

Cost, Profit Efficiency, and Productivity of Islamic Banks and Islamic Windows in Oman

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ABSTRACT

This study examines the cost efficiency, profit efficiency, and productivity of Islamic banks and Islamic windows in Oman. It compares the performance of the two banking models, identifies the factors influencing their efficiency, and evaluates productivity changes over the period 2015–2022. A quantitative study approach was employed using balanced panel data from two fully-fledged Islamic banks and six Islamic windows. Cost efficiency and profit efficiency were estimated using Data Envelopment Analysis (DEA), Tobit regression was applied to identify efficiency determinants, and the Malmquist Productivity Index (MPI) was used to measure productivity growth. The findings indicate that Islamic windows generally outperformed fully-fledged Islamic banks in both cost and profit efficiency, mainly due to shared infrastructure, economies of scale, and managerial support from their parent conventional banks. Productivity growth was primarily driven by technological progress, while capital adequacy and credit risk were significant determinants of efficiency for both banking models. The study contributes to the literature by providing one of the first institution-level comparisons of Islamic banks and Islamic windows in Oman and integrating efficiency, productivity, and determinant analyses within a single framework. The findings offer practical implications for the Central Bank of Oman, Islamic financial institutions, and policymakers seeking to enhance operational efficiency, productivity, and the sustainable development of the Islamic banking sector in support of Oman Vision 2040.

Keywords: – Islamic banks, Islamic windows, cost efficiency, profit efficiency, productivity, Oman

INTRODUCTION

Islamic banking has become one of the fastest-growing segments of the global financial system, offering Shariah-compliant financial services based on the principles of risk-sharing, asset-backed financing, and ethical investment (Al Asmi et al., 2024a). Unlike conventional banking, Islamic banking prohibits interest (Riba), excessive uncertainty (Gharar), and speculative activities, relying instead on financing modes such as Murabaha, Mudarabah, Musharakah, and Ijarah (Central Bank of Oman, 2019). The rapid expansion of Islamic finance has strengthened its role in promoting financial inclusion, economic diversification, and sustainable economic development (Al Asmi et al., 2024b).

In Oman, Islamic banking was formally introduced in 2012 following the implementation of the Islamic Banking Regulatory Framework (IBRF) by the Central Bank of Oman (CBO). Since then, the sector has grown steadily through two full-fledged Islamic banks and six Islamic windows operated by conventional banks, contributing significantly to the country's financial sector and supporting the objectives of Oman Vision 2040 (Central Bank of Oman, 2019). However, rapid institutional growth does not necessarily translate into superior operational performance. Despite continuous increases in Islamic banking assets, financing, and deposits, variations in efficiency and productivity indicate that improvements in resource utilization remain a critical challenge (Al Asmi et al., 2024a).

Cost efficiency (CE), profit efficiency (PE), and productivity are widely recognised as key indicators of banking performance because they measure how effectively financial institutions utilize resources, generate profits, and sustain competitiveness. Enhancing these performance dimensions is essential for improving the operational sustainability of Islamic banking institutions and strengthening their contribution to economic growth (Iqbal, 2008, 2013; Mohanty, 2012).

Although previous studies have extensively compared Islamic and conventional banks across different countries, limited study has examined the performance differences between full-fledged Islamic banks and Islamic windows operating within the same regulatory environment, particularly in Oman (Al Asmi et al., 2024b). The coexistence of these two institutional models provides a unique opportunity to evaluate whether shared infrastructure and economies of scale enable Islamic windows to achieve higher efficiency than standalone Islamic banks. Therefore, this study examines the cost efficiency, profit efficiency, and productivity of Islamic banks and Islamic windows in Oman during the period 2015–2022 using Data Envelopment Analysis (DEA), Tobit regression, and the Malmquist Productivity Index (MPI). By integrating efficiency measurement, determinant analysis, and productivity assessment within a single framework, the study contributes to the literature on Islamic banking and provides practical implications for regulators, policymakers, and bank managers seeking to enhance the sustainable development of the Islamic banking sector.

LITERATURE REVIEW

This section reviews previous studies related to banking efficiency, focusing on cost efficiency (CE), profit efficiency (PE), and productivity. It examines the theoretical foundations of efficiency, measurement approaches, and the internal and external factors influencing the performance of Islamic banks. The review also highlights empirical evidence from global, regional, and Omani banking contexts, identifying study gaps and providing the basis for the development of the study framework.

The factors of cost efficiency (CE) and profit efficiency (PE) of banks

Previous studies have identified several internal and external factors that influence the cost efficiency (CE) and profit efficiency (PE) of banks. The most frequently examined determinants include bank size, the ratio of equity to total assets, information technology, average annual inflation rate, profitability, credit risk, labour productivity, population density, market competition, operating costs, GDP per capita, and education level. These factors affect banks' ability to utilize resources efficiently, improve profitability, and maintain competitiveness.

Bank size is widely recognized as an important determinant of banking efficiency. Larger banks generally benefit from economies of scale, greater capital resources, and improved operational capabilities, leading to higher cost and profit efficiency (Bader et al., 2008; Isik & Hassan, 2002). Similarly, Srairi (2010) reported that larger banks with stronger capital bases and higher asset levels tend to achieve better operational performance.

The **ratio of equity to total assets** reflects a bank's financial strength and capital adequacy. Well-capitalized banks are generally more resilient and better able to absorb financial risks. Although Hassan and Ahmed (2019) found that this variable has a positive relationship with profitability, its direct effect on cost and profit efficiency appears to be relatively weak and depends on the banking environment.

Information technology (IT) plays a critical role in improving banking efficiency by reducing operating costs, enhancing service quality, and increasing productivity. Technological advancement enables banks to automate processes, improve customer service, and optimize resource utilization (Frei et al., 2014; Sinkey, 2002). Studies by Vander Venet (2005) and Abduh and Alias (2014) further demonstrate that investment in technology contributes significantly to both cost and profit efficiency through operational integration and process innovation.

Among the external factors, the **average annual inflation rate** influences banks' operating environment by affecting costs, purchasing power, and financial stability. While some studies report that inflation has an insignificant effect on banking efficiency (Hassan & Ahmed, 2019; Mghaieth & Khanchel, 2015), others argue that persistent inflation can negatively affect financial performance and long-term efficiency (Sanusi, Meyer, & Ślusarczyk, 2017). These mixed findings suggest that the impact of inflation depends largely on macroeconomic conditions and banks' ability to adapt to changing economic environments.

The **Return on Assets (ROA)** ratio measures a bank's profitability in relation to its total assets and reflects the efficiency of asset utilization in generating profits. Hassan (2005) found a strong relationship between ROA and cost efficiency, while Srairi (2010) indicated that higher ROA has a positive impact on efficiency. However, Rosly and Bakar (2003) showed that although Islamic banks in Malaysia achieved higher ROA than conventional banks, they were not necessarily more efficient. Credit risk also plays a significant role in influencing cost efficiency and profit efficiency (Abduh and Alias, 2014), as it is one of the main factors affecting bank profitability (Srairi, 2010).

Several internal and external factors influence bank efficiency, including employee skills, competition, organizational size, and operating costs. Pilar et al. (2018) highlighted that improving labor skills positively affects business efficiency. Srairi (2010) found that population density negatively influences cost and profit efficiency, while competition and market pressure are important determinants of organizational efficiency (Sinkey, 2002; Vander Venet, 2005). Furthermore, high operating costs negatively affect bank profitability (Sufian, 2011).

The **Gross Domestic Product (GDP)** represents the economic growth level of a country and influences the demand for banking services. Yildirim and Philippatos (2005) found that GDP has a positive relationship with cost efficiency but a negative relationship with profit efficiency. Similarly, Dietsch and Lozano-vivas (2000) emphasized that differences in GDP per capita across countries can affect the demand for banking services.

Education is also considered an important factor affecting bank efficiency and profitability; however, limited data availability has restricted its use in previous studies. Study by Abduh and Alias (2014) suggested that improving education levels can reduce inefficiency and enhance performance. Ogunniyi (2011) also found that education contributes to variations in production efficiency.

Efficiency is widely recognised as one of the most important indicators of banking performance because it reflects the ability of financial institutions to transform inputs into outputs while minimizing resource wastage. Banking efficiency contributes to profitability, competitiveness, and financial sustainability. The literature distinguishes several forms of efficiency, including technical, allocative, scale, cost, and profit efficiency. Among these, cost efficiency measures a bank's ability to minimize operating costs for a given level of output, whereas profit efficiency evaluates the ability to maximize profits by jointly considering revenues and costs. Previous empirical studies generally report that Islamic banks incur relatively higher operating costs because of Shariah governance, asset-backed financing, and more complex contractual structures. However, they often achieve strong profit efficiency through customer loyalty, product differentiation, and ethical financial services. Within dual banking systems, Islamic windows may possess operational advantages because they share infrastructure, branch networks, information technology, and managerial resources with their parent conventional banks, thereby reducing operating costs and improving efficiency.

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 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 b- 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 e- Market competition	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 measure variables are correlated with ROA and ROE.
Hussain (2003)	17 Islamic Banks 1990-2000 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

This study reviewed the literature on banking efficiency, focusing on cost efficiency (CE) and profit efficiency (PE). Productivity theory was identified as the most suitable foundation, linking efficiency with technological progress and innovation. The review highlighted different efficiency types and examined factors affecting banking performance, including bank size, technology, credit risk, competition, operating costs, GDP, and education. Evidence from Oman showed challenges for Islamic banks in achieving cost efficiency, while maintaining strong profit efficiency. The study also identified study gaps in comparing Islamic banks and Islamic windows in Oman and integrating productivity measures with efficiency analysis, leading to the development of a framework examining CE, PE, and productivity determinants.

Theory of cost efficiency and profit efficiency

CE is a broader efficiency measure than technical efficiency because it includes both technical and allocative efficiency (Pasiouras et al., 2009). It measures a financial institution's ability to minimize costs compared with the best-performing institution under similar conditions (Isik and Hassan, 2002). A CE score of 0.90 indicates that the institution operates at 90% efficiency and has 10% higher costs than the best practice. PE is a broader measure than CE as it considers both costs and revenues (Sihotang et al., 2022). It measures the ratio between a financial institution's actual profit and the maximum possible profit achieved by the most efficient institution (Maudos et al., 2002).

The conceptual framework

The conceptual framework is developed to examine the determinants of cost efficiency (CE), profit efficiency (PE), and productivity of Islamic banks and Islamic windows operating in Oman. It assumes that both internal bank characteristics and external macroeconomic conditions affect banking efficiency, while efficiency itself contributes to improvements in productivity. The framework contains three main components:

- Independent variables.
- Dependent variables (Cost Efficiency and Profit Efficiency).
- Outcome variable (Productivity).

The proposed relationships are illustrated in Figure 1.

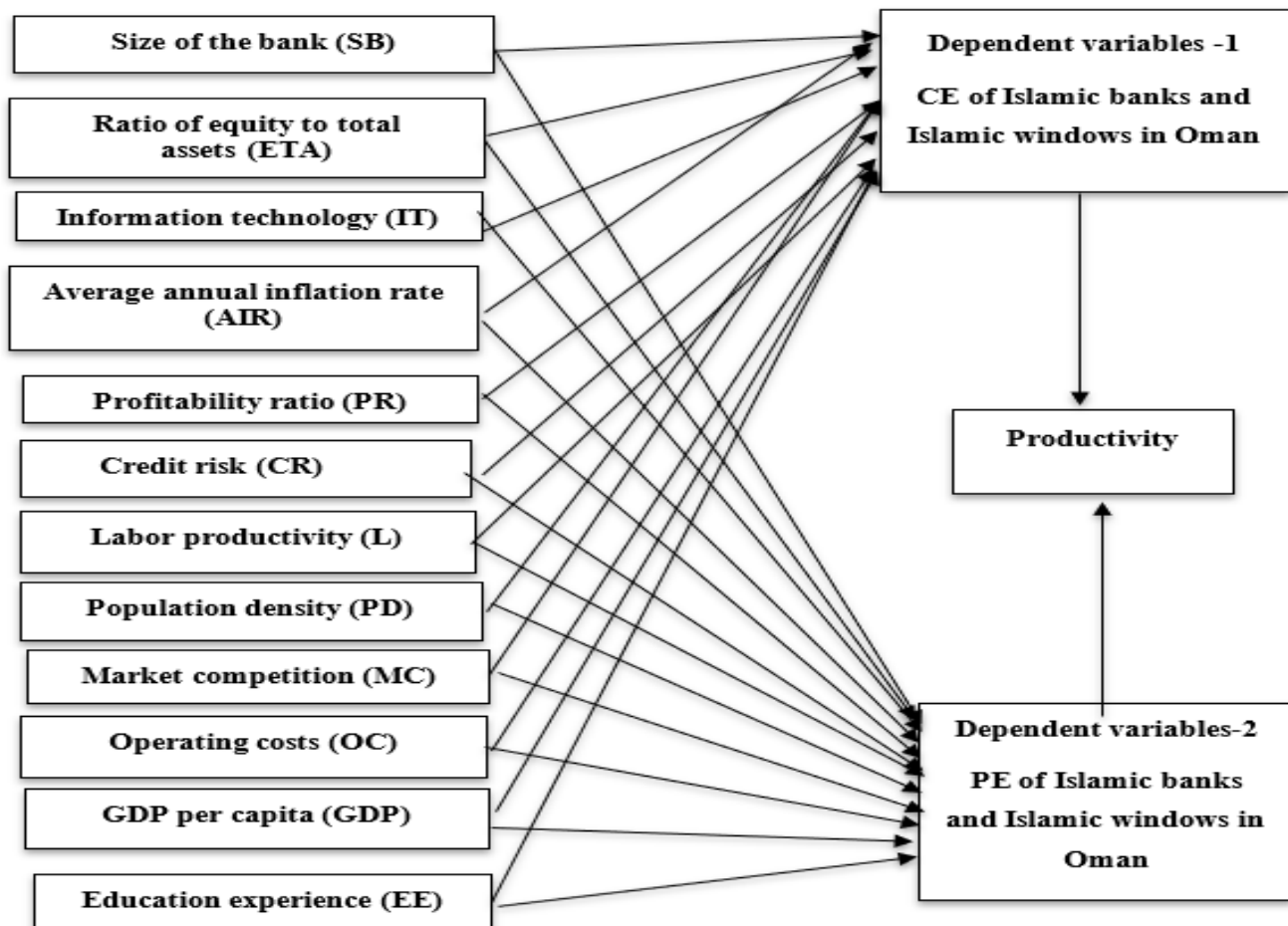


Figure 1. Conceptual Framework PE, CE and productivity

Bank-specific factors (SB, ETA, IT, PR, CR, L, OC, and EE) and macroeconomic factors (AIR, PD, MC, and GDP) influence both cost efficiency (CE) and profit efficiency (PE). CE and PE act as mediating variables, as improvements in efficiency enhance banking productivity. The dependent variables are CE and PE scores measured using Data Envelopment Analysis (DEA), where CE evaluates cost minimization and PE measures profit maximization. The independent variables include internal factors (bank size, equity ratio, IT, profitability, credit risk, labor productivity, operating costs, and education) and external factors (inflation, GDP per capita, market competition, and population density). The study applies Tobit regression to examine the relationship between these factors and efficiency outcomes through twelve hypotheses (H1a–H12b), assessing their effects on CE and PE.. The twelve sets of hypotheses (H1a–H12b) are summarized as follows:

- H1a and H1b propose that bank size positively influences both cost efficiency and profit efficiency.
- H2a and H2b test whether the equity-to-asset ratio significantly impacts CE and PE.
- H3a and H3b hypothesize that IT investments enhance CE and PE.
- H4a and H4b examine the role of inflation, suggesting that average annual inflation rate significantly influences CE and PE.
- H5a and H5b evaluate the effect of profitability ratios on CE and PE.
- H6a and H6b address the impact of credit risk on CE and PE.
- H7a and H7b consider whether labor productivity improves efficiency outcomes.
- H8a and H8b test the influence of population density on CE and PE.
- H9a and H9b examine whether market competition significantly affects CE and PE.
- H10a and H10b analyze the impact of operating costs on efficiency levels.
- H11a and H11b focus on the role of GDP per capita as a macroeconomic driver of CE and PE.
- H12a and H12b test whether education experience significantly enhances CE and PE.

Malmquist – Productivity model

The Malmquist Productivity Model analysis of Islamic banks and Islamic windows from 2015 to 2022 provides insights into changes in efficiency and productivity over time. The model evaluates different efficiency components, including Constant Returns to Scale Technical Efficiency (CRS TE), Variable Returns to Scale Technical Efficiency (VRS TE), Efficiency Change (EFFCH), Technological Change (TECHCH), Pure Efficiency Change (PECH), Scale Efficiency Change (SECH), and Total Factor Productivity Change (TFPHC). The findings demonstrate that both Islamic banks and windows have adapted to technological developments and market changes, highlighting the importance of innovation and operational flexibility in improving productivity. The efficiency distance analysis in Table 4.14 shows variations in technical efficiency between 2015 and 2022. Both Islamic banks and windows experienced fluctuations in CRS TE and VRS TE due to changes in technology adoption and operational strategies. Islamic banks showed stronger improvements in CRS TE, particularly in certain periods, reflecting greater adaptation to technological progress. Islamic windows also demonstrated improvements but with different patterns of efficiency development. Overall, the results indicate that efficiency levels changed significantly across the study period, with notable improvements in 2017 and 2021, while 2016 and 2022 showed more stable efficiency patterns. The decline in CRS TE relative to future technology in 2022 suggests a possible adjustment in the relationship between technological advancement and efficiency performance. These findings emphasize the importance of continuous technological adaptation and effective management strategies for enhancing productivity in the Islamic banking sector.

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 of Bank means and Windows

The Malmquist Index Summary of Bank Means, as detailed in Table 3, showcases a comparative analysis of productivity and efficiency changes within Islamic banks and their windows. This evaluation, informed by the foundational study 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) results show clear differences between Islamic banks and Islamic windows. Islamic banks recorded stable efficiency and productivity levels, with both EFFCH and TFPHC values reaching 1.047, indicating consistent performance over time. In comparison, Islamic windows achieved higher improvements, with EFFCH and TFPHC scores of 1.225 and 1.204, respectively, reflecting greater growth in efficiency and productivity.

The Technological Change (TECHCH) results indicate slight variations in technology adoption. Islamic banks recorded a TECHCH score of 1.047, showing positive technological progress, while Islamic windows reported a slightly lower score of 0.983, suggesting different approaches to technology utilization. The Pure Efficiency

Change (PECH) remained unchanged at 1.000 for both groups, indicating stable operational efficiency. However, Islamic windows achieved a higher Scale Efficiency Change (SECH) of 1.225, compared to 1.000 for Islamic banks, demonstrating greater improvement in operational scale.

Overall, the findings highlight differences in strategic adaptation between Islamic banks and windows in responding to technological developments, market conditions, and regulatory requirements. These results support previous studies (Alexakis et al., 2019; Alsharif et al., 2019) emphasizing the importance of adaptive strategies for maintaining competitiveness. Additionally, study by Chowdhury and Haron (2021) and Yas, Mardani, and Alfarttoosi (2020) confirms that operational efficiency and technological innovation are key drivers of productivity improvement in Islamic banking.

Table 3: Malmquist index summary of banks 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

METHODOLOGY

The study adopts a quantitative study design using balanced panel data covering the period 2015–2022. The sample consists of all licensed Islamic banking institutions in Oman, namely two full-fledged Islamic banks and six Islamic windows.

Three complementary analytical techniques were employed:

- Data Envelopment Analysis (DEA) to estimate cost and profit efficiency.
- Tobit regression to examine the determinants of efficiency.
- Malmquist Productivity Index (MPI) to measure productivity change over time.

The independent variables include bank size, capital adequacy, information technology, inflation, profitability, credit risk, labor productivity, population density, market competition, operating costs, GDP per capita, and education experience. Cost efficiency and profit efficiency act as dependent variables, while productivity is measured using the MPI framework.

Data analysis and hypothesis testing

This section presents the empirical analysis of the study. Data Envelopment Analysis (DEA) was first applied to estimate the cost efficiency (CE) and profit efficiency (PE) scores of Islamic banks and Islamic windows. The Malmquist Productivity Index (MPI) was then used to measure productivity changes over time and identify the contributions of efficiency and technological progress. Finally, Tobit regression analysis was employed to test the study hypotheses by examining the effects of bank-specific and macroeconomic factors on CE and PE. The findings determine whether the proposed hypotheses are supported and identify the key determinants of banking efficiency and productivity.

Table 4.: Summary Comparison of CE between Islamic Banks and Islamic Windows (2015–2022)

Year	Islamic Banks (VRS)	Islamic Windows (VRS)	Better Performer
2015	1.000	1.000	Equal
2016	0.934	1.000	Islamic Windows
2017	0.877	0.727	Islamic Banks
2018	0.806	0.431	Islamic Banks
2019	0.745	1.000	Islamic Windows
2020	0.707	1.000	Islamic Windows
2021	0.666	1.000	Islamic Windows
2022	0.630	1.000	Islamic Windows

Table 4 presents a year-by-year comparison of the cost efficiency performance of Islamic banks and Islamic windows under the Variable Returns to Scale (VRS) assumption during the period 2015–2022. Since the BCC-VRS model was selected as the most appropriate DEA specification for this study, the comparison focuses on pure technical cost efficiency by excluding scale effects.

The results demonstrate that Islamic windows generally achieved stronger cost efficiency than fully-fledged Islamic banks throughout the study period. Both institutional forms operated on the efficient frontier in 2015, recording a VRS efficiency score of 1.000. However, their subsequent efficiency trajectories differed considerably. Islamic banks experienced a continuous decline in cost efficiency after 2015, with VRS efficiency falling steadily from 0.934 in 2016 to 0.630 in 2022, indicating progressively weaker managerial cost efficiency over time. In contrast, Islamic windows experienced an initial decline between 2016 and 2018, before recovering completely and maintaining full cost efficiency (1.000) from 2019 to 2022.

A year-by-year comparison further shows that Islamic windows outperformed Islamic banks in five of the eight years (2016 and 2019–2022), whereas Islamic banks recorded higher cost efficiency in 2017 and 2018, while both institutional forms performed equally in 2015. The temporary superiority of Islamic banks during 2017–2018 coincided with the period in which Islamic windows experienced substantial operational adjustments, reflected by the decline in their VRS efficiency to 0.727 and 0.431, respectively. Nevertheless, Islamic windows recovered rapidly after 2018 and sustained optimal efficiency for four consecutive years, demonstrating a stronger long-term improvement in cost management.

The superior performance of Islamic windows after 2018 may be attributed to the operational advantages derived from their integration with parent conventional banks, including access to shared infrastructure, established technological platforms, experienced human resources, and broader customer networks. These institutional advantages enabled Islamic windows to optimise resource utilisation and maintain stable operating costs despite changes in the banking environment. Conversely, the gradual decline in cost efficiency observed among Islamic banks suggests continuing challenges associated with maintaining independent operations, expanding organisational capacity, and meeting Shariah governance requirements within a relatively young Islamic banking sector.

The comparative analysis demonstrates that Islamic windows exhibited stronger and more sustainable cost efficiency performance than fully-fledged Islamic banks during most of the study period. Although Islamic banks performed better during two intermediate years, Islamic windows maintained optimal efficiency during the latter half of the study period, indicating greater operational stability and more effective resource utilisation. These findings support the conclusion that organisational structure and the operational support available to Islamic windows constitute important sources of competitive advantage within Oman's dual Islamic banking system.

Table 5.: Comparative summary of factors influencing PE between Islamic Banks and Islamic Windows

Factor	Islamic Banks	Islamic Windows	Comparison
Education Experience (EE)	Significant (+)	Not Significant	Human capital contributes only to Islamic Banks

Profitability Ratio (PR)	Significant (+)	Not Significant	Profitability improves PE only in Islamic Banks
Equity-to-Total Assets (ETA)	Significant (+)	Significant (-)	Opposite effects between the two institutional forms
GDP per Capita (GDP)	Significant (+)	Marginal (+)	Stronger influence in Islamic Banks
Population Density (PD)	Significant (+)	Not Significant	Demographic effects observed only in Islamic Banks
Credit Risk (CR)	Significant (+)	Not Significant	Risk management contributes only to Islamic Banks
Labour Productivity (L)	Not Significant	Significant (+)	Workforce productivity contributes only to Islamic Windows
Average Annual Inflation Rate (AIR)	Not Significant	Significant (+)	Inflation influences only Islamic Windows
Information Technology (IT)	Not Significant	Significant (+)	Technology improves PE only in Islamic Windows
Market Competition (MC)	Not Significant	Not Significant	No meaningful influence in either institutional form
Operating Costs (OC)	Not Significant	Not Significant	No meaningful influence in either institutional form
Bank Size (SB)	Not Significant	Not Significant	No meaningful influence in either institutional form

Table 5 provides an overall comparison of the determinants influencing profit efficiency in Islamic banks and Islamic windows. The comparison demonstrates that the two institutional forms are characterised by distinct drivers of profitability. Islamic banks rely primarily on financial and managerial factors, including capital adequacy, profitability, credit risk management, staff education, and favourable macroeconomic conditions, to enhance profit efficiency. In contrast, Islamic windows depend more heavily on operational and technological factors, with labour productivity, information technology, and inflation emerging as the principal determinants of profit efficiency.

A particularly noteworthy finding is the contrasting role of Equity-to-Total Assets (ETA). While stronger capitalisation improves profit efficiency in Islamic banks, it exerts a significant negative influence in Islamic windows, suggesting that higher equity levels may reduce leverage opportunities within the Islamic window model. Similarly, Information Technology (IT) and Labour Productivity (L) significantly improve profit efficiency only in Islamic windows, reflecting the operational advantages associated with their integration into conventional parent banks. Conversely, Education Experience (EE), Credit Risk (CR), Profitability Ratio (PR), and Population Density (PD) influence profit efficiency only in Islamic banks, indicating that independent Islamic banks rely more on managerial capability and financial strength to achieve profitability.

Overall, the comparative findings indicate that profit efficiency in Islamic banks is primarily driven by financial stability and institutional capability, whereas profit efficiency in Islamic windows is more dependent on operational efficiency, digital capability, and workforce productivity. These differences reflect the distinct organisational structures of the two institutional forms and provide a comprehensive synthesis of the Tobit regression findings before proceeding to the productivity analysis.

Table 6:Summary Comparison of CE and PE between Islamic Banks and Windows

DEA Indicator	Islamic Banks	Islamic Windows	Better Performer
Cost Efficiency (CE) – Overall Average	76%	87%	Islamic Windows
Profit Efficiency (PE) – Overall Average	72%	83%	Islamic Windows
Cost Efficiency Trend	Declined gradually during the study period	Recovered after 2018 and remained relatively stable	Islamic Windows
Profit Efficiency Trend	Fluctuated across the study period	Maintained relatively stable performance	Islamic Windows
Operational Characteristics	Independent operations with	Shared infrastructure,	Islamic Windows

	higher operational and Shariah compliance costs	parent-bank support, economies of scale, and better resource utilisation	
Overall DEA Performance	Moderate efficiency with greater year-to-year variability	Higher and more consistent efficiency performance	Islamic Windows

Table 6 provides a consolidated comparison of the DEA results obtained for Islamic banks and Islamic windows over the period from 2015 to 2022. The comparison clearly shows that Islamic windows consistently achieved stronger efficiency performance than fully-fledged Islamic banks across both efficiency dimensions. The overall average cost efficiency of Islamic windows reached 87%, compared with 76% for Islamic banks, while the corresponding average profit efficiency was 83% for Islamic windows and 72% for Islamic banks. These findings indicate that Islamic windows utilised their available resources more efficiently and generated stronger financial returns from those resources during the study period. The comparison also reveals notable differences in the efficiency patterns of the two institutional forms. Islamic banks experienced a gradual decline in cost efficiency over time and fluctuations in profit efficiency, suggesting that operational costs, organisational expansion, and market conditions influenced their efficiency performance. In contrast, Islamic windows experienced only a temporary reduction in efficiency during the early years before recovering and maintaining relatively stable cost and profit efficiency throughout the remainder of the study period. This stability reflects their stronger operational resilience and ability to sustain efficient banking operations.

Islamic banks, throughout the analyzed period, have demonstrated notable stability in their operational efficiency and productivity. Figure 2 below summarizes the annual means for key productivity indicators, highlighting consistent patterns and significant shifts in specific years. Islamic banks have maintained a steady EFFCH score of 1.000 across all years, signifying stable operational efficiency. This consistent performance suggests that Islamic banks have effectively managed their internal processes, even as external pressures such as market competition and regulatory changes evolved.

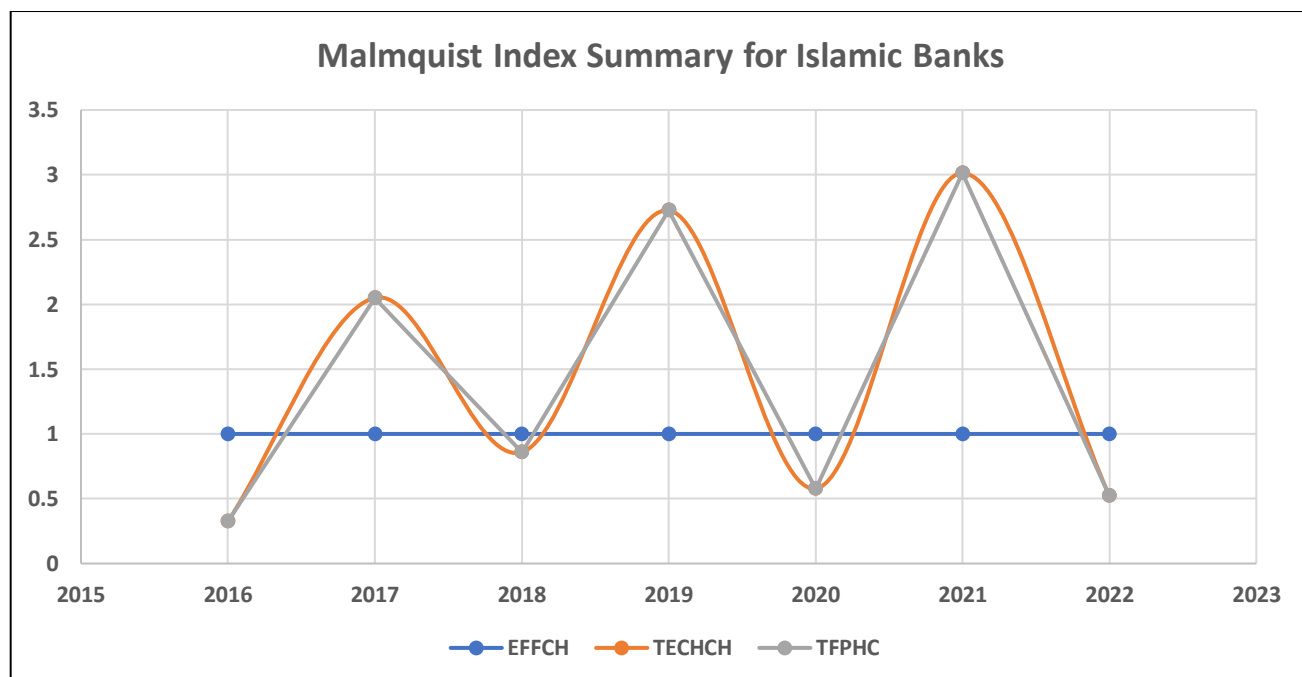


Figure2: Malmquist Index Summary for Islamic Banks

Islamic windows, which operate within conventional banks, display a different trajectory in terms of productivity and efficiency. As shown in Figure 3, Islamic windows exhibit more variability in their Efficiency Change

(EFFCH) and Technological Change (TECHCH) scores, reflecting the distinct operational challenges and opportunities they face compared to standalone Islamic banks.

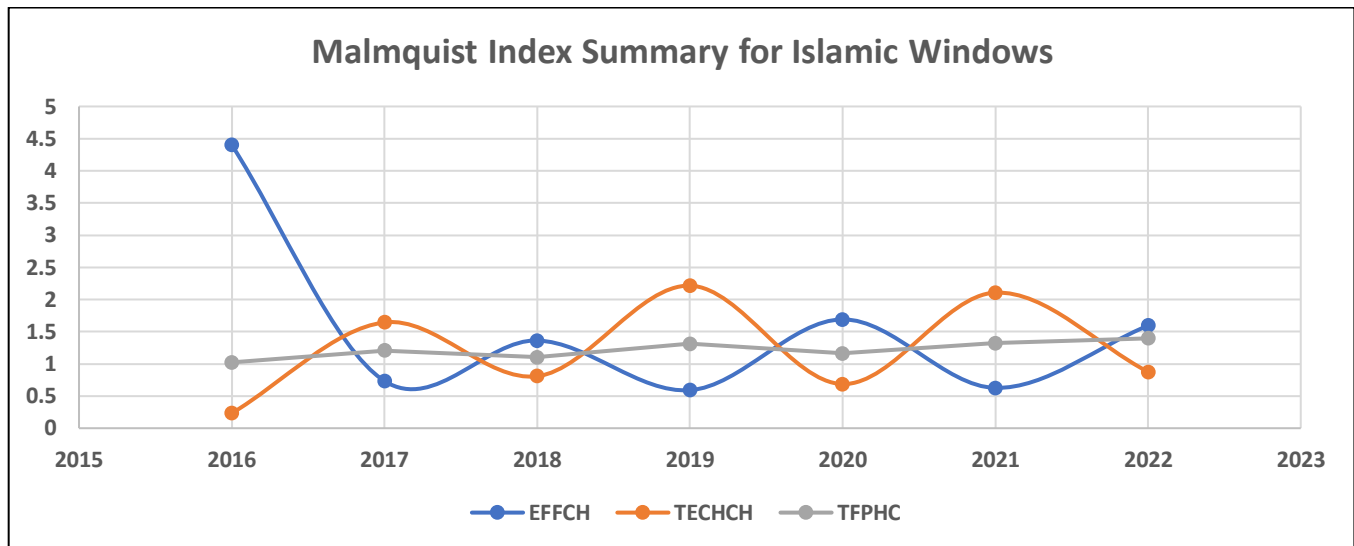


Figure3: Malmquist Index Summary for Islamic Windows

Table 7: Comparative summary of productivity performance between Islamic Banks and Islamic Windows

Productivity Indicator	Islamic Banks	Islamic Windows	Comparison
Efficiency Change (EFFCH)	Stable (1.000 throughout)	Highly variable	Islamic Banks maintained more stable operational efficiency.
Highest TECHCH	3.013 (2021)	2.215 (2019)	Islamic Banks achieved greater technological progress.
Highest TFPHC	3.013 (2021)	1.396 (2022)	Islamic Banks recorded higher peak productivity growth.
Average TFPHC	1.439	1.217	Islamic Banks achieved higher average productivity growth.
Productivity Pattern	Productivity mainly driven by technological progress	Productivity driven by both efficiency changes and technological improvements	Different productivity strategies were observed between the two institutional forms.

Table 7 presents an overall comparison of productivity performance between Islamic banks and Islamic windows using the Malmquist Productivity Index. The comparison demonstrates that the two institutional forms adopted different productivity pathways during the study period. Islamic banks maintained stable operational efficiency, as reflected by a constant Efficiency Change (EFFCH) value of 1.000 throughout the study period. Their productivity improvements were therefore primarily attributable to technological progress, with the highest Technological Change (TECHCH) and Total Factor Productivity Change (TFPHC) values both recorded in 2021 (3.013).

RESULTS AND DISCUSSION

The findings indicate that Islamic windows achieve higher cost efficiency (CE) and profit efficiency (PE) than full-fledged Islamic banks, mainly due to economies of scale, shared infrastructure, lower operating costs, and access to established customer networks. These advantages enable Islamic windows to generate stronger financial performance while maintaining operational efficiency (Al Asmi et al., 2024a; Chowdhury and Haron, 2021; Sihotang et al., 2022).

Islamic banks, however, maintain stable efficiency levels due to their specialized Shariah-based operations, customer loyalty, and ability to develop innovative Islamic financial products. Previous studies emphasized that adherence to Shariah principles and effective operational strategies contribute to competitiveness and efficiency in Islamic banking (Otaviya and Rani, 2020; Alexakis et al., 2019). Meanwhile, Islamic windows benefit from integration with conventional banks, allowing them to leverage existing resources and expand their market presence (Usman, Andriyani, and Pambuko, 2019; Jubilee et al., 2021).

The Malmquist Productivity Index results demonstrate that productivity growth during the study period was mainly driven by technological progress, including digital banking and operational innovation. This supports previous findings that technology adoption enhances efficiency, customer service, and productivity in Islamic financial institutions (Alexakis et al., 2019; Chowdhury and Haron, 2021). The Tobit regression results further reveal that capital adequacy and credit risk significantly influence CE and PE, while IT, organizational factors, and macroeconomic variables have stronger effects on Islamic windows.

Although previous studies examined Islamic banking performance in Oman and GCC countries, limited study has focused on CE, PE, and productivity at the individual institutional level (Al Asmi et al., 2024b; Rosman, 2013; Mohanty, 2012; Badreldin, 2015). Therefore, this study contributes by examining the determinants of efficiency and productivity among Islamic banks and Islamic windows in Oman. Overall, Islamic windows currently demonstrate operational advantages, while Islamic banks continue to improve their efficiency and competitiveness through innovation and strategic development.

Implications of the study

This study contributes to the theoretical and practical understanding of Islamic finance by comparing the cost efficiency (CE) and profit efficiency (PE) of full-fledged Islamic banks and Islamic windows. It addresses gaps in previous literature by developing a framework that recognizes the different operational and regulatory environments of these banking models. The findings show that Islamic windows benefit from greater strategic flexibility, shared resources, and innovation opportunities through their parent conventional banks. However, they should strengthen Sharia governance and improve transparency to enhance customer trust and market confidence.

From a practical perspective, the study provides guidance for managers and policymakers to improve operational efficiency, strengthen Sharia compliance, and enhance competitiveness. The findings also support the Central Bank of Oman, Islamic financial institutions, and policymakers in developing strategies for sustainable Islamic banking growth in line with Oman Vision 2040. Overall, this study contributes by integrating efficiency measurement, determinants analysis, and productivity assessment into one framework, providing valuable insights for future academic studies and industry development.

Limitations and future study

This study provides insights into the cost efficiency and profit efficiency of Islamic banks and Islamic windows; however, several limitations should be considered. First, the study mainly relies on quantitative methods, which may not fully capture managerial practices and customer perspectives. Future study could apply a mixed-method approach to provide deeper insights. Second, the limited sample size and focus on Oman may restrict the generalizability of the findings. Future studies could expand the sample to include Islamic financial institutions from different countries and regulatory environments. Third, the study period and data availability may limit the analysis of long-term efficiency changes and internal factors. Therefore, longitudinal studies using broader datasets are recommended.

Future study should also examine the impact of emerging technologies, including Artificial Intelligence (AI), FinTech, blockchain, and digital transformation, on banking efficiency and productivity, as technological progress was identified as a key driver of productivity growth. Additionally, applying alternative efficiency

measurement techniques, such as Stochastic Frontier Analysis (SFA), alongside DEA, Tobit regression, and the Malmquist Productivity Index, could enhance the robustness and validity of future findings.

CONCLUSION

This study provides one of the first institution-level comparisons of cost efficiency, profit efficiency, and productivity between Islamic banks and Islamic windows in Oman. The findings demonstrate that Islamic windows generally outperform full-fledged Islamic banks in both cost and profit efficiency because of shared infrastructure and economies of scale. Productivity improvements are mainly driven by technological progress, while capital adequacy and credit risk remain the most important determinants of efficiency. Islamic banking has become an important component of Oman's financial system. Although both Islamic banks and Islamic windows operate under the same regulatory framework and Shariah principles, differences in business models influence their efficiency and productivity. Islamic windows generally demonstrate superior cost efficiency because they share infrastructure and administrative resources with their parent conventional banks, while standalone Islamic banks incur higher operating costs but have greater flexibility to specialize and innovate. Overall, Omani institutions appear more effective at generating profits than minimizing operating costs. Continued investment in technology, human capital, governance, and operational excellence will be critical to improving both cost and profit efficiency and ensuring sustainable productivity growth.

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