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Bank overall financial strength: Islamic versus conventional banks

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ABSTRACT

A number of recent studies compare the performance of Islamic and conventional banks with the use of individual financial ratios or efficiency frontier techniques. The present study extends this strand of the literature, by comparing Islamic banks, conventional banks, and banks with an Islamic window with the use of a bank overall financial strength index. This index is developed with a multicriteria methodology that allows us to aggregate various criteria capturing bank capital strength, asset quality, earnings, liquidity, and management quality in controlling expenses. We find that banks differ significantly in terms of individual financial ratios; however, the difference of the overall financial strength between Islamic and conventional banks is not statistically significant. This finding is confirmed with both univariate comparisons and in multivariate regression estimations. When we look at the bank financial strength within regions, we find that conventional banks outperform both the Islamic banks and the banks with Islamic window in the case of Asia and the Gulf Cooperation Council; however, Islamic banks perform better in the MENA and Senegal region. Second stage regressions also reveal that the bank overall financial strength index is influenced by various country-specific attributes. These include control of corruption, government effectiveness, and operation in one of the seven countries that are expected to drive the next big wave in Islamic finance.

1. Introduction

The market share of Islamic banking is still small in the global financial sector; however, it is growing fast in many countries, especially in the Middle East and Asian regions (International Monetary Fund, 2015). In theory, there are many differences between Islamic and conventional banks. Nonetheless, these two types of institutions compete in the same banking arena, and some claim that the Islamic ones showed stronger resilience, on average, during the global financial crisis (e.g. Hasan and Dridi, 2010). Therefore, it is not surprising that Islamic banks have attracted considerable attention by academics, policy makers, and other market practitioners.

Within this context, a growing number of studies investigates the differences in the performance between the two types of banks. For example, many studies compare the efficiency of Islamic and conventional banks. There are two issues associated with these studies. First, their findings are mixed. For instance, Srairi (2010) conclude that Islamic banks are, on average, less cost and profit efficient than conventional banks. Bader et al. (2008) conclude that there are no significant differences. Johnes et al. (2014) find that Islamic banks are typically on a par with conventional ones in terms of gross efficiency, significantly higher on net efficiency and significantly lower on type efficiency. Second, an important drawback is that while these indicators capture adequately the efficiency of banks in terms of transforming their inputs into outputs, they usually fail to take into account other aspects like risk and liquidity.

Other studies compare the financial ratios of the banks, focusing on individual aspects like capital adequacy (Beck et al., 2013), deposits and loans growth (Karim et al., 2014), credit risk (Kabir et al., 2015), bank insolvency risk (Bourkhis and Nabi, 2013), and profitability (Beck et al., 2013). The conclusions of these studies, as for the relative performance of the two groups across different dimensions, are often conflicting. For example, Beck et al. (2013) find that Islamic banks are less cost-effective, but have a higher intermediation ratio, higher asset quality and are better capitalized, whereas at the same time there are no differences in terms of insolvency risk and profitability. Therefore, the drawback of this analysis is that it provides only partial views, and it is difficult to conclude if one group is better than the other in terms of overall performance and financial strength.

In the present study we attempt to close this gap in the literature by asking a straightforward question: does the overall financial strength of Islamic banks differ from that of conventional ones? To this end, we propose the use of a multicriteria methodology that allows us to aggregate various financial criteria and estimate an overall indicator

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of financial strength. Thus, we obtain a general picture about the overall financial strength of Islamic versus commercial banks, instead of focusing on individual bank characteristics. In a second stage, to shed more light, we also investigate whether and how bank overall financial strength is influenced by country specific attributes, like institutional development and macroeconomic conditions.

The advantage of the multcriteria framework that we use is that it allows us to simultaneously take into account the conflicting objectives of managers and the unique operating characteristics of different types of banks, and examine multiple scenarios with respect to the way that these contribute to overall bank financial strength. For example, under the "skimping" hypothesis there is a trade-off between short-term operating costs and future loan performance problems (Berger and DeYoung, 1997). The underlying idea is that a bank can maximize its profits by lowering its operating expenses in the short run by skimping on the resources devoted to underwriting and monitoring loans. However, this may result in loan performance problems and increase the costs to deal with these problems in the future. Additionally, as discussed in Doumpos et al. (2016) there is a trade-off between liquidity and profitability. Managers may try to increase bank returns, by decreasing the liquid assets that they hold. However, this may result in liquidity risk. Nonetheless, prudent managers should aim for profit maximization, while minimizing the non-performing to loans ratio, and maintaining liquidity, capital adequacy, etc. The idea that gains on one dimension must be potentially sacrificed on another dimension (i.e. trade-off) is central in the analysis of financial economics and bank management (Thakor, 2014). Therefore, it is not surprising that various studies highlight the need to take into account the multi-dimensionality of performance, instead of focusing on individual measures like profits, liquidity, etc. (see e.g. McKiernan and Morris, 1994; Devinney et al., 2010; Kyrgidou and Spyropoulou, 2013).

To our knowledge, this is the first study in the Islamic banking literature that adopts this multicriteria methodological framework. We believe that such an analysis is particularly important, in light of the different business model and objectives of Islamic and conventional banks. For instance, while Berger and DeYoung (1997) refer to conventional banks, this issue is of considerable relevance to Islamic banks as well. As we discuss in Section 2, Islamic banks do not take collateral for credit risk and as such additional efforts are necessary during the screening of the proposed projects. Similarly, Islamic banks and conventional banks have different options when deciding about the liquid assets that they keep in their portfolio as the former cannot invest in conventional interest-bearing bonds, and they can only invest in Sukuk issues which have various differences. Taken together with a different philosophy in terms of risk-return sharing between the two types of banks, it is natural to wonder if these differences translate into differences in the overall financial strength of banks.

The rest of the paper is as follows. Section 2 provides a short background to the main differences between Islamic and conventional banks. Section 3 describes the data and methodology. Section 4 discusses the results. Section 5 concludes.

2. Background on Islamic banking

This section provides a brief discussion of the key features of Islamic finance and its potential influence on bank financial strength. The first element is the prohibition of interest-bearing contracts since the Quran prohibits the receipt and payment of interest in all transactions. However, to ensure their sustainability and continue their operations, Islamic banks must receive some kind of reward. For this reason they rely on the idea of risk sharing under profit/loss sharing (PLS) arrangements. This idea extends to the liability side, and consequently, Islamic banks become partners with both deposits and borrowers, and they share risk with both.

For example, under the classic concept of *mudaraba* there are two parties, one with capital (i.e. financier or silent partner), and one with know-how (working partner) that provides labour and entrepreneurship for the completion of a project. The financier provides the capital and the entrepreneur has the ultimate control over the project. If the project is profitable the two parties share the profits at a pre-arranged ratio, whereas in the case of losses, the entire loss is borne exclusively by the financier. In the case of Islamic banking, an intermediary (i.e. the bank) comes into the concept to create a triangle. Investors deposit their funds at the bank, and the bank finances projects put forward by entrepreneurs. In this arrangement, the investor is essentially a sleeping partner who provides capital and then shares the profit or absorbs the loss. The entrepreneur must present a good proposal, and convince the financier that it is viable and profitable, etc. Consequently, the bank has a dual role. When the bank accepts funds from an investor, it becomes an entrepreneur; and when it finances a project it becomes the financier.

Another common agreement used by Islamic banks is based on a *musharaka* contract. In this case the bank and one or more clients establish a partnership or joint venture for an economic activity where all parties may contribute some percentage of all three factors of economic production (i.e. capital, labor, and entrepreneurship). A partner may keep its share in the partnership until the very end of the project or not, depending on whether it is a consecutive musharaka or diminishing musharaka. The profit and loss sharing ratio may be revised every time the client repurchases equity units or according to some other agreement between the bank and the client.

The composition of the assets portfolio of Islamic banks also differs from the one of conventional banks. More detailed, conventional banks may diversify their portfolio by allocating part of their funds to non-lending investments like interest-bearing bonds that have different risk-return characteristics. However, Islamic banks are not allowed to invest in such interest-bearing securities, and they can only invest in Islamic bonds (i.e. *Sukuk*).[1] At the same time, this means that Islamic banks lack liquid securities on the asset side (Saeed and Izzeldin, 2016). Another difference is that conventional banks use both debt and equity to finance their asset portfolio, whereas Islamic banks depend primarily on equity financing and deposits. These deposits come in two forms for Islamic banks. First, there are current deposits that bear no interest, and serve as safekeeping accounts. Depositors have access to their accounts and may withdraw money any time they wish. Second, there are savings deposits that do not carry interest rate but participate in the profits of the bank. In this case, depositors cannot withdraw money prior to the maturity date without a penalty.

Finally, in addition to the PLS activities, Islamic banks may engage in other activities like lease and fee-based services. For example, Islamic banks may receive fees through: (i) consultation and professional services, fund placements and trust services (*Ju'ala*), (ii) agency contracts (*Wakalah*), (iii) lease contracts (*Ijarah*), (iv) purchase and

[1] Sukuk issues do not earn interest payments as conventional Western bonds. Instead they are asset-based securities and they are not considered debt instruments. More detailed, Sukuk issues are associated with the partial ownership of the underlying asset, and the investor can be either rewarded with a share of the profits derived from the assets or share a loss. The issue of Islamic banks' liquidity in relation to the availability of short-term liquid assets has been mentioned in a number of studies. For instance Kammer et al. (2015) highlight that "*Islamic banks tend to hold high levels of liquidity, but they suffer from a lack of well-developed markets for Shari'ah-compliant, high-quality liquid assets (HQLA).This tends to force many Islamic banks to hold a higher share of cash, which affects their profitability*" (p. 22). They also discuss the lack of regular sovereign issuance at different maturities which is critical for deepening the market, since only a few governments of central banks have issuance programs as part of their public debt management strategy (Bahrain, Malaysia and Qatar). Thus, it appears that the development of Sukuk falls short compared to the alternative of Treasury bills which is a very mature and liquid market. Iqbal and Mirakhor (2011) also highlight the lack of liquidity and the complexity of Sukuk issues, along with managerial implications. Finally, Godlewski et al. (2013) approach this issue from a market perspective, and they document that the stock market is neutral to announcements of conventional bonds but it reacts negatively to announcements of Sukuk bonds.

sales contracts (*Murabaha*). While conventional banks also engage heavily in non-traditional activities that generate fee income, Beck et al. (2013) discuss that one could expect differences between the two banks that could go in either direction. As they mention, on the one hand there might be a higher share of non-interest revenue in Islamic banks as these banks might charge higher fees and commissions to compensate for the lack of interest revenue. On the other hand, the share of revenue related to non-lending and including investment bank activities should be lower for Islamic banks. Using a large sample of Islamic and conventional banks operating in over 20 countries between 1995 and 2009 they find that overall there are no significant differences in the share of fee-based to total income between the two types of banks. This finding holds when they compare small, medium and large banks. Therefore, they do not seem to find evidence to support the argument of Čihák and Hesse (2010) that small Islamic banks may concentrate on low-risk investments and fee income, while large banks do more PLS business Nonetheless, additional analysis in Beck et al. (2013) shows that there can be differences among countries, with Islamic banks having lower fee income than conventional banks in some countries (e.g. Egypt, Indonesia), and higher in others (e.g. Kuwait, and Lebanon).These particular characteristics of Islamic banking have various implications for the risk-taking, performance, and consequently overall financial strength of banks. For example, on the one hand Beck et al. (2013) highlight that the equity-like nature of savings and investment deposits might increase depositors' incentives to discipline the bank. In turn, this should result in a bank with better overall financial strength. On the other hand, Saeed and Izzeldin (2016) point out that as an agent, the bank is not liable for losses but shares the profits with the investment account holder, and it has an incentive to attract more account holders that it has the capacity to handle which could lead to more risky investment decisions, and higher default risk.

Another issue is that Islamic banks cannot request collateral to reduce credit risk since their relationship is based on partnership. Therefore, risk sharing investments require additional effort to capture good investment opportunities and to analyse the proposed projects, along with a high level of confidence and transparency between investors, banks and depositors (Bourkhis and Nabi, 2013)[2]. Thus, there are various complexities associated with PLS models of finance in Islamic banking that could result in higher risk or lower performance. For instance, Beck et al. (2013), highlight operational risk as an area where risk might be higher in Islamic banks due to complexities of Sharia law, legal and compliance risks. In contrast, Islamic banks may more stable than conventional banks, as they cannot participate in risky trading activities.

The actions of the depositors can also be related to the capital strength and liquidity position of the bank. Abedifar et al. (2013) argue that on the upside, larger pay-outs to investment account holders may increase deposits and this can force bank shareholders to raise more equity capital in order to maintain capital ratios and prevent dilution of their ownership rights. On the other hand, poor pay-outs may lead to deposit withdrawals, and associated liquidity and solvency problems. To make things more complex, Abedifar et al. (2013) argue that the behaviour of the depositors may depend on their religiosity. As they discuss, existing studies (Miller and Hoffmann, 1995; Osoba, 2003) suggest that religious people are more risk averse, so Islamic bank depositors may be more sensitive to bank performance and exhibit higher withdrawal risk than the depositors of conventional banks. On the other hand, higher loyalty to the bank due to religious reasons may mitigate depositors' discipline.

To summarize, theory does not make clear predictions whether the financial strength of Islamic banks should be better than the one of conventional banks. On the one hand, some claim that the PLS approach provides an opportunity to Islamic banks to transfer risks from the asset side to the liability side, sustain their net worth, and avoid the deterioration of their balance sheet. On the other hand, moral hazard and agency problems, restrictions of Islamic banks to certain asset classes, limited use of hedging instruments, and lack of high quality Sharia-compliant bonds, may increase the riskiness of Islamic banking institutions. In this study, we attempt to answer this question empirically, by adopting a multicriteria framework that allows us to compare for the first time in the literature, the overall financial strength of Islamic and conventional banks.

3. Sample and methodology

3.1. Methodology

3.1.1. Estimating bank overall financial strength index (BOFSI)

The BOFSI is developed with the use of a scenario-based multicriteria approach, taking into account five financial criteria that map the categories of the CAMEL framework.[3] These are the equity to assets ratio (EQAS), measuring Capital strength; the loan loss provision to gross loans ratio (LLP), as an indicator of Asset quality; the cost to income ratio (COST), as an indicator of Managerial quality in terms of expenses management; the return on assets (ROA), as a measure of Earnings, and the liquid assets to deposits and short term funding ratio (LIQ), as an indicator of Liquidity.[4]

In the adopted multicriteria framework, the banks are evaluated through an additive value (performance) function of the five aforementioned ratios, i.e.:

$$V = W_{EQAS} f_{EQAS} + W_{LLP} f_{LLP} + W_{COST} f_{COST} + W_{ROA} f_{ROA} + W_{LIQ} f_{LIQ} \quad (1)$$

where w_{EQAS}, w_{LLP}, w_{COST}, w_{ROA}, and w_{LIQ} are non-negative weighting constants (summing up to one) of the five ratios, representing their relative importance in the evaluation model and $f_{EQAS}, f_{LLP}, f_{COST}, f_{ROA}$, f_{LIQ} are monotone partial scoring (value) functions of the ratios normalized in [0, 1]. The overall performance score (global value) ranges in [0, 1] with higher values indicating higher overall performance.

To evaluate the financial strength of the banks under different scenarios for the specification of the performance model (1), we implement a simulation approach (Lahdelma and Salminen, 2001). The simulations involve the weighting constants and the marginal value functions of the additive evaluation model. The process is based on sampling different evaluation models, uniformly distributed over

[2] For more details on this issue see, Ashraf et al. (2016) and Pigini et al. (2016).

[3] Building on the CAMEL framework, supervisory agencies in the U.S. estimate a rating to assess a bank's overall condition. This assessment was initially known as CAMEL rating. In 1997, a sixth component was added to this US regulatory rating, namely the Sensitivity to market risk, and the name of the rating changed to CAMELS. This particular rating that is on a scale from 1 to 5 is based on financial statements of the bank and on-site examination by regulators like the Federal Reserve and the Federal Deposit Insurance Corporation. However, these ratings are confidential, they are for US banks, and they are being disclosed only to senior bank management and to the appropriate supervisory personnel. Thus, in the context of the present study we use a multicriteria technique to estimate an overall financial strength indicator that considers simultaneously the bank-specific CAMEL-related attributes. As in the vast majority of previous studies that adopt the CAMEL framework, data (un)availability for a suitable proxy has not allowed us to consider the last dimension of sensitivity to market risk (see e.g. Barth et al., 2002; Poghosyan and Čihak, 2011; Calice, 2014; Doumpos et al., 2016).

[4] As discussed by an anonymous reviewer, one may consider additional factors like loan concentration as indicators of asset quality. Unfortunately, this information was not available in our case. Therefore, we follow past studies that rely on the loan loss provisioning ratio to proxy for the asset quality dimension of the CAMEL framework (see e.g. Poghosyan and Čihak, 2011; Betz et al., 2013; Calice, 2014). Similarly, in the case of managerial capacity it may be more appropriate to look at qualitative factors like managerial experience, decision making, etc. However, such data are usually not available. Therefore, we follow past studies that proxy for managerial quality in the context of the CAMEL framework with the use of cost control ratios, mostly the cost to income ratio (see e.g. Barth et al., 2002; Poghosyan and Čihak, 2011; Betz et al., 2013; Calice, 2014; Doumpos et al., 2016).

the unit simplex of all additive value functions. Following the suggestions of Tervonen and Lahdelma (2007) on the implementation of such simulation-based approaches to multicriteria evaluation problems, we consider a large set of 10,000 scenarios, which is sufficient to achieve robust results.

Under each scenario k, the banks are evaluated with a randomly generated additive model V_k and are classified into five rating (financial strength) classes: very strong, strong, medium, weak, very weak. The classification is performed so that the banks are approximately normally distributed in the classes for each simulation run. In particular, let V_{ik} denote the financial strength score of bank i according to the evaluation model under scenario k, and p_k^t the t% percentile of the performances for all banks under the same scenario. Then, a bank i with $V_{ik} \le p_k^{10}$ is assigned to the class of very weak performers, to the class of weak banks if $p_k^{10} < V_{ik} \le p_k^{32.5}$, to the medium class if $p_k^{32.5} < V_{ik} \le p_k^{67.5}$, to the class of strong banks if $p_k^{67.5} < V_{ik} \le p_k^{90}$, or to the class of very strong performing banks if $V_{ik} > p_k^{90}$.

The final BOFSI for each bank i is constructed by aggregating its ratings under all specifications (scenarios) for the evaluation model (1), as follows:

$$OFSI_i = \underbrace{\sum_{r=1}^{5} \pi_{ir} r}_{\bar{r}_i} + \underbrace{\sum_{r=1}^{5} \pi_{ir} [1 - e^{-a_i(r-\bar{r}_i)}]}_{F_i} \quad (2)$$

where π_{ir} is the percentage of evaluation scenarios under which bank i is classified in category r (1-very weak, 2-weak, 3-medium, 4-strong, 5-very strong). The BOFSI for a bank i consists of two components: the mean rating ($\bar{r}_i$) and the risk adjustment F_i. The latter adjusts the mean rating, taking into consideration the variability of a bank's ratings distribution over all simulation runs. The risk adjustment is modelled as a weighted average of partial risk factors specified by the negative exponential function $1 - e^{-a_i(r-\bar{r}_i)}$ on the basis of the deviations of a bank's ratings from its mean rating, with $0 < a_i < 1$ being a risk aversion constant. The negative exponential function is commonly used for modelling risk aversion (Kirkwood, 2004). It is bounded by above by one and its concave form implies that the penalty assigned to negative deviations from the mean rating ($r < \bar{r}_i$) outweighs the "premium" associated with positive deviations ($r > \bar{r}_i$). For a bank that is consistently classified in the same rating throughout all evaluation scenarios, the risk adjustment equals zero. For all other banks, the parameter a_i is specified so that at the worst possible evaluation case, $BOFSI_i$ equals one, i.e.:

$$\bar{r}_i + [1 - e^{-a_i(1-\bar{r}_i)}] = 1 \Rightarrow a_i = -\frac{\ln(\bar{r}_i)}{1 - \bar{r}_i} \quad (3)$$

With this specification the risk adjustment component for bank i ranges in $[1 - \bar{r}_i, 0]$ and the risk adjustment parameter is a decreasing function of $\bar{r}_i$. Thus, the risk adjustment is stronger for banks that perform poorly on average.

3.1.2. Determinants of BOFSI

In the second part of the analysis we investigate the driving factors of BOFSI, by estimating the following equation:

$$BOFSI_{ijt} = \alpha + \beta X_{ijt} + \gamma Z_{jt} + \varepsilon_{ijt} \quad (4)$$

Thus, the BOFSI of bank i that operates in country j in year t is written as a function of a vector of bank-level variables (bank size and bank type), X; variables that capture the macroeconomic, institutional and other country conditions common to all banks in country j in year t, Z; and the error term ε_{ijt}. Given that we have a panel dataset, we estimate a random effects model with robust standard errors clustered at the bank level. The alternative of fixed-effects is not possible given that one of the main variables of interest (i.e. the type of bank) is time invariant. The Breusch and Pagan Lagrangian multiplier test indicates that the random effects model is more appropriate than pooled OLS (Prob > chibar2=0.000).

The bank level variables that we use are: dummy variables to distinguish between the three types of banks, and the logarithm of total assets (LNTA) to control for bank size.[5] At the country level, we examine the impact of macroeconomic conditions using GDP growth (GDPGR) and inflation (INFL). We also investigate the impact of institutional environment using the average of the following six indicators: (i) control of corruption (CORR), (ii) regulatory quality (RQUAL), (iii) rule of law (RLAW), (iv) government effectiveness (GOVEFF), (v) political stability and absence of violence/terrorism (PSTAB), (vi) voice and accountability (VACC). Finally, we include three more variables to account for other market specific attributes. These are: (i) a dummy variable that takes the value of one in the case of seven countries considered to be driving factors behind the next big wave in Islamic finance (i.e. Bahrain, Qatar, Indonesia, Saudi Arabia, Malaysia, UAE, Turkey) and zero otherwise (BWAVE), (ii) market concentration of the five largest commercial banks in the country, in terms of bank assets (CONC), and (iii) ratio of private credit by deposit money banks & other financial institutions to GDP (CRGDP).

3.2. Sample

We start the construction of the sample by considering all 57 countries that are members of the Organisation of Islamic Cooperation, and we continue by focusing on 22 countries that have a presence of Islamic banking (i.e. we exclude Iran and Sudan that have purely Islamic banking). We check the web-site of each bank in those 22 countries to classify them as purely Islamic commercial, purely conventional commercial or conventional commercial banks with Islamic window. We match this dataset with financial information obtained from Bankscope database of Bureau van Dijk. To be included in the sample, banks must have information for all five ratios discussed in 3.1.1. After removing banks with missing data, our sample consists of 101 Islamic banks, 347 conventional banks, and 52 banks with an Islamic banking window operating in 21 countries over the period 2000–2011. This results in 4170 bank-year observations.[6] Table 1 presents the distribution of these banks, by type and country.

Information on macroeconomic conditions, market concentration, the development of the banking sector, and the institutional environment, are obtained from three World Bank databases, namely the Global Financial Development Database, the World Development Indicators Database, and the Worldwide Governance Indicators Database. Information for the countries identified as the driving factors behind the next big wage in Islamic finance is from the Ernst and Young 2013-14 World Islamic Banking Competitiveness Report.

4. Empirical results

4.1. Discussion of BOFSI

Table 2 presents the average values for the five criteria used in the development of the BOFSI along with a Kruskal-Wallis test for the statistical significance of the differences among the three groups. It appears that there are no significant differences in terms of credit risk as measured by the loan loss provision to gross loans ratio. However, Islamic banks are the best ones in terms of capital strength (equity to assets), followed by conventional banks, and banks with an Islamic window. In contrast, conventional banks are the best ones in terms of expenses management (cost to income) and liquidity (liquid assets to deposits & short term borrowing), followed by Islamic banks, and banks with an Islamic window.

[5] We use one dummy for Islamic banks (IBs), and one for banks with Islamic window (IWBs), with conventional banks (CBs) being the omitted category.

[6] There are 628 observations from Islamic banks, 2857 observations from conventional banks, and 685 observations from banks with an Islamic window.

Table 1
Sample distribution by bank type and country.

	IBs	CBs	IWBs	Total
Algeria	21	106	0	127
Bahrain	52	39	27	118
Bangladesh	56	228	99	383
Brunei	19	12	0	31
Egypt	21	190	66	277
Indonesia	30	513	88	631
Iraq	10	16	0	26
Jordan	10	117	0	127
Kuwait	34	65	5	104
Lebanon	4	391	15	410
Malaysia	100	188	112	400
Mauritania	3	24	16	43
Pakistan	43	114	132	289
Qatar	29	59	4	92
Saudi Arabia	32	7	87	126
Senegal	5	73	0	78
Syria	7	37	0	44
Tunisia	14	152	8	174
Turkey	35	303	0	338
UAE	62	166	26	254
Yemen	41	57	0	98
Total	628	2857	685	4170

Note: IBs: Islamic Banks; CBs: Conventional Banks; IWBs: Islamic Window Banks

Table 2
Average values of financial ratios.

Panel A: Average				
	All sample	IBs	CBs	IWBs
EQAS	11.689	13.896	11.771	9.325
LLP	1.392	1.405	1.411	1.300
COST	54.274	53.890	55.355	50.115
ROA	1.551	1.334	1.570	1.673
LIQ	39.305	39.649	41.319	30.590
Panel B: Kruskal-Wallis Chi-sq.				
	All groups	IBs vs CBs	IBs vs IWBs	CBs vs IWBs
EQAS	121.744***	28.684***	108.596***	74.891***
LLP	0.392	0.066	0.129	0.351
COST	41.479***	6.055**	7.714***	40.017***
ROA	28.197***	11.324***	29.571***	11.095***
LIQ	119.344***	9.393***	33.599***	118.802***

IBs: Islamic Banks; CBs: Conventional Banks; IWBs: Islamic Window Banks; Variables are defined in Appendix A.
** Statistically significant at the 5% level.
*** Statistically significant at the 1% level.

Finally, banks with an Islamic window, are the best ones in terms of profitability (return on assets), followed by conventional banks, and Islamic banks. All these differences are statistically significant. Therefore, these preliminary statistics provide support to our earlier argument that it is difficult to draw conclusions for the relative overall financial performance of different types of banks by looking at individual indicators.

Table 3 presents the average BOFSI over the entire sample as well as by type of bank. We find that Islamic banks (IBs) have a higher BOFSI than both conventional banks (CBs) and banks with an Islamic window (IWBs). However, the difference between IBs and CBs is not statistically significant. In contrast, the difference between IBs and IWBs is statistically significant, and so is the one between CBs and IWBs. The insignificant difference between the two main groups of interest implies that the trade-off between the five financial ratios cancels out their differences on an individual basis, and results in a similar profile for these banks in terms of their overall financial strength.[7] More specifically, even though Islamic banks appear to

[7] For example, a bank may absorb higher losses and write-off a higher amount of bad loans if it is has a higher capital buffer.

Table 3
Comparison of BOFSI with Efficiency measures.

Panel A: Average scores				
	All Banks	IBs	CBs	IWBs
BOFSI	2.940	3.036	2.955	2.791
TE	0.743	0.728	0.750	0.723
PE	0.773	0.785	0.763	0.802
CE	0.873	0.856	0.843	0.973
Panel B: Kruskal-Wallis test (Chi sq.)				
	All Groups	IBs vs CBs	IBs vs IWBs	CBs vs IWBs
BOFSI	17.355***	2.538	15.457***	12.201***
TE	55.185***	24.520***	0.052	40.965***
PE	8.382**	0.757	2.931*	7.971***
CE	1615.146***	9.252***	873.013***	1556.222***

Notes:
* Statistically significant at the 10% level; BOFSI: Bank overall financial strength index; TE: Technical efficiency; PE: profit efficiency; CE: cost efficiency; IBs: Islamic banks; CBs: Conventional banks; IWBs: Banks with Islamic window.
** Statistically significant at the 5% level.
*** Statistically significant at the 1% level.

be better capitalized (higher EQAS ratio) and achieve higher managerial efficiency (lower COST ratio), these qualities are fully compensated by lower profitability (ROA) and liquidity levels (LIQ), as opposed to conventional banks. Thus, there appear to be some differences in the risk-profitability patterns observed for the two groups, but they are ameliorated when considered in an integrated CAMEL-based context. This result seems to be in line with the findings of earlier studies claiming that, the theoretical differences discussed in Section 2, may not fully translate to noticeable distinctions when it comes to the types of products and services provided.[8]

For comparison purposes, we also estimate efficiency measures with frontier techniques employed in past studies. Technical Efficiency (TE) is estimated with data envelopment analysis (DEA). Cost Efficiency (CE) and Profit Efficiency (PE) are estimated with stochastic frontier analysis (SFA), namely through the Battese and Coelli (1995) model. Further information for these estimations is available in Appendix A (DEA) and Appendix B (SFA). Conventional banks are more efficient in terms of technical efficiency; however, banks with an Islamic window outperform the other two groups in terms of both cost and profit efficiency. Thus, consistent with our expectations, these indicators appear to capture different aspects of bank performance from the overall financial strength indicator. This is confirmed by the Spearman's rank correlation coefficient, which is -0.148 (BOFSI and TE), 0.120 (BOFSI and PE), and 0.088 (BOFSI and CE).

Tables 4 and 5 provide some further insights into BOFSI. In Table 4 we present the relationship between the BOFSI and the financial ratios that constitute its building blocks. The table presents the averages of the ratios for different ranges of the BOFSI, together with the Pearson's correlation coefficient between the ratios and the BOFSI. The results

[8] For example, Beck et al. (2013) mention that Islamic banks have developed products that resemble conventional banking products, replacing interest rate payments and discounting with fees and contingent payment structures. Chong and Liu (2009) also argue that in practice Islamic banking is not very different from conventional banking. Using Malaysian data they reveal that only a negligible portion of Islamic bank financing is strictly PLS based and that Islamic deposits are not interest-free, but are closely pegged to conventional deposits. Similarly, Khan (2010) concludes that there are substantial differences between the ideals of Islamic banking and finance and its actual implementation, and much of Islamic banking and finance still remains functionally indistinguishable from conventional banking. Bourkhis and Nabi (2013) highlight that in a typical Islamic bank only 20% are dedicated to long term and risk sharing investments, and they conclude that Islamic banks are mimicking the conventional banks and they diverge from their theoretical business model. Also, as discussed in El-Hawary et al. (2007), in an attempt to induce investment account holders not to withdraw their funds to invest them elsewhere, Islamic banks may distribute profits to the investment depositors that differ from the "actual" terms of the investment contract, adversely affecting their shareholder equity. Alternatively, IBs may have losses on the asset side absorbed by other depositors or equity holders rather than investment accounts.

Table 4
Relationship of financial ratios to BOFSI (averages and correlations).

	EQAS	LLP	COST	ROA	LIQ	Mean score
[1, 1.5]	6.649	3.836	97.918	-1.498	26.418	1.214
(1.5, 2.5]	8.473	1.825	63.436	0.742	30.456	2.083
(2.5, 3.5]	10.237	1.049	50.128	1.751	34.880	2.977
(3.5, 4.5]	15.644	0.799	41.037	2.543	49.143	3.922
(4.5, 5]	24.988	0.710	34.033	3.853	80.222	4.805
Correlation	0.653	-0.388	-0.568	0.705	0.451	

Note:Variables are defined in Appendix A.

Table 5
BOFSI by Year and Region.

	IBs	CBs	IWBs
Panel A: Results by year			
2000	3.120	2.759	2.670
2001	2.968	2.681	2.670
2002	3.081	2.783	2.620
2003	2.976	2.918	2.583
2004	3.015	2.980	2.927
2005	3.221	3.026	2.867
2006	3.292	2.994	3.032
2007	3.432	3.120	2.895
2008	2.972	2.989	2.786
2009	2.734	2.960	2.697
2010	2.924	3.097	2.896
2011	2.989	3.069	2.843
Panel B: Results by region			
Asia	2.685	2.942	2.618
GCC	3.494	3.730	3.559
MENA & Senegal	2.985	2.786	2.413

Notes: GCC: Golf Cooperation Council; MENA: *Middle East and North Africa; IBs: Islamic Banks; CBs: Conventional Banks; IWBs: Islamic window banks*

indicate that ROA is the ratio most strongly related to the BOFSI, followed by equity to assets ratio, and the cost to income ratio. In Table 5, we present BOFSI by year (Panel A) and geographical region (Panel B). We observe that Islamic banks outperformed the other two groups over the period 2000–2007; however, conventional banks are the best performers over the period 2008–2011. Turning to the regions, the results show that conventional banks outperform both the Islamic banks and the banks with Islamic window in the case of Asia and the Gulf Cooperation Council; however, Islamic banks perform better in MENA and Senegal.[9]

4.2. Determinants of BOFSI

Table 6 present the results of the regressions using BOFSI as the dependent variable. In Column 1 we present a basic model that includes only the bank-specific variables and the ones capturing the macroeconomic conditions. In Columns 2 to 4 we replace, in turn, the variables for the macroeconomic environment by the ones for institutional development (column 2), the next big wave Islamic finance markets (column 3), and other market conditions (column 4). In column 5 we include all the variables together. We extend this specification by including time dummies (column 7), dummies for the geographical regions (column 7), and both time and regional dummies (column 8).

The dummies for the Islamic banks and the banks with an Islamic window are insignificant, showing that there is no difference between these groups and the conventional banks in terms of their impact on BOFSI. This finding is to some extent consistent with the univariate results disused in the previous section. It also provides support to earlier studies, like the one of Beck et al. (2013) which reports that the Islamic bank variable is insignificant in most regressions in their case.

Turning to the control variables, we find that size has a negative and significant impact on BOFSI in several regressions shown in Tables 6 and 7. This suggests that the financial strength of banks deteriorates as their size increases, and it is consistent with the findings of recent studies like Čihák and Hesse (2010) and Laeven et al. (2014), among others. For instance, Čihák and Hesse (2010) report that small Islamic banks tend to be financially stronger than large Islamic banks. They argue that there are various explanations for this, like complexities to adjust the credit risk monitoring system as banks become bigger, complexities in monitoring the various profit-loss-arrangements, problems relating to adverse selection and moral hazard, and the possibility is that small banks concentrate on low-risk investments and fee income, while large banks do more PLS business. Similarly, Laeven et al. (2014) in a study of approximately 1300 financial institutions from 50 countries conclude that large banks (on average) create more individual and systemic risk than smaller banks, especially when they have insufficient capital or unstable funding, which are common features of large banks. They also document that large banks are more organizationally complex than small banks, this being another attribute that amplifies systemic risk.

GDP growth has a positive and statistically significant impact on BOFSI, a finding that is robust across all estimations. Therefore, consistent with our expectations and earlier studies (e.g. Soedarmono et al., 2011; Doumpos et al., 2016), our results show that higher economic growth improves bank financial strength.[10]

The dummy variable for the countries identified as the driving factors of the next big Islamic finance wave is also positive and statistically significant across all the estimations. Thus, operating in one of these countries results in higher bank financial strength. This can be attributed to the particular attributes of this group of countries. For example, they are characterized as expanding economies with a fast-growing customer base for financial services, they have a large pool of financial and intellectual capital of the industry, they constitute 78% of the international Islamic banking assets, and they grow at 5-year compound annual growth rate (CAGR) of 16.4% (2008–2012), with expectations for a CAGR of 19.7% over the period 2013-18 (Ernst and Young, 2013).

CRGDP enters the regressions with a negative and statistically significant coefficient. Therefore, higher private credit to GDP results in lower bank financial strength. To some extent this is consistent with the findings of a recent study by Sahay et al. (2015) which reports that a faster pace of financial deepening in emerging markets means a greater risk of crisis and macroeconomic instability.

Institutional development has a positive impact on BOFSI. This is in line with the results of earlier studies which conclude that weak institutions enhance bank risk (Klomp and De Haan, 2014; Fang et al., 2014) and the probability of banking crisis (Demirgüç-Kunt and Detragiache, 1998). Additionally, Fang et al. (2014) find that banks in emerging markets tend to have lower ROA volatility and fewer nonperforming loans following reforms of the institutional environment. Our finding is also consistent with studies reporting that good institutions enhance various indicators of bank performance, like cost efficiency (Lensink et al., 2008) and technical efficiency (Barth et al., 2013).

The regional dummy variables (i.e. GCC, ASIA) added in the last two regressions in Table 6, aim to control for potential unobserved country-specific characteristics that are similar within regions, and

[9] In the case of regions, we also used a Kruskal-Wallis test to assess the statistical significance of the differences. The results show that the only cases where the differences are statistically insignificant are the Islamic banks versus banks with Islamic window in the case of Asia and the GCC.

[10] For example, using a sample of commercial banks from 12 Asian countries during the 2001–2007 period, Soedarmono et al. (2011) find that economic growth contributes to neutralize greater risk taking and higher instability in less competitive markets. Doumpos et al. (2016) use a sample of over 1000 banks operating in 111 countries between 2001 and 2010 and they also conclude that GDP growth has a robust positive impact on banks' financial strength.

Table 6
Driving factors of BOFSI.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IBs	0.080	0.045	0.047	0.125	0.081	-0.017	0.031	-0.080
	(0.371)	(0.615)	(0.609)	(0.197)	(0.373)	(0.844)	(0.732)	(0.347)
IWBs	-0.099	-0.078	-0.089	-0.064	-0.096	-0.015	-0.109	-0.033
	(0.283)	(0.403)	(0.348)	(0.507)	(0.278)	(0.867)	(0.218)	(0.711)
LNTA	0.006	0.004	0.003	0.019	-0.003	-0.110***	-0.023	-0.132***
	(0.793)	(0.865)	(0.913)	(0.458)	(0.909)	(0.000)	(0.365)	(0.000)
GDPGR	0.034***				0.032***	0.028***	0.032***	0.027***
	(0.000)				(0.000)	(0.000)	(0.000)	(0.000)
INFL	-0.003				-0.004	-0.003	-0.005	-0.003
	(0.255)				(0.153)	(0.349)	(0.111)	(0.290)
INSTIT		0.226***			0.174*	0.331***	0.030	0.189*
		(0.004)			(0.057)	(0.000)	(0.763)	(0.056)
BWAVE			0.408***		0.349***	0.335***	0.366***	0.348***
			(0.000)		(0.000)	(0.000)	(0.000)	(0.000)
CONC				-0.003	-0.003	0.001	-0.005**	-0.001
				(0.205)	(0.211)	(0.703)	(0.030)	(0.513)
CRGDP				-0.003**	-0.004**	-0.003**	-0.003**	-0.003**
				(0.024)	(0.014)	(0.018)	(0.021)	(0.028)
GCC							0.625***	0.683***
							(0.000)	(0.000)
ASIA							-0.222**	-0.176*
							(0.024)	(0.055)
Constant	2.699***	2.966***	2.710***	3.027***	3.116***	4.150***	3.524***	4.561***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Time dummies	No	No	No	No	No	Yes	No	Yes
R-overall	0.037	0.076	0.071	0.013	0.091	0.136	0.129	0.173
Banks	500	500	500	500	500	500	500	500
Obs.	4170	4170	4170	4170	4170	4170	4170	4170

Random effects model with errors clustered at the bank level; Variables are defined in Appendix A.
** Statistically Significant at the 5% level.
*** Statistically significant at the 1% level.

were not captured adequately with the country-level variables discussed above (e.g. GDPGR, INFL, etc.). We observe that the dummy for the GCC countries carries a positive and statistically significant coefficient, whereas the one for Asia enters the regressions with a negative and statistically significant coefficient. Thus, the financial strength of banks in the GCC countries is superior to the ones operating in the MENA and Senegal region (omitted group), whereas the ones of the Asian banks is inferior. These findings are consistent with the mean scores discussed in Table 5. To some extent, the differences across regions can be attributed to both bank-level practices and the country-level operating environment. For example, Beck et al. (2013) highlight that "*anecdotal evidence suggests that there are significant differences across countries in terms of how Sharia-compliant products are exactly structured, with some of the banks basically offering conventional products repackaged as Sharia-compliant products*" (p. 434). Similarly, the report of Ernst and Young (2013) argues that Islamic finance markets are far from being homogenous with customer attitudes, and regulations being significantly different across markets.

In Table 7, we present some additional regressions that focus on institutional development. The rationale is that the statistical significance of INSTIT differs across the regressions in Table 6 and we try to shed some additional light on this issue. More detailed, we disaggregate the overall index, INSTIT, to its components and we re-estimate the specification of Column 8 in Table 6. Due to the high correlations of these individual indicators we include them in the regressions one by one.[11] We find that all the variables enter with a positive sign; however, only the control of corruption and government effectiveness have a statistically significant impact on BOFSI.

[11] For example, the correlation of regulatory quality (RQUAL) and corruption (CORR) is 0.853, the correlation of rule of law (RLAW) and corruption (CORR) is 0.900, the correlation of political stability (PSTAB) and rule of law (RLAW) is 0.859, etc.

5. Conclusions

The comparative performance of Islamic and conventional banks has attracted a lot of attention in the literature. However, existing studies rely on either individual ratios or on efficiency measures. These metrics can provide conflicting or partial views. For example, univariate comparisons of the banks in our sample reveal that Islamic banks are the best ones in terms of capital strength, conventional banks are the best ones in terms of expenses management and liquidity, and banks with an Islamic window are the best ones in terms of profitability.

In the present study we propose and illustrate the comparison of Islamic and conventional banks on the basis of an overall indicator of financial strength. Therefore, we use a multicriteria methodology to aggregate indicators of bank capital strength, asset quality, management efficiency, earnings, and liquidity, into a single index. This approach provides a general picture about the overall financial strength of banks while taking simultaneously into account the conflicting objectives of managers.

Univariate comparisons show that the financial strength of Islamic banks is greater than that of conventional banks and the one of banks with an Islamic window. However, the difference between Islamic banks and conventional banks is not statistically significant. When we examine the results at the regional level, we observe that conventional banks perform better than both the Islamic banks and the banks with Islamic window in the case of Asia and the Gulf Cooperation Council; however, Islamic banks perform better in the MENA and Senegal region.

We also estimated second stage regressions, using the overall financial strength index as the dependent variable. The results confirm that there are no statistically significant differences between Islamic banks and conventional banks. We find that the bank overall financial

Table 7
Institutional Development and BOFSI: Further regressions.

	(1)	(2)	(3)	(4)	(5)	(6)
IBs	-0.091	-0.068	-0.078	-0.086	-0.069	-0.064
	(0.284)	(0.428)	(0.365)	(0.319)	(0.420)	(0.466)
IWBs	-0.037	-0.044	-0.040	-0.032	-0.042	-0.042
	(0.683)	(0.624)	(0.657)	(0.726)	(0.640)	(0.646)
LNTA	-0.138***	-0.126***	-0.130***	-0.136***	-0.127***	-0.125***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDPGR	0.028***	0.027***	0.028***	0.028***	0.028***	0.028***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
INFL	-0.002	-0.004	-0.004	-0.003	-0.004	-0.004
	(0.599)	(0.156)	(0.188)	(0.357)	(0.190)	(0.182)
BWAVE	0.332***	0.408***	0.392***	0.299***	0.427***	0.422***
	(0.000)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)
CONC	-0.001	-0.002	-0.002	-0.003	-0.002	-0.002
	(0.767)	(0.452)	(0.493)	(0.264)	(0.456)	(0.500)
CRGDP	-0.003**	-0.003*	-0.003**	-0.004**	-0.003*	-0.002*
	(0.013)	(0.088)	(0.043)	(0.011)	(0.081)	(0.089)
GCC	0.593***	0.717***	0.688**	0.719***	0.714***	0.741***
	(0.703)	(0.000)	(0.049)	(0.000)	(0.000)	(0.703)
ASIA	-0.117	-0.212**	-0.186	-0.207**	-0.219**	-0.226**
	(0.195)	(0.029)	(0.191)	(0.020)	(0.017)	(0.012)
CORR	0.236***					
	(0.000)					
RQUAL		0.052				
		(0.623)				
RLAW			0.115			
			(0.191)			
GOVEFF				0.232**		
				(0.012)		
PSTAB					0.021	
					(0.610)	
VACC						0.028
						(0.748)
Constant	4.588***	4.401***	4.484***	4.696***	4.396***	4.351***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-overall	0.180	0.165	0.170	0.171	0.165	0.163
Banks	500	500	500	500	500	500
Obs.	4170	4170	4170	4170	4170	4170

Random effects model with errors clustered at the bank level; Variables are defined in Appendix A.
** Statistically Significant at the 5% level.
*** Statistically significant at the 1% level.

strength index is influenced by various country-specific characteristics, like control of corruption, government effectiveness, and operation in a group of countries that are expected to drive the next big wave in Islamic finance.

Our findings have important managerial and policy making implications at a time when the effective implementation of risk-based supervision remains a challenge in the banking sector. In particular, our results highlight the usefulness of aggregating traditional financial ratios associated with the CAMEL rating system into a single overall financial strength indicator that can form the basis of a monitoring system. These findings reveal that when we consider the trade-off between individual ratios, and we estimate the overall financial strength of the banks, then the Islamic banks' stability might not be too different from the one of the conventional banks. This provides partial support to earlier studies arguing that Islamic banks are imitating the strategies of their conventional peers while deviating from their theoretical business model. At the same time, as discussed in Abedifar et al. (2013), various questions arise like whether there should be a different regulatory system for the two types of banks and whether or not traditional risk management tools could be used to control the activities of Islamic banks. The results of the second stage analysis have also important policy implications, since they provide insights to policy makers in relation to the country-specific characteristics that shape bank financial strength. This may help regulators in adopting appropriate initiatives for a more stable financial sector.

Despite its importance our study is not without its limitations. First, it would be interesting to consider additional variables during the estimation of the overall financial strength index, like loan concertation or the diversification of the loan or/and asset portfolio. At this stage, unfortunately, we do not have access to such detailed data and we hope that future research will improve upon this as more detailed data becomes available to researchers. Second, it would be interesting to examine additional factors in the second stage regressions like corporate governance characteristics, the experience of bank managers or geographical strategies. Again, data (un)availability has not allowed us to extend our study towards this direction.

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Appendix A. Definition of variables

Panel A: Estimation of BOFSI	
EQAS	Equity / Total Assets
LLP	Loan loss provision / Gross loans ratio
COST	Cost / Income
ROA	Profits / Total Assets
LIQ	Liquid assets / Deposits and short term funding ratio
Panel B: Determinants of BOFSI	
IBs	Dummy variable that takes the value of one for Islamic banks and zero otherwise (i.e. banks with Islamic window and Conventional banks)
IWBs	Dummy variable that takes the value of one for banks with Islamic window and zero otherwise (i.e. Islamic banks and Conventional banks)
LNTA	Natural logarithm of bank total assets
GDPGR	GDP Growth (annual % change)

INFL	Inflation, measured by annual % change in consumer prices
INSTIT	Overall indicator of institutional development, calculated as the average of six indicators accounting for: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, control of corruption. It takes values from -2.5 to 2.5, with higher scores corresponding to better outcomes.
BWAVE	Dummy variable that takes the value of one in the case of seven countries considered to be driving factors behind the next big wave in Islamic finance (i.e. Bahrain, Qatar, Indonesia, Saudi Arabia, Malaysia, UAE, Turkey) and zero otherwise
CONC	Concentration in the banking sector, calculated as assets of five largest commercial banks as a share of total commercial banking assets.
CRGDP	Private credit by deposit money banks & other financial institutions / GDP.
GCC	Dummy variable that takes the value of one in the case of countries from the Gulf Cooperation Council and zero otherwise (i.e. Asia, MENA & Senegal).
ASIA	Dummy variable that takes the value of one in the case of Asian countries and zero otherwise (i.e. Gulf Cooperation Council, MENA & Senegal).
CORR	Indicator of the control of corruption, capturing perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. It takes values from -2.5 to 2.5, with higher scores corresponding to better outcomes.
RQUAL	Indicator of regulatory quality, capturing perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. It takes values from -2.5 to 2.5, with higher scores corresponding to better outcomes.
RLAW	Indicator of rule of law, capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. It takes values from -2.5 to 2.5, with higher scores corresponding to better outcomes.
GOVEFF	Indicator of Government effectiveness, capturing perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. It takes values from -2.5 to 2.5, with higher scores corresponding to better outcomes.
PSTAB	Indicator of Political Stability and Absence of Violence/Terrorism, measuring perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism. It takes values from -2.5 to 2.5, with higher scores corresponding to better outcomes.
VACC	Indicator of Voice and Accountability, capturing perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. It takes values from -2.5 to 2.5, with higher scores corresponding to better outcomes.

Appendix B. Data envelopment analysis

Data Envelopment Analysis (DEA) uses linear programming for the development of production frontiers and the measurement of bank efficiency relative to the developed frontiers. Let us assume that there data on K inputs and M outputs on each of N banks. For the *i*-th bank these are represented by the vectors x_i and y_i, respectively. The $K \times N$ input matix, X, and the $M \times N$ output matrix, Y, represent the data for all N banks. The input oriented measure of a particular bank, under CRS (Charnes et al., 1978), is calculated as:

$$Min_{\theta,\lambda}\theta$$

$$s.\ t.\ \ -y_i + Y\lambda \geq 0$$

$$\theta x_i - X\lambda \geq 0$$

$$\lambda \geq 0$$

where $\theta \leq 1$ is the scalar efficient score and λ is $N \times 1$ vector of constants. If $\theta = 1$, the bank is efficient as it lies on the frontier. If θ<1, the bank is inefficient and needs a $1 - \theta$ reduction in the inputs levels to reach the frontier. The linear programming is being solved N times, once for each bank in sample, and a value of θ is obtained for each bank corresponding to its efficiency score. Banker et al. (1984) proposed a model with variable returns to scale (VRS). This approach decomposes the overall technical efficiency (i.e. the one under CRS) into a product of two components, namely pure technical efficiency (or technical efficiency under VRS) and scale efficiency (SE). The CRS linear programming is modified to consider VRS by adding the convexity $N1'\lambda$=1, where $N1$ is a $N \times 1$ vector of ones. In the present study, we estimate a VRS model with 2 outputs (Loans, Other earning assets), and 3 inputs (Deposits, Equity, Overheads).

Appendix C. Stochastic frontier analysis

We use the stochastic frontier approach (SFA), introduced by Aigner et al. (1977) and Meeusen and van den Broeck (1997) to obtain annual estimates of the cost and profit efficiencies for each bank in the sample. To control for differences in the operating environment of the banks (i.e. country specific attributes) we use the Battese and Coelli (1995) model. This specification allows the simultaneous estimation of the parameters of the stochastic frontier and the inefficiency model in a single step. The models are estimated with the intermediation approach, assuming that banks have two outputs, namely loans (Q1) and other earning assets (Q2), and two input prices (W1=Interest expenses/deposits, W2=Overheads/Total assets). To impose linear homogeneity restrictions we normalize the dependent variable and the input prices by W2. The frontier function also includes: Equity as a fixed netput (EQ), a time trend (T), and dummy variables for Islamic banks (IB) and Islamic window banks (IWB) to allow for technological differences in the production among the three groups of banks (conventional is the omitted group). The inefficiency term includes: (i) a dummy for 7 countries considered to be driving factors behind the next big wave (BWAVE) in Islamic finance (Bahrain, Qatar, Indonesia, Saudi

Arabia, Malaysia, UAE, Turkey), (ii) an indicator of Institutional development (INSTIT), (iii) market concentration in the commercial banking sector (CONC), (iv) private credit by deposit money banks & other financial institutions / GDP (CRGDP), (v) GDP growth (GDPGR), and inflation (INFL), and (vi) the dummies for Islamic banks and Islamic Window banks (Conventional is the omitted). As it concerns the inclusion of the dummies for the bank type in the inefficiency model and in the stochastic frontier, it should be mentioned that this approach does not violate the assumption of the independence when the equations are estimated simultaneously as in the Battese and Coelli (1995) model. As Battese and Coelli (1995) mention "*The explanatory variables in the inefficiency model may include some input variables in the stochastic frontier*" (p. 327). Using a translog specification, the cost function is given by:

$$\ln \frac{TC}{W2} = \beta_0 + \beta_1 \ln(Q_1) + \beta_2 \ln(Q2) + \beta_3 \ln\left(\frac{W1}{W2}\right) + \beta_4 \frac{1}{2}(\ln(Q1))^2 + \beta_5 \frac{1}{2}(\ln(Q2))^2$$
$$+ \beta_6 \ln(Q1)x \ln(Q2) + \beta_7 \frac{1}{2}\left(\ln\left(\frac{W1}{W2}\right)\right)^2 + \beta_8 \ln(Q1)x \ln\left(\frac{W1}{W2}\right) + \beta_9 \ln(Q2)x \ln\left(\frac{W1}{W2}\right)$$
$$+ \beta_{10} T + \beta_{11} \frac{1}{2} T^2 + \beta_{12} \ln(Q1)xT + \beta_{13} \ln(Q2)xT + \beta_{14} \ln\left(\frac{W1}{W2}\right)xT + \beta_{15} \ln(EQ)$$
$$+ \beta_{16} \frac{1}{2}(\ln(EQ))^2 + \beta_{17} \ln(EQ)x \ln(Q_1) + \beta_{18} \ln(EQ)x \ln(Q_2) + \beta_{19} \ln(EQ)x \ln\left(\frac{W1}{W2}\right)$$
$$+ \beta_{20} \ln(EQ)xT + \beta_{21} IB + \beta_{22} IWB + u_{it} + v_{it}$$

As mentioned before, the Battese and Coelli (1995) models allow us to estimate simultaneously the parameters of the stochastic frontier and the country-specific and bank-specific determinants of inefficiency in one step using maximum likelihood. Therefore, the inefficiency effects ($u_{i,t}$) in the above Equation are specified as:

$$u_{it} = \delta_0 + \delta_1 BWAVE_t + \delta_2 INSTIT_t + \delta_3 CONC_t + \delta_4 CRGDP_t + \delta_5 GDPGR_t + \delta_6 INFL_t + \delta_7 IB_{it} + \delta_8 IWB_{it} + w_{it}$$

In the case of profit efficiency model, the profits before taxes replace total cost as the dependent variable. Thus, as in most previous studies, we estimate an alternative profit frontier, which ignores output price data by assuming imperfect competition. Additionally, as in previous studies, since a number of banks in the sample exhibit negative profits (i.e. losses), the dependent variable in the profit model is transformed to $\ln(PBT + |(PBT)^{\min}| + 1)$, where $|(PBT)^{\min}|$ is the minimum absolute value of PBT over all banks in the sample. Finally, the sign of the inefficiency term in the above equation becomes negative ($-u_{it}$).

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