JKSCI

한국컴퓨터정보학회논문지
Journal of The Korea Society of Computer and Information
Vol. 30 No. 11, pp. 373-381, November 2025
https://doi.org/10.9708/jksci.2025.30.11.373

Analysis of Regional Efficiency of the Tourism Industry in China Inner Mongolia Autonomous Region

Zhang Jing*, Sangwook Kim**

*Doctor Student, Dept. of East-Asia Studies, Paichai University, Daejeon, Korea
**Professor, Dept. of China Trade and Commerce, Paichai University, Daejeon, Korea

[Abstract]

This study compares the efficiency of the tourism industry in the Inner Mongolia Autonomous Region of China across 12 regions. This study uses the number of travel agencies and hotels as input variables, and the number of tourists and tourism revenue as output variables, to analyze the Malmquist index. The results can be summarized in three points. First, the efficiency of the Inner Mongolia Autonomous Region's tourism industry is improving. This suggests that the future development potential of the Inner Mongolia Autonomous Region's tourism industry is significant. Second, the efficiency of the tourism industry in small and medium-sized cities is relatively higher than in large cities like Huhehaote or Baotou. This suggests that the tourism industry in these small and medium-sized cities holds relatively large potential for future development. Third, the efficiency of the tourism industry, which focuses on domestic tourists, is higher than that of the tourism industry, which focuses on foreign tourists.

▸ **Key words**: China, Inner Mongolia Autonomous Region, Tourism Industry, Tourism Revenue, Malmquist Index

[요 약]

소득수준이 높아지면서 관광산업은 지역경제발전에서 더욱 중요한 역할을 하고 있다. 본 연구는 중국 내몽고자치구의 12개 지역의 관광산업의 효율성을 비교한다. 본 연구는 여행사와 호텔 수를 투입변수로, 관광객 수와 관광수입을 산출변수로 사용하여 Malmquist 지수를 분석한다. 분석 결과는 세 가지로 요약할 수 있다. 첫째, 2002-2023년 기간 내몽고자치구 관광산업의 효율성이 향상되고 있다. 특히 코로나19 팬데믹 이후 관광산업의 효율성이 크게 향상되었다. 이는 내몽고자치구 관광산업의 미래 발전 잠재력이 상당함을 시사한다. 둘째, 중소도시의 관광산업 효율성은 후허하오터나 바오터우와 같은 대도시보다 상대적으로 높다. 이는 이러한 중소도시의 관광산업이 미래 발전 잠재력이 비교적 크다는 것을 시사한다. 셋째, 국내 관광객을 중심으로 하는 관광산업의 효율성이 외국인 관광객을 중심으로 하는 관광산업보다 높다.

▸ **주제어**: 중국, 내몽고자치구, 관광산업, 관광수입, Malmquist 지수

• First Author: Zhang Jing, Corresponding Author: Sangwook Kim
*Zhang Jing (479581403@qq.com), Dept. of East-Asia Studies, Paichai University
**Sangwook Kim (jinxiangyu@pcu.ac.kr), Dept. of China Trade and Commerce, Paichai University
• Received: 2025. 10. 22, Revised: 2025. 11. 06, Accepted: 2025. 11. 12.

http://www.ksci.re.kr pISSN:1598-849X | eISSN:2383-9945

I. Introduction

With rising incomes and improved living standards, tourism has evolved from a luxury enjoyed by a select few to a widespread lifestyle. Besides satisfying the people's growing cultural and spiritual needs, the tourism industry is playing an increasingly prominent role in driving consumption upgrades[1], promoting local and regional economic development[2], and upgrading the industrial structure[3]. According to statistics from China's National Bureau of Statistics, approximately 870 million domestic tourists visited China in 2003, generating approximately 344.2 billion yuan in tourism revenue. By 2023, the number of domestic tourists nationwide had reached 4.891 billion peoples, with tourism revenue reaching approximately 4.91 trillion yuan. Over the past 20 years, China's tourism industry has grown rapidly, becoming both a new driver of regional economic development and a key driver of coordinated regional economic development[1]. However, the spatial distribution of tourism development across China is uneven. While the eastern coastal regions developed tourism earlier, boasting relatively well-developed infrastructure and a mature market economy, the central and western regions boast more abundant tourism resources. However, due to constraints in transportation, funding, and market conditions, the speed and quality of tourism development vary considerably[2]. The Inner Mongolia Autonomous Region (IMAR) is a resource-rich and frontier province in China. With its vast territory and diverse natural ecosystems, including grasslands, deserts, forests, lakes, and wetlands, and rich ethnic cultural heritage, it is one of China's most diverse and diverse geo-tourism regions[4]. In recent years, driven by China's Western Development Strategy, the Belt and Road Initiative for international economic cooperation, and the Yellow River Basin ecological protection and high-quality development strategy, the Inner Mongolia Autonomous Region's tourism industry has entered a period of rapid development. Statistics from the Inner Mongolia Autonomous Region's Department of Culture and Tourism indicate that the region received 230.45 million domestic tourists in 2023, a 149% increase compared to 2022. Domestic tourism revenue in 2023 reached 335.47 billion yuan, a 218% increase compared to 2022, the highest growth rate in nearly a decade. Compared to 2003, the number of tourists received and total tourism revenue in the Inner Mongolia Autonomous Region have increased by more than five times and nearly 13 times, respectively, demonstrating the rapid expansion of the tourism industry. However, these data reveal that simply demonstrating an increase in the scale of the tourism industry doesn't necessarily translate into a simultaneous improvement in its efficiency, nor does it reveal differences in development quality within the region[5]. Measuring the quality of the tourism industry requires not only its overall scale but also its input and output—that is, its efficiency. Differences in tourism industry development levels can be explained by efficiency. Analysis of tourism industry efficiency can explain the scale and quality of the tourism industry. The scale of a tourism industry does not necessarily equate to its quality. Efficiency can be used to compare differences in the quality of tourism industry development. Compared to 2003, the number of tourists received and total tourism revenue in the IMAR increased by more than five times and nearly 13 times, respectively, in 2023. However, the efficiency of the tourism industry is another issue. Based on this, this paper also uses the DEA-Malmquist index method to analyze the efficiency of the tourism industry in the IMAR. The input variables in this paper include the number of travel agencies and the number of star-rated hotels, while the output variables include the number of tourists and tourism revenue. The analysis period is 2003-2023, and since 2020-2022 coincides with the pandemic, this analysis can explain changes in the efficiency of the tourism

industry in the IMAR during the pandemic. Unlike previous studies, this paper compares 12 prefecture-level cities in the IMAR. Because the IMAR has a unique geographical environment, with an east-west geographic distance exceeding 2,000 kilometers, the development of its tourism industry exhibits geographical characteristics. The DEA-Malmquist index not only measures static efficiency levels but also analyzes dynamic efficiency trends and the contribution of technological progress. Through efficiency analysis, this paper reveals the periodic fluctuations in efficiency levels in the IMAR's tourism industry over its 20-year development period. This provides strategic references for the high-quality development of the region's tourism industry and offers lessons for the development of tourism industries in other less-developed regions.

II. Literature reviews

The DEA-Malmquist index is often used in tourism industry efficiency analysis. In a cross-national study, Zofío (2007) further combined the DEA-Malmquist index with decomposition methods, breaking down efficiency changes into three dimensions: technological progress, technical efficiency, and scale efficiency[6]. Assaf and Josiassen (2012) used the DEA-Malmquist index to conduct a dynamic analysis of tourism industry productivity in 10 major countries between 2000 and 2009[7]. Wu and Lin (2022) used a dynamic DEA method to measure the dynamic efficiency of the tourism industry and evaluated the tourism performance of Asian cultural tourism destinations [8]. Sánchez (2024) analyzed the DEA efficiency of Spanish coastal tourist areas and used the Tobit model to measure the factors influencing efficiency[9]. Guo and Guo (2024) proposed applying a hybrid DEA-Malmquist index approach to the dynamic measurement of urban tourism eco-efficiency[10]. Furthermore, Cotte and Pardo (2024) calculated the tourism efficiency index for Latin American countries and then used stochastic frontier analysis to study changes in the efficiency of the tourism industry[11]. Scholars in China are also concerned about the efficiency analysis of the tourism industry, mainly efficiency estimation at the regional and enterprise levels, and analysis from the perspective of spatial and temporal dynamic evolution. Li Xiaxi (2017) used the DEA model to compare the comprehensive efficiency, technical efficiency, and scale efficiency of the tourism industry in the IMAR. Efficiency index data revealed uneven development of the tourism industry in the IMAR, with some geographical variations[12]. Liu Yixuan (2021) used the DEA multi-model combined with the benchmarking management method to study the efficiency of rural homestay tourism in pastoral areas[13]. Tian Zhifu (2023) measured the level of public services for tourism in the IMAR based on the entropy method, spatial autocorrelation, and geographic detectors, and explored its spatial pattern and driving factors[14]. Based on panel data from nine prefecture-level cities in the IMAR from 2011 to 2019, Wang Qingyu (2025) used the entropy method to calculate the development levels of the digital economy and tourism, and quantified the level of coordinated development between the two systems using a coupled coordination model[15]. Research on tourism industry efficiency is becoming increasingly mature, with the DEA-Malmquist index becoming a mainstream analytical tool. However, existing research also has certain shortcomings. First, foreign research has mostly focused on the national or city level, with few systematic studies focusing on frontier provinces and regions with unique locations and resource endowments. Second, while Chinese domestic research has produced significant results in inter-provincial comparisons, analysis of efficiency differences within regions with vast geographical disparities, such as the IMAR, is relatively weak. Based on this, this paper will focus on the IMAR and use the

DEA-Malmquist index to not only examine the overall efficiency evolution, but also further analyze the efficiency differences within the region.

III. Tourism Industry Development in the IMAR

1. Development Conditions

The development conditions for the tourism industry in the IMAR can be summarized into three main points. First, the IMAR boasts abundant tourism resources and significant natural advantages[16]. Second, the tourism industry continues to expand, driving the coordinated development of related industries. In recent years, the tourism industry has continued to grow in scale, gradually becoming a major pillar of the IMAR's economic development. Third, the policy system is becoming increasingly well-developed, with clear strategic goals for tourism development. The IMAR fully recognizes the important role of tourism in promoting economic development towards transformation, upgrading, and a green and ecological model. It is continuously enriching its systematic, phased, and multi-tiered support and guarantee policies to form a policy support system to ensure the high-quality development of the tourism industry[17]. At the macro level, the IMAR's 14th Five-Year Tourism Development Plan proposes the development goals of building a world-renowned eco-cultural tourism destination and reaching 190 million tourists and 500 billion yuan in total tourist revenue by 2025.

2. Number of Tourists

From an overall perspective, the number of tourists received by the IMAR from 2003 to 2023 showed rapid growth with periodic significant fluctuations (Figure 1). In 2003, the IMAR received a total of 13.24 million tourists, of which Chinese tourists accounted for inbound tourists for 3.12% In 2023, the IMAR received a total of 142.50 million tourists, 10.76 times the number of Chinese tourists in 2003.

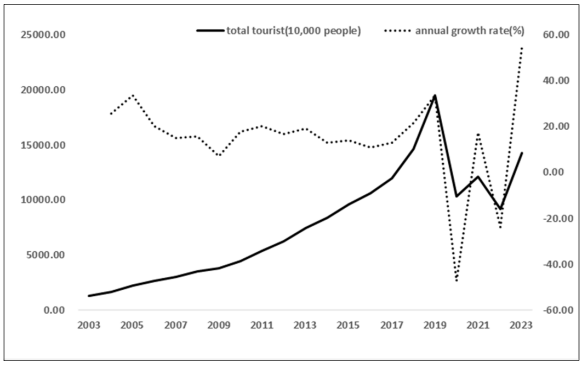


Fig. 1. Trends of Total Tourist in IMAR
source: Inner Mongolia Statistical Yearbook

This demonstrates a significant structural shift towards Chinese domestic tourists, with the proportion of inbound tourists continuing to decline. Calculated at an annualized rate, the compound annual growth rate of tourist arrivals from 2003 to 2023 is approximately 12.61%.

Table 1. Percentage of tourists in 12 IMAR regions (2023, %)

regions	Total Tourist	Domestic Tourist	Foreigner Tourist
Huhehaote	12.98	13.79	30.02
Hulunbeier	11.43	12.14	25.82
Eerduosi	10.72	11.42	7.15
Baotou	9.85	10.49	5.27
Chifeng	9.31	9.92	5.41
Tongliao	9.14	9.74	5.91
Xilinguole	8.80	9.38	4.70
Wulancabu	7.09	7.55	4.33
Xingan	5.20	5.54	3.36
Bayanzhuoer	3.30	3.51	2.32
Alashan	3.30	3.51	2.96
Wuhai	2.82	3.01	2.75

source: Inner Mongolia Statistical Yearbook

Looking at the regional distribution of tourists in 2023(Table 1), Huhehaote has the highest share at 12.98%, followed by Hulunbeier at 11.43% and Eerduosi at 10.72%. These three regions also account for the largest proportion of domestic tourists, with Baotou also accounting for 10.49%. Most foreign tourists are concentrated in Huhehaote and Hulunbeier. Although their numbers are small, they account for 30.02% and 28.82% of

all foreign tourists, respectively.

3. Tourism Revenue

From 2003 to 2023, total tourism revenue in the IMAR grew rapidly, but with periodic fluctuations (Figure 2).

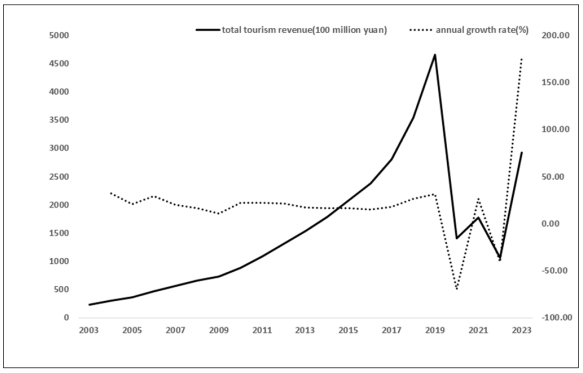


Fig. 2. Trends of Total Tourism Revenue in IMAR
source: Inner Mongolia Statistical Yearbook

In 2003, total tourism revenue in the IMAR was 22.79 billion yuan. By 2023, tourism revenue will have risen to 292.64 billion yuan, a 12.84-fold increase from 2003. Domestic tourism revenue will account for 291.12 billion yuan, while foreigner tourism revenue will account for 1.52 billion yuan. Calculated based on average annual growth rates, total tourism revenue will increase by approximately 13.61% per year from 2003 to 2023, slightly exceeding the growth rate in tourist arrivals. This indicates that the industry's product structure, per capita spending, and supply capacity are generally evolving in a long-term, coordinated manner, with both quantity and price, largely in sync with the number of visitors. Tourism revenue peaked in 2019 (465.23 billion yuan), reached a low point in 2022 (105.85 billion yuan), and then rapidly climbed to 292.64 billion yuan in 2023, still somewhat below 2019. In terms of composition, the proportion of domestic revenue in China continues to expand, becoming a key source of recovery and growth. The proportion of foreigner tourism income has dropped from 4.25% in 2003 to 0.52% in 2023, indicating that the inbound high-value-added market needs to be further cultivated.

Table 2. Percentage of tourism revenue in 12 regions (2023, %)

regions	Total Tourism Revenue	Domestic Tourism Revenue	Foreigner Tourism Revenue
Huhehaote	24.06	24.05	26.22
Hulunbeier	13.89	13.85	19.32
Baotou	13.17	13.22	4.21
Eerduosi	10.77	10.82	3.38
Chifeng	8.90	8.93	3.57
Tongliao	8.80	8.83	4.11
Xilinguole	7.23	7.12	24.80
Wulancabu	5.39	5.40	2.74
Xingan	2.12	2.12	2.35
Bayanzhuoer	2.33	2.32	3.62
Alashan	2.00	1.99	3.42
Wuhai	1.35	1.34	2.25

source: Inner Mongolia Statistical Yearbook

According to 2023 data, Huhehaote, Hulunbeier, Baotou, and Eerduosi account for a relatively high proportion of tourism revenue, similar to the number of tourists. These four regions also account for a relatively high proportion of domestic tourism revenue. Huhehaote accounts for 25.05% of IMAR's domestic tourism revenue, while Hulunbeier and Baotou account for 13.85% and 13.22%, respectively. Huhehaote, Xilinguole, and Hulunbeier account for a relatively high proportion of foreign tourism revenue.

IV. Efficiency Analysis

1. Method

This study analyzes the efficiency of tourism industry in China IMAR, using the Malmquist index. The Malmquist index is one of the most frequently used methods in studies when analyzing efficiency of tourism industry. The Malmquist index has the advantage of analyzing dynamic efficiency over a certain period of time. In particular, the Malmquist index has become a more useful analysis tool because it can distinguish whether changes in efficiency simply depend on quantitative inputs or improvements in structural efficiency[18]. When interpreting the analysis results of the Malmquist index, it is more accurate to interpret an increase

in the index value as improving efficiency rather than interpreting it as efficiency. This is because the Malmquist index analyzes dynamic efficiency rather than static efficiency. And when comparing different DMUs, it is more accurate to express that the degree of improvement in efficiency is relatively large or small. The Malmquist index(tfpch) can be further divided into efficiency change(effch) and technological change(techch). Efficiency change can be interpreted as indicating the impact of structural efficiency improvement on efficiency in the relationship between inputs and outputs. And technological change can be interpreted as improving efficiency depending on quantitative input.

2. Input and Output Variables

This study analyzes the efficiency of the tourism industry in China's IMAR. Efficiency analysis relies on defining input and output variables, as these can directly impact efficiency outcomes. Building on existing research, this study defines two input variables: the number of travel agencies and the number of star-rated hotels. This study uses tourism revenue and the number of tourists as output variables. When considering the tourism industry as a single industry, tourism revenue and the number of tourists are direct outputs. And all of these data are from the Inner Mongolia Statistical Yearbook. This study uses data from 12 prefectures and cities in the IMAR to compare the regional efficiency of the tourism industry. The 12 prefectures and cities include Huhehaote, Baotou, Hulunbeier, Xingan, Tongliao, Chifeng, Xilinguole, Wulancabu, Eerduosi, Bayanzhuoer, Wuhai, and Alashan. The analysis period for this study is set at 2002-2023. Since the 2000s, China's domestic tourism industry has experienced rapid growth. Therefore, the analysis period covers the period after 2000. Notably, this study includes the COVID-19 pandemic period. When analyzing efficiency using the DEA-Malmquist index, it's crucial to distinguish between input-oriented and output-oriented approaches. This study assumes output-oriented approaches, as the input variables (the number of travel agencies and hotels) are less likely to change compared to the output variables.

3. Efficiency Analysis Results

Table 3 compares the Malmquist index (tfpch) results for 12 regions. According to Table 3, the efficiency of the IMAR's tourism industry improved by 4.8% between 2003 and 2023. This is because the tfpch is 1.048. The primary factor behind this efficiency improvement is not efficiency improvement (effch), but technological progress (techch).

Table 3. Efficiency Analysis Results of Total Tourism Industry

regions	effch	techch	tfpch
Huhehaote	0.948	0.974	0.924
Baotou	0.951	1.001	0.951
Hulunbeier	0.965	1.035	0.998
Xingan	0.971	1.055	1.025
Tongliao	0.977	1.047	1.023
Chifeng	1.007	1.029	1.036
Xilinguole	1.011	1.093	1.105
Wulancabu	1.012	1.109	1.123
Eerduosi	1.009	1.089	1.099
Bayanzhuoer	0.989	1.119	1.106
Wuhai	0.984	1.117	1.099
Alashan	0.979	1.136	1.113
Mean	0.983	1.066	1.048

Efficiency improvement refers to an ideal relationship between inputs and outputs. However, during this period, the effch of the IMAR's tourism industry actually worsened by 1.7%, reaching 0.983. Conversely, the techch, which represents technological progress, improved by 6.6%, reaching 1.066. Technological progress represents improved efficiency due to increased scale. In summary, the efficiency improvement in the IMAR's tourism industry between 2003 and 2023 was primarily due to the expansion of the industry's scale. Second, the efficiency of the tourism industry in regions with relatively high tourist numbers and tourism revenues is deteriorating. According to Tables 1 and 2, Huhehaote, Hulunbeier, and Baotou are regions with relatively high tourist numbers and tourism

revenues. However, Huhehaote's tfpch was 0.924, a 7.6% deterioration in efficiency. Baotou's tfpch was 0.951, a 4.9% deterioration. Hulunbeier also saw a 1.2% deterioration. However, Eerduosi's tourism industry efficiency improved by 9.9%. Regions with relatively low tourist numbers and tourism revenues have tfpch values greater than 1, which can be interpreted as improving efficiency. This suggests that the improvement in tourism industry efficiency in the IMAR is more pronounced in relatively underdeveloped regions than in regions with a developed tourism industry. These analytical results provide important implications for the development of the IMAR's tourism industry. This highlights the need for strategies to improve efficiency in regions where the existing tourism industry is relatively underdeveloped. Table 3 present the results of an efficiency analysis of the tourism industry, which combines domestic and international tourists. Because the IMAR is located on the northern border of China, it has relatively few foreign tourists compared to other regions, with domestic tourists accounting for the overwhelming majority. Therefore, to compare the efficiency of the tourism industry, which focuses on domestic tourists, with that of the foreign tourists, we analyzed the Malmquist index by distinguishing between domestic and foreign tourists, and domestic and foreign tourism revenues.

Table 4 compares the efficiency of the domestic tourism industry in 12 regions. As in Table 3, the tfpch values for Huhehaote, Baotou, and Hulunbeier are all less than 1, indicating that the efficiency of the domestic tourism industry in these three regions is deteriorating. Huhehaote's efficiency deteriorated by 7.5%, Baotou's by 5.0%, and Hulunbeier's by 0.5%. However, the remaining regions with relatively small domestic tourist populations showed improvement in efficiency. The average Malmquist index across the 12 regions was 1.048, representing a 4.8% improvement in efficiency. This is consistent with the results in Table 3 for all tourists. Regions with relatively large domestic tourist populations and revenues exhibit relatively low efficiency, while regions with relatively small domestic tourist populations and revenues exhibit high efficiency. These results provide important implications for the future development strategy of the IMAR's tourism industry. This is because areas where the existing tourism industry has developed need to make efforts to improve efficiency.

Table 4. Efficiency Analysis Results of Domestic Tourist

regions	effch	techch	tfpch
Huhehaote	0.948	0.975	0.925
Baotou	0.950	1.001	0.950
Hulunbeier	0.963	1.034	0.995
Xingan	0.970	1.056	1.024
Tongliao	0.975	1.048	1.021
Chifeng	1.007	1.028	1.035
Xilinguole	1.011	1.093	1.105
Wulancabu	1.012	1.109	1.123
Eerduosi	1.009	1.089	1.099
Bayanzhuoer	0.989	1.120	1.108
Wuhai	0.984	1.119	1.101
Alashan	0.979	1.137	1.113
Mean	0.983	1.066	1.048

Table 5 present the results of an analysis of the efficiency of the tourism industry in the IMAR, centered on foreign tourists. Table 5 compares the efficiency of the tourism industry, which focuses on foreign tourists, across 12 regions. The tfpch of the tourism industry, which focuses on foreign tourists, is 0.963. This represents a 3.7% decrease in efficiency.

Table 5. Efficiency Analysis Results of Foreign Tourist

regions	effch	techch	tfpch
Huhehaote	0.915	1.006	0.920
Baotou	1.030	1.053	1.085
Hulunbeier	1.013	1.010	1.024
Xingan	1.012	1.009	1.021
Tongliao	1.011	1.084	1.096
Chifeng	0.995	1.094	1.089
Xilinguole	1.005	1.086	1.092
Wulancabu	0.992	1.094	1.086
Eerduosi	0.697	1.085	0.756
Bayanzhuoer	0.681	1.071	0.729
Wuhai	0.801	1.023	0.820
Alashan	0.887	1.071	0.950
Mean	0.911	1.057	0.963

What differs from the efficiency analysis of the domestically-focused tourism industry is that the tfpch values for Baotou and Hulunbeier are greater than 1. Baotou's efficiency improved by 8.5%, and Hulunbeier's by 2.4%. However, Huhehaote, the administrative capital of the IMAR, still experienced an 8.0% decrease in efficiency. Another difference is that the tfpch values for Bayanzhuoer, Wuhai, and Alashan are all less than 1. While these regions exhibited values greater than 1 when their tourism industries focused on domestic tourists, they all exhibited values less than 1 when their tourism industries focused on foreign tourists. This is because these regions have very small numbers of foreign tourists.

V. Conclusions

This study uses the number of travel agencies and hotels as input variables, and the number of tourists and tourism revenue as output variables, to analyze the Malmquist index. The results can be summarized in three points. First, the efficiency of the IMAR's tourism industry is improving. In particular, since the COVID-19 pandemic, the efficiency of the tourism industry has improved significantly. Second, the efficiency of the tourism industry in small and medium-sized cities is relatively higher than in large cities like Huhehaote and Baotou. Third, the efficiency of the tourism industry, which focuses on domestic tourists, is higher than that of the tourism industry, which focuses on foreign tourists. This study analyzes the efficiency of the tourism industry in the IMAR using the Malmquist index. This study uses only the number of travel agencies and hotels as input variables. Various other tourism industry input variables, such as transportation and restaurants, could be considered. Due to data availability, this study only uses the number of travel agencies and hotels. However, expanding the input variables would allow for a more comprehensive assessment of the efficiency of the tourism industry. This will require continued consideration in future research.

REFERENCES

[1] Li, Y. C., "Research on the impact of tourism industry policy on tourism economy: A discussion on effective market and able government", Jiangsu Commercial Forum, No.10, pp.73-78+86, 2025. DOI:10.13395/j.cnki.issn.1009 -0061.2025.10.008.

[2] Wang, H., He, X., Zhang, H., "Bibiometrics analysis of research hot sports and trends of development in rural tourism industry based on Cite Space", Anhui Agricultural Science Bulletin, Vol.31, No.12, pp.137-144, 2025. DOI:10.16377/j.cnki.issn1007-7731. 2025.12.033.

[3] Li, J. Y., Li, P. F., Wang, Z. X., "Research on the mechanism of digital economy empowering high-quality development of the tourism industry", Journal of Entrepreneurship in Science & Technology, Vol.38, No.08, pp.151-159, 2025. DOI:10.3969/j.issn. 1672-2272.202505076.

[4] Li, S. N., "Research on the innovative development of tourism industry in Inner Mongolia", Northern Economy, No.8, pp.57-60, 2023. DOI:10.3969/j.issn.1007-3590.2023.08.016.

[5] Feng, D., Liu, T., 2024, "Problems and paths for high-quality development of Inner Mongolia's tourism industry", Western Travel, No.18, pp.10-12, 2024.

[6] Zofío, J. L., "Malmquist productivity index decompositions: A unifying framework", Applied Economics, Vol.39, No.18, pp.2371 -2387, 2007. DOI:10.1080/00036840600606260.

[7] Assaf, A. G., Josiassen, A., "Identifying and ranking the determinants of tourism performance: A global investigation", Journal of Travel Research, Vol.51, No.4, pp.388-399, 2012. DOI:10.1177/0047287511426337.

[8] Wu, Y. C., Lin, S. W., "Efficiency evaluation of Asia's cultural tourism using a dynamic DEA approach", Socio-Economic Planning Sciences, Vol.84, No.1, pp.122-127, 2022. DOI:10.1016/ j.seps.2022.101426.

[9] Sánchez-Sánchez, F. J., Sánchez-Sánchez, A. M., "Evaluating the efficiency and determinants of mass tourism in Spain: A tourist area perspective", Portuguese Economic Journal, Vol.23, No.1, pp.111-145, 2024. DOI:10.1007/s10258-022-00228-9.

[10] Guo, Y., Guo, J., "Dynamic analysis of ecological efficiency in urban tourism industry based on DEA-Malmquist model", Informatica, Vol.48, No.18, pp.54-71, 2024. DOI:10.31449/ inf.v48i18.6172.

[11] Cotte Poveda, A., Pardo Martínez, C. I., "Efficiency and sustainability of the tourism industry in Latin America", Regional Sustainability, Vol.4, No.1, pp.1-4, 2024. DOI:10.1016/j.regsus.

2024.100178.

[12] Li, X. X., "Analysis of urban tourism efficiency in IMAR based on DEA model", New West, No.12, pp.12,14, 2017.

[13] Liu, Y. X., "Evaluation of the efficiency of rural homestay tourism in pastoral areas of IMAR based on DEA multi-model and benchmarking management method", Rural Economy and Science- Technology, No.17, pp.311-313, 2021.

[14] Tian, Z. F., Yu, Y. J., "Public tourism services in Inner Mongolia: level measurement, spatial pattern and driving factors", Journal of Inner Mongolia University of Finance and Economics, Vol.21, No.03, pp.70-75, 2023. DOI:10.13895/j.cnki.jimufe.2023.03.008.

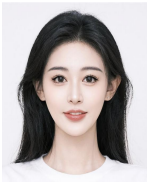
[15] Wang, Q. Y., "Research on the strategy of digital economy empowering tourism development in Inner Mongolia from the perspective of coupling coordination", Marketing Management Review, No.18, pp.99-101, 2025. DOI:10.19932/j.cnki.22-1256 /F.2025.06.099.

[16] Li, M. Q., "Research on the problems and countermeasures of tourism development in IMAR from the perspective of people's livelihood", Popular Science & Technology, No.1, pp.211-213, 2023.

[17] Zhang, Z. Y., "A preliminary discussion on the development of tourism industry clusters in IMAR", Inner Mongolia Science Technology & Economy, No.18, pp.112-114, 2022.

[18] Liu, L., Kim, S. W., "Analysis of utilization efficiency of airports in Sichuan and Chongqing, China", Chinese Studies, Vol.85, pp.567-592, 2023.

Authors



Zhang Jing is currently a Ph.D. student in the Department of East Asian Studies at PaiChai University, Korea. She is interested in regional economics, public finance and economic modelling.

Sangwook Kim received the B.S. and M.S. degrees in Economics from Kyungpook National University, Korea, in 1996, 1998 and received Ph.D. degrees in Regional Economics from Nankai University, China, in 2002.

Dr. Kim joined the faculty of the Department of China Trade and Commerce at Paichai University, Daejeon, Korea, in 2008. He is interested in regional economics, urban economics, economic modelling.