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Do Indonesia Islamic Banks Perform Better Than Malaysia? A Malmquist Index Approach

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This study aims to measure the productivity of Islamic banks in Indonesia and Malaysia using the Malmquist Productivity Index (MPI) method with the research period 2010-2019. The research objects used are 23 Islamic banks in Indonesia and Malaysia. The data of this study comes from the annual financial statements of each bank from the period 2010-2019. The input variables in this study are employee costs, administrative costs and third-party funds. And for the output variable is financing and operating income. The results of this study explain that during the period 2010-2019, the productivity level of Islamic banks in Indonesia and Malaysia has a fluctuating trend from year to year. Based on the average TFPCH score, it is concluded that the productivity of Islamic banks shows no increase in productivity or constant and technological change has not contributed optimally to the increase in productivity of Islamic banks in Indonesia and Malaysia. Furthermore, analyzing individually on Islamic Banks in Indonesia and Malaysia, it is found that there are 8 Islamic Banks with increased productivity, one Islamic bank in Malaysia and seven Islamic banks in Indonesia. The results also highlighted that the productivity level of Islamic banks in Indonesia is relatively better than Islamic banks in Malaysia. Then, the Malmquist Index quadrant analysis found that Islamic Banks in Indonesia and Malaysia dominate in quadrant 3 with a total of 12 Islamic Banks, followed by quadrant 4 with a total of 7 Islamic banks, and quadrant 1 with a total of 4 Islamic banks.

Keywords: Productivity; Islamic Banks; Indonesia; Malaysia; Malmquist Index, MPI

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INTRODUCTION

The financial sector has an important role in real growth, which is also the main focus of the global economy (Grassa & Gazdar, 2014; Masrizal et al., 2022). The role of the financial sector can be seen from channeling funds to industries with promising growth prospects. The development of the financial sector is increasing along with the ability to allocate financial resources to productive projects and to encourage economic growth (Zarrouk et al., 2017). This explains that the better the financial system performs its functions, the greater its contribution to economic growth. It can be concluded that the financial sector has a vital role in national and regional economic growth (Adriani & Wiksuana, 2018; Supartoyo et al., 2018). Tongurai & Vithessonthi (2018), Berger et al (2020), and Zavadska (2021) also explain that the banking sector plays an important role in the economy by facilitating capital flows and liquidity in the market, which is important for economic growth and development.

The Islamic banking sector also plays an important role in the economy by adhering to Islamic principles and contributing to financial performance and economic growth. Empirical evidence from the International Monetary Fund (IMF) shows that Islamic banking is positively associated with economic growth, demonstrating its potential to contribute to overall economic development (Imam & Kpodar, 2015). Therefore, the healthy performance of the banking sector has always been a key issue for researchers and policy makers tasked with ensuring an inclusive and economically sustainable country (Sharma et al., 2013).

Islamic finance is one of the fastest growing segments of the financial market industry (Johnson, 2013). Therefore, the Islamic banking sector has become systemically important in several countries. Southeast Asia is home to a significant Muslim population, and the number of Muslims in the region continues to increase (Komijani & Taghizadeh-Hesary, 2018). This growth in the Muslim population has led to an increased demand for Islamic financial products and services. The Islamic banking market in Southeast Asia is expected to grow significantly in the coming years. It is projected to grow at a compound annual growth rate of around 8% over the next three years, with Malaysia and Indonesia leading the growth (S&P Global, 2022).

Other studies have also explained that Southeast Asia, particularly Malaysia, Indonesia, and Brunei, is a central hub for Islamic banking and finance, with a large Muslim population. The region is ranked third in total Islamic banking assets, with Malaysia and Indonesia being the largest markets (Venardos, 2006; Chowdhury & Haron, 2021). Globally, Malaysia and Indonesia's Islamic banking sectors have a significant impact on the global Islamic finance industry, with Malaysia being a leader in sukuk issuance and Indonesia being a high potential growth market (Orix, 2023; Venardos, 2006).

Despite the growth and expansion of Islamic banking in Indonesia and Malaysia, there are still several challenges and issues facing the industry. One of the main challenges facing Islamic banking in Indonesia and Malaysia is the low awareness and understanding of Islamic banking products and services among the general public (Abdullah, 2017; Orix, 2023). This may limit the growth potential of the industry. In addition, although both countries have made progress in improving the regulatory framework of Islamic banking, there are still challenges in terms of regulatory compliance and standardization (Abdullah, 2017; Haque, 2020). Furthermore, Islamic banks in Indonesia and Malaysia face stiff competition from conventional banks, which have a larger market share and a more established customer base (Abdullah, 2017; Orix, 2023). Furthermore, Islamic banking in both countries also faces challenges in terms of efficiency and stability. This can also affect the productivity of banks (Ikhwan & Riani, 2023).

Therefore, it is important to research related to bank productivity. A number of relevant studies include Rani et al (2020) analyzing the comparison of Islamic banking productivity in Indonesia, Malaysia and Brunei Darussalam. Rodoni et al (2017) analyzed the efficiency and profitability of the Islamic banking industry in Indonesia. Kamarudin et al (2017) analyzed the productivity of Islamic banks in Southeast Asian countries. Basri et al (2018) analyzed the efficiency and productivity of Islamic banks in Malaysia. Nugrohowati et al (2020) examine technological change and productivity of the Islamic banking industry. Marlina et al (2018) analyzed the malmquist index to measure the efficiency and productivity of Islamic banks. Alexakis et al (2019) assessed the performance and productivity of Islamic and conventional banks using financial ratios, the Malmquist productivity index (MPI) two and four meta-frontier components. Firmansyah et al (2019) measured the productivity of Islamic banks in Indonesia from 2013 to 2017.

Based on this research, there is no research that specifically examines the productivity of Islamic banking in Indonesia and Malaysia. The purpose of this study is to analyze the productivity of Islamic banking in Indonesia and Malaysia during the period 2010-2019 using the Malmquist Index Productivity.

LITERATURE REVIEW

Islamic banking refers to a banking system that is based on the principles of Islamic law (sharia law) and is guided by Islamic economics. It is a financial system that adheres to Sharia (Islamic law) and prohibits the collection and payment of interest by lenders and investors. Instead, Islamic banks earn profits through equity participation, which requires borrowers to give the bank a share of their profits instead of paying interest (Hussain et al., 2015). That means, Islamic banks prohibit the use of interest or what is commonly referred

to as usury in every banking transaction. Islamic law strictly prohibits various additional interest in financial transactions, so the rate of return on investment must refer to real economic activity, and the contract must be agreed upon based on mutual agreement. Distribution is not only in the form of profit but also in risk because Islamic banking strongly upholds the values of justice (Juhandi et al., 2019).

Islamic banks and conventional banks differ in fundamental principles, operational mechanisms, and profitability factors. Islamic banks operate based on sharia principles, which prohibit interest, gambling, speculation, and certain activities that are considered detrimental to society. The banks replace interest with profit and loss sharing, following Shariah rules and principles. In contrast, conventional banks operate on interest-based principles (Jubilee et al., 2021). Juhandi et al (2019) also explain the differences between Islamic banks and conventional banks, namely the prohibition of interest, emphasis on Islamic moral principles, emphasis on collateral, where conventional banks tend to finance projects that have a strong collateral value, while Islamic banking tends to consider the sustainability of the project and the profitability of the operation itself, not just the amount of collateral. Then, there is the certainty of deposits and income, as well as liquidity and solvency risks.

Islamic banking has an important role not only for the community but also for the national economy. Therefore, the importance of measuring the productivity of Islamic banks lies in its potential to provide insight into the efficiency and performance of Islamic banks, so as to contribute to the growth of the economy and the banking sector as a whole. In general, productivity levels are used to measure the achievements of financial institutions. In addition, productivity is usually associated with the success of financial institutions in achieving institutional goals (Mawarati, 2016). Productivity measurement can be calculated based on input variables and output variables used by a financial institution. Mongid & Tahir (2010) explain that productivity shows the relationship between output variables and input variables to an institution.

Kopelman (1986) defined productivity as the proportion of one or more of the output variables to the input variables used in the production process. Thus, total production (output) is affected by the amount of input variables. Productivity can also be affected by changes in efficiency due to technological developments (Fare et al., 1994). Therefore, the productivity growth index also captures technological change (Herindar et al., 2021). This will also have an impact on changes in institutional performance, where Firmansyah (2019) states that bank profitability can increase as productivity increases.

A number of studies have examined the productivity of Islamic banks in Indonesia and Malaysia. Among the relevant research is Firmansyah et al (2019) measuring the productivity of Islamic banks in Indonesia for the period 2013 to 2017. The results showed that in 2014 was the most productive period for Islamic banks in Indonesia, the bank that most consistently experienced an increase in productivity was Bank Syariah Mandiri, the bank that experienced the most decline in productivity was Bank Victoria Syariah, the bank that was most able to increase its productivity was Bank Muamalat followed by Bank Syariah Mandiri.

Alexakis et al (2019) assessed the performance and productivity of Islamic and conventional banks using financial ratios, Malmquist productivity index (MPI) two and four component meta-frontier. The results found that Islamic banks showed worse cost and profit performance but were equal in terms of revenue performance compared to conventional banks. The MPI component meta-frontier shows that conventional banks' technology progressed rapidly in the years leading up to the financial crisis and then declined thereafter. Islamic banks show a similar but more stable pattern. In contrast, the variation in technical and technological efficiency within the Islamic bank group suggests that the Islamic bank group is quite heterogeneous. Overall, the MPI analysis shows that the two types of banks are more aligned after the global financial crisis.

Marlina et al (2018) analyzed the Malmquist index to measure the efficiency and productivity of Islamic banks. The results obtained from the Malmquist index score show that 9 Islamic banks out of 11 BUSs have increased productivity or around 82% of all Islamic commercial banks. For the analysis group of banks with criteria for efficiency change (EFFCH) and technological change (TECH), there is 1 Islamic bank in quadrant 1 (technical change and high efficiency change), there are 4 Islamic banks in quadrant 2 (high technical change but low efficiency change), and 6 Islamic banks that fall into quadrant 3 (low technical change but high efficiency change). Meanwhile, none of the Islamic banks are included in quadrant 4.

Nugrohowati et al (2020) examined technological change and productivity of the Islamic banking industry. The results showed that the average productivity of Islamic banks increased during the study period. The increase in productivity is supported by technological innovation, which significantly increases the level of productivity. However, the expansion of high technology was not followed by an increase in the level of efficiency. This finding explains that the development of banking technology is not fully able to support the development of products and services. Other relevant studies include Rani et al (2020) analyzing the comparison of Islamic banking productivity in Indonesia, Malaysia and Brunei Darussalam. Rodoni et al (2017) analyzed the efficiency and profitability of the Islamic banking industry in Indonesia. Kamarudin et al (2017) analyzed the productivity of Islamic banks in Southeast Asian countries. Basri et al (2018) analyzed the efficiency and productivity of Islamic banks in Malaysia. Based on these studies, there are still very limited studies that examine the productivity of Islamic banks in

Indonesia and Malaysia, especially in the period 2010-2019. Therefore, this study specifically analyzes the productivity of Islamic banks in Indonesia and Malaysia.

RESEARCH METHOD

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

The Malmquist Index has several advantages that make it a good choice for measuring productivity. First, it is a non-parametric method, so it does not require the specification of a production function. Second, the Malmquist index does not require assumptions about the behavior of economic production units, such as cost minimization or profit maximization. Third, the calculation of this index does not require price data, which is often unavailable, so it is helpful if the objective is a different or unknown manufacturer. Fourth, the Malmquist productivity index can be divided into two components, namely efficiency change and technological change (Marlina et al., 2018; Rahayu, 2023).

To measure the Malmquist productivity index in this study using DEAP 2.1 software as an analytical tool. This study was conducted on 23 Islamic banks in Indonesia and Malaysia during the period 2010 to 2019. All data used were collected from the annual reports of Islamic banks available in the publication reports on each bank's website. In selecting the sample of Islamic banks, all relevant data is required during the time span of one year from 2010 to 2019, resulting in a sample of 23 Islamic banks in Indonesia and Malaysia. The data used in the productivity analysis includes inputs, namely employee costs, administrative costs and third party funds. And for the output variable is financing and operating income. The calculation of productivity of Islamic banks 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 is the Malmquist Productivity Index (MPI), where the measurement index is seen from changes in total factor productivity (TFPCH) which can be divided into technological change (TECHCH) and efficiency change (EC) (EFFCH). The efficiency change index can be further decomposed into a PECH component (pure efficiency change) that is comprehensively calculated against the VRS technology, and a SECH component (scale change) that captures changes in deviations between VRS and CRS technologies (As-Salafiyah, 2023).

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

RESULTS

Productivity of Islamic Banks in Indonesia and Malaysia During the Observation Period

Productivity change factors can be identified through the Efficiency Change Index (EFFCH) and Technology Change Index (TECHCH) values. Meanwhile, the Pure Efficiency Change Index (PECH) and Scale Efficiency Change Index (ECH) are used to determine the cause of changes in EFFCH. Furthermore, the value of Total Factor Production (TFP) is intended to see any changes in the index. If the value of $M > 1$, then it explains an increase in productivity, and vice versa, where if $M < 1$ indicates a decrease in productivity value. If $M = 1$ then there is no increase in productivity.

The table below explains the results of the analysis using the Malmquist Productivity Index (MPI) of Islamic Banks in Indonesia and Malaysia which are the objects of observation in this study.

Table 1. Average Malmquist Index Score of Islamic Banks in Indonesia and Malaysia per Year

YEAR	EFFCH	TECHCH	PECH	SECH	TFPCH
2010-2011	1,080	0,963	1,044	1,034	1,040
2011-2012	1,047	0,968	1,026	1,021	1,013
2012-2013	1,043	1,005	1,038	1,005	1,049
2013-2014	1,098	0,893	1,025	1,071	0,981
2014-2015	0,997	0,933	1,012	0,985	0,930

2015-2016	0,874	1,098	0,932	0,937	0,960
2016-2017	1,024	1,015	1,032	0,992	1,039
2017-2018	1,008	0,995	0,983	1,025	1,003
2018-2019	1,008	0,986	1,015	0,993	0,994
Mean	**1,018**	**0,983**	**1,012**	**1,006**	**1,000**

The table above explains the changes in the total productivity (Tfpch) of Islamic Banks in Indonesia and Malaysia as well as the influencing factors namely technological change (Techch) and efficiency change (Effch) during the observation period. From the MPI results on 23 Islamic Banks in Indonesia and Malaysia, it can be concluded that the productivity trend fluctuates from year to year. The average score results show that the productivity value of Islamic Banks in Indonesia and Malaysia tends to be constant (1.000), which is dominantly caused by a decrease in technological change (0.983), although the change in efficiency increases (1.018). This explains that technological change dominantly contributes to the level of productivity of Islamic Banks in Indonesia and Malaysia which tends to be constant.

If analyzed per year, in 2010-2013 the level of productivity of Islamic Banks in Indonesia and Malaysia has increased, with each productivity value (1.040), (1.013), and (1.049). The high level of productivity in the three periods was dominantly due to the value of efficiency changes that increased and was higher than technological changes. The value of efficiency change in each period is (1.080), (1.047), and (1.043). As for technological change in the first two periods showed a decrease, namely (0.963), (0.968), and in the third period showed an increase (1.005). Furthermore, the productivity results in the period 2013-2016, the productivity level of Islamic Banks in Indonesia and Malaysia has decreased, with the tfpch value sequentially being (0.819), (0.030) and (0.060). The period 2013-2014, efficiency changes reached a value of (1.098), while technological changes decreased with a value of (0.893). Then the 2014-2015 period was the period with the lowest level of productivity throughout the study period, where the value of efficiency changes (0.997), and technological changes (0.933). Furthermore, in the 2015-2016 period, changes in efficiency experienced a significant decline and the lowest value throughout the study period, namely with a value of (0.874), on the other hand technological change (1.098) showed an increase in this period.

In the 2016-2018 period, the productivity level showed an increase with a value of (1.039) and (1.003). The increase in productivity in both periods was dominantly caused by changes in efficiency which also showed an increase. The value of efficiency change for each period is (1.024) and (1.008). Then, for technological changes in the 2016-2017 period showed an increase (1.015), while in the 2017-2018 period showed a decrease (0.995). Finally, in the 2018-2019 period the productivity level again showed a decrease with a value of (0.994). Efficiency changes in this period still showed an increase (1.008), while technological changes decreased (0.986). It can be concluded that in the 2018-2019 period, technological changes contributed more to the decline in productivity of Islamic Banks in Indonesia and Malaysia.

Further analysis can be seen from the productivity trends of Islamic Banks in Indonesia and Malaysia as shown in the figure below.

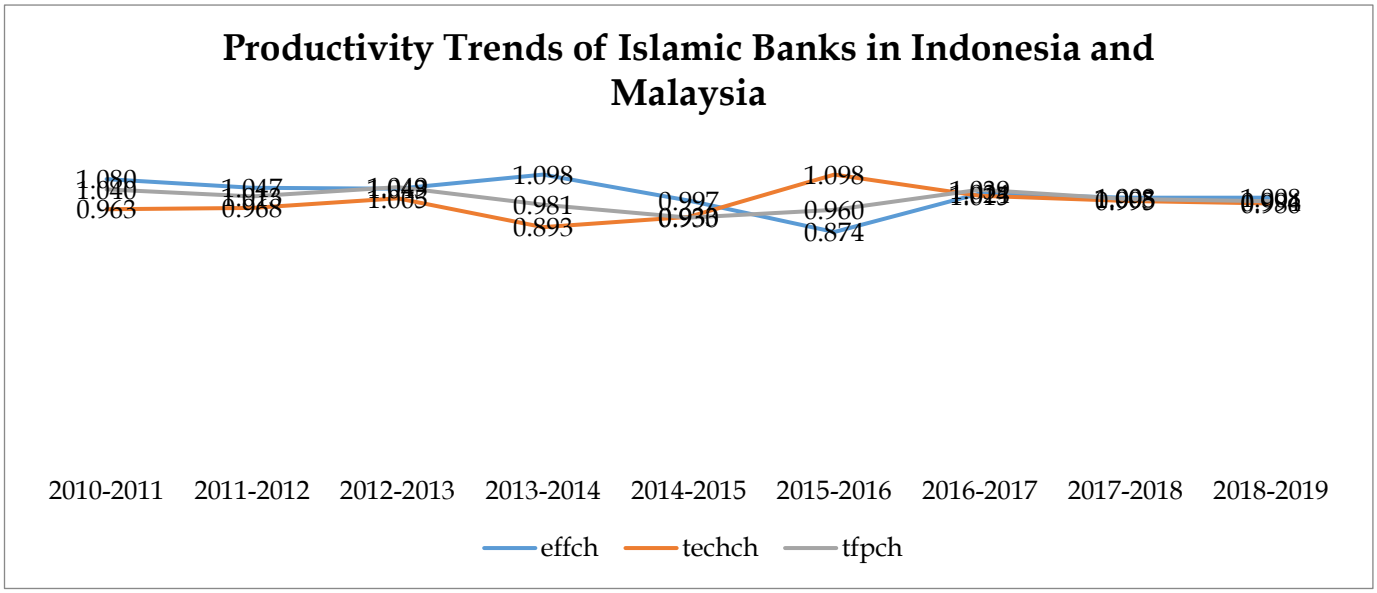

Figure 1. Productivity Trends of Islamic Banks in Indonesia and Malaysia

Based on the figure above, it can be concluded that the productivity trends of Islamic Banks in Indonesia and Malaysia fluctuate from year to year. Judging from the trend of tfpch or the level of productivity, in the 2012-2013 period there was an increase in productivity, which then decreased in the 2013-2014 period to the 2015-2016 period. Then, the productivity level again showed an increase in the period 2016-2017 to 2017-2018, and again decreased significantly in the period 2018-2019. Almost the same thing also happened to the effch trend or efficiency change which also fluctuated from year to year. Efficiency changes showed a decline in the 2015-2016 period. Then, for technological changes or techch, the increase in techch occurred throughout the 2012-2013 period, the 2015-2016 period to 2016-2017.

Overall, it can be concluded that changes in efficiency contribute to an increase in productivity, and changes in technology (techch) affect the decline in the level of productivity of Islamic Banks in Indonesia and Malaysia. Therefore, Islamic Banks in Indonesia and Malaysia must begin to focus on the use of technology in each of their operations. This is intended so that the level of productivity can increase.

Summary of Average Malmquist Index of Islamic Banks in Indonesia and Malaysia

Table 2. Average Productivity of Islamic Banks in Indonesia and Malaysia in 2010-2019

FIRM	EFFCH	TECHCH	PECH	SECH	TFPCH
CIMB Islamic Berhad	0,991	0,963	1.000	0,991	0,954
HLB Islamic Berhad	0,984	0,980	0,984	1.000	0,964
Bank Islamic Malaysia Berhad	1.018	0,973	1.019	0,999	0,990
Al Rajhi Bank Berhad	1.043	0,964	1.032	1.011	1.005
HSBC Amanah Berhad	1.017	0,970	1.017	1.000	0,987
KFHM Berhad	0,969	0,978	0,965	1.004	0,948
Maybank Islamic Berhad	1.000	0,980	1.000	1.000	0,980
OCBC Al-Amin	0,998	0,980	1.000	0,997	0,978
PIB Berhad	1.012	0,988	1.000	1.012	0,999
RHB Islamic Bank Berhad	0,987	0,956	0,991	0,996	0,944
Affin Islamic Bank Berhad	0,964	0,965	0,966	0,998	0,930
Bank Muamalat Malaysia Berhad	1.004	0,965	1.011	0,993	0,969
Bank BJB Syariah	1.009	1.030	1.006	1.002	1.039
Bank Syariah Bukopin	1.076	1.004	1.072	1.004	1.081
BCA Syariah	1.005	0,928	1.000	1.005	0,932
Bank Victoria Syariah	1.000	0,978	1.000	1.000	0,978
Maybank Syariah Indonesia	1.155	0,998	1.149	1.005	1.152
Panin Dubai Syariah	1.108	1.015	1.000	1.108	1.124
BMI	1.066	0,980	1.051	1.014	1.044
BSM	1.001	0,998	1.000	1.001	0,999
BNIS	1.026	1.082	1.003	1.022	1.109
BRIS	1.015	0,990	1.011	1.004	1.004
Bank Mega Syariah	0,988	0,949	1.000	0,988	0,937
MEAN	**1.018**	**0,983**	**1.012**	**1.006**	**1.000**

Based on the average productivity table of Islamic Banks in Indonesia and Malaysia throughout the study period shows no increase in productivity or tends to be constant (1.000). This level of productivity is influenced by a decrease in the average value of technological change (techch) with a value of (0.983). Meanwhile, the efficiency change (effch) increased by contributing (1.018). Furthermore, the analysis conducted individually on Islamic Banks in Indonesia and Malaysia, it can be concluded that there are 8 Islamic Banks with increased productivity, 1 Islamic bank in Malaysia and 7 Islamic banks in Indonesia, namely Al

Rajhi Bank Berhard (1.005), Bank BJB Syariah (1.039), Bank Syariah Bukopin (1.081), Maybank Syariah Indonesia (1.152), Panin Dubai Syariah (1.124), BMI (1.044), BNIS (1.109), and BRIS (1.004). The high level of productivity in Islamic Banks in Indonesia and Malaysia is equally influenced by increased efficiency changes and technological changes in particular, and is dominantly influenced by changes in efficiency. Then, for Islamic Banks in Indonesia and Malaysia with the lowest productivity value obtained by Affin Islamic Bank Berhad with a productivity value of (0.930), where low productivity is influenced by the decline in effch (0.964) and techch (0.965). The results of this study also highlight that the productivity level of Islamic banks in Indonesia is relatively better than Islamic banks in Malaysia.

Malmquist Index Quadrant

At this stage, Islamic banks in Indonesia and Malaysia will be grouped into four quadrants based on the level of efficiency and the level of technology, with high and low categories. The value of efficiency and technology is seen from the industry average, if the value of efficiency and technology is higher than the industry average, it shows a high category, and vice versa, if efficiency and technology are below the industry average, it shows a low category. Quadrant 1 describes Islamic banks in Indonesia and Malaysia with high efficiency and technology categories, and it can be considered that these Islamic banks have a high level of technology. Quadrant 2 includes high technology, but on the other hand efficiency is still low. Quadrant 3, includes a group of Islamic Banks with low technology, and high efficiency. And quadrant 4, describes a group of Islamic Banks with technology and efficiency both showing a low category.

Table 3. Quadrant Malmquist Index of Islamic Banks in Indonesia and Malaysia

Quadrant 1 (High Efficiency, High Technology)	**Quadrant 2 (High Technology, Low Efficiency)**
Bank BJB Syariah Bank Syariah Bukopin Panin Dubai Syariah BNIS	
Quadrant 3 (Low Technology, High Efficiency)	**Quadrant 4 (Low Technology, Low Efficiency)**
Bank Islamic Malaysia Berhad Al Rajhi Bank Berhad HSBC Amanah Berhad Maybank Islamic Berhad PIB Berhad Bank Muamalat Malaysia Berhad BCA Syariah Bank Victoria Syariah Maybank Syariah Indonesia BMI BSM BRIS	CIMB Islamic Berhad HLB Islamic Berhad KFHM Berhad OCBC Al-Amin RHB Islamic Bank Berhad Affin Islamic Bank Berhad Bank Mega Syariah

Based on the table above, it can be concluded that Islamic Banks in Indonesia and Malaysia dominate in quadrant 3 with a total of 12 Islamic Banks. Then quadrant 4 with a total of 7 Islamic banks, and quadrant 1 with a total of 4 Islamic banks. Based on this, there are still few Islamic Banks in Indonesia and Malaysia that have a high level of productivity and there are also few Islamic banks that adopt the use of technology. But on the other hand, the level of efficiency of Islamic Banks in Indonesia and Malaysia can still be categorized as quite high. This is evidenced in quadrants 1 and 3 which also state that Islamic Banks in Indonesia and Malaysia have achieved high efficiency.

Findings

Based on the research results, several findings were obtained that can be used as a reference by related parties in making policies and further research, especially in increasing the productivity of Islamic Banks. The first finding based on the results of the study found that the results of the average score of MPI show that the value of productivity of Islamic Banks in Indonesia and Malaysia tends to be constant or there is no increase in productivity, which is caused by a decrease in technological change, although the change in efficiency increases. This indicates that technological change

contributes to the level of productivity of Islamic Banks in Indonesia and Malaysia which tends to be constant, with an increasing level of bank efficiency. The results of this study are relevant to research from Jubilee et al (2021) comparing Islamic and conventional banks found that Islamic banks show technological progress, but the number of banks that show technological regression increases over time, thus causing a decrease in total factor productivity change (TFPCH).

Another study from Nugrohowati et al (2020) revealed that Islamic banks experienced a decrease in technological innovation that affected their efficiency level, despite an increase in banking efficiency. In addition, the meta-frontier Malmquist productivity index (MPI) shows that conventional bank technology increased significantly in the years leading up to the financial crisis, while the increase in Islamic bank productivity was limited (Alexakis et al., 2019). Therefore, a decrease in technological change may impact the productivity of Islamic banks, affecting efficiency and total factor productivity. Alexakis et al (2019) explained that the restrictive nature of sharia rules in terms of operational freedom, low asset utilization commensurate with the need for high liquidity and capitalization reserves, and limited access to interbank capital and markets are some of the factors contributing to the decline in technological change. In addition, the decline in technological innovation of Islamic banks is also caused by the high cost of technology spending, cash maintenance costs, and operational costs (Nugrohowati et al., 2020; Chowdhury & Haron, 2021).

Based on this explanation, it can be concluded that technology plays an important role in increasing the productivity of Islamic banks. A number of studies explain the relevance between technology and bank productivity. Ahmed (2013) explained that technology allows Islamic banks to simplify their processes and reduce costs, thereby increasing efficiency. Alnsour (2023) argues that the application of technology, such as internet banking and mobile banking, can have a significant impact on the financial performance of Islamic banks. The use of technology allows Islamic banks to expand their market reach and serve a larger customer base, develop new products and services, which can help them remain competitive and attract more customers, thereby increasing productivity (Ahmed, 2013). Alexakis et al (2019) also argue that technology can help Islamic banks reduce costs associated with traditional banking processes, and can allocate resources more efficiently and increase productivity.

Then, the trend of MPI scores in 23 Islamic Banks in Indonesia and Malaysia, shows a fluctuating trend of productivity from year to year, where the highest productivity in the 2012-2013 period, and the lowest level of productivity occurred in the 2014-2015 period. The results of this study support research from Rani et al (2020) found that Islamic banking productivity in Indonesia and Malaysia fluctuates from year to year as well as changes in efficiency and technological advances, which contribute to productivity fluctuations. Increasing the productivity of Islamic banks is an important issue because of its potential to contribute to economic growth, financial stability, and the development of Islamic finance. This is expressed by Johnson (2013) that Islamic banking has the potential to play an important role in economic growth, especially in regions with a high prevalence of Muslim population. The growth of Islamic banking can influence economic development and contribute to the growth of the financial sector as a whole.

On the other hand, the increasing integration of Islamic financial services into global financial markets strengthens the financial system and contributes to financial stability. Rigorous risk management and good corporate governance in Islamic banks are also critical to ensuring the safety and soundness of the international banking system (Knight, 2007). Therefore, the development of Islamic financial products and Islamic banking has become one of the fastest growing segments of the financial market industry, operating through various institutions in different countries (Johnson, 2013). This growth underscores the importance of increasing productivity within the Islamic banking sector to further develop Islamic finance and its contribution to the global financial system.

Furthermore, individual analysis on Islamic Banks in Indonesia and Malaysia, it is found that there are 8 Islamic Banks with increased productivity, one Islamic bank in Malaysia and seven Islamic banks in Indonesia, namely Al Rajhi Bank Berhard (1.005), Bank BJB Syariah (1.039), Bank Syariah Bukopin (1.081), Maybank Syariah Indonesia (1.152), Panin Dubai Syariah (1.124), BMI (1.044), BNIS (1.109), and BRIS (1.004). Then, for Islamic Banks with the lowest productivity value obtained by Affin Islamic Bank Berhad. It can also be concluded that the productivity level of Islamic banks in Indonesia is relatively better than Islamic banks in Malaysia. The results of this study support the research of Ascarya & Yumanita (2008) who compared the efficiency of Islamic banks in Malaysia and Indonesia using Data Envelopment Analysis (DEA) found that Indonesian Islamic banks are more efficient than Malaysian Islamic banks in all three measurements: technical, scale, and overall efficiency. Furthermore, Islamic banks in Indonesia face less competition from conventional banks compared to banks in Malaysia. Under the dual banking system, Islamic banks in Malaysia have to compete directly with conventional banks, and this can be a challenge. To improve their productivity, Islamic banks in Malaysia should focus on addressing their weaknesses and identifying their strengths relative to their competitors (Ascarya & Yumanita, 2008).

Further explanation, the high level of productivity in Islamic Banks in Indonesia and Malaysia is dominantly influenced by changes in efficiency that show an increase. Karanlioglu & Musajeva (2017)

explained that efficiency in Islamic banks leads to increased profitability, higher quality of prices and services for consumers, and increased risk absorption due to capital. This shows that efficiency is closely related to technological advances and productivity growth in Islamic banks (Alexakis et al., 2019; Nugrohowati et al., 2020). Technological advancements can improve efficiency and contribute to overall productivity gains.

Jubilee et al (2021) comparing the efficiency and productivity of Islamic and conventional banks has highlighted the importance of efficiency in driving productivity improvements. Efficient operations contribute to the financial stability of Islamic banks, which is important for maintaining trust and confidence in the banking system (Alexakis et al., 2019). Efficient Islamic banks are better positioned to compete in the global financial market, attract investors and contribute to the growth of Islamic finance (Maradin et al., 2021). Hence, the importance of efficiency in improving the productivity of Islamic banks is underscored by its impact on operational profitability, technological advancement, financial stability, market competitiveness, and overall productivity growth.

The results of the analysis are reinforced by the malmquist quadrant which found that Islamic Banks in Indonesia and Malaysia dominate in quadrant 3 with a total of 12 Islamic Banks, followed by quadrant 4 with a total of 7 Islamic banks, and quadrant 1 with a total of 4 Islamic banks. Based on this, there are still few Islamic Banks in Indonesia and Malaysia that have a high level of productivity and there are also few Islamic banks that adopt the use of technology. On the other hand, the level of efficiency of Islamic banks in Indonesia and Malaysia can still be categorized as quite high. The efficiency of Islamic banks is important for the competitiveness and profitability of banks, as well as their ability to provide high-quality services to customers while minimizing costs (Izzeldin et al., 2021).

CONCLUSION

This study aims to analyze the productivity level of Islamic banks in Malaysia and Indonesia during the period 2010-2019. The 23 Islamic banks sampled in this study were analyzed using the Malmquist Productivity Index (MPI) analysis. The results of the study can be concluded that the average score of MPI shows the productivity value of Islamic Banks in Indonesia and Malaysia tends to be constant, which is caused by a decrease in technological change, although efficiency change increases. Then, the productivity trend shows a fluctuating movement from year to year, where the highest productivity in the 2012-2013 period, and the lowest level of productivity occurred in the 2014-2015 period.

Furthermore, analyzing individually on Islamic Banks in Indonesia and Malaysia, it was found that there were 8 Islamic Banks with increased productivity, one Islamic bank in Malaysia and seven Islamic banks in Indonesia. The high level of productivity in Islamic Banks in Indonesia and Malaysia is dominantly influenced by changes in efficiency that show an increase. Furthermore, the results of malmquist quadrant analysis found that Islamic Banks in Indonesia and Malaysia dominate in quadrant 3 with a total of 12 Islamic Banks, followed by quadrant 4 with a total of 7 Islamic banks, and quadrant 1 with a total of 4 Islamic banks. This explains that there are still few Islamic banks in Indonesia and Malaysia that have a high level of productivity and there are also few Islamic banks that adopt the use of technology. On the other hand, the level of efficiency of Islamic Banks in Indonesia and Malaysia can still be categorized as high.

Based on this, Islamic banks should focus on increasing investment in technology to overcome the decline in technological change. This will contribute to improving overall efficiency and productivity. In addition, banking institutions need to invest in training and skills development programs for their workforce to ensure that they are well equipped to handle new technologies. This will improve efficiency and facilitate the successful integration of technological advancements. Regulators should also establish a robust monitoring mechanism to assess the technological capabilities and efficiency levels of Islamic banks on a regular basis. This will ensure that the banks are consistently adapting to advancements in the financial technology landscape. In addition, regulators may consider providing incentives or rewards for Islamic banks that actively adopt and implement advanced technologies. This can motivate banks to be more ready to accept technological changes. Then, academics can further encourage research on the latest technology trends and their impact on productivity that will contribute to the sustainable growth of the industry.

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