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The Level of the Productivity of the Islamic Banks and Islamic Windows of Commercial Banks in Oman

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Abstract

Omani Islamic banks' (including windows) total assets reached OMR6.4 billion (USD16.6 billion) in 2022. The financing growth of Islamic banks was 12.2%, exceeding conventional banks' 3.4% growth. Islamic bank's deposit growth of 10.9% also outpaced conventional banks', which fell by 0.9%. The Islamic banking market share, based on both financing and deposits, crossed 18.5% in 2022.Islamic windows of conventional banks are significant growth drivers, with about 40% share of sector assets as of end-3Q22, while the balance is held by full-fledged Islamic banks. Islamic bank windows significantly benefit from their parent conventional bank in terms of use of their existing franchise and infrastructure, making them more cost-efficient. This study on the cost and profit efficiency of Islamic and conventional bank Islamic windows in Oman: A proposed framework . Moreover, we examine the bank-specific variables that may explain the sources of inefficiency. The empirical results indicate that banks in the Oman are relatively more efficient at generating profits than at controlling costs. We also find that in terms of both cost and profit efficiency levels, the conventional banks on average are more efficient than Islamic banks. Furthermore, we observe a positive correlation of cost and profit efficiency with bank capitalization and profitability, and a negative one with operation cost. Higher loan activity increases the profit efficiency of banks, but it has a negative impact on cost efficiency.

Keywords: Commercial Banks, Islamic and Conventional Banks, Islamic Windows, Oman

Introduction

Islamic banks and Conventional banks Islamic windows in Oman are currently facing challenges in cost and profit efficiency, the trend of the efficiency during the year 2016 has dropped more than 6%, This has negatively reflected the utilization of the liquidity surplus reported by those Islamic institutions, (Central Bank of Oman Economic Report, 2019).Besides

that, the level of the cost and profit efficiency of the Islamic financial institutions were further challenged, and has further dropped during the years to 2019 by almost 10%. Government and Central bank of Oman demanding high liquidity ratio to be maintained by the Islamic banks may have pushed the efficiency and performance of these institutions to more difficult challenges and high competition, (CBO The Omani Economics, 2019). Failure to maintain efficient cost and profit efficiency of Islamic banking system, will limit the productivity and future stability in investment and future contribution of these Islamic institutions to the country's economy (Iqbal, 2013).

In contrast to that, the matching of costs (including operational cost and financial cost) with the capital of the Islamic banks and Islamic windows in Oman will be very expensive as compared to the return it generates from investment of the Capital (ROI) (CBO Almarkazi, 2019). Therefore, if this cost matching gape increases and last for long, this will be going to put these organizations into future competition difficulties which in turn will threat the improvement of the cost and profit efficiency and the sustainability of these organizations. More than that, the low trend in the cost and profit efficiency during the years 2016 to the year 2019, and due to the direct relationship between the cost and profit efficiency of the Islamic institutions and their performance and financial position growth, it was observed that, there were inconsistencies in the growth of the total assets and total profit of Islamic banks and Islamic windows in Oman. Based on the consolidated total assets of the Oman's Islamic banks and Islamic windows for the past five years (2015 to 2019), the growth in the direction of total assets has fluctuated negatively and the trend significantly shows that the growth rate was more than 20% for the year 2016 to 2017. The growth for 2018 to 2019 was only 14% (CBO annual report, 2019).

The inconsistency in the growth rate and the level of the efficiency and performance of Islamic banks and Islamic windows, together with their position have raised a question about the ability of these Islamic banks to continue in the market for the long run unless improve the cause of the efficiency and growth stability, (Economist, 2019).Consequently, this will affect boycott expectations from Islamic banks and Islamic windows to play an important role in the country's economic development. Other than that, having CE and PE analyses will support the Islamic business to get a better view of its profitability and costs as it can then implement a better business strategy to support its sustainability (CBO Almarkazi, 2019).

This position demonstrates that, the level of CE and PE should be highly posited in order to address the emergence of new operations and support the identification of efficiency factors within Islamic banks and Islamic windows. It will ultimately improve the country's economic growth momentum by ensuring that the Islamic finance and banking industry in Oman play the role an engine for national transformation. Industries that are unprepared to upgrade CE and PE certainly cannot boost their productivity and thus will not be able to boost the country's economic growth momentum as a result of economic openness and trade liberalization within the state's financial system (Iqbal, 2008; Mohanty, 2012).

Thus, based on the problems and research gap in this study, an effort was made to study the CE, PE level, performance and productivity of Islamic finance in Oman. This study is considered very important and in line with the country's objectives of developing Islamic banking and the Islamic financial industry as one of the competitive and attractive sectors,

not only locally but internationally. Indeed, the Islamic sector in Oman needs to become more attractive and competitive to increase its productivity (CBO Almarkazi, 2019). This can give an indication for the impact of CE and PE levels and the overall efficiency that occurring in the Islamic financial sector on the growth in the country's national economy as a result of CE and PE, and the overall productivity of the Islamic sector in the long run. Therefore, this study can identify and answer the question about the extent of the CE, PE's influences, as well as the growth rate of the Islamic sector, in how the factors that determine CE and PE affect the level of the performance and productivity of Islamic banks and Islamic windows in Oman. In addition, such a comprehensive study on the efficiency of the Islamic banking system in Oman will also be introduced to the market with full a focus on the performance and productivity of Islamic banking services using CE and PE technologies. This will serve as a reference and support for academic researchers as well as operational management of Islamic banks.

Empirical Study of CE and PE factors

All the factors used is in relation to the performance efficiency including the CE and PE based on the previous research papers, and they measure the correlation and the implications between the performance and the element impacting the behavior and the outcome of the Islamic and banking industry. Although there are many elements have been identified for PE and CE, most of the previous studies showed that the main causes of the efficiency of Islamic banks and Islamic windows of the conventional banks have internal and external factors, such as: size of the business, ratio of equity to total assets, information technology, avg. Inflation rate, profitability ratio, credit risk, Labor productivity, Population density, competition, operating cost, GDP per capita, and education experience.

Based on Bader et al. (2008), the efficiency of the financial institution is influenced and effected positively by the size of the bank. Likewise, Isik and Hassan (2002), emphasized on companies, as in order to be able to execute their operation at an optimal scale, they should maintain a certain size. More than that, Pilar, Marta, and Antonio (2018), have identified on their research of Spain's SMEs, that the size of the SME impacted the PE of the companies positively. Recent study of Srairi (2010), addressed that, the bigger banks size, the bigger capital and assets and the higher profitability are associated with better efficiency. Bader et al. (2008) total assets of the conventional banks are much greater than the total assets of the Islamic banks, since there is positive relation between the size of the bank and its performance, which then proved the conventional banks as more cost and profit efficient.

This indicator helps to find out how much shareholders would receive in the occasion of company liquidation. The results are presented as a percentage, which is formulated by dividing total shareholders' equity by total assets of the company, and it represents the value of assets on which shareholders have a residual claim in case of the liquidation. Hassan and Ahmed (2019) found that the variable does not have a strong impact on bank performances in countries with different levels of income. On the other hand, Hassan and Ahmed (2019) stated that the variable is highly significant and positively related to ROA both conventional and Islamic banks; therefore, this indicator has insignificant impact to the CE and PE. However, in case of the significant drop in the ratio, it might indicate a problem in the CE or PE as they are part of the equities retained earnings.

Frei, Harker and Hunter (2014), shed light on the significant of the technology on the cost and profit efficiency of the banks. Further to that, Sinkey (2002) highlighted information technology as one of the most significant five issues that affect banking performance (Alber, 2011). In addition to that, technology modernization in retail banking industry has been stimulated on by the introduction of new system, such as personal computers banking (Alber, 2011). On the other hand, Abduh and Alias (2014), emphasized that the technology and the date starting processing are the heart and the core of financial services institutions. Based on Vander Vennet (2005), a study on the CE and PE for European specialized and de-specialized banks has concluded that the cost and profit efficiency is more efficient for the universal banking system. This was mainly due to the sharing, implementation, and integration of technology across and over the organization multiple outputs. Likewise, a study on the banking expansion on PE of the Saudi banks covers a period from 1998 to 2007 has concluded that, the expansion of the bank using information technology does impact the cost and profit efficiency.

AAIR disturbs money to efficiently and effectively perform its roles both as a means of exchange and as measurement of value (Vander Vennet, 2005). Likewise, AAIR is the annual pricing rate raising of the goods and services, in which consequently lead to fall in purchasing power of the product (General dictionary). Hassan and Ahmed (2019) declared that the rate of inflation does not seem to have a significant effect on the bank's CE/PE. Due to inflation which was largely moderate in their sample countries between 2004 to 2010, Mghaieth and Khanchel (2015) established the rate of inflation as unrelated to CE. Bas on Sanusi and Meyer (2017), on their study on the relationship between the inflation and the financial development of the financial institutions of the South Africa during the year 2016 to 2017, have concluded that, the verbal's between the inflation and the financial development are bound together for the long run of the business and there is significant impact by the inflation to the financial development and performance of the business due to the strong correlation of these two variables (Sanusi, Meyer, and Ślusarczyk, 2017).

This ratio indicates, how profitable is the bank in relation to its total assets. In addition to that, this indicates the level of efficiency on the usage of the assets of the bank to generate profit for the organization. According to Hassan (2005), the return on assets ratio is closely correlated to a bank's cost efficiency. Likewise, Srairi (2010) stated the return on assets ratio as high by 10% and it has a positive effect on cost efficiency. In addition to that, Rosly and Bakar (2003), on their study on the performance of the Islamic and Conventional banks in Malaysia proved that the Islamic banks are not efficient although they have reported high ROA compared to the conventional banks.Hence, the impact of the credit risk to the CE and PE is significant (Abduh and Alias, 2014). Likewise, Srairi (2010), examined elements that might affect the profitability of the Islamic and the conventional banks within of the GCC countries, and was proved that the profitability of both Islamic and conventional banks are affected mainly by three variables including credit risk (Abduh and Alias, 2014).

Pilar et al. (2018), concluded that enhancement of labor skills has positive impact on the business efficiency. Moreover, Srairi (2010), concluded on the GCC countries cost and profit efficiency levels for more than 70 conventional banks and the impact of the population density was negative to the cost and profit efficiency. Frei, Harker and Hunter (2014), shed light on the crucial of the intensified global competition and other factors can influence the

degree of the efficiency within the organizations. Likewise, Sinkey (2002), highlighted that competition is one of the most factors that affect efficiency of the organizations (Vander Vennet, 2005). Similarly, based on Maudos (2002), the competition pressure and the organization production size do influence the market prices of the product. The recent research paper covers Oman banking industry on the reasons of customers switching between banks, highlighted that bank customers in Oman believes, that they have kept changing the bank in order to get better and attractive offer or consumer loans at a competitive price (Al Ghammari, 2017). More than that, Husseini et al., (2019) found that, operating cost to total assets have a significant negative impact on the profitability of Malaysian Islamic banks. Furthermore, it was also stated that the entrance of foreign banks to the market has led to higher operational cost (Abduh and Alias, 2014).

The GDP flexible signifies the growth degree in country domestic product and is used as a substitution for home fiscal economic situations. Favorable economic environments will affect confidently the demand and supply of banking sectors services, and will perhaps enhance bank efficiency (Yildirim and Philippatos, 2005). Based on Yildirim and Philippatos (2005), his study that analyzed the cost and profit efficiency of banking industry in 12 transition economy European companies for the period between 1993 to 2000 has stated that the GDP is positively linked to CE, which however is negatively linked to profit efficiency. Furthermore, Oman Islamic Finance Report (2015), indicates that, the Sultanate of Oman government claims that, the economy's tough fundamentals and diversification energies were the core drivers to the attainment of a growth of 3.7% in the year 2009, while admitting that GDP reduction in the same year was due to the 44% fall in oil prices (Badreldin, 2015). In addition to that, a study paper on the environmental variables that has in the CE of the Spanish and French stated that, variables in GDP per capita through countries could produce momentous differences in the mandate for banking sectors services among consumers (Dietsch and Lozano-vivas, 2000).

Educational efficiency is one of the important factors that might affect the profit and cost efficiency of the banks. However, few research papers had wrote using this element due to the difficulties on the information collection of this element. Few organizations displayed the details information on the educational cost as they may consider it confidential. A study was conducted by Ogunniyi L. T on measurement of the PE of maize products in Nigeria during the year 2011 for a sample of 240 maize products, which was concluded the PE of the farmers as varied significantly between 1% and 99.9% with a basis of 41.4%. This was due to different factors which included the education element and was suggested that the education element needs to be significantly improved in order to improve and reduce profit inefficiency (Abduh and Alias, 2014). In addition to that, it was also found that there is a significant negative coefficient on the education and the profit efficiency of the farms. These results are consistent with (Abduh and Alias, 2014). Moreover, Abbot, presented a paper during the year 2003 on PE among Bangladeshi Rice farmers using data during the year 1996.

Table 1
Summary of the Factors of the Empirical Literature Review for the Cost and Profit Efficiency

Author	Sample/Year / Country	Methodology	Factors	Results / conclusion
Abduh and Alias (2014)	15 Islamic Banks 2006 - 2010 Malaysia	a- Regression method b- Pooled OLS method	a- Size b- Operating cost c- ROA d- Annual Inflation e- Credit risk f- Education cost	Study objective to find out the element of Islamic banks performance, the results showed some of the variables effect significantly the performance of the Islamic banks.
Alber (2011)	6 commercial banks 1998-2007 Saudi Arabia	a- Ratios of actual profitability	a- Information Technology b- Population density c- ROA d- ROE e- Labor f- Credit risk g- Competition h- Production cost	The study examining the PE of the Saudi banks and analyzing how it might be affected by banking examination. It was found that, it did impact certain banking products and services but not the POS services.
Srairi (2010)	71 Commercial banks 1999-2007 GCC	b- SFA	a- Size b- Equity to assets c- Population density d- Annual inflation e- GDP g- Operating cost	Examine the cost and profit efficiency of the GCC countries and comparative of the efficiency between the GCC countries and was concluded that the banks in this reign are more efficient at profit than controlling cost. It was also found that the conventional banks are more efficient in the profit part than the Islamic banks.
Yildirim and Philippatos (2005)	12 Banks 1993-2000 Central and Eastern Europe (CEE)	SFA DFA	a- Size b- GDP per Capita c- Credit risk d- Annual Inflation e- Operating cost	Analysis the cost and profit efficiency of the banks and concluded that the managerial inefficiency was found to be substantial.
Hassan (2005)	43 Islamic banks 1995-2001 Worldwide	SFA DEA Malmquist Model	a- Information technology b- Production cost c- ROA d- ROE	Paper inspects the cost, profit, revenue, x-efficiency, in the world, and was concluded that the Islamic banks are less efficient compared to the conversional banks, it was also stated that all efficiency

			e- Market competition	measure variables are correlated with ROA and ROE.
Hussain (2003)	17 Islamic Banks1990-20000 Sudan	SFA	a- Size b- GDP c- Annual Inflation d- Operational Cost e- Market competition	Examine the operational efficiency of the Islamic banks and was stated that the Islamic banks in Sudan do not create inefficiency and was added that although the efficiency is constant the efficiency between the banks was different and worth consideration.
Abbot (2003)	21 Villages as on 1996 Bangladesh	SFA	a- Size b- Education factor c- Production cost d- Labor productivity e- Competition	The study is investigating the production efficiency of the Bangladesh rich rice firm as on 1996, it was stated that there is high level of inefficiency in modern rice farming,

Source(s): The study's authors

Theory of Cost Efficiency and Profit Efficiency

Based on Pasiouras et al (2009), CE is a broader model than efficiency models such as technical efficiency (TE), as it refers to both technical and allocative efficiency (AE). Likewise, the PE is also a broader model as it addresses both costs and revenues in the evaluation and measurement of the financial institutions' efficiency. The main meaning and explanation of the CE correspond to one important financial goal of cost minimization (Isik and Hassan, 2002) has defined CE as a measure of how far financial institutions cost is from the best practice financial institutions cost, if it was to have the same output of production under the same conditions. It is evaluated and measured as the trends and ratios between the lowest cost, at which it is possible to achieve a given quantity and capacity of outcome and the observed costs for an institution. For example, a CE score of 0.90 would mean that the financial institution is using 90% of its resources efficiently or instead trashes 10% of its cost's comparatively to a best-practice institution.

PE is a broader model than CE, as it considers the effect of the choice of the cause and vector of production on both cost and revenues (Sihotang et al, 2022). It is also determined as the trend or ratio between the actual profit of a financial institution and the extreme level that could be reached by the most efficient financial institution (Maudos et al, 2002). In other words, the number signifies the percent of the extreme profits that a financial institution making.

The Framework of the Research

This conceptual frame work was developed on the literature based from the previous research papers, on the same topic of the PE and CE. This framework is more in line with the current research paper, which therefore leads the current researcher to propose the use of the same factors to support his theses analysis, related to the PE and CE of the Islamic banks and Islamic windows of the Sultanate of Oman,

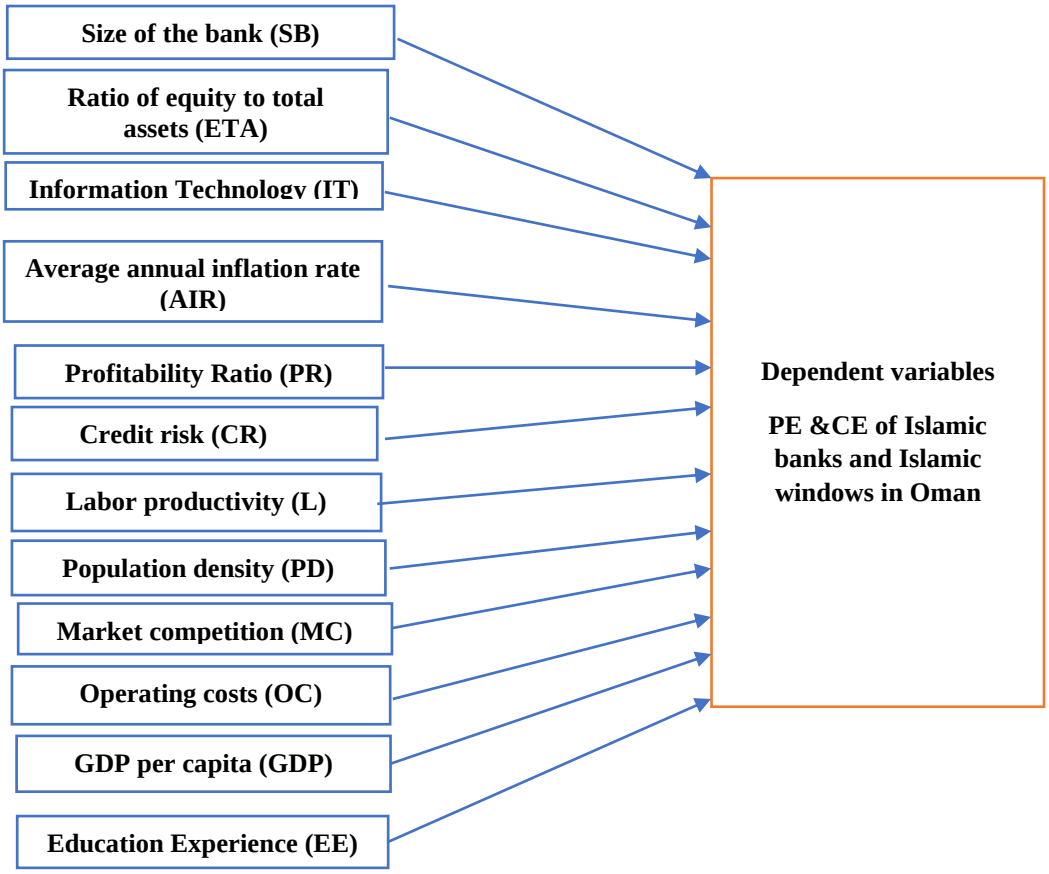

Figure 1. Conceptual Framework PE and CE

The above conceptual framework was built from different research papers backgrounds, theories, and concepts related to the PE and CE of the Islamic and non-Islamic banks of other countries worldwide, for the purpose of analyzing and exploring the elements that effect of the PE and CE of the Islamic banks and Islamic windows in Oman. Compiling information and understanding in regards with the PE and CE of the Islamic banks in Oman will be obtained by the end of this study. Above are collection of 12 factors including profitability ratios and other economic related elements such as GDP per Capita, Inflationary element, production cost, educational level and others, which are expected to find out the impact of these elements to the PE and CE of the Islamic banks and Islamic windows in Oman and to determine the cause of the inefficiency if any to the PE and CE of the Islamic banks and Islamic windows in Oman.

Malmquist – Productivity Model

The Malmquist Productivity Model, applied to Islamic banks and Islamic windows, yields insights into efficiency and productivity dynamics from 2015 to 2022. This analysis reveals how both entities navigate technological changes and efficiency adaptations over time. The decomposition of efficiency into metrics such as Constant Returns to Scale Technical Efficiency (CRS TE) relative to technology in preceding and succeeding years, and Variable Returns to Scale Technical Efficiency (VRS TE), provides a detailed understanding of the maintenance of efficiency amidst technological evolution and market shifts.

Throughout the observed periods, Islamic banks demonstrate adaptability, as indicated by fluctuations in CRS TE. Islamic windows, displaying varying levels of efficiency relative to Islamic banks, also show significant adaptability in technical efficiency, reflecting

responses to technological advancements and operational challenges. The Malmquist Index Summary, elucidating efficiency change (EFFCH), technological change (TECHCH), pure efficiency change (PECH), scale efficiency change (SECH), and total factor productivity change (TFPHC), offers a comprehensive perspective on productivity evolution within these banking entities.

This model underscores a narrative of growth, adaptation, and strategic pursuit of efficiency within the Islamic banking sector, emphasizing the critical role of technological adoption and operational flexibility in maintaining a competitive edge and enhancing productivity. This analysis not only provides a retrospective and current view of dynamics within Islamic banks and windows but also acts as a predictive tool for future trends in efficiency and productivity, guiding strategic decisions in the financial industry's evolving landscape.

Distances Summary

The analysis of distances within the realm of Islamic banking and windows, as summarized in Table 4.14, presents a nuanced understanding of the efficiency dynamics characterizing this segment over the years. This summary draws upon the insights and methodologies discussed extensively in the literature, notably by Otaviya and Rani (2020), Usman, Andriyani, and Pambuko (2019), Alexakis et al. (2019), Jubilee et al. (2021), Alsharif et al. (2019), Chowdhury and Haron (2021), and Yas, Mardani, and Alfarttoosi (2020), which collectively underscore the importance of evaluating technical efficiency (TE) and productivity within Islamic financial institutions.

The progression from 2015 through 2022 highlights significant fluctuations in Constant Returns to Scale Technical Efficiency (CRS TE) relative to technology across both Islamic banks and windows. The data underscores a pivotal movement in year-to-year efficiency, especially noticeable in the transition from CRS TE relative to technology in year (t-1) to year (t), and subsequently to year (t+1), alongside Variable Returns to Scale Technical Efficiency (VRS TE).

In 2015, Islamic banks and windows start from a base point where CRS TE relative to technology in year (t-1) is 0.000, indicating a reset or a baseline measurement in efficiency. Islamic banks remarkably reached a CRS TE of 1.000 in year (t), with a significant leap to 4.304 in year (t+1), showcasing a substantial adaptation or improvement relative to technological advancements. Conversely, Islamic windows depicted a more modest increase, marking a notable difference in adaptability or technological leverage between the two.

As the years progress, an evident fluctuation in efficiency metrics signifies varied responses to technological changes and operational adjustments. For instance, the mean values in subsequent years reflect an overarching trend of adaptation, with the mean CRS TE relative to technology in year (t) consistently showing improvement or maintenance of high efficiency levels, especially notable in Islamic banks.

The years 2017 and 2021 notably exhibit higher distance measurements, indicating significant shifts in technological adaptation or efficiency strategies, contrasting sharply with the years 2016 and 2022, where a more stabilized efficiency pattern emerges. Particularly, the year 2022 marks a point where CRS TE relative to technology in year (t+1) drops to 0.000

for both Islamic banks and windows, suggesting a pivotal shift or recalibration in the efficiency and technology relationship.

Table 2
Distances Summary

Year	Bank type	CRS TE Rel to Tech in Yr (t-1)	CRS TE Rel to Tech in Yr (t)	CRS TE Rel to Tech in Yr (t+1)	VRS TE
2015	Islamic banks	0.000	1.000	4.304	1.000
2015	Islamic windows	0.000	0.227	0.978	1.000
Mean		0.000	0.614	2.641	1.000
2016	Islamic banks	0.454	1.000	0.598	1.000
2016	Islamic windows	0.232	1.000	0.612	1.000
Mean		0.343	1.000	0.605	1.000
2017	Islamic banks	2.510	1.000	1.309	1.000
2017	Islamic windows	1.213	0.734	0.908	1.000
Mean		1.862	0.867	1.108	1.000
2018	Islamic banks	0.966	1.000	0.410	1.000
2018	Islamic windows	0.808	1.000	0.458	1.000
Mean		0.887	1.000	0.434	1.000
2019	Islamic banks	3.046	1.000	1.810	1.000
2019	Islamic windows	1.328	0.591	0.862	1.000
Mean		2.187	0.796	1.336	1.000
2020	Islamic banks	0.604	1.000	0.358	1.000
2020	Islamic windows	0.686	1.000	0.489	1.000
Mean		0.645	1.000	0.424	1.000
2021	Islamic banks	3.255	1.000	1.917	1.000
2021	Islamic windows	1.361	0.627	0.716	1.000
Mean		2.308	0.814	1.317	1.000
2022	Islamic banks	0.525	1.000	0.000	1.000
2022	Islamic windows	0.876	1.000	0.000	1.000
Mean		0.700	1.000	0.000	1.000

CRS: Constant Returns; TE: Technical Efficiency; Tech: Technology

Malmquist Index Summary

The Malmquist Index Summary in Table 2 encapsulates the evolution of productivity and efficiency in Islamic banks and Islamic windows from 2016 to 2022, providing a clear lens through the works of noted scholars in the field. The research by Otaviya and Rani (2020), Usman, Andriyani, and Pambuko (2019), Alexakis et al. (2019), Jubilee et al. (2021), Alsharif et al. (2019), Chowdhury and Haron (2021), and Yas, Mardani, and Alfarttoosi (2020) forms a foundational backdrop to understanding these dynamics, particularly in the context of efficiency change (EFFCH), technological change (TECHCH), pure efficiency change (PECH), scale efficiency change (SECH), and total factor productivity change (TFPHC).

The distinctions in productivity and efficiency between Islamic banks and Islamic windows are starkly illustrated, with Islamic windows often demonstrating higher variability in efficiency and productivity changes compared to Islamic banks. This variability suggests different strategic focuses and operational dynamics within the broader Islamic banking sector.

Both entities' adaptation to technological advancements, indicated by TECHCH, underscores the sector's evolving nature. Specifically, the fluctuation in technological change scores across the years points to the varying pace of technological adoption and integration into operational practices. The works of Alexakis et al. (2019) and Alsharif et al. (2019) highlight the impact of global financial environments and regulatory frameworks on such adaptations.

Notably, Islamic banks show a consistent EFFCH score of 1.000 across the years, suggesting a steady state of operational efficiency. In contrast, Islamic windows exhibit more significant fluctuations, as evidenced by their EFFCH and TFPHC scores. These findings align with Jubilee et al. (2021) and Chowdhury and Haron (2021), which compare Islamic banks to conventional counterparts, shedding light on the inherent differences in operational efficiency and productivity enhancement strategies.

The variance in PECH and SECH across the years for both Islamic banks and windows points to operational challenges and the impact of external factors on efficiency levels. Yas, Mardani, and Alfarttoosi (2020) specifically address the issues facing staff in the Islamic banking industry, which directly influence productivity levels.

Table 3
Malmquist Index Summary

Year	Bank	EFFCH	TECHCH	PECH	SECH	TFPHC
2016	Islamic banks	1.000	0.325	1.000	1.000	0.325
2016	Islamic windows	4.402	0.232	1.000	4.402	1.023
2017	Islamic banks	1.000	2.050	1.000	1.000	2.050
2017	Islamic windows	0.734	1.644	1.000	0.734	1.206
2018	Islamic banks	1.000	0.859	1.000	1.000	0.859
2018	Islamic windows	1.363	0.808	1.000	1.363	1.102
2019	Islamic banks	1.000	2.725	1.000	1.000	2.725
2019	Islamic windows	0.591	2.215	1.000	0.591	1.310
2020	Islamic banks	1.000	0.578	1.000	1.000	0.578
2020	Islamic windows	1.691	0.686	1.000	1.691	1.161
2021	Islamic banks	1.000	3.013	1.000	1.000	3.013
2021	Islamic windows	0.627	2.107	1.000	0.627	1.322
2022	Islamic banks	1.000	0.523	1.000	1.000	0.523
2022	Islamic windows	1.594	0.876	1.000	1.594	1.396

EFFCH: Efficiency Change; TECHCH: Technological Change; PECH: Pure Efficiency Change; SECH: Scale Efficiency Change; TFPHC: Total Factor Productivity Change

Malmquist Index Summary of Annual Means

The Malmquist Index Summary of Annual Means, as presented in Table 4, encapsulates the trajectory of productivity and efficiency across Islamic banking entities over a period extending from 2016 to 2022. This analysis draws on foundational research within the domain, notably contributions from Otaviya and Rani (2020), Usman, Andriyani, and Pambuko (2019), Alexakis et al. (2019), Jubilee et al. (2021), Alsharif et al. (2019), Chowdhury and Haron (2021), and Yas, Mardani, and Alfarttoosi (2020), providing a comprehensive framework for understanding efficiency and productivity dynamics in Islamic banks and windows.

The table illustrates significant fluctuations in Efficiency Change (EFFCH), Technological Change (TECHCH), and Total Factor Productivity Change (TFPHC) across the observed years, indicating the Islamic banking sector's dynamic response to technological advancements and operational efficiencies. The years 2017 and 2019 are particularly notable for high technological change (TECHCH) scores, suggesting periods of intense technological adaptation or shifts within the sector. These findings resonate with the observations made by Alexakis et al. (2019) regarding the global financial crisis's impact on bank performance and productivity.

The consistency in Pure Efficiency Change (PECH) and Scale Efficiency Change (SECH) across years underscores a stable operational efficiency level within the sector, despite the varying magnitude of technological and total factor productivity changes. This stability aligns with the insights from Jubilee et al. (2021) regarding the comparison of productivity levels between Islamic and conventional banks. The Total Factor Productivity Change (TFPHC) provides a nuanced view of productivity growth within the sector, with 2019 and 2021 marking significant peaks. This growth pattern highlights the sector's resilience and adaptability, as discussed in the work of Chowdhury and Haron (2021), focusing on the efficiency of Islamic Banks in the Southeast Asia region.

The summary underscores the strategic importance of balancing technological advancements with operational efficiencies to sustain and enhance productivity within the Islamic banking sector. The insights from Alsharif et al. (2019) on the productivity of GCC Islamic and conventional banks post-Basel III announcement further contextualize these findings within a regulatory and compliance framework.

Table 4
Malmquist Index Summary of Annual Means

Year	EFFCH	TECHCH	PECH	SECH	TFPHC
2016	2.701	0.279	1.000	2.701	0.750
2017	0.867	1.847	1.000	0.867	1.602
2018	1.181	0.833	1.000	1.181	0.983
2019	0.796	2.470	1.000	0.796	1.967
2020	1.346	0.632	1.000	1.346	0.851
2021	0.814	2.560	1.000	0.814	2.084
2022	1.297	0.699	1.000	1.297	0.907

EFFCH: Efficiency Change; TECHCH: Technological Change; PECH: Pure Efficiency Change; SECH: Scale Efficiency Change; TFPHC: Total Factor Productivity Change

Malmquist Index Summary of Bank Means

The Malmquist Index Summary of Bank Means, as detailed in Table 5, showcases a comparative analysis of productivity and efficiency changes within Islamic banks and their windows. This evaluation, informed by the foundational research of Otaviya and Rani (2020), Usman, Andriyani, and Pambuko (2019), Alexakis et al. (2019), Jubilee et al. (2021), Alsharif et al. (2019), Chowdhury and Haron (2021), and Yas, Mardani, and Alfarttoosi (2020), offers a deep dive into the operational dynamics and strategic evolutions witnessed within the Islamic financial sector.

The Efficiency Change (EFFCH) and Total Factor Productivity Change (TFPHC) metrics notably differentiate the performance between Islamic banks and windows. Islamic banks maintain a steady EFFCH and TFPHC at 1.047, indicating a consistent level of efficiency and productivity. In contrast, Islamic windows exhibit a higher EFFCH at 1.225 and TFPHC at 1.204, suggesting a more significant improvement in both efficiency and productivity over time.

The Technological Change (TECHCH) scores reveal subtle differences in the adoption and impact of technology between the two entities. Islamic banks show a slight increase in technology-related efficiency at 1.047, whereas Islamic windows have a marginally lower TECHCH score at 0.983, indicating diverse strategies or impacts of technological investments on operational efficiency. The Pure Efficiency Change (PECH) remains constant at 1.000 for both entities, suggesting that both Islamic banks and windows have maintained their operational efficiency without significant fluctuations. However, the Scale Efficiency Change (SECH) is higher for Islamic windows at 1.225, highlighting a more considerable improvement in scale efficiency compared to Islamic banks, which maintain a SECH score of 1.000.

This analysis underscores the nuanced operational and strategic responses of Islamic banks and windows to the challenges and opportunities presented by technological advancements, market demands, and regulatory environments. The differential in efficiency and productivity growth rates between Islamic banks and windows illuminates the sector's dynamic nature, as discussed in the works of Alexakis et al. (2019) and Alsharif et al. (2019), highlighting the importance of adaptive strategies in sustaining growth and competitiveness.

Furthermore, the insights from Chowdhury and Haron (2021) and Yas, Mardani, and Alfarttoosi (2020) emphasize the critical role of efficient operational practices and the adoption of technological innovations in enhancing productivity within the Islamic banking industry. The comparative analysis between Islamic banks and windows through the Malmquist Index Summary of Bank Means not only reflects on past and present performance metrics but also projects potential future trajectories for strategic planning and policy formulation within the sector.

Table 5
Malmquist Index Summary of Bank Means

Bank	EFFCH	TECHCH	PECH	SECH	TFPHC
Islamic banks	1.000	1.047	1.000	1.000	1.047
Islamic windows	1.225	0.983	1.000	1.225	1.204

EFFCH: Efficiency Change; TECHCH: Technological Change; PECH: Pure Efficiency Change; SECH: Scale Efficiency Change; TFPHC: Total Factor Productivity Change

Discussion

The comparative analysis of productivity levels between Islamic banks and Islamic windows within commercial banks reveals nuanced insights into their operational efficiency and strategic orientations. Drawing from the seminal works of scholars such as Otaviya and Rani (2020), Usman, Andriyani, and Pambuko (2019), Alexakis et al. (2019), Jubilee et al. (2021), Alsharif et al. (2019), Chowdhury and Haron (2021), and Yas, Mardani, and Alfarttoosi (2020), this discussion synthesizes findings on the productivity dynamics within these banking segments.

The consistent efficiency and productivity metrics observed in Islamic banks, as highlighted by Otaviya and Rani (2020) and Alsharif et al. (2019), suggest a robust operational framework that effectively leverages Islamic banking principles to maintain competitive advantage and customer satisfaction. The regulatory and ethical environment within which Islamic banks operate, as discussed by Alexakis et al. (2019), further enhances their productivity by aligning financial products and services with market demand and Islamic financial law (Shariah).

Islamic windows, operating within conventional commercial banks, exhibit varying levels of productivity, often influenced by the broader strategic goals and operational frameworks of their parent institutions. The research by Usman, Andriyani, and Pambuko (2019) and Jubilee et al. (2021) indicates that Islamic windows face unique challenges and opportunities in integrating Islamic financial products within a conventional banking setup, affecting their productivity levels. However, their strategic positioning allows for innovative product offerings and market expansion, leveraging the established infrastructure and customer base of conventional banks.

The adoption of technology and innovation emerges as a critical factor in enhancing the productivity of both Islamic banks and windows. The work by Chowdhury and Haron (2021) underscores the efficiency gains from technological investments, which enable Islamic financial institutions to streamline operations, enhance customer experience, and introduce innovative Shariah-compliant financial products. Operational efficiency, driven by effective risk management, skilled human capital, and streamlined processes, as discussed by Yas, Mardani, and Alfarttoosi (2020), plays a pivotal role in sustaining productivity. Islamic banks and windows benefit from a focus on operational excellence, aligning business practices with Islamic financial principles and customer expectations. The productivity of Islamic banks and windows is significantly influenced by market dynamics and the regulatory environment. The evolving landscape of Islamic finance, characterized by increased competition, regulatory changes, and market globalization, necessitates adaptive strategies to maintain and enhance productivity. The insights from Alexakis et al. (2019) highlight the importance of a conducive regulatory framework that supports innovation while ensuring compliance with Islamic financial principles.

Islamic banks operate under a unique model that adheres to Shariah principles, prohibiting interest (riba) and ensuring ethical investments. This model presents both constraints and opportunities. Otaviya and Rani (2020) argue that the adherence to Shariah principles necessitates innovative financial products and services, driving Islamic banks to enhance operational efficiency and customer service. Conversely, Islamic windows within

commercial banks must navigate the dual requirements of Shariah compliance and integration within conventional banking frameworks, often leading to operational complexities but also opportunities for innovation and market expansion (Usman, Andriyani, and Pambuko, 2019). The adoption of technology significantly impacts the productivity of both Islamic banks and windows. Alexakis et al. (2019) highlight that technological advancements, including fintech and blockchain, offer Islamic financial institutions the tools to streamline operations, enhance customer engagement, and develop new Shariah-compliant products. The ability to effectively integrate technology into operational and service models is a key driver of productivity, distinguishing more successful institutions from their peers.

The regulatory environment and market dynamics play crucial roles in shaping the productivity of Islamic banks and windows. Jubilee et al. (2021) and Alsharif et al. (2019) note that regulatory advancements and a supportive legal framework are vital for fostering innovation and operational efficiency in Islamic finance. Furthermore, the competitive landscape, characterized by the presence of both Islamic and conventional financial institutions, compels Islamic banks and windows to continually improve service delivery and operational efficiency to maintain and enhance market share.

The productivity of Islamic financial institutions is also influenced by human capital and organizational culture. Yas, Mardani, and Alfarttoosi (2020) emphasize the importance of skilled personnel who are not only proficient in modern banking practices but also deeply understand Islamic finance principles. The cultivation of a corporate culture that values innovation, customer service, and Shariah compliance contributes to enhanced productivity and operational efficiency. Scale efficiency and market penetration further elucidate the productivity differences between Islamic banks and windows. Chowdhury and Haron (2021) illustrate how scale efficiency, achieved through operational optimization and market expansion, directly impacts productivity. Islamic windows, benefiting from the established infrastructure and customer base of their parent commercial banks, may experience different scale efficiencies and market penetration rates compared to standalone Islamic banks. The productivity levels of Islamic banks and Islamic windows are the result of a complex interplay of factors, including operational models, technological adaptation, regulatory environments, human capital, and scale efficiency. These institutions' ability to navigate these factors, leveraging opportunities and mitigating challenges, ultimately determines their productivity and efficiency in the competitive landscape of global finance.

Based on a previous study, the efficiency of Islamic banks and Islamic windows in Oman is still less favorable for researchers from other industries, as compared to banks and other traditional industries. Most studies (Badreldin, 2015; Mohanty, 2012) only discuss the performance of traditional banking and Islamic banks in general within the GCC countries. In addition, research on CE and PE factors was limited only to the GCC, Middle East and North Africa (MENA) countries and the majority were either in cost efficiency or profit efficiency individually, less researches covered the Islamic banking industry in Oman due to that Oman Islamic banking was newly introduced and for those who included Oman Islamic banking covered it at aggregate level and did not include the Cost and Profit efficiency and the productivity level of these Islamic institutions, which also shown a studies by Rosman (2013); Mohanty (2012).

Although there were previous studies on Islamic banking in Oman (such as Rosman, 2013), they used the Islamic financial sector in general at the industry level, and did not take into account the factors that determine the efficiency of CE and PE towards the level of efficiency and productivity respectively. CE and PE can be more accurately measured when using the level of individual Islamic data by taking into account the causes of efficiency, which can enhance the efforts of improving and performing individual Islamic banks (Sihotang et al, 2022). Moreover, CE and PE levels and productivity growth can be measured more accurately when using the individual data level by taking into account the efficiencies while driving improvement efforts. Mohanty (2012) asserts that budgeting using the level of individual data as an individual is preferable because further analysis of factors affecting the budget level can be studied. Therefore, studies and analyses that use company-wide data have considered the cost and efficiency elements of profit and the value of efficiency and productivity to be more relevant and accurate.

Benefits and Managerial Implications

There are research benefits that can be gained from this paper. Firstly, efforts towards improvement can be made based on CE and PE level decisions, productivity, factors and elements that determine the cause of efficiency. Policymakers who are aware of the factors driving efficiency can improve effective policy proposals and recommendations for developing CE and PE levels and entity productivity. For example, if productivity growth slows down due to low technological progress, policymakers should suggest a policy that stimulates continuous development of technology and application of the latest technologies, which will enhance the efficiency of the organization. In individual Islamic banks, if slow performance and productivity growth is caused by the high manual process and the large waste of inputs that affecting CE and PE of the enterprise, policies that promote CE and PE are required to automatize manual processes by introducing specific technologies and also working with experts in providing extensive training program to improve skills for the production team to optimize the use of raw materials and reduce waste.

In addition to that, this paper provides useful quotes and information for all parties, whether private sector, investors and society to improve public efficiency and use economic resources more efficiently to produce higher performance and productivity, like using the same inputs for maximum production. While the government can offer strategies to enhance the competency of CE and PE certification for companies and the Islamic financial sector as a whole. More than that, this study paper is important for the methodological aspect by applying data envelope analysis (DEA) to determine the level of proficiency. Then, the researcher will use DEAP model to find out the efficiency results. This method is important because of the use of variables on various elements (either makes or causes efficiency in the Islamic financial sectors), is flexible to allow for changes to the variables of the data used. As a result, this method gives a better and clearer analysis of the efficiency of Islamic financial sectors accurately.

Finally, this study is ideal to serve as a citation and additional reference for future generations for the researcher to conduct more studies and analyzes related to Islamic finance in Oman. Indeed, the information obtained by internal or external (global) researchers can be used in the future to determine and trade CE, PE and the productivity of Islamic

banking services in Oman. This study, therefore, can become beneficial as valuable reading material in adding knowledge to faster economic progress.

Conclusion

To ensure the Islamic banks industry future economic sustainability and participation on the country fiscal economy to support the Omani's government on diversification of the country's source of fund and Oman's GDP, it is very important and crucial to encourage Islamic banks to have strong economic performance, including their profitability and productivity. Many researchers and literatures proved that cost and profit efficiency have direct impact on the banks and other organizations performance; therefore, it is important for the banks to have a proper measurement of their organization performance. Many elements and factors have direct impact on the efficiency of the banks including competition, size and labor productivity. Some of the researchers proved that there is positive relation of these factors with the performance of the banks while some has proved a negative impact. Islamic banks as SMEs of the country is considered to have big role in supporting the country's fiscal economy, such as provision of work, support, financing, and act as financial intermediary to the country. The increasing significance of Islamic finance globally and particularly in Oman highlights the need for a detailed analysis of productivity levels in this sector. Oman's efforts to diversify its economy away from oil dependence make understanding the role of Islamic banking crucial, as it can attract investments and promote sustainable growth.

The establishment of specific regulations for Islamic banks and windows in Oman necessitates an evaluation of their productivity to ensure compliance and efficiency. Islamic banking can enhance financial inclusion in Oman, addressing the needs of individuals who prefer Sharia-compliant products. There's a need for benchmarks in productivity to compare Islamic banks with conventional banks and assess their competitive position in the market.

This study provides empirical data on the productivity levels of Islamic banks and windows, contributing to the literature on Islamic finance and banking performance. Insights from the study can inform policymakers about the strengths and weaknesses of Islamic banking practices, aiding in the formulation of supportive policies. Banks can utilize the findings to develop strategies aimed at improving productivity, enhancing service delivery, and meeting customer needs more effectively.

The study can serve as a resource for educating stakeholders about the benefits and challenges of Islamic banking, fostering a deeper understanding of its operations. By identifying gaps in the existing literature and highlighting areas for further study, this research can stimulate ongoing academic inquiry into Islamic banking practices in Oman and beyond. The study of productivity in Islamic banks and Islamic windows in Oman is timely and essential. It not only addresses current economic needs but also contributes to the broader understanding of Islamic finance's role in fostering economic growth and financial stability.

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