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AN EMPIRICAL ANALYSIS OF COST EFFICIENCY IN GCC BANKING SECTOR: A COMPARATIVE STUDY BETWEEN ISLAMIC & CONVENTIONAL BANKS

Keywords: cost efficiency, technical efficiency, allocative efficiency, banking sector, DEA, GCC area.

J E L Classification: G21, D24, C14.

Abstract: This study seeks to evaluate and contrast the efficiency of Islamic and conventional banks across multiple dimensions, including technical efficiency, resource

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allocation, and cost efficiency in the banking sector of GCC countries. To do that, we use non-parametric techniques “DEA” on 48 banks across 6 countries (2010–2024). We found that Islamic banks exhibit varying levels of technical efficiency across different countries. In some cases, they demonstrate high technical efficiency, particularly in Oman and the UAE. Conventional banks also vary in technical efficiency. Bahraini Conventional banks are considered the most technically efficient, while Omani Conventional banks face significant inefficiencies. Conventional banks, particularly in Saudi Arabia and the UAE, demonstrate higher efficiency in resource allocation and cost control compared to Islamic banks. However, there are variations among conventional banks, with Bahraini banks exhibiting the highest efficiency in resource allocation.

■■■ INTRODUCTION

In the contemporary global financial landscape, Islamic banking has emerged as a significant alternative to conventional banking systems, offering unique principles and practices grounded in Shariah law (Farah, Mohamed, Ali Farah, Yusuf & Abdulle, 2025).

According to Islamic Financial Services Board IFSB (2023), The Gulf Cooperation Council (GCC) represents the largest global hub for Islamic financial services, accounting for approximately 53.6% of total Islamic financial assets, which reached USD 3.25 trillion by the end of 2022. Islamic banking dominates the sector, particularly in Saudi Arabia and Kuwait, where it constitutes over half of domestic banking assets. In contrast, countries such as the UAE, Qatar, Bahrain, and Oman exhibit a dual banking structure, where Islamic and conventional banks coexist. Given the strategic importance of banking efficiency for profitability, competitiveness, and financial stability, cost efficiency has become a critical concern in the GCC banking sector. Islamic banks, in particular, face the challenge of balancing Shariah compliance with operational efficiency. Therefore, analyzing cost efficiency differences between Islamic and conventional banks is essential for improving resource allocation, enhancing financial performance, and supporting sustainable banking development in the GCC region.

This leads to the following research question:

What factors contribute to the differences in cost efficiency between Islamic and conventional banks in the GCC countries, and how do these differences impact overall banking performance in the region?

LITERATURE REVIEW

Early foundational works laid the groundwork for efficiency measurements in banking. Weill (2004) compared cost efficiency across European banks using Stochastic Frontier Approach (SFA), Distribution Free Approach (DFA), and Data Envelopment Analysis (DEA), finding significant variations influenced by country-specific factors and highlighting the consistency of frontier methods. Similarly, Şahin, Yılmaz and Akgün (2013) applied DEA to Turkish banks, identifying inefficiencies driven by input-output mismatches. Building on this, Othman, Mohd-Zamil, Rasid, Vakilbashi and Mokhber (2016) reviewed DEA applications in banking, emphasizing its utility in capturing multi-dimensional performance without assuming functional forms. Mani (2016) extended DEA to Indian banks, revealing an average inefficiency of 47% and potential output gains of 1.88 times with fixed inputs. These studies underscore the global applicability of DEA for benchmarking efficiency, particularly in emerging markets.

Mai, Phung, Tong, Cheng and Le (2021) applied a two-stage DEA to Islamic banks across 16 countries from 2005–2020, noting an upward efficiency trend that persisted during the COVID-19 pandemic, albeit with cross-country variations. Akhtar (2023) used DEA and Tobit regression on Indian banks pre- and post-demonetization (2015–2018), showing stable efficiency trends and superior post-demonetization performance for public banks.

Antunes, Hadi-Vencheh, Jamshidi, Tan and Wanke (2022) proposed a novel DEA-RENNa model for Chinese banks (2010–2018), linking efficiency declines post-2015 to factors like profitability and non-traditional activities. These findings align with broader trends in efficiency literature, where bank-specific variables (e.g., size, diversification) and macroeconomic factors influence outcomes.

Shifting to comparative analyses between Islamic and conventional banks, the literature reveals mixed results, often attributed to Shariah compliance constraints in Islamic banking, such as profit-and-loss sharing (PLS) and asset-backed financing, which may elevate costs but enhance stability (Beck, Demirgüç-Kunt & Merrouche, 2013; Miah & Uddin, 2017). In the GCC, Srairi (2010) found Islamic banks less cost-efficient but more stable than conventional counterparts. Slimen, Belhaj, Hadriche and Ghroubi (2022) used SFA on GCC banks (2006–2015), confirming Islamic banks' lower cost efficiency. Khokhar (2020)

applied DEA to 21 Islamic and 42 conventional GCC banks (2010–2016), concluding Islamic banking was at par or superior in efficiency terms. Sillah and Harrathi (2015) echoed this, showing Islamic banks' competitive edge in GCC via DEA (2006–2012).

Alqahtani, Mayes and Brown (2017) compared efficiency during the global financial crisis, noting Islamic banks closed efficiency gaps with conventional ones in GCC. Chaffai (2022) found Islamic banks less cost-efficient in GCC via DEA.

In the GCC specifically, recent evaluations emphasize performance disparities. Kamaruddin, Shafii, Hanefah, Salleh and Zakaria (2024) reported Islamic banking's equality or superiority in profitability, risk, solvency, and efficiency over conventional peers. Parsa (2022) used meta-frontier analysis for GCC banks, showing Islamic models' technological gaps but enhanced stability. Al-Hussain and Johnson (2009) and Siraj and Pillai (2012) noted Islamic banks' higher growth in operating income (24.62% AAG vs. 16.47% for conventional, 2005–2010), with less crisis impact. Al-Muharrami and Matthews (2009) found Islamic systems less cost-efficient but more revenue-efficient in GCC via FRA and bootstrapped DEA.

The study uncovers significant insights into the operational efficiencies and inefficiencies prevalent in the GCC banking sector by analyzing a diverse sample of banks. This research also addresses the methodological gaps by employing DEA and a detailed examination of input and output variables relevant to the banking process. Additionally, the study's findings on the impact of country-specific factors and regulatory environments on bank efficiency provide valuable implications for policymakers and banking professionals aiming to enhance the performance of the banking sector in the region.

Overall, this research enriches the literature by offering a nuanced understanding of the cost efficiency dynamics in Islamic and conventional banks in the GCC, thereby contributing to the broader discourse on banking efficiency and financial stability.

Islamic Banking versus Conventional Banking: Characteristics, Differences, and Implications for Efficiency

Conventional banking operates on interest-based intermediation: banks borrow funds from depositors at a lower rate and lend at a higher rate, earning a net interest margin. This model grants banks broad flexibility in pricing their

inputs, which underpins their allocative efficiency advantage (Berger & Humphrey, 1997). Islamic banking, by contrast, is governed by *Shariah* law, which prohibits *riba* (interest), *gharar* (excessive uncertainty), and investment in impermissible sectors (Beck et al., 2013; Miah & Uddin, 2017).

Instead, Islamic banks use asset-backed instruments – principally *Murabaha* (cost plus financing), *Ijara* (leasing), *Musharaka* (equity participation), and *Sukuk* (Islamic bonds) and operate under the oversight of a Shariah Supervisory Board (SSB), whose governance and compliance costs have no equivalent in conventional banking (Ben Zeineb & Mensi, 2018; Nawaz, Haniffa & Hudaib, 2021).

Regarding Technical Efficiency (TE): the asset-backed nature of Islamic financing creates a tighter link between inputs and productive outputs, which tends to support strong TE. Ghroubi (2025) confirm that Islamic banks achieve the highest TE among all bank categories across 14 MENA countries. However, scarcity of qualified Shariah scholars and regulatory immaturity in smaller markets (e.g., Oman) remain identifiable constraints on operational productivity (Bahrini, 2017).

Regarding Allocative Efficiency (AE): this is where the two models diverge most sharply. Islamic banks face binding structural constraints on optimal input pricing: (i) *Mudaraba*-based deposits introduce revenue uncertainty that prevents locking in funding costs (Nouman, Hashim, Trifan, Spinu, Siddiqi & Khan, 2022); (ii) prohibition on interest-bearing instruments restricts access to low-cost liquidity in underdeveloped Shariah-compliant money markets (Ghroubi, 2025); and (iii) SSB governance overhead constitutes a non-discretionary fixed cost that inflates the effective cost base regardless of operational performance (Safiullah & Shamsuddin, 2019).

Cost Efficiency

Ashton (1998) defines cost efficiency as the measure of how much the production costs of an individual institution deviate from those of a best-practice institution or firm operating under similar conditions and producing equivalent outputs. This metric is determined with reference to a cost function derived from observations of all institutions within the sample. The cost function assumes that total production costs for each institution depend on the prices of variable inputs such as capital and labor the quantity or value of outputs produced,

random error, and additional factors reflecting the institutional environment or specific circumstances.

From Farrell (1957), economic efficiency can be decomposed into technical efficiency and allocative efficiency. According to Koopmans (1951), technical efficiency is formally defined as a situation in which increasing any output necessitates the reduction of at least one other output or an increase in at least one input. Conversely, a reduction in any input requires an increase in at least one other input or a decrease in at least one output. Technical inefficiency arises when a producer can either maintain the same output using fewer inputs or produce more output with the same input levels. Koopmans' (1951) concept of efficiency extends to a multi-output, multi-input production technology, which can be represented by a transformation function (Matthews, 2010).

Allocative efficiency refers to the condition in which a production entity achieves the best possible allocation of available resources in light of the relative prices and costs of these resources. Therefore, allocative efficiency can be understood as indicating the correct and optimal utilization of input-output combinations within the framework of resource prices (Benzid & Bourakba, 2023).

DATA AND METHODOLOGY

Data Envelopment Analysis is a linear programming methodology used to evaluate the performance of homogeneous organizational units, with its application increasingly prevalent in the banking sector (Klimberg, Lawrence, Yermish, Lal & Mrazik, 2009). Additional applications of DEA in banking include assessing efficiency considering resource and output prices, estimating operating budgets that promote efficiency, evaluating financial risks at the branch level, and measuring the effects of managerial changes on productivity (Thanassoulis, 1999).

Cost efficiency will be measured according to the cost function, applied to a sample of 48 banks comprising 25 conventional banks and 23 Islamic banks operating within the Gulf Cooperation Council (GCC) member states in the period extending between (2010–2024), The Analysis and Comparison will be Conducted Across Various Levels (By Bank & By Country).

Table 1. Sample of Study

Country	Conventional		Islamic	
	Bank's Name	Code	Bank's Name	Code
UAE	Emirate Dubai National Bank	ENB	Dubai Islamic Bank	DIB
	Abu Dhabi Commercial Bank	ADC	Abu Dhabi Islamic Bank	ADI
	Bank of Sharjah	BOS	Emirate Islamic Bank	EIB
	First Gulf Bank	FGB	Sharjah Islamic Bank	SIB
	Mashreq Bank	MAS	National Bank of Ras Al- Khaimah	RAK
KSA	Al-Ahly Bank	SNB	Al-Rajhi Bank	ALR
	Saoudi-British Bank	SAB	Alinma Bank	ALI
	Arabe National Bank	ANB	Bank Al-Jazira	ALJ
	Riyad Bank	RIA	Al-Bilad Bank	ALB
	Alawwal Bank	AWA		
Kuwait	National Bank Kuwait	NBK	Kuwait Finance House	KFH
	Burgan Bank	BUR	Al Ahli Bank of Kuwait	AHL
	Commercial Bank of Kuwait	CBK	Kuwait International Bank	KIB
		ABK	Boubyan Bank	BOB
			Warba Bank	WAR
Bahrain	Ahli United	AHU	Bahrain Islamic Bank	BIS
	National Bahrain Bank	NBB	Al-Baraka Bank	ALB
	Bahrain-Kuwait Bank	BBK	Al-Salem Bank	ALSA
Oman	Bank Dhofar	DHO	Al-Izz Bank	ALI
	National Bank of Oman	NBO	Nizwa Bank	NIZ
	Sohar Bank	SOH		
	Oman Arab Bank	OAB		
	Muscat Bank	MUS		
Qatar	Qatar National Bank	QNB	Dukhan Bank	DUK
	The Commercial Bank of Qatar	CBQ	Qatar International Islamic Bank	QIIB
	Doha Bank	DOH	Masraf Al Rayan	RAY
			Qatar Islamic Bank	QIB

Source: authors' elaboration based on banks' official websites and annual reports.

The study relies on the DEAP software to estimate cost efficiency (CE) and decompose it into technical efficiency (TE) and allocative efficiency (AE). Since the objective does not include the measurement of scale efficiency, the analysis systematically adopts the BCC (Variable Returns to Scale – VRS) model, which is the framework used by Data Envelopment Analysis Program (DEAP) for estimating economic efficiency without the need to calculate scale efficiency.

Table 2. Inputs and Outputs of the Banking Process

		Code	Conventional Banks	Islamic Banks
Inputs	Labor	x_1	total expenses related to employees	
		p_1	total expenses / total employees	
	Tangible Capital	x_2	fixed assets	
		p_2	total depreciation / fixed assets	
	Cash Capital	x_3	total deposits	
		p_3	distributed "interest & profits" to deposit holders / total deposits	
Outputs	Loans/Islamic Financing	y_1	all loans and advances provided by banks	Murabaha, Ijara, Salam and Istisna
	Investments	y_2	investment in securities such as stocks and bonds	Mudharaba, Mucharaka and investment in Sukuk

Source: authors' elaboration based on the previously presented data.

The study utilized secondary data extracted from the annual reports of 48 conventional and Islamic banks operating in the Gulf Cooperation Council (GCC) countries, covering the period from 2010 to 2024.

Table 3. Descriptive Analysis of the Inputs and Outputs of the Banks under Study

Unit: U.S Millions

	Islamic Banks (23 Banks)						
	Inputs and their prices					Outputs	
	x_1	x_2	p_2	x_3	p_3	y_1	y_2
Mean	163.416	320.979	0.125	13537.069	0.033	12151.570	2736.178
Lowest Value	16.286	12.713	0.039	111.611	0.002	329.416	155.149
Greatest Value	750.932	2151.864	0.226	78504.915	0.230	56040.729	12888.697
Total	3758.562	7382.519	2.886	311352.587	0.759	279486.113	62932.095

Table 3. Descriptive...

	Conventional Banks (25 Banks)						
	Inputs and their prices					Outputs	
	x_1	x_2	p_2	x_3	p_3	y_1	y_2
Mean	292.793	841.339	0.129	38833.291	0.020	28684.552	6826.124
Lowest Value	44.256	37.251	0.022	4318.329	0.005	3333.193	247.949
Greatest Value	948.638	3491.946	0.307	140583.632	0.057	123765.762	38348.570
Total	7319.825	21033.498	3.231	970832.291	0.51	717113.819	170653.123

* The price of the first input (labor price P1) was excluded due to the lack of data on the number of bank employees in all years of the study, and this includes all the banks in the study sample.

** All variables reported in local currencies were converted into U.S. dollars using the *average annual exchange rate* for each country and each year.

Source: authors' calculations based on banks' annual reports (2010–2024).

Cost Efficiency Estimation

Descriptive Analysis of Inputs and Outputs

The descriptive statistics of inputs and outputs reveal significant differences in scale and operational capacity between Islamic and conventional banks in the GCC region. Regarding labor expenses (x_1), Islamic banks recorded total average employee expenses of 3.758 billion USD, with Al Rajhi Bank showing the highest value and Alizz Islamic Bank the lowest. Saudi and Emirati Islamic banks exhibited the highest labor costs, while Omani banks recorded the lowest levels. In contrast, conventional banks demonstrated substantially higher labor expenses, averaging 7.319 billion USD, reflecting their larger operational scale, with Saudi and Emirati banks leading in employee expenditures.

Concerning tangible capital (x_2), Islamic banks reported total average fixed assets of 7.382 billion USD, with Saudi banks dominating in asset accumulation. Conventional banks, however, showed significantly higher fixed assets, totaling 21.033 billion USD, with major institutions such as First Gulf Bank and Saudi Commercial Bank exceeding 2 billion USD, indicating stronger capital capacity and infrastructure investment.

In terms of cash capital (x_3), Islamic banks recorded average total deposits of 311.352 billion USD, while conventional banks reached a substantially higher level of 970.832 billion USD. Saudi and Emirati banks led deposit accumulation in both banking systems, whereas Omani and Bahraini banks exhibited comparatively lower deposit volumes.

Regarding outputs, Islamic financing and loans (y_1) averaged 279.486 billion USD for Islamic banks, with Saudi banks demonstrating the highest financing activity. Conventional banks significantly outperformed Islamic banks, with total loans and financing reaching 717.113 billion USD, reflecting their broader intermediation role and stronger credit expansion capacity. Similarly, investment activity (y_2) was higher among conventional banks, averaging 170.653 billion USD compared to 62.932 billion USD for Islamic banks, with Saudi, Emirati, and Qatari banks leading investment operations.

To ensure the robustness of the DEA estimates, several complementary analyses were incorporated. First, bootstrap DEA following (Simar & Wilson, 2007) was employed to correct for bias and provide confidence intervals for efficiency scores.

A second-stage bootstrapped truncated regression was performed to identify the determinants of cost efficiency while addressing serial correlation and bias. These additional checks enhance the credibility and statistical reliability of the findings.

Cost Efficiency Estimation According to Each Bank

Table 4 represents the average indicators of cost efficiency of banks under study, where they were estimated based on the average inputs and outputs of these banks.

Table 4 reveals significant disparities in efficiency levels among Islamic and conventional banks in the GCC region. Several Islamic banks, including Sharjah Islamic Bank, Al Rajhi Bank, Bank Al Bilad, Warba Bank, Qatar Islamic Bank, and Dukhan Bank, achieved full cost efficiency, indicating optimal resource allocation and effective cost management. Other Islamic banks, such as Emirates Islamic Bank and Kuwait Finance House, attained full technical efficiency, although their allocative and cost efficiency varied considerably. Conversely, some institutions, including Bahrain Islamic Bank and Alizz Islamic Bank, exhibited substantial inefficiencies in resource allocation and cost control, highlighting weaknesses in operational management.

Table 4. The Evaluation of the Average Indicators of Cost Efficiency by Bank

Islamic bank's Code	Technical Efficiency ()	Allocative Efficiency ()	Cost Efficiency ()	Conventional bank's Code	Technical Efficiency ()	Allocative Efficiency ()	Cost Efficiency ()
DIB	0.923	0.812	0.749	ENB	0.283	0.843	0.238
ADI	0.387	0.723	0.280	ADC	0.511	0.511	0.261
EIB	1	0.592	0.592	BOS	1	1	1
SIB	1	1	1	FGB	1	0.137	0.137
RAK	0.683	0.862	0.589	MAS	0.650	0.786	0.510
ALR	1	1	1	SNB	1	1	1
ALI	0.543	0.507	0.275	SAB	0.693	0.826	0.572
ALJ	1	0.198	0.198	ANB	0.678	0.867	0.588
ALB	1	1	1	RIA	1	0.895	0.895
KFH	1	0.993	0.993	AWA	0.650	0.258	0.168
AHL	0.075	0.130	0.010	NBK	0.580	0.991	0.575
KIB	1	0.653	0.653	BUR	0.565	0.455	0.257
BOB	0.087	0.115	0.010	CBK	1	0.238	0.238
WAR	1	1	1	ABK	0.369	0.259	0.096
QIB	1	1	1	QNB	1	0.376	0.376
DUK	1	1	1	CBQ	0.682	0.221	0.151
QIIB	0.328	0.009	0.003	DOH	0.914	0.890	0.813
RAY	0.632	0.047	0.029	AHU	1	1	1
BIS	0.288	0.020	0.006	NBB	1	0.214	0.214
ALB	0.311	0.048	0.015	BBK	0.774	0.213	0.165
ALSA	1	0.048	0.048	DHO	0.511	0.108	0.055
ALI	1	0.005	0.005	NBO	0.525	0.049	0.026
NIZ	1	0.022	0.022	SOH	0.723	0.044	0.032
				OAB	0.805	0.018	0.014
				MUS	0.735	0.891	0.656

Source: authors' calculations based on efficiency scores generated using DEAP software.

Similarly, among conventional banks, Sharjah Bank, Commercial Bank, and United Bank achieved full cost efficiency, reflecting best-practice performance. Several other banks, including Riyadh Bank and Qatar National Bank, reached full technical efficiency but demonstrated varying levels of allocative and cost efficiency. While some conventional banks, such as Doha Bank, showed strong efficiency performance, others, including Arab Bank of Oman, experienced significant inefficiencies, particularly in cost control and resource allocation. The findings indicate considerable heterogeneity in efficiency performance across both Islamic and conventional banks. While some institutions operate at optimal efficiency levels, others face substantial operational inefficiencies, suggesting significant potential for improving resource allocation and cost management within both banking systems.

Cost Efficiency Estimation by Country

Table 5. The Evaluation of the Average Indicators of Cost Efficiency by Country

	Islamic Banks			Conventional Banks		
	Technical Efficiency (T_e)	Allocative Efficiency (A_e)	Cost Efficiency (C_e)	Technical Efficiency (T_e)	Allocative Efficiency (A_e)	Cost Efficiency (C_e)
Banks of UAE	0.798	0.797	0.642	0.688	0.655	0.429
Banks of KSA	0.885	0.676	0.618	0.804	0.769	0.644
Banks of KUWAIT	0.632	0.578	0.533	0.628	0.485	0.291
Banks of QATAR	0.740	0.514	0.508	0.865	0.495	0.446
Banks of BAHRAIN	0.533	0.038	0.023	0.924	0.475	0.459
Banks of OMAN	1	0.013	0.013	0.659	0.222	0.156

Source: authors' calculations based on efficiency scores generated using DEAP software.

Omani Islamic banks are considered the most technically efficient. However, they suffer greatly in terms of resource allocation efficiency and cost control, recording exceptionally high levels of inefficiency exceeding 98%. On the other hand, Emirati and Saudi Islamic banks are the most efficient in resource allocation and, consequently, cost control. Kuwaiti and Qatari banks recorded

moderate levels of efficiency when compared to other countries under study. As for Bahraini Islamic banks, they are considered the least technically efficient and exhibit the lowest efficiency in terms of resource allocation and cost control after Omani Islamic banks in the GCC countries.

As for conventional banks, Bahraini banks are considered the most technically efficient, while Kuwaiti banks are the least efficient (technically). Regarding efficiency in resource allocation at prevailing prices and cost control, Saudi conventional banks are the most efficient, with rates of 77% and 64%, respectively. This is followed by Emirati banks with rates of 65% and 43%, respectively. Qatari and Bahraini banks witnessed moderate levels of allocative efficiency and cost efficiency. However, Omani conventional banks experienced significant inefficiency compared to other countries under study, with inefficiency rates reaching 78% in resource allocation and 84% in cost control. This indicates a substantial failure in utilizing resources at prevailing prices, consequently leading to a failure in effectively blending technical and allocative efficiencies.

Comparative Overall Efficiency: A Composite Weighted Analysis

In the absence of a priori theoretical or empirical grounds for assigning differential weights to the three efficiency dimensions, this study adopts equal weighting ($w = 1/3$ for each of TE, AE, and CE). This choice follows the methodological guidance of the Organisation for Economic Co-operation and Development (OECD) (2008), which established in the OECD Handbook on Constructing Composite Indicators that equal weights constitute the appropriate default when the underlying conceptual framework does not privilege one dimension over the others, and when no empirical or expert-based weighting scheme has been validated for the specific context under study. Consistent with this principle, several banking efficiencies studies that construct composite performance scores in the absence of consensus weights have adopted the equal-weighting convention as the most transparent and unbiased aggregation method (Chaffai, 2022). It should be noted, however, that the three dimensions are not fully independent – cost efficiency is mathematically defined as the product of technical and allocative efficiency ($CE = TE \times AE$) – and as such, the composite score should be interpreted as a descriptive ranking instrument rather than a structural decomposition. Sensitivity analysis confirming the robustness of the rankings under alternative weighting schemes is recommended for future research.

Drawing on this equal-weighting convention, a Composite Weighted Efficiency Score (CWES) is computed for each banking model at the GCC level as the arithmetic mean of the three efficiency dimensions. The following table summarizes the average efficiency scores and the resulting composite index:

Table 6. The Average Efficiency Scores

Banking Model	TE (avg.)	AE (avg.)	CE (avg.)	Composite Weighted Score
Islamic Banks	0.668	0.477	0.373	0.506
Conventional Banks	0.746	0.636	0.410	0.597

Composite Weighted Score = (TE + AE + CE) / 3.

S o u r c e : authors' calculations.

The composite weighted analysis confirms that conventional banks (0.597) outperform Islamic banks (0.506) overall, driven primarily by the substantial gap in allocative efficiency. However, the gap in technical efficiency is comparatively modest (0.746 vs. 0.668), indicating that Islamic banks are operationally competitive but face structural impediments in cost optimization. These findings align with Slimen et al. (2022), who similarly found that Islamic banks in the GCC lag in cost efficiency primarily due to allocative rather than technical inefficiency.

RESULTS

Performance at the Individual Bank Level:

- There is considerable variation among individual banks. Several Islamic banks (e.g., Sharjah Islamic Bank and Al Rajhi Bank) have achieved perfect cost efficiency (100%), indicating exemplary practices in resource allocation and cost control.
- Conversely, some Islamic banks (e.g., Bahrain Islamic Bank) display extremely low-cost efficiency – with inefficiency rates ranging from 95% to 99% suggesting significant issues in their management strategies.
- Among conventional banks, institutions such as Sharjah Bank and Commercial International Bank demonstrate best practice performance,

though disparities still exist in resource allocation and cost management across the sector.

Geographical Differences within the GCC:

- Islamic banks in Oman, while recording very high technical efficiency (up to 100%), struggle significantly with allocative efficiency and cost control, reflecting a substantial gap in optimal resource utilization. In contrast, Islamic banks in the UAE and Saudi Arabia achieve higher levels of resource allocation and cost control efficiency, which may be attributed to more effective regulatory environments and operational strategies.
- For conventional banks, Bahraini banks show high technical efficiency, whereas Omani banks face notable inefficiencies in both resource allocation (around 78% inefficiency) and cost control (approximately 84% inefficiency).

DISCUSSION

Conventional banks retain a marginal advantage. The relatively strong technical performance of Islamic banks corroborates findings by Mai et al. (2021) and Mirzaei, Saad and Emrouznejad (2022), who argue that Islamic banks are effective in transforming inputs into outputs, particularly due to their asset-backed financing structures and closer linkage to the real economy. This suggests that Islamic banks possess solid operational capabilities, even if these do not fully translate into cost efficiency.

The most pronounced disparity between the two banking models lies in allocative efficiency. Islamic banks exhibit a substantially lower average allocative efficiency (48%) compared to conventional banks (64%). This finding aligns closely with the arguments advanced by Beck et al. (2013) and Miah and Uddin (2017), who emphasize that Shariah-compliant banking faces inherent challenges in input pricing and optimal resource allocation. Profit-and-loss sharing contracts, restrictions on interest-based instruments, and higher governance and compliance costs complicate the ability of Islamic banks to adjust their input mix in response to market prices, thereby weakening allocative and, consequently, cost efficiency.

The bank-level analysis further reinforces the heterogeneity highlighted in the literature. While several Islamic banks – such as Sharjah Islamic Bank, Al Rajhi Bank, and Qatar Islamic Bank – achieve full cost efficiency and rep-

resent best-practice frontiers, others display extremely low efficiency scores. This wide dispersion supports the conclusions of Zhu (2021) and Antunes et al. (2022), who stress that managerial quality, governance structures, and strategic orientation play a decisive role in determining efficiency outcomes, often outweighing the influence of banking model (Islamic versus conventional) alone. The existence of highly efficient Islamic banks clearly indicates that Shariah compliance, per se, is not incompatible with cost efficiency, provided that effective management and scale advantages are present.

From a geographical perspective, the results reveal strong country-specific patterns. Islamic banks in Oman achieve full technical efficiency but suffer from severe allocative and cost inefficiencies. This paradox suggests that while Omani Islamic banks are capable of producing outputs efficiently, they face significant difficulties in pricing inputs and controlling costs, likely due to market size limitations, lower competitive pressure, or regulatory frictions. Similar country-level disparities have been documented by Parsa (2022) and Kamaruddin et al. (2024), who emphasize the role of institutional and regulatory environments in shaping banking efficiency.

This phenomenon can be explained by several structural and institutional factors. First, the relatively small size of the Omani Islamic banking market limits economies of scale and reduces competitive pressure, which may weaken incentives for optimal resource allocation. Second, regulatory and Shariah compliance constraints may impose rigidities on input pricing and financial structuring, thereby restricting managerial flexibility. Third, the relatively recent establishment of Islamic banks in Oman compared to other GCC countries may imply a transitional phase characterized by high adjustment costs and learning inefficiencies. Furthermore, the lack of depth in Islamic financial markets, particularly in terms of Shariah-compliant liquidity instruments, can constrain efficient fund allocation.

In contrast, Islamic banks in the UAE and Saudi Arabia demonstrate relatively high allocative and cost efficiency, narrowing the gap with conventional banks. This finding is consistent with Miah and Uddin (2017) and Alqahtani et al. (2017), who attribute stronger performance in these markets to more mature financial infrastructures, deeper capital markets, and more developed Shariah governance frameworks. For conventional banks, Saudi Arabia and Bahrain emerge as the most cost-efficient systems, reflecting economies of scale and advanced banking practices, while Omani conventional banks remain among the least efficient – an outcome that mirrors result reported in earlier GCC-focused studies.

■■■ CONCLUSION

This study provides an empirical evaluation of cost efficiency in the GCC banking sector by comparing Islamic and conventional banks across six countries during the period 2010–2024 using the DEA methodology. The findings reveal that Islamic banks demonstrate relatively strong technical efficiency, particularly in Oman and the UAE, reflecting their effectiveness in converting inputs into outputs. However, they exhibit lower allocative and cost efficiency, indicating challenges in optimal resource allocation and cost management. In contrast, conventional banks show superior allocative and cost efficiency, especially in Saudi Arabia and Bahrain, benefiting from greater operational flexibility, diversified income sources, and economies of scale. Despite this general trend, efficiency performance varies significantly across individual banks, highlighting the importance of managerial practices and institutional factors.

The results suggest that while Islamic banks have achieved notable progress in technical efficiency, improving allocative and cost efficiency remains essential to enhance their competitiveness. The study underscores the importance of financial innovation, digital transformation, and improved resource management in strengthening banking efficiency and sustainability. These findings have important implications for policymakers, particularly in promoting innovation, improving regulatory frameworks, and supporting efficiency benchmarking. However, the study is subject to certain limitations, including DEA methodological constraints and data availability issues. Future research may enhance the robustness of efficiency analysis by integrating parametric methods, incorporating macroeconomic variables, and examining the impact of digital transformation and institutional factors on banking efficiency.

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