improving the comprehensive efficiency of other western provinces.

5.2.3. Regional Analysis

By combining horizontal comparison and vertical comparison of 2015, 2020, and the ten-year average, the ranking of the comprehensive efficiency of tourism public services in China's three major economic regions is: Central region > Eastern region > Western region. The eight provinces in the Central region have developed most steadily and balanced, with a ten-year average of 0.833. In recent years, the "latecomer advantage" of the Central region has been more apparent, with abundant tourism resources, rich history, and a geographical advantage that connects the east and west and runs north to south. It has unique advantages in transportation and source markets, and due to the implementation of the "Central Rise Strategy" in recent years, there is greater emphasis on the mutual utilization of existing tourism resources, strategically integrating the tourism resources of the

eight provinces in the Central region, and striving for leapfrog industrial development. Therefore, in recent years, the tourism supply in the Central region has greatly improved both in external environment and endogenous development momentum. Compared to the Eastern region, there is greater potential for tourism market development and space for improvement in public service efficiency. The Eastern region has strong economic strength, a high level of social development, and a mature urbanization process. As a result, the region has ample funds and rich tax sources, and people's expectations for tourism public services are increasing, leading to a consistently high level of supply efficiency. However, in recent years, both technical efficiency and scale efficiency have shown a decreasing trend, indicating that after long-term rapid economic and social development, the Eastern region is now facing issues of stagnation. Therefore, the Eastern region's tourism industry urgently needs to establish a long-term mechanism for sustainable development, focusing on strengthening technological innovation, guided by new development concepts, comprehensively promoting innovation-driven growth, extending the industrial chain, and ensuring that while improving pure technical efficiency, services become more detailed and human-centered, and scale efficiency is expanded, enabling the Eastern region to exert a lasting radiating and driving effect on surrounding areas. Due to relatively lower levels of economic development, weaker locational advantages, and scarce resource endowments, the Western region has limited tourism public service supply, with some resource gaps, and generally a late start and immature development of tourism. As a result, its comprehensive efficiency of public service supply is relatively low, with some areas still facing issues such as poor supply stability, gaps in tourism infrastructure, and fragmentation. However, in recent years, under the influence of the "Belt and Road" initiative, tourism in the Western region has gradually shown a trend of exploring the footprints of the Silk Road, focusing on distinctive ethnic cultural tourism, and beginning to develop regional tourism brands. Its scale efficiency is also gradually improving in a favorable direction, but there remains significant potential for improvement in pure technical efficiency.

6. Policy Suggestions for Improving the Efficiency of Tourism Public Services

By conducting a comprehensive analysis, measurement, and empirical study on the efficiency of tourism public service provision in 31 provinces, municipalities, and autonomous regions across the Chinese mainland during the period from 2010 to 2020, and identifying the underlying causes of the low efficiency of tourism public service provision in different regions [24], it is possible to uncover the reasons for such inefficiencies. Therefore, it is necessary to improve the methods of tourism public service provision in order to effectively and reasonably utilize the existing tourism resources for development. Based on this, the following suggestions are proposed for the construction and development of tourism public services in China's tourist destinations:

6.1. Transforming Government Functions and Exploring Diversified Supply Options

In the context of the “Internet +” era, the domestic tourism market has become more extensive, and people’s expectations for the provision of tourism public services have also been increasing. The concepts of all-for-one tourism and mass tourism are flourishing. Therefore, we should, based on the expansion of the demand side, adapt to the all-for-one tourism era in a timely manner, focus on the supply side, actively explore channels, and explore more effective and diversified supply models. The traditional single tourism public service supply model is no longer able to meet the increasingly rising material and cultural needs of tourists and their yearning for a wonderful tourism experience. Therefore, the government needs to transform its functions, fully utilize the invisible hand of the market to play a role in the allocation of social tourism resources, widely attract more social forces to participate in the construction of the tourism public service system, and form a synergy on the supply side.

On the one hand, the public services provided by the government are generally implemented through resource allocation and project development. Pure financial investment is difficult to have the flexibility of the market and lacks certain sensitivity towards emerging business models. Therefore, introducing a market-oriented management model becomes particularly important. By leveraging the complementary strengths of the government and the market, and widely attracting social forces to participate, diverse market-oriented methods can be adopted to achieve the tripartite linkage effect of the government, the market, and social organizations. For example, through bidding, franchise operation, service outsourcing, etc., multiple supply entities can be established [25]. Compared to government departments, the management systems of private sectors are more flexible and their management experience is more extensive. They can precisely grasp the diverse needs of tourists and provide more precise services, thereby reducing the waste of tourism resources and alleviating the financial pressure on government departments. For instance, tourism stations, cultural exhibition halls, tourism service centers, and tourism toilets, etc., can provide tourism public services through the introduction of market-oriented operations through bidding. The government only needs to strengthen the source control of service quality and implement inclusive and prudent supervision, avoiding the absence of assessment and supervision mechanisms.

On the other hand, the government departments cannot ignore the power of various tourism organizations. They need to encourage and support the establishment and development of various tourism associations and chambers of commerce. The government departments need to better perform their functions and create a favorable market environment for quality improvement and tourism development. This will fully mobilize the strength of tourism organizations. Provide policy support, strengthen financial assistance, and offer talent introduction. Efforts should be made to form a quality improvement and tourism development pattern led by the

government, with enterprises taking the main responsibility, departments jointly participating, society involved, and multiple parties jointly governing.

6.2. Actively Promoting Technological Innovation and Establishing a Smart Platform

From the measurement of supply efficiency and the empirical analysis in the previous text, it can be seen that pure technical efficiency is not only an important factor affecting the overall supply efficiency of tourism public services, but also significantly influences the final implementation effect of tourism public services. Therefore, to create richer tourism experiences and stimulate the endogenous creative motivation of scenic spots, it is not only necessary to actively explore diversified tourism service supply, but also to pay attention to combining the actual conditions of the province, seeking newer types of tourism resources. And the Internet, as the “information superhighway”, can minimize the inefficiency of communication, smooth the communication channels for service supply, reduce information detours, and thus efficiently connect with the needs of tourists. Therefore, we should seize the opportunity, ride the fast train of the Internet dividend, fully utilize the network infrastructure and Internet technology support, and promote the construction of the “Internet +” platform for tourism public service supply.

For instance, in terms of tourism public information services, efforts should be made to build a smart tourism system, improve the 12301 service hotline and tourism consultation centers, and establish a distribution density of tourism electronic touch screens; in terms of tourism transportation services, integrate tourism resources, reasonably plan tourism public transportation routes, establish a smart transportation sign system, launch tourist special trains, and enhance the accessibility of tourist destinations; in terms of tourism safety guarantees, link up the Beidou system to improve safety emergency management measures, and perfect the facial recognition system for infrastructure, etc. By facilitating the information channels among the supply side, production side and demand side, the quality and level of tourism public services can be improved. Under the guidance of the intelligent tourism platform, fully carry out technological and institutional innovations, allowing the source of innovation to flow abundantly in the tourism public service supply side, thereby more accurately matching the tourism groups and avoiding inefficient supply and resource waste. Through various measures, while enhancing the pure technical efficiency, while meeting the universal needs of the public, it helps to provide more differentiated, personalized and highly gratifying public services.

6.3. Enhancing Enterprise Resilience and Actively Carrying out Transformation and Upgrading

Since 2020, China’s tourism industry has been severely impacted by the COVID-19 pandemic. Tourism enterprises such as restaurants, transportation, and accommodation have all faced the severe challenge of cash flow breakdown and the inability to sustain their operations. In 2020, the number of domestic tourists in China de-

creased by 3 billion, a drop of over 50%, and domestic tourism revenue decreased by 61% compared to the previous year. Overseas tourism was temporarily paralyzed. It is expected that the recovery period will be longer. After the arduous efforts of the Party and the people for three years, the domestic epidemic has been largely controlled, the prevention and control situation has been stable and improving, and the economy and the tourism industry have gradually recovered. Through this experience, improving the ability of tourism enterprises to resist uncertain risks and enhancing their resilience has become a consensus for the entire tourism industry.

In the face of this pandemic crisis, tourism enterprises should actively seize the opportunities hidden within the crisis. First, they should adjust their business strategies and shift to online operations. For example, they can adopt methods such as online ordering, online live streaming, and cloud tourism to sensitively capture the development direction of new business models, continuously supply new tourism products to users, integrate digital thinking, and conduct online tourism using technologies like AR and VR, in order to maintain customer loyalty, accumulate new user demands, and make “contactless tourism” a new trend. Changes in technology and expansion of thinking will bring unlimited possibilities. The digital transformation of enterprises is the most powerful way to enhance the resilience of tourism enterprises and resist the risk of cash flow breakdown. Secondly, we should attempt to expand the boundaries of tourism by exploring cross-industry cooperation. In the context of industry integration, there is ample room for further exploration in the “culture and tourism +” model, such as “tourism + film and television”, “tourism + agriculture”, “tourism + health”, and “tourism + technology” [26]. The cultural and tourism industry attracts other industries, while other industries empower the cultural and tourism industry. For instance, 3D experience centers and online digital cultural exhibitions, which are innovative products leveraging digital technology to enhance the cultural and tourism sector, help create captivating and multi-dimensional immersive tourism experiences. The new development concepts have provided a broad space and opportunities for tourism development under the pandemic’s normalization. Cross-border elements are fully integrating into all aspects of tourism public services supply, demand, and production. As the boundaries of the tourism industry expand and industrial clusters grow, in order to make the tourism industry ecosystem vibrant and achieve more efficient industrial development linkage, it is necessary to break down industry development barriers and carry out cross-border cooperation and coordinated development with the technology and film sectors, generating more added value and further forming scale economies, and improving the efficiency of tourism public services supply.

7. Conclusion and Discussion

This paper constructs an evaluation index system for the efficiency of tourism public service supply in China, and uses the DEA model to conduct a quantitative assessment of the efficiency of tourism public service supply in 31 provinces of

China from 2010 to 2020. It also conducts a comprehensive, provincial, and regional analysis of the reasons for the low efficiency of supply, and finally provides implementation suggestions for optimizing the supply. However, in general, there are still many deficiencies. Here, a summary and outlook are presented:

1) When constructing the index system, due to the wide coverage of tourism public services, it is difficult to cover all aspects when selecting the index parameters of tourism public services. Moreover, when using the DEA model for calculation, it is based on the assumption that input indicators and output indicators are equally important. However, the actual situation is not always in the ideal assumed state, and the weights of each indicator in the input-output ratio of tourism public service supply cannot be generalized. Therefore, the next step of this research should focus on constructing a more comprehensive and objective index system and scientifically and systematically assigning weights to each index.

2) This article focuses on the provincial scale as the research object and measures the efficiency of tourism public service supply during the decade from 2010 to 2020. However, this does not accurately explain the spatio-temporal differentiation and changing trend of the overall efficiency of tourism public services in China. To obtain a more detailed and precise spatiotemporal distribution and changing trend, it is necessary to further narrow the research target scale and extend the research period. Therefore, the public service entities at the micro-regional level are the main content that this article will focus on studying next.

Conflicts of Interest

The authors declare no conflicts of interest.

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