Measuring the Productivity of Tourism Sector in Indonesia

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This study aims to measure tourism productivity in Indonesia using the Malmquist Productivity Index (MPI) method with the 2010-2020 research period. The research object used is 34 provinces in Indonesia. The data for this research comes from the annual APBD report in each province. The input variables in this study are the economic sector budget and the tourism and cultural budget. While the output is tourism and culture. The results of this study explain that during the 2015-2020 period, the productivity level of provincial tourism in Indonesia has a fluctuating trend from year to year. Based on the average TFPCH score, it is concluded that tourism productivity has shown a decline and technological change has not contributed optimally to increasing tourism productivity in Indonesia. Furthermore, tourism productivity when the Covid-19 pandemic occurred was still declining. Then, analysis of the Malmquist Index quadrant shows that the provinces of Indonesia dominate quadrant 3, namely 22 provinces, which are then followed by quadrant 4 with a total of 12 provinces.

Keywords: Productivity; Tourism; Province of Indonesia; Malmquist Productivity Index (MPI)

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INTRODUCTION

Traveling or traveling to different locations with the intention of gaining experience or visiting certain places is one of the activities that has the potential to stimulate and strengthen the economic sector. This is due to the influence of individual travel on the tourism sector in an economic context, such as transportation, accommodation and food consumption. Research conducted by Mudrikah et al (2014) revealed that the impact of tourism activities has a significant contribution to a country's economic growth. Especially in Indonesia, the tourism sector is an important sector for the economy, this is because the tourism sector has experienced a significant increase in recent years (Utami & Kafabih, 2021). In Haryana's research (2020) it is also explained that the competitiveness of the Indonesian tourism sector has increased and has encouraged an increase in the number of tourist visits, thereby making a positive contribution to the national economy.

In 2020, the travel and tourism sector in Indonesia contributes around 3.2 percent to Indonesia's GDP (Statista, 2023). In addition, tourism has become a significant source of foreign exchange earnings for Indonesia. Foreign tourists visiting Indonesia bring foreign currency, which contributes directly to the country's economic strength. According to data from the Indonesian Central Statistics Agency (BPS), in 2019, the tourism sector contributed 5.96% to Indonesia's total foreign exchange earnings. In addition, the tourism sector has created significant employment opportunities for Indonesians. Starting from workers in the tourism sector such as tour guides, restaurant waiters, taxi drivers, to supporting sectors such as banking, construction services, and the handicraft industry, all are involved in the tourism value chain. According to data from the Indonesian Ministry of Tourism and Creative Economy, in 2019, the tourism sector provided employment for around 13.5 million people throughout Indonesia.

The large contribution of the tourism sector to the economy is supported by increased tourist arrivals, both foreign and domestic, as well as increased investment in the tourism sector. According to data from the Ministry of Tourism and Creative Economy 2022, foreign tourist arrivals to Indonesia from 2016 to 2019 continued to increase to a high of 16.11 million visits in 2019, an increase of 4.59 million visits compared to 2016. Increased tourist interest due to Indonesia's natural resources, such as rainforests, beaches, and coral reefs, which are significant attractions for tourists. Bali and Yogyakarta are the most popular tourist destinations in the country because of their natural beauty. This shows that the Indonesian tourism sector has great opportunities to develop (Moslehpour et al., 2023; Pham & Nugroho, 2022).

However, the development of the Indonesian tourism sector still faces several obstacles including the indigenous private sector having limited experience with tourism as an industry, lack of promotion and marketing, security and stability issues, inadequate infrastructure, underdeveloped human resources, and still a lack of investment. in the tourism sector (Wall & Nuryanti, 2008; Ministry of Tourism and Creative Economy, 2020; World Travel and Tourism Council, 2020). In addition, according to Wilopo et al (2020) only a few local governments in Indonesia have progressively followed in the footsteps of their predecessors in developing profitable tourist destinations, which has also become one of the obstacles to the growth of the tourism sector.

Seeing the various potentials and challenges faced by the Indonesian tourism sector, it is necessary to carry out further analysis regarding the productivity of Indonesian tourism. Kopelman (1986) explains that productivity is the proportion of one or more physical outputs to the physical inputs used in production. In other words, total production (output) is affected by the amount of capital and labor invested. Productivity measurement is used to see how far the provinces in Indonesia are productive in developing their tourism sector. In addition, measuring tourism productivity helps identify the right factors that contribute to productivity growth in the industry, which in turn can help policy makers design policies that promote productivity growth and long-term sustainability (Brien et al., 2022). Joppe & Li (2014) explained that measuring tourism productivity provides an overview of industry performance, which can help stakeholders identify areas that need improvement. Furthermore, measuring tourism productivity can help identify factors that drive productivity in the industry, such as human resources and innovation such as technology adoption (Saragih & Monika, 2020).

There are several studies that examine tourism in Indonesia, including Haryana (2020) explaining the economic impact and welfare of the Indonesian tourism sector; Chamidah et al (2021) examined the synergy of Penta Helix elements as an effort to develop tourist villages in Indonesia; Yamin et al (2021) analyzed Indonesia's tourism potential through the perspective of sustainable tourism in the new normal era; Soeswoyo et al (2021) explain tourism potential and strategies for developing competitive rural tourism in Indonesia; Vu

& Hartley (2022) describe the drivers of growth and pursuit in the tourism sector of the industrial economy; Ollivaud & Haxton (2019) examines related to utilizing tourism in Indonesia to encourage sustainable regional development; Saragih & Monika (2020) explain the total factor productivity of the tourism economy in Indonesia based on an analysis of input-output tables; Liu & Wu (2019) examines the transmission mechanism between tourism productivity and economic growth; and Karya et al (2019) explain the management of smart tourist destinations in Karangasem Regency, Indonesia.

Research related to tourism productivity is very important to see how far provinces in Indonesia are productive in developing their tourism sector. This research will try to analyze the productivity of Indonesian tourism using the Malmquist Productivity Index (MPI). Given that there are still research gaps on this topic. So there is an urgency to develop research related to tourism productivity.

PREVIOUS STUDY

According to the World Tourism and Travel Council (WTCC), tourism refers to all the activities of individuals who travel and live in a location that is different from their daily environment in less than one year, for recreational, business and other purposes. Tourism is a social, cultural and economic phenomenon involving the movement of individuals to countries or places outside their normal environment, whether for personal, professional or business reasons.

According to Bank Indonesia (BI), the tourism sector is the most effective sector in increasing Indonesia's foreign exchange earnings. One of the factors is because the resources needed for tourism development can be found within the country (Rahma, 2020). Utami & Kafabih (2021) also stated that tourism has significant consequences for the economy, the natural environment, local communities in destinations, and the tourists themselves. The impact involves the factors of production required to produce the goods and services consumed by tourists, as well as the stakeholders involved in the tourism sector. Moslehpour et al (2023) also explained that tourism can be a source of income for the country, creating job opportunities, infrastructure development, and cultural exchange.

Therefore, a holistic approach is needed in developing tourism destinations, tourism management, or monitoring tourism activities. One measurement that can be implicated in seeing the development of Indonesian tourism. Measuring productivity can be done by comparing inputs in the form of economic sector budgets and tourism and culture budgets with outputs in the form of tourism and culture. To calculate productivity, the relationship between output and input is used (Mongid & Tahir, 2010).

Kopelman (1986) explained that productivity describes the relationship between one or more physical outputs with the physical inputs used in production. Fare et al (1994) divided productivity into smaller segments based on the efficiency generated through innovative technological advances. In this case, output is assumed to be constant, while the total factor productivity growth index captures technological changes. Therefore, Total Factor Productivity (TFP) can be seen as an indicator of changes in technology and performance that can be measured and modified by considering the inputs used. In other words, as productivity increases in an industry, more output can be achieved with the same inputs.

Research related to tourism productivity in Indonesia is still very rarely carried out, among relevant studies, namely Saragih & Monika (2020) explaining the total factor productivity of the tourism economy in Indonesia based on an analysis of input output tables. In this study, it was explained that the Indonesian government had determined the tourism sector as one of the priority sectors to drive the Indonesian economy. The target for the contribution of Gross Domestic Product (GDP) from tourism is 8 percent of total GDP in 2019. Since 2010 the number of foreign tourists coming to Indonesia has increased every year. However, the share of GDP from tourism has remained stable at 4 percent. The specific objective of this research is to analyze the TFP of the tourism sector in Indonesia. The results of the analysis found that changes in the tourism sector's TFP were relatively small and tended to be negative for each economic sector related to tourism.

Ollivaud & Haxton (2019) examines related to utilizing tourism in Indonesia to encourage sustainable regional development. In this study it is explained that tourism has developed rapidly in Indonesia in recent years and has become one of the main sources of foreign exchange earnings. Indonesia has rich and diverse natural wealth, whose tourism potential is still underutilized. The government has an ambitious target of attracting 20 million tourists by 2019, up from nearly 14 million in 2017. Upgrading local residents' tourism-related skills will provide them with a wider range of employment opportunities. This calls for reform of education and vocational training. In addition, recent efforts by the authorities to improve the business environment need to be continued, including by helping

companies embrace digitalization. Tourism may be growing too fast in some destinations without adequately considering sustainability issues, both for the environment and local communities. Better planning and coordination across all levels of government and across relevant policy areas can facilitate more sustainable tourism development.

Liu & Wu (2019) examine the transmission mechanism between tourism productivity and economic growth. The results of the analysis show the impact of tourism productivity on economic growth and describe spillover effects between tourism and other sectors caused by externalities of physical and human capital and public services. The simulation results further reveal that when overall economic productivity increases, domestic tourism demand increases more than domestic tourism demand, whereas when tourism sector productivity increases, domestic tourism consumption increases more than incoming tourism consumption.

Other studies include Haryana (2020) explaining the economic impact and welfare of the Indonesian tourism sector; Chamidah et al (2021) examined the synergy of Penta Helix elements as an effort to develop tourist villages in Indonesia; Yamin et al (2021) analyzed Indonesia's tourism potential through the perspective of sustainable tourism in the new normal era; Soeswoyo et al (2021) explain tourism potential and strategies for developing competitive rural tourism in Indonesia; Vu & Hartley (2022) describe the drivers of growth and pursuit in the tourism sector of the industrial economy; and Karya et al (2019) explain the management of smart tourist destinations in Karangasem Regency, Indonesia.

Based on some of the studies above, there is no research that specifically addresses tourism productivity in Indonesia using the Malmquist Productivity Index (MPI). Therefore, the purpose of this research is to analyze Indonesia's tourism productivity during 2015-2020 using the MPI.

METHODOLOGY

The Malmquist index is a useful measuring tool in measuring productivity, which was first introduced by Sten Malmquist in 1953, but later developed again by Caves et al. (1982). This index has two measurement dimensions namely catch-up effect which measures the rate of change in efficiency relative to the first period to the second period, and frontier shift effect, measures the rate of technological change, the combination of inputs and outputs from the first to the second period. Frontier shift effect also known as the innovation effect (Caves et al., 1982; Rani et al., 2017; Rusydiana & Widiastuti, 2018).

To measure the Malmquist productivity index in this study using DEAP 2.1 software as an analysis tool. This research was conducted in 34 provinces in Indonesia during the period 2015 to 2020. All data used was collected from provincial budgets on the official website of the Central Statistics Agency (BPS) and other relevant institutions such as the Ministry of Tourism and regional website portals for each Indonesian province. In selecting the sample, all relevant data is required over a five-year period from 2015 to 2021, resulting in a sample of 34 provinces in Indonesia.

The data used in the productivity analysis includes inputs, namely the economic sector budget and the tourism and cultural budget. While the output is tourism and culture. The calculation of tourism productivity uses the BCC or VRS approach with output orientation. Furthermore, the estimation of TFP growth and its components refers to the Malmquist index and uses the Cobb-Douglas production function.

Furthermore, in this study the method used to measure efficiency is part of the Data Envelopment Analysis (DEA), namely the Malmquist Productivity Index (MPI). Then, changes in total factor productivity (TFPCH) can be divided into changes in technology (TECHCH) and changes in efficiency (EC) (EFFCH). The efficiency change index can be further decomposed into a PECH (pure efficiency change) component which is calculated comprehensively against the VRS technology, and a SECH (scaling change) component which captures the change in deviation between the VRS technology and CRS.

Factors that influence changes in productivity can be seen through the values of the efficiency change index (EFFCH) and the technology change index (TECHCH) to explain the reasons for changes in productivity. In addition, the pure efficiency change index (PECH) and scale efficiency change index (SECH) are used to determine the cause of the change in efficiency change index (EFFCH). The total factor productivity (TFP) value shows the change in index. M value > 1 indicates increased productivity; M = 1 indicates no increase in productivity; and M < 1 indicates a decrease in productivity.

The Malmquist index has several advantages that make it the right choice for measuring productivity. First, this index is a non-parametric method, so it does not require specification of the production function. Second, the Malmquist index does not require assumptions about the behavior of economic units of

production, such as minimizing costs or maximizing profits. Third, the calculation of this index does not require price data which is often not available, so it is very helpful if the destination is a different or unknown manufacturer. Fourth, the Malmquist productivity index can be divided into two components, namely changes in efficiency and changes in technology (Marlina et al., 2018).

ANALYSIS RESULTS

Tourism Productivity in Indonesia

The table below describes the results of the analysis using the Malmquist Productivity Index (MPI) from 34 provinces in Indonesia which are the objects of observation in this study.

Table 1: Average Score of Indonesia's Malmquist Tourism Index per Year

Year	EFFCH	TECHCH	PECH	SECH	TFPCH
2015-2016	0,988	1,073	0,981	1,007	1,060
2016-2017	1,017	0,944	1,018	0,999	0,960
2017-2018	1,027	0,955	1,021	1,005	0,980
2018-2019	0,922	1,026	0,923	0,999	0,946
2019-2020	1,093	0,904	1,093	1,000	0,988
Mean	1,008	0,978	1,006	1,002	0,986

The table above describes changes in the total productivity (Tfpch) of tourism in Indonesia and the factors that influence them, namely changes in technology (Techch) and changes in efficiency (Effch) during the observation period. From the MPI results in 34 provinces in Indonesia, it can be concluded that productivity trends fluctuate from year to year.

If analyzed further, in the 2015-2016 period tourism productivity in Indonesia has increased with a score of (1.060) which is also the highest productivity level during the six research periods. Where, in this period the increase in productivity was caused by an increase in technological change (1.073) which was also the highest technological change throughout the study period, while changes in efficiency decreased (0.988). That means, in the 2015-2016 period changes in technology have made an optimal contribution, while changes in efficiency have not contributed optimally to the level of tourism productivity in Indonesia.

Furthermore, in the following period 2016-2017, Indonesia's tourism productivity level has decreased (0.960). The cause of the decline in Indonesia's tourism productivity in this period was a decrease in technological change (0.944), although changes in efficiency showed an increase (1.017) compared to the previous period. This explains that, even though efficient changes show an increase, technological changes have decreased so that it has an impact on the level of productivity of Indonesian tourism which has decreased.

In the following period 2017-2018, the productivity level still showed a decline (0.980) even though the productivity value increased when compared to the previous period. In this period, changes in efficiency still showed an increase (1.027) and changes in technology showed a decrease (0.955). It can be concluded in this period that technological changes have contributed more to the decline in the productivity level of Indonesian tourism.

Then, in the 2018-2019 period the productivity level decreased significantly (0.946) and was the lowest productivity level throughout the research period. In this period, changes in efficiency also decreased significantly (0.922) and became the lowest level of efficiency throughout the period, while changes in technology increased (1.026). Although changes in technology have increased, changes in efficiency have shown a significant decline, affecting the productivity level of Indonesian tourism which has decreased.

Finally, for the 2019-2020 period Indonesian tourism still experienced a decline in productivity (0.988) even though its productivity value increased compared to the previous period. The cause of the decrease in productivity in this period was dominated by technological change which decreased significantly (0.904) and became the lowest technological change throughout the study period, although the change in efficiency itself experienced a significant increase (1.093) and was the highest level of efficiency change throughout the study period.

Overall, it can be concluded from the results of the average MPI score, it shows that the value of tourism productivity in Indonesia has decreased (0.986) caused by a decrease in technological change (0.978) and an increase in efficiency change (1.008). This explains that technological change has contributed more to the decline in tourism productivity in Indonesia.

The figure below shows trends in tourism productivity in Indonesia throughout the study period.

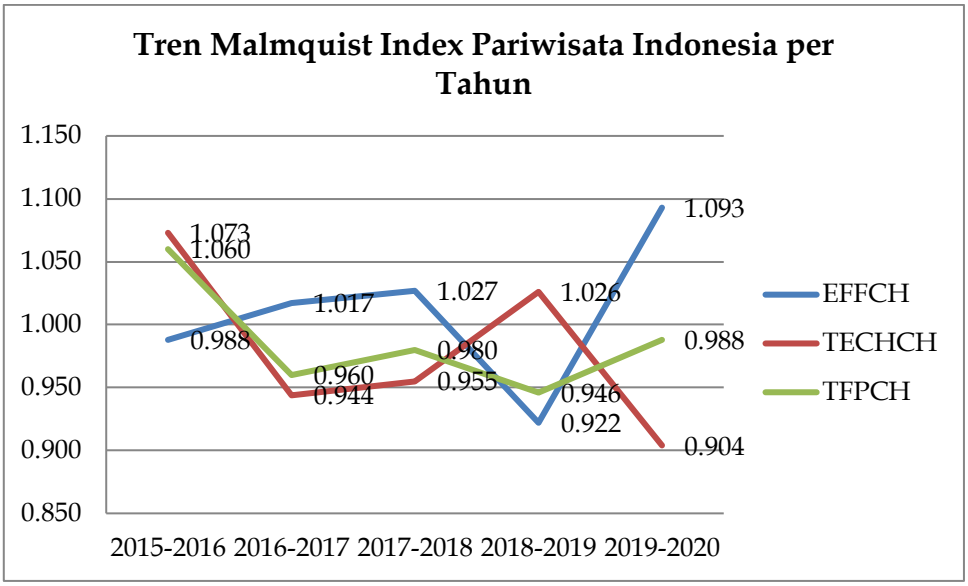

Figure 1: Trends in Indonesia's Malmquist Tourism Index per year

It can be concluded based on the figure above, that both changes in efficiency (EFFCH), changes in technology (TECHCH) and productivity (TFPCH) both experienced fluctuations throughout the study period. The lowest decline in technology change occurred in 2019-2020, while in efficiency and productivity changes in 2018-2019. The period with the highest levels of productivity and technological change occurred in 2015-2016, while changes in efficiency occurred at the end of the research period, namely 2019-2020. At the end of the research period, namely 2019-2020, the phenomenon of the Covid-19 pandemic occurred which of course this could affect the level of productivity of Indonesian tourism, given the implementation of policies starting from*social distancing* until*stay at home* which makes most of the tourist spots temporarily closed. The closure of tourism certainly makes managers do not get income, which affects the decline in the level of productivity of Indonesian tourism.

Summary of the Malmquist Tourism Index per Province in Indonesia

The next analysis is seen from the productivity of Indonesian tourism per province based on the Malmquist Productivity Index (MPI).

Table 2 Average Tourism Productivity per Province in Indonesia

Provinsi	EFFCH	TECHCH	PECH	SECH	TFPCH
Provinsi Aceh	1,039	0,982	1,036	1,004	1,021
Provinsi Sumatera Utara	1,033	0,985	1,032	1,001	1,017
Provinsi Sumatera Barat	1,034	0,984	1,031	1,003	1,017
Provinsi Riau	1,012	0,982	1,009	1,003	0,993
Provinsi Jambi	0,996	0,978	0,993	1,003	0,974
Provinsi Sumatera Selatan	1,022	0,978	1,026	0,997	1,000
Provinsi Bengkulu	1,002	0,978	1,001	1,002	0,981
Provinsi Lampung	0,983	0,980	0,981	1,002	0,963
Provinsi DKI Jakarta	1,016	0,980	1,017	0,999	0,996
Provinsi Jawa Barat	0,999	0,980	1,014	0,986	0,979
Provinsi Jawa Tengah	0,989	0,981	0,991	0,998	0,970
Provinsi DI Yogyakarta	1,005	0,981	1,004	1,001	0,985

Provinsi Jawa Timur	1,020	0,974	1,014	1,006	0,994
Provinsi Kalimantan Barat	1,021	0,975	1,015	1,006	0,995
Provinsi Kalimantan Tengah	1,021	0,975	1,014	1,007	0,996
Provinsi Kalimantan Selatan	0,986	0,975	0,988	0,998	0,961
Provinsi Kalimantan Timur	0,975	0,977	0,977	0,998	0,953
Provinsi Sulawesi Utara	1,003	0,978	1,016	0,987	0,981
Provinsi Sulawesi Tengah	0,998	0,978	0,998	1,001	0,976
Provinsi Sulawesi Selatan	1,004	0,978	1,005	0,999	0,982
Provinsi Sulawesi Tenggara	1,016	0,978	1,016	1,000	0,993
Provinsi Bali	0,987	0,978	0,988	0,999	0,965
Provinsi Nusa Tenggara Barat	1,003	0,978	1,007	0,996	0,981
Provinsi Nusa Tenggara Timur	1,014	0,978	1,012	1,003	0,992
Provinsi Maluku	1,031	0,975	1,021	1,010	1,005
Provinsi Papua	1,018	0,977	1,005	1,014	0,999
Provinsi Maluku Utara	1,031	0,980	1,018	1,013	1,010
Provinsi Banten	1,014	0,978	1,021	0,993	0,992
Provinsi Bangka Belitung	0,994	0,979	1,000	0,995	0,973
Provinsi Gorontalo	1,014	0,977	0,160	0,998	0,991
Provinsi Kepulauan Riau	0,999	0,977	0,986	1,014	0,976
Provinsi Papua Barat	0,995	0,977	0,982	1,013	0,971
Provinsi Sulawesi Barat	1,011	0,979	0,996	1,015	0,990
Provinsi Kalimantan Utara	0,981	0,976	0,971	1,010	0,958
Mean	1,008	0,978	1,006	1,002	0,986

Based on the table, the average productivity of Indonesian tourism per province throughout the study period shows a decrease in productivity (0.986). This decrease in productivity was influenced by a decrease in the average value of technological change (TECHCH) with a value of (0.978). Meanwhile, the change in efficiency (EFFCH) contributes a value of (1.008). The increase in efficiency is due to an increase in the EFFCH forming factor, namely an increase in *Pure Efficiency Change* (PECH) with a value of (1.006), and *Scale Efficiency Chage* (SECH) with value (1.002).

Furthermore, an analysis conducted individually in 34 provinces in Indonesia shows that the provinces with the highest tourism productivity sequentially are Aceh (1,021), North Sumatra (1,017), West Sumatra (1,017), North Maluku (1,010) and Maluku (1,005). The high level of tourism productivity in the five provinces in Indonesia was influenced by an increase in efficiency change (EFFCH), while technology change (TECHCH) in the five provinces both experienced a decrease. Then, for the province with the lowest value of tourism productivity, it was obtained by the province of East Kalimantan, where the low level of tourism productivity was caused by changes in efficiency (0.975) and changes in technology (0.977) which both showed a decrease.

Malmquist Index Quadrant

At this stage, 34 provinces in Indonesia will be grouped into four quadrants based on changes in efficiency (EFFCH) and changes in technology (TECHCH), with high and low categories. The EFFCH and TECHCH values are seen from the industry average, if the values on EFFCH and TECHCH are higher than the industry average, it indicates a high category, and vice versa, if EFFCH and TECHCH are below the industry average, it indicates a low category.

Quadrant 1 describes provinces with high category efficiency changes and technological changes, and it can be considered that these provinces have a high level of productivity. Quadrant 2 includes high technological changes, but on the other hand efficiency changes are still low. Quadrant 3, includes groups of provinces with low technological changes and high efficiency changes. And quadrant 4, explaining the group of provinces with changes in technology and changes in efficiency both show a low category.

Table 3: Quadrant Malmquist Index

Kuadran 1 (Teknologi Tinggi, Efisiensi Tinggi)	Kuadran 2 (Teknologi Tinggi, Efisiensi Rendah)
-	-
Kuadran 3 (Teknologi Rendah, Efisiensi Tinggi)	Kuadran 4 (Teknologi Rendah, Efisiensi Rendah)
Provinsi Aceh	Provinsi Jambi
Provinsi Sumatera Utara	Provinsi Lampung
Provinsi Sumatera Barat	Provinsi Jawa Barat
Provinsi Riau	Provinsi Jawa Tengah
Provinsi Sumatera Selatan	Provinsi Kalimantan Selatan
Provinsi Bengkulu	Provinsi Kalimantan Timur
Provinsi DKI Jakarta	Provinsi Sulawesi Tengah
Provinsi DI Yogyakarta	Provinsi Bali
Provinsi Jawa Timur	Provinsi Bangka Belitung
Provinsi Kalimantan Barat	Provinsi Kepulauan Riau
Provinsi Kalimantan Tengah	Provinsi Papua Barat
Provinsi Sulawesi Utara	Provinsi Kalimantan Utara
Provinsi Sulawesi Selatan	
Provinsi Sulawesi Tenggara	
Provinsi Nusa Tenggara Barat	
Provinsi Nusa Tenggara Timur	
Provinsi Maluku	
Provinsi Papua	
Provinsi Maluku Utara	
Provinsi Banten	
Provinsi Gorontalo	
Provinsi Sulawesi Barat	

Based on the table above, it can be concluded that the 34 Indonesian provinces that became the research sample dominated in quadrant 3, namely 22 provinces and in quadrant 4, there were 12 provinces. Based on this, it can be concluded that the average province in Indonesia has a high level of efficiency, and technology adoption is still not optimal. However, the productivity level of Indonesian tourism is still relatively low.

Findings

Based on the results of the analysis, there are several findings that can be used as a reference in making policies by related parties to improve the tourism sector in Indonesia. The findings are based on the results of the Malmquist Productivity Index (MPI) score based on the analysis of each province in Indonesia explaining that the productivity level of Indonesian tourism has fluctuated from year to year. Based on the average TFPCH score, it is concluded that tourism productivity has decreased, which is caused by a decrease in technological change (TECHCH) and an increase in efficiency change (EFFCH). This explains that technological change has contributed more to the decline in tourism productivity in Indonesia. The results of this study are relevant to research from Saragih & Monika (2020) which states that changes in the tourism sector's TFP are relatively small and tend to be negative for every economic sector related to tourism.

In addition, the use of technology that is not yet optimal also influences the level of tourism productivity. Even though technology is needed to be a catalyst in creating meaningful travel experiences. The travel experience is the backbone of the tourism industry, and technology can enhance that experience (UTS, 2023). This is reinforced by a statement from Ollivaud & Haxton (2019) which explains that technology can be one of the factors that can contribute to the development of the tourism sector. Furthermore, the use of technology can be utilized to develop tourism, namely for marketing and promotion, the use of technology plays an important role in the marketing and promotion of tourism products and services. This is because technology allows tourism businesses to reach a larger audience with their marketing messages. For example, social media can be used to connect with potential customers from around the world (Aeologic, 2022). In addition, the use of technology can increase operational efficiency and enhance customer service and experience. For example, technology helps replace expensive human labor with technological labor, and

helps reduce labor costs. This explains that technological innovation can drive development and competitiveness in the tourism sector (Buhalis, 2020).

Furthermore, at the end of the research period, namely 2019-2020, the phenomenon of the Covid-19 pandemic occurred where this affected the level of productivity of Indonesian tourism, given the implementation of policies starting from *social distancing* until *stay at home* which caused most of the tourism places to be temporarily closed, which in the end based on the results of an analysis of the level of productivity in that period decreased. This is supported by data from the Ministry of Tourism and Creative Economy 2022 explaining that in 2020 the number of foreign tourist arrivals to Indonesia has decreased significantly, from 16.11 million visits in 2019 to 4.05 million visits. This figure continues to show a significant decline so that in 2021 the number of visits will only reach 1.56 million. Skare et al (2020) also explained that the tourism sector was the sector most affected by the Covid-19 pandemic. Furthermore, an estimated 75 million jobs in the tourism sector have experienced shocks and the tourism industry is at risk of losing more than USD 2.1 trillion in turnover (Utami & Kafabih, 2021).

Individually, the 34 provinces in Indonesia show that the provinces with the highest tourism productivity are Aceh, North Sumatra, West Sumatra, North Maluku and Maluku respectively. Meanwhile, the province with the lowest tourism productivity value was obtained by the province of East Kalimantan. According to data from the BPS Statistics for Tourist Attractions for 2021, it shows that Aceh, North Sumatra, West Sumatra, North Maluku and Maluku are among the areas most visited by tourists. Apart from that, Aceh has 28 objects of tourist attraction, North Sumatra has 163 objects, West Sumatra has 64 objects, North Maluku has 5 objects and Maluku has 13 objects (BPS, 2021).

Apart from this, there are several possible reasons why Indonesia's tourism productivity is still relatively low and has differences in each province, including 1) popular tourist destinations, some provinces, such as Bali and Yogyakarta, are more attractive to international tourists, generating higher tourism revenues higher; 2) human capital (HR) and innovation, increasing human capital and innovation can boost the productivity of the tourism sector. In addition, provinces that have human resources who are skilled, trained and knowledgeable about the tourism industry can provide good service to tourists, promote destinations well, and create satisfying tourist experiences; 3) government policies and support, local government support in developing tourism plays a very important role. Provinces that have clear pro-tourism policies, financial support, and active promotional efforts generally have higher levels of tourism productivity. Local governments that play an active role in facilitating investment, protecting and maintaining tourist destinations, and improving safety and hygiene can also have a positive impact on tourism productivity; and 4) tourism infrastructure, the availability of adequate tourism infrastructure such as airports, roads, hotels, restaurants and other supporting facilities is an important factor in increasing tourism productivity. Provinces that have good and adequate infrastructure tend to attract more tourists and create a better experience for them (Saragih & Monika, 2020; Pham & Nugroho, 2022).

Then, the analysis of the Malmquist Index quadrant which is categorized into four quadrants shows that Indonesia's provinces in terms of tourism productivity dominate in quadrant 3, namely 22 provinces and quadrant 4, there are 12 provinces. It can be concluded that the average province in Indonesia has a high level of efficiency, but technology adoption has not been carried out optimally. Research from Nindito et al (2020) explains that one of the factors causing the low competitiveness index of the Indonesian tourism sector is the low utilization of technology to support its growth. In addition, a lack of motivation or readiness to adopt technology could hinder its adoption in the Indonesian tourism sector. Furthermore, the limited use of technology by tourism businesses in rural areas can also have an impact on the overall adoption of technology in the Indonesian tourism sector. In fact, in adopting tourism technology the role of technology acceptance and readiness plays an important role in the intention to adopt tourism technology (Senalasari et al., 2022; Pham & Nugroho, 2022).

Therefore, it is important for tourism managers to increase the maximum use of technology for tourism in Indonesia. This is aimed at increasing Indonesia's tourism productivity, which in turn can increase the country's foreign exchange and national economic growth. In addition, increasing national tourism productivity can help improve the community's economy so that poverty rates can be reduced.

CONCLUSION

This study aims to analyze the level of tourism productivity in Indonesia during the 2015-2020 period using the Malmquist Index. The results of the Malmquist Producrivity Index (MPI) score based on the analysis of

each province in Indonesia explain that the productivity level of Indonesian tourism has fluctuated from year to year. Based on the average TFPCH score, it is concluded that tourism productivity has decreased, which is caused by a decrease in technological change (TECHCH) and an increase in efficiency change (EFFCH). This explains that technological change has contributed more to the decline in tourism productivity in Indonesia.

Furthermore, at the end of the research period, namely 2019-2020, the phenomenon of the Covid-19 pandemic occurred where this affected the level of productivity of Indonesian tourism, given the implementation of policies starting from *social distancing* until *stay at home* which caused most of the tourism places to be temporarily closed, which in the end based on the results of an analysis of the level of productivity in that period decreased. Then, the analysis of the Malmquist Index quadrant which is categorized into four quadrants shows that Indonesia's provinces in terms of tourism productivity dominate in quadrant 3, namely 22 provinces and quadrant 4, there are 12 provinces. It can be concluded that the average province in Indonesia has a high level of efficiency, and technology adoption is still not optimal. However, Indonesia's tourism productivity level is still relatively low.

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