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Shari'ah Governance and Islamic Banks efficiency: Evidence from GCC countries

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Abstract

The aim of the paper is to investigate the effect of Shariah governance mechanisms on the efficiency of Islamic banks in a sample of 56 Islamic banks in the GCC region over the period 2008-2020. The main results indicate that Shariah governance can improve the technical and scale efficiency of Islamic banks. The study shows that the introduction of new rules and regulations by policymakers can improve the efficiency of Islamic banks. This will be achieved by giving special emphasis to Islamic governance. our results provide policy makers, bank managers and investors with important insights into the determinants of the technical efficiency of Islamic banks. Policymakers may consider introducing new rules and regulations to improve the efficiency of Islamic banks by paying more attention to sharia governance. In addition, bank managers should consider improving the operations of Islamic banks to increase their market share. Furthermore, investors and customers can easily decide to invest in Islamic banks by referring to their efficiency scores.

Keywords: Shari'ah Governance, bank efficiency, Tobit, GCC

1. Introduction

The efficiency of banking institutions and financial entities is considered a necessary condition for growth and stability (Belke et al., 2016). Specifically, the efficiency of banks, thus constituting the most important participants in the financial system, makes them more resilient to shocks. Consequently, this is likely to promote financial sector development and growth (see, among others, Zhang et al., 2016 and Diallo, 2018).

According to Cevik et al. (2016), improving bank efficiency generates a better allocation of financial resources. It increases economic growth, while promoting investment. Such efficiency then reduces the adverse effects of possible crises. It follows that banking efficiency should not be undervalued. It should be one of the main approaches to maintaining sustainable growth and the overall financial system stability (Titova, 2016).

Referring to the literature of Islamic finance, it can be seen that banks, which apply Shariah practices, represent the spine of the Islamic financial system in Muslim economies (especially in GCC countries).

During the recent worldwide economic crisis, the rapid growth of Islamic banks as an alternative financial apparatus has become an area that has attracted attention of many specialists and academics (Kolsi & Grassa, 2017). Specifically, the extent of Islamic banks in Muslim economies has been marked by genuine economic and financial development, even

during the period of crises. This real development is initially envisaged in GCC countries (Kolsi & Grassa, 2017). Therefore, a rapid expansion of Islamic banking systems has been attributed to the increase in global Islamic banking assets. These assets have undergone a further increase between 2008-2012. They were estimated to be worth $800 billion in 2008. However, this value increased to a value of $1.4 trillion in 2012. This is because the development of Islamic banks is higher than that of traditional banks during this period.

Indeed, given this rapid expansion of the Islamic banking system, it is logical to assume that the efficiency of banks belonging to this system will be the focus of research interest in this area. Despite their different policies and ideologies, Islamic banks share the same objectives as their traditional counterparts (Olson & Zoubi, 2008). Islamic banks are likely to face intense competition from their conventional counterparts. Thus, in a competitive banking environment and to stay in the race, the ability of Islamic banks to meet all these challenges will depend on their performance efficiency.

This would require the proper implementation and strengthening of governance measures of firms. (Mahtab & Abdullah, 2016). In the previous literature, the question of governance (particularly Islamic) and its relationship with bank efficiency is relatively examined in the GCC (Ghosh, 2017). To enrich this literature, this study aims to investigate the impact of Islamic governance on the efficiency of banks in the GCC countries. The rationale behind this choice is that GCC countries have undertaken some governance reforms in the last decade. Therefore, the effectiveness of these reforms on banking efficiency remains a major empirical concern.

This study examines the effect of Shari'ah Governance on Islamic banks. In fact, this study is very important in several respects. Previous research has mainly focused on the impact of corporate governance in conventional banking, thus excluding Islamic banking. Very few studies have been conducted to determine the effect of certain governance indices on the efficiency of Islamic financial institutions. This is practically our contribution.

The rest of this paper is organized as follows. The second section will be devoted to the presentation of the literature review. The third section will be presented to the research methodology. The empirical results will be reported in the fourth section. The paper will end with the conclusion.

2. Literature Review and Hypotheses Development

Actually, bank governance has been the subject of several debates in the literature. According to Hasan & Dridi (2011) and Mollah & Zaman (2015), Islamic banks maintain social justice i.e., they are founded on the profit and loss sharing (PLS) principle i.e., the Islamic principles of "fair and just" income. Within this framework, SSBs have been set up by Islamic banks as their promoters and funders. The advantages of strong governance frameworks are well known and comprise better efficiency and better access to a favourable banking environment, (Claessens & Yurtoglu, 2013). Moreover, the risk increase is especially due to poor corporate governance.

This postulate could be explicated by the fact that poor governance could affect bank asset quality, reduce bank efficiency, and thus lead to excessive risk taking (Dong et al., 2016). As a consequence, international regulatory organisations have issued new principles to strengthen good governance in the banking sector (Basel Committee on Banking Supervision, 2010). Boards of directors always seek the practice of good governance in order to realize goals which, on the one hand, balance the interests of banks and shareholders and, on the other hand, strengthen and facilitate effective monitoring. These conditions then encourage banks to employ resources more efficiently (Ibrahim, 2017). Despite considerable developments in the banking sector, there are insufficient studies that focused on the subject of banking efficiency, especially in GCC countries (Kamarudin et al., 2017). Mollah & Zaman (2015) examined the relationship between governance structure and efficiency, comparing conventional and Islamic banks. Moreover, Mezzi (2018) studied efficiency of Islamic banks of MENA region and Southeast Asia addressing the importance of governance structure in enhancing bank efficiency.

The results suggest that Islamic banks are facing an increase in cost efficiency, especially in GCC countries and Malaysia. The findings showed that some governance structure affected banking efficiency. After the international economic crisis, the distressed conditions of many banks, including Islamic banks, have reopened the discussion on the governance framework of these establishments and its influence on efficiency (Adams & Mehran, 2012; Mulbert, 2009). However, only a few studies studied the relationship between Shariah governance and efficiency of Islamic banking. This is explained by the fact that the corporate governance of Islamic banks differs in many respects from that of other banks. In addition,

Ajili & Bouri (2018) show that Islamic banks in GCC countries place much more emphasis on the effectiveness of SSBs. Finally, Khan (2017) find that value creation depends mainly on Shariah governance and boards of directors.

We try to bridge the gap in the literature by examining the effect of Shariah governance characteristics on efficiency of Islamic banks. In this case, it is important to examine the effect of governance structure (Board Independence, Board Size, and ownership structure) on bank efficiency.

- **Board Independence (CEO duality) and Efficiency**

Another important feature of the Sharia Supervisory Board (SSB) is the double designation of the CEO and the Chairman. According to the literature, two main theories exist to understand the question of whether it is better for a bank to have a single CEO and president and the potential effects of this duality on a banks efficiency. The first view considers that board independence could improve bank efficiency. Choe & Lee, 2003) show that the reduction of agency problems is reflected in the existence of a large proportion of directors. The authors also point out that board effectiveness is achieved through the ownership of a large proportion of outside directors. On this theme, Fama & Jensen (1985) find that the increase in bank value reflects the existence of independent non-executive directors on the board. The authors link this to the ability of these directors to properly monitor and safeguard the interests of different stakeholders. According to Pathan et al. (2007), collusion between executives on the board could be prevented by increasing the number of outside directors. This is likely to increase and strengthen management within the organisation. Similarly, Adams & Ferreira (2007) argued that independent directors work hard and more effectively for the bank. An independent board is much helpful for the bank's performance and efficiency. In this line of thinking, Kallamu (2016) reported that independent directors positively impact banking efficiency. Indeed, Wang (2014) argues that independent directors increase equity holders' returns and firm efficiency. Outside directors use strict rules in the firm and work for the good efficiency of the bank. Kouki & Guizani (2015) showed that efficiency levels of banks could be improved through external directors because they minimize agency problems. Mollah & Zaman (2015) showed that SSB exerts a positive effect on Islamic banks' efficiency. Furthermore, Minton et al. (2014) found that the duality of

CEOs with financial expertise encouraged more risk-taking, which reduced the efficiency of banks. Moreover, Wang et al. (2012) show that CEO duality lowers banking efficiency. The second hypothesis is presented as follows:

H1. *CEO duality will be positively correlated with banking efficiency.*

- **Board Size and Efficiency**

Hermalin & Weisbach (2001) indicate that management control inefficiency depends mainly on the large board size. This idea is explained by greater agency costs, less transparency and coordination problems between directors, and longer decision-making time due to communication difficulties. By contrast, some studies indicate that large Islamic banks are characterized by many boards. This could then help to disrupt their business models. (Dalton et al.,1999). In this case, larger boards of directors then strengthen bank efficiency through effective monitoring. In addition, according to Upadhyay & Sriram (2011), to strengthen monitoring, it was necessary to increase the number of boards of directors since they have more resources. Indeed, this is evidence of why banks have more directors on the board than firms in other sectors (especially non-financial firms) (Titova (2016)). Moreover, Bokpin (2013), studying the Ghanaian banking industry, found that improve bank efficiency, but marginally decrease cost efficiency. Furthermore, Adams & Merhan (2012) showed that large board sizes could improve the market value (Tobin's Q) of banks. In this case, they suggest that constraints on board size may be counterproductive. Farag et al. (2017) found that the larger SSB, the higher efficiency. This finding supports the fundamental role of the SSB, which is reflected in the authorization of financial products. Interestingly, they found that the reduction in agency costs is mainly a result of increasing the size of the SSB. Furthermore, Mezzi (2018) points out that efficiency is more significant when the expansion of board size is large. Moreover, he showed that large board size could improve cost efficiency. However, other studies showed that improving bank efficiency depends on reducing board size that are independent and well diversified (Dong et al., 2017). According to agency theory, a small board is preferred to reduce agency costs through efficient management control, whereas a larger board may increase interactions and potential conflicts between members (Andres & Vallelado (2008) and Yoshikawa & Phan, 2003). In addition, using the US context, Pathan and Faff (2013) show that financial efficiency is very important for banks with a small board. In the same vein, Mamatzakis & Bermpei (2015) showed that

small board size and unitary management structure could improve bank efficiency in USA using the SFA method. For instance, studying Islamic banking efficiency in Pakistan, Hassan et al. (2017) indicate that board size affect negatively and significantly return on equity (ROE). This result is explained by the fact that financial decisions are affected significantly by the size of the board of directors (Hassan et al .2017). Some studies gather evidence indicating that board size is inappropriate for efficiency. Erkens et al. (2012) indicated that the neutrality between board size on US large bank efficiency. From this literature, it appears that there is no consensus on the relationship between board size and Islamic banking efficiency. The first hypothesis is formulated as follows:

H2. *Board Size will be positively related with banking efficiency.*

- **Ownership structure and Efficiency**

The question of ownership structure (or shareholder identity) has also been of particular importance in the earlier literature on corporate governance (Shleifer & Vishny, 1997). More specifically, the examination of the relationship between shareholder identity and bank efficiency has been the subject of several empirical studies. In this framework, Görg & Greenaway, 2004) find that foreign ownership improves bank performance, Clarke et al (2001) show that domestic banks are less profitable than their foreign counterparts. It is in this context that Means (2017) challenged the idea that bank efficiency is not affected by ownership structure. Furthermore, Sanders, 1999 point out that the reduction of corporate risk is achieved through the proliferation of the percentage of institutional ownership. Similarly, Ab-Rahim et al (2013) show that domestically owned Islamic banks are less efficient compared to foreign-owned Islamic banks. Finally, Mezzi (2018) prove that banking efficiency is not affected by the identity of shareholders. We formulate the third hypothesis as follows:

H3. *Ownership structure will be positively related with banking efficiency.*

3. Data and Methodology
3.1 Data

This study employed a sample of 56 Islamic banks from Gulf Cooperation Council (GCC) countries during the period 2008-2020. The choice of this period is important as most Islamic banks started operating in 2006. Thus, after this period, it is logical to predict that the

time horizon starting with the year 2010 and ending in 2020 represents a good occasion to investigate the effectiveness of Islamic banks. In addition, the adoption of the GCC region depends critically on the high concentration of Islamic financial assets in the region. This is likely to support Islamic financial systems in a comprehensive manner. In addition, the Islamic banking system is of particular importance due to the increasing market share of Islamic financial institutions in the region. Finally, the data is collected from the BankScope source.

3.2 Empirical model

In this paper, we have constructed a model to analyze the impact of Shariah governance on the efficiency of Islamic banks. To regress this model, we used Tobit estimation. The choice of this econometric approach depends essentially on the nature of the dependent variable, which is between 0 and 1. In this case, the equation model is written as follows:

$$
\begin{aligned}
Efficiency_{it} = {} & \alpha_0 + \beta_1 CEO_{it} + \beta_2 Bsize_{it} + \beta_3 Pown_{it} \\
& + \beta_4 Iown_{it} + \beta_5 Fown_{it} + \beta_6 Size_{it} + \beta_7 Invest_{it} \\
& + \beta_8 Debt_{it} + \beta_9 CreditG_{it} + \beta_{10} GDP_{it} + \varepsilon_{it}
\end{aligned}
\tag{1}
$$

Where *Efficiency*$_{it}$ is the efficiency scores (technical efficiency (TE), pure technical efficiency (PTE) and scale efficiency (SE)) of bank i at the time t, *CEO duality* is board independence, *Bsize* is board size, *Pown* is the private ownership, *Iown* is the institutional ownership, *Fown* is the foreign ownership. *Size*, *Invest*, *Debt*, *GreditG*, and *GDP* are the control variables, and ε is the error terms.

3.3 Measurements of variables

3.3.1 *Dependent variable*

The question of measuring the efficiency of banking costs is a subject that has been pursued in the literature according to two types of approaches: parametric and non-parametric. The former provides an econometric estimate of cost function parameters. The second provides a type of linear frontier that envelops the observed points.

In this study, we will use two main approaches namely Data Envelopment Analysis (DEA) and Stochastic Frontier Approach (SFA) as they will be applied as they are the most

used in the literature.[1] The DEA approach is considered as a non-parametric method (Farrell, 1957 and Charnes et al., 1978). It provides a type of linear cost frontier (envelope) completely determined by the most efficient banks. The level of inefficiency is measured by the distance of the observation from the envelope.

The DEA approach be able to input-oriented or output-oriented. The former is the possibility to produce from a minimum of input to produce a given of output. While the second is the possibility of producing from a given input the maximum output. According to Coelli & Perelman (1996), from the first method, one can calculate by how much one must reduce the quantity of input without varying the quantity of output to have an efficient production. From the second method, one can calculate by how much one should increase the output without changing the quantity of inputs. These two orientations provide the same efficiency measures under the assumption of constant returns to scale for the bank (Pasiouras & Kosmidou, 2007). In most studies, the input-oriented technical efficiency is the most used. Moreover, there are two approaches that they define the two types of variables (Inputs, outputs) to be introduced in the estimation: the production approach and the intermediation approach. As for the production approach, which was developed by Benston (1965) and Bell & Murphy (1968), banks are considered as the user of capital and labor to produce credits and deposits. While the intermediation approach, which was introduced by Sealy & Lindley (1977), banks are seen as collectors of funds that will be transformed into credit. In fact, the production approach is more adopted to studies of industries other than banks.

Therefore, we use the input-oriented DEA method under the intermediation approach to measure overall technical efficiency and its components. Inputs are mainly financial capital consisting of deposits collected and funds borrowed on the financial market plus physical capital and labor. Outputs, on the other hand, are represented by the volume of credits and portfolio investments. In our study we introduce the following factors: Banking inputs: three inputs will be examined. The first is the labor factor. It is captured by personnel expenses. The second input is physical capital. It is measured by the volume of fixed assets. The last input is the financial capital, we retain the total deposits and assets of the customers. Bank

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[1] For more details, see Berger & Humphrey (1997) and Mezzi (2018).

outputs: two outputs will be considered. The first output is the volume of loans[2] (Leightner & Lovell, 1998). The second output is apprehended through the securities portfolio[3].

Under the intermediation approach, below the principle of profit and loss sharing (PLS), they employ labor and capital to convert these funds into debt and equity assets (Mezzi, 2018). In this regard, following Majeed & Zanib (2016), Mezzi (2018) and Sakti & Mohamad (2018), it is obvious then to employ three inputs (total deposits, capital, and personal expenses) to produce three outputs (total debt, securities, and other income). Table 1 summarizes then the different inputs and outputs.

Table 1. Outputs and Inputs

Variables	Description
Inputs	
Total Deposits	Deposits of Customers
Capital	Share Capital
Personal expenses	Personal expenses
Outputs	
Total Debt	Mourabaha, Ijara
Securities	Moudharaba, Moucharaka
Other Income	Financing from other assets

By definition, technical efficiency means that a bank can employ the certain level of inputs to generate a certain level of output. In our analysis, we choose the output-oriented model. This is because this model better matches the cost reduction objectives of Islamic banks.

In the second stage, we defined the technical efficiency scores. TE is the capacity of a bank to produce the possible optimal output with the same given level of input. According to the literature, the DEA method involves bank inputs and outputs. In this framework, Messi (2018) suggests that the calculation of efficiency scores and the explanation of inefficiency factors depends mainly on the estimation of efficiency using the DEA method. Among the main advantages of this method is the use of a small sample size (Sakti & Mohamad, 2018). Therefore, it is important to use this method since we are using a small sample size (56 Islamic banks located in the GCC region). To obtain the maximum point between the

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[2] Islamic financing products are like conventional loans. In our study we retain the products Murabaha, Salam, Istisna', Ijara, etc.

[3] For Islamic banks, these assets are represented by participatory financial products (mainly Moudharaba and Mucharaka).

proportion of outputs and inputs, it is imperative to employ the DEA method to measure a DMU (Sakti & Mohamad, 2018). In other words, when the generation of outputs is at the same level of inputs, then it can be called an efficient bank. As a contribution, Banker et al (1984) used variable returns to scale (VRS) to assess bank efficiency.

As for the second method, the stochastic frontier analysis (SFA) was first initiated by Meeusen & Van den Broek (1977). It has two main advantages: First, the SFA can resolve a random error term and remedy controllable inefficiency (Titova, 2016). Second, it allows a simultaneous regression of efficiency frontier parameters and inefficiency coefficients (Battese & Coelli's, 1995). This method also allows for greater reliability of the estimated efficiency (Lensink & Meesters, 2014 and Titova, 2016). In a recent study, Titova (2016) measure cost efficiency using SFA to estimate the link between the last and a set of board-related characteristics for a sample of US banks.

3.3.2 *Independent variables*

According to Titova's (2016) study, a series of variables have been carefully selected to have more robust results. This undoubtedly helps to better explore the main factors of Shariah governance that could affect banking efficiency. Table 2 reports the description of all variables.

Table 2. Definitions of variables and measures

Variable	Definition	Measurement	Sources
Dependent variables			
TE	Technical efficiency	DEA method	Authors calculate
PTE	Pure technical efficiency	DEA method	Authors calculate
SE	Scale efficiency	DEA method	Authors calculate
SFA	Stochastic frontier analysis	SFA method	Authors calculate
Independent variables			
Structure of the Shariah Board			
CEO duality	Position of independent directors	Dummy variable takes 1 if CEO and chair roles are divided (Independent) and 0 otherwise.	BankScope
Shariah Board Size	Size of board of scholars	Number of scholars on the board	BankScope
Ownership structure			
Private ownership	Share held by private shareholders	The percentage of private shareholders shares	BankScope
Foreign ownership	Share held by foreign shareholders	The percentage of foreign shareholders shares.	BankScope
Institutional	Share held by	The percentage of institutions shareholders	BankScope

ownership	institutions shareholders	shares.	
Control variables			
Size	Size of bank	Natural logarithm of total assets.	BankScope
Investment	The ratio investments	Total Investments / total deposits	BankScope
Debt	The debt ratio	Total debt / total assets	BankScope
CreditG	The change in total outstanding loans	The change in total outstanding loans	BankScope
GDP	Economic development	Economic growth	World Bank

4. Results and Discussion

4.1 Descriptive statistics

Table 3 reports the descriptive statistics of all variables used in the first step. It presents the means, standard deviations, and number of observations for the whole sample. The efficiency scores of GCC Islamic banks are obtained using the DEA method with the CRS and VRS models. Table 4 summarizes the efficiency scores for each year.

In this framework, the scores are obtained for the whole period year by year for all banks. According to Table 3 below, TE for all banks in our sample is 0.94, PTE is 0.97 and SE is 0.96. This indicates optimal use of inputs. This indicates an optimal use of inputs. Islamic banks generally perform well in terms of overall efficiency, TE, and SE between 2008 and 2020. As mentioned above, technical efficiency (TE) presupposes SRCs, while considering their variability allows decomposing technical efficiency into pure technical efficiency and scale efficiency. This decomposition reveals the sources of technical inefficiency.[4]

In the VRS model, pure technical efficiency is almost high for the GCC region. The average pure technical efficiency score is 0.97 over the period 2008-2020. The pure technical efficiency score has increased over the study period, implying that the management efficiency of banks has improved over the period.

The average scale efficiency of GCC banks over the period 2008-2020 is 0.968. The larger the size of Islamic banks, the more efficient they are. Islamic banks in the GCC have operated at a relatively optimal operational scale.

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[4] For more details see Mezzi (2018).

Table 3. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
TE	728	0.942	0.045	0.816	1
PTE	728	0.975	0.034	0.862	1
SE	728	0.968	0.033	0.842	1
SFA	728	0.731	0.129	0.35	0.93
CEO (%)	728	20.8	40.6	0	1
Bsize	728	9.093	2.269	5	14
Pown (%)	728	43.1	42.2	0	1
Iown (%)	728	14	25.2	25	70
Fown (%)	728	0.368	0.403	0	1
Sise (US $ billon)	728	17.293	3.029	3.238	85.999
Debt (%)	728	4.745	11.021	11.7	49.188
CreditG (%)	728	10.538	28.108	-0.998	123.217
GDP (%)	728	5.606	5.183	-7.076	26.170

Note: this table summarize the descriptive statistics for different variables used in this study (mean, standard deviation, min, and max).

Table 4. Annual average of different efficiency scores

Year	TE (CRS)	PTE(VRS)	SE (VRS)
2008	0.9374	0.9621	0.9743
2009	0.9399	0.9643	0.9747
2010	0.9418	0.9712	0.9697
2011	0.9355	0.9733	0.9612
2012	0.9154	0.9622	0.9514
2013	0.9447	0.9644	0.9796
2014	0.9552	0.9755	0.9792
2015	0.9404	0.9617	0.9779
2016	0.9077	0.9623	0.9433
2017	0.9102	0.9666	0.9416
2018	0.8992	0.9657	0.9311
2019	0.8901	0.9657	0.9217
2020	0.8594	0.94313	0.9112

Note: TE is technical efficiency (CRS); PTE is pure technical efficiency (VRS); SE is scale efficiency (VRS).

Table 5 tabulates the results of the Pearson correlation matrix. The Pearson correlation test shows that there is no problem of multi-collinearity between the variables since all the estimated coefficients have values less than 0.80.

Table 5. Correlations Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) CRS	1.000												
(2) VRS	0.649*	1.000											
(3) Scale	0.691*	-0.014	1.000										
(4) SFA	-0.050	0.020	-0.112*	1.000									
(5) CEO	0.009	0.129*	-0.109*	0.016	1.000								
(6) Bsize	-0.032	-0.033	-0.018	-0.068	0.183*	1.000							
(7) Pown	-0.014	-0.068	0.072	-0.016	-0.038	0.293*	1.000						
(8) Iown	0.139*	0.158*	0.053	-0.143*	0.090*	0.233*	-0.315*	1.000					
(9) Fown	-0.016	-0.121*	-0.021	0.101*	-0.131*	-0.377*	-0.498*	-0.204*	1.000				
(10) Size	-0.074*	-0.008	-0.078*	0.036	-0.071	-0.062	0.143*	-0.158*	-0.101*	1.000			
(11) Debt-Ratio	0.031	0.118*	0.044	-0.001	0.063	0.104*	0.130*	0.093*	-0.231*	-0.057	1.000		
(12) Credit-Growth	0.032	0.119*	0.047	-0.005	0.062	0.103*	0.129*	0.099*	-0.236*	-0.056	0.198*	1.000	
(13) GDP	0.028	0.102*	0.049	0.000	0.061	0.093*	0.115*	0.083*	-0.205*	-0.050	0.396*	0.196*	1.000

Note: This table reports the correlations of variables for GCC banks between 2008-2020. Correlation is significant at the 5% level.

4.2 Impact of Shariah Governance Mechanism on Technical Efficiency

4.2.1 Impact of Islamic banking Shariah Governance on Technical Efficiency (TE)

Table 6 presents the results of the impact of governance structures on banking technical efficiency. CEO duality has a positive impact on bank efficiency (TE), but not a significant one. An independent director makes rapid decisions and appropriate strategies more effectively (column 8). This result then shows that it is important to strengthen greater independence of the board of directors to improve the efficiency of banks. This is done by enhancing the role of Shariah board. More specifically, the strengthening of the Sharia board allows for an improvement in the ability of banks to better manage their costs. It is similar with the result found by Kouki & Guizani (2015) and Mezzi (2018). In this case, the H1 hypothesis is not accepted.

In addition, the Shariah Board Size has a negative impact on technical efficiency (TE) (column 8). This result could be explained by the fact that the appropriate management of operations could be hampered by a reduced number of directors. This could hinder the efficiency of the bank. In this context, it is important to note that the reduced number of board of directors of an Islamic bank is beneficial to improve bank's efficiency. As such, the improved efficiency level could address coordination problems, mitigate divergent interests among board members and enhance decision-making. It is similar with the result found by Lipton & Lorsch (1992), Yermack (1996), Adams & Mehran (2005), Belkhir (2009), Jamaldeen (2012) and Ellouz & Jawada, 2017. In this case, the hypothesis H2 is not accepted.

Let's now turn to the result of the impact of ownership structure on Islamic banks' technical efficiency (TE). First, the private ownership (Pown) positively affects the banks' efficiency (column 8). This result is explained by the fact that the efficiency of Islamic banks could be improved by strengthening the number of private shareholders. Second institutional ownership (Iown) positively affects the banks' efficiency (column 8). From an economic viewpoint, this result is explained by excessive price controls and strict regulation as they allow for a high level of public ownership. In this case, it is important that the state be included as it helps to enhance the efficiency of banks and maintain financial development. Third, foreign ownership (Fown) positively affects the banks' efficiency (column 8). Economically, this result is explained by the fact that foreign banks are more efficient than

their local counterparts in managing risk and reducing costs.-It is similar with the result found by Zouari & Taktak (2014) and Ellouz & Jawada (2017). Hypothesis H3 is validated.

Turning now to the results of the control variables. For the *Invest* variable, it has a negative impact on bank efficiency (TE). This seems to mean that small banks have better control over their costs than large banks. The rest of the control variables are not significant.

Table 6. The impact of Shariah Governance Variables on DEA Technical Efficiency

variables	(1) TE	(2) TE	(3) TE	(4) TE	(5) TE	(6) TE	(7) TE	(8) TE
CEO	0.005					0.013		0.029
	(0.036)					(0.036)		(0.039)
Bsize		-0.008				-0.008		-0.019**
		(0.007)				(0.007)		(0.008)
Pown			-0.013				0.119***	0.166***
			(0.038)				(0.043)	(0.049)
Iown				0.220***			0.317***	0.378***
				(0.076)			(0.077)	(0.079)
Fown					-0.007		0.115***	0.119**
					(0.039)		(0.044)	(0.047)
Size	-0.007	-0.008	-0.007	-0.005	-0.007	-0.008	-0.004	-0.005
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Invest	-0.019	-0.020*	-0.019	-0.021*	-0.019	-0.021*	-0.022*	-0.027**
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)
Debt	-0.002	0.001	-0.001	0.002	-0.002	0.001	0.002	0.008
	(0.025)	(0.026)	(0.025)	(0.022)	(0.025)	(0.026)	(0.024)	(0.023)
CreditG	0.010	0.010	0.010	0.006	0.010	0.010	0.008	0.007
	(0.010)	(0.010)	(0.010)	(0.008)	(0.010)	(0.010)	(0.009)	(0.009)
GDP	-0.174	-0.231	-0.197	0.007	-0.153	-0.230	-0.082	-0.086
	(0.391)	(0.391)	(0.392)	(0.388)	(0.394)	(0.391)	(0.392)	(0.390)
Constant	1.716***	1.797***	1.719***	1.637***	1.721***	1.797***	1.525***	1.678***
	(0.098)	(0.114)	(0.097)	(0.096)	(0.100)	(0.114)	(0.102)	(0.121)
Observations	728	728	728	728	728	728	728	728
Number of banks	56	56	56	56	56	56	56	56
Pseudo R2	0.001	0.001	0.001	0.002	0.001	0.001	0.003	0.003

Notes: This table presents the Tobin regressions. The standard errors are in parentheses. *, **, *** are degree of significance 10%, 5 % and 1% percent levels, respectively.

4.2.2 Impact of Islamic Banking Shariah Governance on Pure Technical Efficiency (PTE)

This subsection presents and discusses the results on the impact of governance structures on PTE. Table 7 then summarizes these different results. In fact, the CEO duality has a positive and a significant impact on PTE (column 8). This result is explained by good management and resource maximization. More specifically, these advantages depend mainly on the introduction of independent boards of directors, which improves bank efficiency. Having a higher level of disclosure and transparency makes Islamic banks less risk-taking and hence, maximizes shareholder value and bank efficiency, (Ulussever, 2018). This confirms the validation of hypothesis H1.

Turning now to the results of the impact of Board size on PTE. It appears that there is a negative relationship between Bsize and PTE. It is similar with the result found by Johnson & Ellstrand (1996) and Ashfaq et al. (2017). This result is explained by the fact that the increase in pure technical inefficiency depends mainly on reducing the size of the board, and thus on reducing costs. In this case, The H2 hypothesis is not accepted.

Another Shariah Governance mechanism having an impact on pure technical efficiency is ownership structure of Islamic banks. First, private ownership negatively affects PTE. This result is mainly due to the abuse of rights by private shareholders. This abuse also reduces the pure technical efficiency of Islamic banks. Second, institutional ownership positively affects PTE. The H2 hypothesis is accepted. As for the presence of foreign investors, we note that the variable, unlike the case of technical efficiency, has a negative and significant relationship with PTE. It is similar with the result showed by Sufian & Habibullah (2010). They indicate that the impact of foreign ownership relies on both the understanding of the market and the regulation of the country.

Table 7. The impact of Shariah Governance structures on PTE

Variables	(1) PTE	(2) PTE	(3) PTE	(4) PTE	(5) PTE	(6) PTE	(7) PTE	(8) PTE
CEO	0.196***					0.225***		0.164***
	(0.059)					(0.060)		(0.062)
Bsize		-0.021**				-0.028***		-0.039***
		(0.010)				(0.010)		(0.012)
Pown			-0.149***				-0.658***	-0.540***
			(0.054)				(0.162)	(0.166)
Iown				0.368***			-0.229	-0.100
				(0.104)			(0.181)	(0.187)
Fown					-0.084		-0.652***	-0.611***
					(0.059)		(0.164)	(0.166)
Size	-0.001	-0.003	0.000	0.001	-0.004	-0.001	-0.000	0.000
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Invest	-0.057***	-0.057***	-0.053***	-0.057***	-0.054***	-0.062***	-0.053**	-0.067***
	(0.019)	(0.021)	(0.020)	(0.022)	(0.020)	(0.019)	(0.022)	(0.021)
Debt	0.059	0.065	0.069	0.066	0.054	0.068	0.063	0.074
	(0.075)	(0.077)	(0.080)	(0.064)	(0.066)	(0.079)	(0.054)	(0.055)
CreditG	0.023	0.025	0.024	0.017	0.020	0.026	0.012	0.013
	(0.030)	(0.032)	(0.033)	(0.026)	(0.028)	(0.033)	(0.022)	(0.022)
GDP	-1.569***	-1.751***	-1.895***	-1.310**	-1.311**	-1.789***	-1.044*	-1.122*
	(0.559)	(0.567)	(0.580)	(0.560)	(0.574)	(0.572)	(0.569)	(0.572)
Constant	1.982***	2.258***	2.070***	1.926***	2.098***	2.254***	2.569***	2.813***
	(0.133)	(0.165)	(0.134)	(0.134)	(0.135)	(0.167)	(0.192)	(0.219)
Observations	728	728	728	728	728	728	728	728
Number of banks	56	56	56	56	56	56	56	56
Pseudo R2	0.011	0.010	0.010	0.012	0.010	0.013	0.018	0.022

Notes: This table presents the Tobin regressions. The standard errors are in parentheses. *, **, *** are degree of significance 10%, 5 % and 1% percent levels, respectively.

4.2.3 Impact of Islamic banking Shariah Governance on Scale Efficiency (SE)

This subsection presents and discusses the results on the impact of governance structures on SE. Table 8 then summarizes these different results. CEO duality negatively affects the SE. More separated member reduces the scale efficiency. Hence, this result then shows that the independence of board members could enhance the scale inefficiency of Islamic banks. The H1 hypothesis is not accepted. In addition, Board size has a negative impact on SE. This result is explained by the fact that the scale inefficiency of Islamic banks is mainly due to coordination costs and free rider problems. The H2 hypothesis is not accepted. Finally, it seems that ownership structure (Pown, Iown, and Fown) has a positive impact on SE. More precisely, regardless foreign, institutional, or private Islamic banks, in our sample, have been operating at a relatively optimal scale of operations. In this case Hypothesis H3 is accepted.

Table 8. The impact of shariah governance structure on SE

variables	(1) SE	(2) SE	(3) SE	(4) SE	(5) SE	(6) SE	(7) SE	(8) SE
CEO	-0.126***					-0.127***		-0.096**
	(0.041)					(0.041)		(0.044)
Bsize		-0.003				0.001		-0.013
		(0.009)				(0.008)		(0.009)
Pown			0.098**				0.261***	0.249***
			(0.047)				(0.057)	(0.061)
Iown				0.099			0.288***	0.308***
				(0.090)			(0.095)	(0.095)
Fown					-0.042		0.182***	0.130**
					(0.048)		(0.060)	(0.063)
Size	-0.007	-0.006	-0.008	-0.005	-0.006	-0.007	-0.005	-0.006
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Invest	0.013	0.010	0.010	0.010	0.011	0.014	0.007	0.008
	(0.019)	(0.021)	(0.021)	(0.020)	(0.020)	(0.019)	(0.020)	(0.019)
Debt	-0.066**	-0.066**	-0.072**	-0.065**	-0.068**	-0.066**	-0.069**	-0.063**
	(0.031)	(0.031)	(0.033)	(0.031)	(0.032)	(0.031)	(0.033)	(0.032)
CreditG	0.010	0.011	0.010	0.009	0.009	0.010	0.011	0.008
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
GDP	0.731	0.753	0.923*	0.861*	0.906*	0.738	0.849*	0.895*
	(0.481)	(0.483)	(0.488)	(0.473)	(0.499)	(0.486)	(0.494)	(0.490)
Constant	2.001***	1.987***	1.942***	1.916***	1.975***	1.989***	1.716***	1.898***
	(0.105)	(0.131)	(0.102)	(0.109)	(0.103)	(0.130)	(0.117)	(0.145)
Observations	728	728	728	728	728	728	728	728
Number of banks	56	56	56	56	56	56	56	56
Pseudo R2	0.003	0.002	0.002	0.002	0.002	0.003	0.004	0.006

Notes: This table presents the Tobin regressions. The standard errors are in parentheses. *, **, *** are degree of significance 10%, 5 % and 1% percent levels, respectively.

4.3 Islamic Governance Mechanism on SFA Efficiency: Sensitivity Analysis

After examining the results of the DEA method, the aim of this section is to test the sensitivity of our results to the used method. Compared to the previous section, in which we measure efficiency by the DEA method, an SFA analysis implemented in this section shows the high robustness of results. The DEA and SFA methods separately yielded the same signs and significance for the main variables representing the Shariah governance and banking efficiency relationship. From the SFA analysis (Table 9), CEO-duality positively but insignificantly affects Islamic banking efficiency: when the CEO does not serve as a chairman of the board, the bank still has a high level of technical efficiency. In this case, hypothesis H1 is not yet accepted.

By contrast, the impact of Board size on technical efficiency in Islamic banks is negative and significant. This means that larger boards are associated with a low technical efficiency. The hypothesis H2 is rejected. Table 9 shows that private ownership has a positive and a significant impact on Islamic banks' technical efficiency. Institutional ownership has a positive and a significant impact on efficiency. This result is confirmed by Lang and So (2002). In fact, the authors show that state-owned banks are expected to bear a lower disciplinary effect from the financial market and the environment than private banks do. This could enhance banking outputs and improve the efficiency of Islamic banks. Foreign ownership has a positive and a significant effect on ownership. Foreign expertise of foreign shareholders could increase the level of outputs from an increased level of inputs. Hypothesis H3 is accepted.

Table 9. The impact of Shariah Governance Variables on SFA Efficiency

VARIABLES	(1) SFA	(2) SFA	(3) SFA	(4) SFA	(5) SFA	(6) SFA	(7) SFA	(8) SFA
CEO	0.013					0.028		0.040
	(0.036)					(0.035)		(0.037)
Bsize		-0.013**				-0.014**		-0.004
		(0.006)				(0.006)		(0.007)
Pown			-0.026				-0.006	0.014
			(0.034)				(0.060)	(0.065)
Iown				-0.230***			-0.208***	-0.189**
				(0.057)			(0.077)	(0.083)
Fown					0.134***		0.107	0.121*
					(0.041)		(0.067)	(0.068)
Size	0.001	-0.000	0.001	-0.003	0.002	0.000	-0.001	-0.001
	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Invest	-0.007	-0.009	-0.007	-0.005	-0.006	-0.010	-0.004	-0.006
	(0.020)	(0.020)	(0.020)	(0.021)	(0.019)	(0.020)	(0.020)	(0.020)
Debt	0.061	0.067*	0.063	0.059	0.071*	0.067*	0.068	0.068
	(0.039)	(0.038)	(0.039)	(0.042)	(0.042)	(0.039)	(0.044)	(0.045)
CreditG	-0.014	-0.013	-0.014	-0.010	-0.010	-0.013	-0.007	-0.007
	(0.011)	(0.011)	(0.011)	(0.013)	(0.013)	(0.011)	(0.015)	(0.015)
GDP	-0.477	-0.576	-0.525	-0.707	-0.921*	-0.573	-1.043**	-1.053**
	(0.500)	(0.501)	(0.504)	(0.504)	(0.512)	(0.499)	(0.518)	(0.517)
Constant	0.598***	0.738***	0.605***	0.703***	0.535***	0.737***	0.640***	0.648***
	(0.101)	(0.104)	(0.100)	(0.099)	(0.104)	(0.105)	(0.119)	(0.123)
Observations	728	728	728	728	728	728	728	728
Number of banks	56	56	56	56	56	56	56	56
Pseudo R2	0.001	0.001	0.001	0.002	0.002	0.001	0.003	0.003

Notes: This table presents the Tobin regressions. The standard errors are in parentheses. *, **, *** are degree of significance 10%, 5 % and 1% percent levels, respectively.

5. Conclusion and implications

This paper has aimed to study the impact of Shariah governance mechanisms on the efficiency of Islamic banks. To do so, a sample of 56 Islamic banks in the GCC region was selected over a period from 2008 to 2020. For further research, sharia governance structure and three dependent efficiencies (TE, PTE, SE) were selected. The results of this study indicate that Shariah governance plays an important role in the technical and scale efficiency of Islamic banking. There is clear evidence that Shariah board positively affects the technical efficiency of the banking sector. The study can be extended by adding more complex variables representing other characteristics of *Shari'ah* governance and exerting effects on the efficiency of Islamic banks.

In summary, our results provide policy makers, bank managers and investors with important insights into the determinants of the technical efficiency of Islamic banks. Policymakers may consider introducing new rules and regulations to improve the efficiency of Islamic banks by paying more attention to sharia governance. In addition, bank managers should consider improving the operations of Islamic banks to increase their market share. Furthermore, investors and customers can easily decide to invest in Islamic banks by referring to their efficiency scores. Due to some limitations, we believe that this study could be extended in several ways. Future research could consider measuring the cost, revenue, and profit efficiency of Islamic banks. In addition, researchers could consider using other methodologies in the future.

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