The performance of Islamic vs. conventional banks: A note on the suitability of capital ratios

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Abstract.

This paper examines the effect of various types of bank capital on the profitability and efficiency of conventional and Islamic banks. Our results show that higher quality forms of capital ameliorate the profitability and efficiency for both systems although the results are stronger for conventional banks. The capital effect is more pronounced for large, too-big-to-fail, and highly capitalized banks. The findings also suggest that the capital guidelines provided by the Islamic Financial Services Board (IFSB) are more effective in increasing the performance of Islamic banks than those provided by the Basel Committee on Banking and Supervision (BCBS). Furthermore, the impact of capital on bank performance is more pronounced in countries with better information disclosure, better auditing standards, and more dynamic regulatory authorities. Overall, the results are robust across various subsamples, alternative profitability and efficiency measures and different estimation techniques.

Key words: Bank capital, Basel capital, Islamic Financial Services Board, profitability, efficiency.

JEL *Classification*: G21, G28, P43, P47.

1. Introduction

The severity of the 2007 - 2009 subprime crisis followed by the European sovereign debt crisis in 2010 and more recently Greece announcing its incapacity to pay its debt to the International Monetary Fund (IMF) (June 2015), has sparked continuous overhauls in financial regulation throughout the financial system. It also encouraged the emergence and the development of alternative and/or complementary financial systems such as Islamic banking and finance[1]. Becoming systemically important in several countries (Song and Oosthuizem, 2014), Islamic banks are expected to reach $1.6 trillion in assets with an annual growth rate of 19.7% during the period 2013 to 2018 (Ernst and Young, 2014). Demirgüç-Kunt et al. (2013) and Imam and Kpodar (2015) ascertain that Islamic banks can also play a key role in promoting financial inclusion[2] and economic growth in Muslim countries.

Islamic banking can be defined as *"a type of finance that respects the principles of Sharia'a"* (Gheeraert, 2014, pg. 4). The Arabic term *Sharia'a* means Islamic law and involves a series of instructions that govern not only the religious life of every Muslim but also all financial and economic aspects. These instructions include five principles that apply to Islamic banks (López-Mejía et al., 2014). First, the risk sharing between Islamic banks and their depositors – in particular investment account holders – provides more protection to the banks; second, Islamic banks are more conservative in their investments because they need to provide stable and competitive returns to their depositors; third, Islamic bank activities are asset-backed and thus directly associated with the real economy; fourth, investment account holders exercise more control on management since they share their risk with the bank; and finally, Islamic banks tend to hold important reserves with central banks because they lack short-term investment activities.

These features of the Islamic banking system raise several regulatory concerns about the development of this industry. Recent surveys such as Song and Oosthuizem (2014) and López-Mejía et al. (2014) show that, although several countries are improving their legal, regulatory, and

[1] The World Bank Islamic Banking Database reports 394 financial institutions distributed in 57 countries across the globe.

[2] The 2014 Global Financial Development Report (GDFR) defines financial inclusion as the percentage of individuals and firms that have access to financial services. According to this concept, having rapid access to financial services is an important indicator that can be used to trace poverty; and it therefore works to ameliorate inequalities and improve prosperity and sustainable economic development between countries.

supervisory framework regarding Islamic banking activities, several challenges persist and require further investigation[3].

In this paper, we shed light on the effect of banking regulations – in particular the capital ratios implemented by the Basel Committee on Banking and Supervision (BCBS) and the capital guidelines proposed by the Islamic Financial Services Board (IFSB) [4] – on the performance of both Islamic and conventional banks. More precisely, we analyze the impact of capital on the profitability and efficiency of Islamic and conventional banks. We examine the differences and similarities among various forms of capital using an unbalanced sample of 656 banks located in 33 countries over the period 1999-2013. To the best of our knowledge, this is the first study that investigates the impact of capital ratios in the context of the BCBS/IFSB accords on the performance of both Islamic and conventional banks. We choose to evaluate the impact of capital ratios because of the tremendous change and rapid development in definitions and approaches used to compute capital ratios. This development not only reflects the importance of complying with regulatory guidelines to avoid financial distress but also the growing regulatory complexities faced by modern banking institutions.

Our results provide important new insights. First, higher capital ratios have a positive and significant impact on the profitability and efficiency of Islamic and conventional banks, suggesting that well capitalized banks have a lower cost of funding, better monitoring and credit risk management, and make wiser lending decisions which in turn lead to higher profitability and better efficiency. This is in line with the public interest and the moral hazard hypotheses about the importance of capital in improving bank performance and economic growth. Second, the impact of different forms of capital is stronger for conventional than for Islamic banks. Third, we document that our results are primarily driven by larger and too-big-to-fail banks. Fourth, highly capitalized banks, defined as banks whose capital ratios as disclosed by the banks in their annual report far

[3] At the 4th Islamic Banking and Finance Conference held in 2014, Thorsten Beck questioned how regulators should treat *Sharia'a* compliant finance and proposed two alternative solutions. First, regulators should try to fit Islamic banks into the existing regulatory framework subject to certain exceptions (e.g. Profit Loss Sharing (PLS) transactions). Second, they should create independent regulatory guidelines that deal specifically with *Sharia'a* compliant finance.

[4] Established in Kuala Lumpur, Malaysia in 2002, The Islamic Financial Services Board (IFSB) is an international regulatory organization that promotes the stability and performance of Islamic financial institutions with the rest of the financial system. The IFSB is comprised of 188 members including 61 regulatory authorities, 8 inter-governmental organizations, and 119 market players. It is often considered to be the equivalent of a Basel committee for Islamic financial institutions.

exceed the minimum level required by the banking regulatory authorities, i.e. BCBS, exhibit significantly better performance. In addition, the IFSB capital guidelines are more effective for Islamic banks than the BCBS capital guidelines, demonstrating that the regulation of Islamic banks requires a specific approach, such as the IFSB capital guidelines for the calculation of its capital ratios. Fifth, capital measures have a more pronounced effect in countries with better information disclosure, better auditing standards, and more and dynamic regulatory authorities, suggesting that these factors can substitute for capital in improving bank performance. We conduct a series of robustness tests that show similar results when we break down our sample into banks in the Middle East and North Africa (MENA) region, the Gulf Cooperation Council (GCC) countries and South East Asia (SEA), and before, during and after the financial crisis. Finally, alternative performance and capital measures, additional macroeconomic and institutional indexes, a truncated regression, and a quantile regression approach confirm our earlier findings.

Our research contributes to the existing literature in several ways. First, for the first time, we examine the impact of the Basel guidelines – in term of risk- and non-risk-based regulatory capital ratios – on the profitability and efficiency of commercial and Islamic banks. Second, our study is different because we use eight capital ratios including risk-based and non-risk-based capital measures in addition to traditional capital ratios to compare and examine whether the Basel Accords have a pronounced effect on the performance of commercial versus Islamic banks. We use risk and non-risk based capital ratios because of the renewed debate on the effectiveness of capital ratios. For instance, Demirgüç-Kunt et al. (2013) and Anginer and Demirgüç-Kunt (2014) ask what kind of capital banks need to maintain and how to structure the capital. This corroborates with Haldane (2012), Dermine (2015) and Cathcart et al. (2015) who shed doubt on the ability of risk weighted assets in reflecting actual bank risk exposure, especially during the subprime crisis. This paper adds to the literature on the effectiveness of capital (i.e. the Basel risk-based capital ratios versus traditional non-risk based capital ratios) by examining Islamic banks. Third, we distinguish between the BCBS and IFSB guidelines when examining capital ratios and consider for a series of institutional environment factors. Fourth, we test the impact of the institutional environment on the relation between capital ratios and the performance of Islamic banks. Finally, we utilize several regression techniques and combine parametric approaches (e.g. OLS regressions and truncated

regressions) and non-parametric approaches (quantile regressions) to examine the robustness of our results.

The rest of the paper is organized as follows. Section 2 reviews the literature. Section 3 describes the data set, provides definitions and sources for all variables, and discusses our methodology. Section 4 examines the impact of regulatory capital on bank profitability and efficiency. Section 5 concludes.

2. Literature review

2.1. Capital ratios and the performance of conventional banks

The nature of the relationship between regulations and bank performance is not yet conclusive and often suggests mixed results. Several hypotheses have been put forward to explain this association. Ayadi et al. (2015) propose the *"public interest"* and *"private interest"* hypotheses to explain the impact of regulations on bank performance. The public interest view suggests that governments and regulatory authorities have necessary information to better regulate the financial system especially with market failures (Barth et al., 2013). This increasing role in the economy promotes public interest and can lead to a better functioning of banks by nourishing competition and ameliorating effective governance and thus bank performance. Choretareas et al. (2012) explain that governments with powerful supervision can eventually improve bank efficiency by reducing corruption in bank lending activities. However, caution must be exercised in less developed countries where higher governmental involvement could have an adverse effect on the efficiency of banking institutions. In contrast, defenders of the private interest hypothesis argue that well-conceived regulation can distort bank efficiency by putting constraints on firms and channel resources to few special-interest groups at the expense of the broader public.

Another hypothesis, which coincides with the public interest view, is the *"moral hazard"* hypothesis. This hypothesis suggests that banks are required to hold more capital to impede moral hazard and thus agency conflicts between bank managers and shareholders (Fiordelisi et al., 2011; Barth et al., 2013).[5] For instance, bank managers have an incentive to take excessive risk at the

[5] Moral hazard is generated from the agency conflicts between bank managers and shareholders where managers benefit from information asymmetry and take on excessive risk at the expense of shareholders.

expense of bank shareholders and by exploiting flat-deposit insurance schemes. Accordingly, higher capital ratios play a key role in alleviating moral hazard, reducing cost and aligning the interests of bank managers and depositors which results in better screening and more efficient lending activities. Barth et al. (2013) investigate the relationship between banking regulations and efficiency. Their results suggest that banking regulation, supervision, and monitoring are important determinants of bank efficiency. For instance, capital stringency and equity to asset ratios are positively associated with bank efficiency.

Examining an unbalanced panel of 5,227 bank-year observations in 22 European Union countries, Chortareasa et al. (2012) find that capital have a positive effect on bank efficiency and a negative effect on costs. Their results suggest that higher capitalization alleviates the agency problems between managers and shareholders. Hence, the latter will have greater incentives to monitor management performance and ensure that a given bank is efficient. Staub et al. (2010) test the moral hazard hypothesis and find that when banks hold more capital they are more cautious in terms of their risk behavior, which can be channeled into higher efficiency scores. Consistent with the moral hazard hypothesis,[6] Banker et al. (2010) argue that higher capital adequacy ratios reduce the portfolio risk of banks and lead to safer and better credit risk management practices (Niswander and Swanson, 2000) and consequently to a better performance of the entire banking system (Hsiao et al., 2010). This argument is also supported by the profitability literature. Lee and Hsieh (2013) find a positive association between the capital and profitability of commercial, cooperative, investment, and other banks in 42 Asian countries. In addition, Demirgüç-Kunt et al. (2013) find a positive impact of capital on bank stock returns for a sample of developed countries, especially in the crisis period and for larger banks.

While the literature provides important empirical support for the public interest and the moral hazard hypotheses, which suggest a positive association between capital regulation and bank performance, it also posits a negative impact. For instance, Berger and Di Patti (2006) develop the agency cost hypothesis, which suggests that high leverage or low capital ratios ameliorate bank efficiency. Some early banking studies also claim that capital ratios should be negatively associated

[6] Another possible explanation for the positive relationship between capital and efficiency is provided by Carvallo and Kasman (2005) and Ariff and Can (2008) who argue that efficient banks are more profitable and thus hold higher capital buffers as retained profits.

with bank performance by arguing that higher capital ratios may alter the demands of investors who may thus accept lower rates of return. This is due to the fact that higher capital ratios alleviate banks' risk taking and cause investors to accept lower returns on their investments (Park and Weber, 2006). In this context, Altunbas et al. (2007) report a negative relationship between bank efficiency and bank capital and suggest that inefficient European banks hold more capital than efficient ones. Their results are in line with those obtained by Goddard et al. (2013, pg. 15) who argue that *"capitalized banks are less risky and therefore tend to generate lower returns"*.

2.2. BCBS vs. IFSB capital guidelines: Two complementary frameworks

The main feature of Islamic banks is the existence of investment accounts (i.e. Restricted Investment Accounts (RIA) and Unrestricted Investment Accounts (UIA)) on their liability side. On a theoretical level, these accounts should be used to finance profit sharing and loss bearing projects (i.e. *Mudaraba* and *Musharaka*) that are fully compliant with *Sharia'a* law. In addition, Investment Account Holders (IAHs) are treated like investors; therefore, they are fully aware and acknowledge the risk related to each project financed using their deposits. Given these particularities, assets financed by Islamic banks' investment accounts should be treated differently in terms of risk weighting.

In addition, almost all Islamic banks compete with conventional banks under a dual banking system. In this context, the rate of return on investment accounts must be at least equal or very close to the interest rates proposed by conventional banks. Otherwise, investors can easily withdraw their funds from Islamic banks[7] and shifts them to conventional banks[8]. To compete with higher interest rates, Islamic banks can use three types of profit smoothing techniques[9] to ameliorate IAH returns. Nevertheless, according to *Sharia'a* law, Islamic banks should not guarantee the initial capital and

[7] Depositors can notify their banks of their intention to withdraw their deposits subject to a one-month notice period.

[8] This argument is still very relative. The clients of Islamic banks may prefer Islamic banks to conventional banks—even if conventional banks offer higher interest rates—due to many factors such as religiosity. Abedifar et al. (2013) indicate that religiosity is an important determinant of individuals' risk aversion. Thus, religiosity beliefs can play a disciplinary role on the depositors' side of Islamic banks' balance sheets and can encourage borrowers (i.e. investors or entrepreneurs) to respect their contractual obligations with Islamic banks.

[9] i) Profit Equalization Reserve (PER): this reserve collects a proportion of profits generated by projects that are financed by investment accounts. The rest of the profits are distributed between IAHs (i.e. UIA) and the banks' shareholders (IFSB, 2010); ii) Investment Risk Reserve (IRR): deducts the returns from past operations and is used to cover losses generated by projects that are funded by investment accounts but cannot be used to smooth profits; iii) *hiba* or donations source as a last resort and involve the banks' shareholders donating their profits to UIA holders to improve their returns and make them competitive with the interest rates of conventional banks.

returns of investment accounts and profit smoothing is normally prohibited (especially if there is no competition between Islamic banks and conventional banks). Accordingly, losses should be fully borne by IAHs. In this case, the assets financed via investment accounts (RIA and UIA) do not increase any regulatory capital because IAHs bear all the risk. Thus, these assets should be excluded from the calculation of the capital adequacy ratio denominator, as they do not generate any risk exposure for Islamic banks (Song and Oosthuizem, 2014; López-Mejía et al., 2014). As a result, the capital adequacy ratio (CAR) of Islamic banks should be calculated using the IFSB standard formula as reported in Table A.1 in Appendix A (IFSB, 2013).

In other cases, Islamic banks compete with conventional banks. Owing to the fact that conventional banks are much more experimental and more developed than Islamic banks, the latter seek to increase the rates of return on investment accounts using smoothing techniques to ensure the same level of competition with conventional banks. Their main objective is to avoid withdrawal risk. By doing so, UIAs are treated as a *Sharia'a* compliant substitute for the deposits of conventional banks (IFSB, 2011), and Islamic banks create an illusion of stable returns on investment accounts even in the worst scenario.[10] Consequently, in a competitive environment and to avoid withdrawal risk, the supervisory authorities such as IFSB may require Islamic banks to support investment account holders by using PER, IRR or donations (see footnote 9). In this case, the capital adequacy ratio of Islamic banks can be calculated according to a discretionary formula reported in Table A.1 in Appendix A (IFSB, 2013).

2.3. The capital and performance of Islamic banks

While there is growing body of literature that compares the efficiency of Islamic and conventional banks, the question whether capital ameliorate or impede the efficiency of these institutions is still far from being answered.

Pasiouras et al. (2009) argue that capital can influence the efficiency of the banking system for several reasons. First, by definition banks are financial intermediaries that transform their inputs (e.g. investment deposits in the case of Islamic banks) into outputs (i.e. mark-up transactions and

[10] Accordingly, the IFSB illustrated that, *"By maintaining stable returns to (unrestricted investment account holders) regardless of whether it rains or shines (an Islamic bank) automatically sends a signal that (it) has a sustainable and low-risk earnings stream for (those account holders), while the reality may be quite different"* (IFSB, 2010, pg. 9).

profit loss sharing transactions in the case of Islamic banks). Therefore, capital stringency may influence the quantity and the quality of lending activities. Second, requiring banks to commensurate their capital ratios with the amount of risk taken may affect how managers allocate their bank's asset portfolio and may alter the level of returns they are able to generate. Finally, capital ratios may shift banks' decisions regarding the mix of deposits and equity employed to finance their activities. Rosmie et al. (2014) examine the determinants of Islamic bank efficiency for the 2007/2010 period and find a positive association between capital and bank efficiency. The authors explain that Islamic banks hold higher capital buffers to protect against future losses. In addition, because more efficient banks are probably less leveraged (i.e. have more equity), they enjoy a lower cost of capital and thus are more efficient.

On a theoretical level, Islamic banks can benefit from applying PLS principles to IAHs; therefore, they can take on more leverage and generate higher profits to satisfy shareholders at the expense of IAHs who bear any potential losses. Accordingly, bank managers and shareholders may continue to attract more IAHs and take on more leverage, which reduces the agency costs between both parties. This implicit agreement provides higher profits to the shareholders of Islamic banks while ameliorating the reputation, salary, and bonuses of Islamic bank managers. In other words, the investment accounts of Islamic banks may be used as leverage to maximize bank profits at the expense of bank IAHs and the banks' capital position, thereby suggesting that higher leverage and thinner capital ratios ameliorate bank efficiency (Berger and Di Patti, 2006).

However, on a practical level, Islamic banks cannot always channel losses to IAHs because eventually they will no longer invest with Islamic banks. IAHs could withdraw their money causing liquidity and solvency problems. One solution is that Islamic banks maintain profit smoothing reserves;[11] which will enable Islamic banks to channel retained earnings from these reserves to remunerate IAH accounts and avoid any possible withdrawals, especially when competing with conventional banks. Yet, Islamic banks need to adjust their equity base in case of severe losses or when their reserves are no longer capable of providing profits to IAHs. As a result, they may decide to maintain higher capital ratios than conventional banks to avoid any possible solvency problems. This can also create incentives for bank shareholders to better control bank managers' investment

[11] See section 2.1 and note 9.

decisions. Higher capital ratios force bank owners to absorb losses using their own resources as a response to a "more skin in the game" policy instead of seeking a bailout through public funds (Demirgüç-Kunt et al., 2013), thus supporting the moral hazard hypothesis cited above.

Based on the results of these empirical studies, we formulate the following hypotheses:

H.1: *Increased capital ratios are positively associated with the profitability and efficiency of conventional banks.*

H.2: *Increased capital ratios are positively associated with the profitability and efficiency of Islamic banks.*

Finally, the Basel III agreement could penalize Islamic banks because they lack experience and efficiency in liquidity management, and are restricted by *Sharia'*s principle in their use of debt and collateral instruments. Thus, we address the question whether higher forms of capital have the same or a different impact on Islamic and conventional banks by posing the following hypothesis:

H.3: *Increased capital ratios have a more pronounced effect on the profitability and the efficiency of conventional banks compared to Islamic banks.*

3. Sample, Methodology and Variables

3.1. Sample

We use Bankscope as a primary source of data for this study (Abedifar et al., 2013; Demirgüç-Kunt et al., 2013; Anginer and Demirgüç-Kunt, 2014). For each bank in the sample, we retrieve annual data from 1999 to 2013. Our initial sample includes more than 656 banks (including 116 Islamic banks) from 33 countries. A bank is excluded from the sample if it does not have at least 3 continuous observations. In addition, we remove countries that have data for fewer than 4 banks. We note that our tests and the significance of our results are limited by data availability restrictions.

3.2. Regression model

We examine the relation between capital ratios and bank profitability/efficiency by employing the following basic OLS regression models:[12]

$$f(\text{PROF1\&2, EFF1\&2})_{ijt} = \alpha + \varphi \times \text{bank\_control}_{ijt} + \beta_1 \times \text{IBDV} \times \text{Capital\_ra}_{ijt} + \beta_2 \times \text{CBDV} \times \text{Capital\_ra}_{ijt} + C_c + Y_Y + \varepsilon_i \quad (1)$$

where i refers to bank i's profitability ratios (PROF1 and PROF2) and efficiency scores (EFF1 and EFF2) in country j in year t. Capital_ra are the eight capital ratios, i.e. Tier 1 capital, Tier 2 capital, total capital, common equity, and tangible equity, as expressed in Section 3.3.[13] Bank_control are bank-level control variables including bank size, the growth of total assets, bank loan engagement, fixed assets and non-operating income. IBDV is a dummy variable that takes on a value of 1 for Islamic banks and 0 for conventional banks while CBDV is a dummy variable that takes on a value of 1 for conventional banks and 0 for Islamic banks. C_C and Y_y represent country and year fixed effect dummy variables. C_C and Y_y are included to mitigate any effect of omitted variables related to each country and year specifications as explained by Demirgüç-Kunt and Anginer (2014).[14]

3.3. Variable descriptions

3.3.1. Measures of profitability and efficiency

The main objective of this paper is to examine the impact of various definitions of capital on bank profitability and efficiency. We measure profitability using the ratio of net income to three year average assets (PROF1) and the ratio of operating profit to three year average assets (PROF2). These accounting ratios are used to control for any cross-bank differences in terms of performance

[12] Our regression methodology differs from Beck et al. (2013) and Abedifar et al. (2013) in two aspects: First, we examine the direct impact of capital ratios on both commercial (CBDV) and Islamic banks (IBDV). Second, we measure whether the results are similar or different for both systems.

[13] Except for the capital ratios, all correlation coefficients are below 0.4. Therefore, we run each model using only one measure of capital to avoid multicollinearity. The Pearson correlation matrix is available from the authors upon request.

[14] We follow Beck et al. (2013) and Anginer and Demirgüç-Kunt (2014) and cluster on the bank level instead of the country level for two reasons. First, some countries have a much larger number of observations than other countries in the sample. Second, we have thirty three countries. Therefore, clustering at the country level might create biased results.

(Mullah and Zaman, 2015). An increased value indicates a higher level of profitability and operational efficiency.

As for efficiency scores, we estimate a model[15] that incorporates four inputs and three outputs. The inputs are: deposits and short term funding (Hsiao et al. 2010; Belans and Hassiki, 2012; Chortareasa et al. 2012; Barth et al., 2013; Johnes et al., 2013), fixed assets (Pappas, Izzeldin et al. 2013; Rosman et al., 2014), overhead as a proxy for general and administrative expenses and loan loss provisions as a proxy of risk (Drake and Hall, 2003; Sufian, 2007; Barth et al., 2013). The efficiency literature is divided about the incorporation of loan loss provisions[16] versus equity to control for a bank's risk exposure. On one hand, researchers such as Johnes et al. (2009, 2013) propose to use equity as an indicator of risk taking because data is less available for loan loss provision. On the other hand, Barth et al. (2013) point out that risk can be incorporated by including loan loss provisions in efficiency analyses. The outputs are: total loans (Hsiao et al., 2010; Staub et al., 2010; Chortareasa et al. 2012; Pappas et al., 2013; Barth et al., 2013), other earning assets (Abdul-Majid et al. 2010; Pappas et al., 2013; Barth et al., 2013), and other operating income. Barth et al. (2013) argue that an important reason behind the inclusion of other operating income is to avoid any penalization of banks that largely rely on non-traditional activities in their investment portfolio.

3.3.2. Measures of capital and control variables

We follow Demirgüç-Kunt et al. (2013) and Anginer and Demirgüç-Kunt (2014) and use several definitions of capital ratios. These measures are computed according to the Basel rule using risk-weighted assets (rwa) in the first step[17]. Then, in a second step, we compute the same ratios but use total assets (ta) instead. The objective of such a comparison is to avoid any untruthful assessment related to the calculation of risk-weighted assets (Arnold et al., 2012; Cathcart et al., 2015; Dermine,

[15] Detailed description of the methodology is available upon request.

[16] We compute a basic gross efficiency score model in which we do not control for the risk in bank inputs in the first step (EFF1) and re-calculate our scores by introducing loan loss provisions to control for banking risk (EFF2).

[17] Song and Oosthuizen (2014) explain that the calculation of capital ratios for Islamic banks might differ between countries. Countries such as Turkey, the United Arab Emirates, and the United Kingdom apply BCBS guidelines to all banks including Islamic ones without any reservations while countries such as Bahrain, Jordan, Malaysia and the Sudan adjust the BCBS capital framework as recommended by IFSB to cater to the characteristics of Islamic banks (see section 2.1).

2015). The first vector employs three ratios[18]: Tier 1 (tier 1/rwa), Tier 2 (tier 2/rwa) and Tier 1 plus Tier 2 divided by risk-weighted assets and off-balance sheet exposures (total capital/rwa). Tier 1 capital is the sum of shareholders' funds and perpetual, non-cumulative preference shares. Tier 2 capital is the sum of hybrid capital, subordinated debt, loan loss reserves and valuation reserves. Song and Oosthuizen (2014) and López-Majía et al. (2014) ascertain that Islamic banks have a very small Tier 2 capital ratio because they prohibit instruments such as subordinated debt (e.g. junior security and subordinated loans) that require interest payments. Thus, Basel III should not impact Islamic banks' capital compared to conventional banks. Total capital, known as the capital adequacy ratio, contains Tier 1 and Tier 2 capital, all scaled by risk weighted assets, and must be at least 8% under the Basel II rules. The second vector incorporates five ratios: Tier 1 to total assets (tier1/ta), Tier 2 to total assets (tier2/ta), Tier 1 plus Tier 2 divided by total assets (total capital/ta), common equity to assets (common equity/ta), and tangible equity to assets (tangible equity/ta). Bank common equity includes common shares and premium, retained earnings, reserves for general banking risks, and statutory reserves. Tangible common equity removes goodwill and any other intangible assets from its equity.

We also employ a series of bank-level control variables to capture the differences in bank characteristics. We first include the natural logarithm of total assets to control for bank size (size). Second, we use the growth of total assets (growth assets) to control for the development in total bank assets in the current year compared with the previous year. For instance, Abedifar et al. (2013) use this ratio as a proxy for bank growth and development strategies. Third, we use the ratio of net loans to total assets (net loans/ta) because the literature shows that banks that possess a strong loan portfolio are less exposed to risk than other banks that prefer to invest in derivatives, other types of securities, and other non-traditional activities. Fourth, we employ the ratio of fixed assets to assets (fixed assets/ta) to control for the bank's financing activities. According to Beck et al. (2013) this ratio accounts for the opportunity cost that arises from incorporating non-earning assets in the banks' balance sheet. Finally, we control for activities that are not related to bank core operations using

[18] The Bankscope database lacks observations regarding Tier 1 capital (tier 1/rwa) and the total capital ratio (total capital/rwa). Therefore, whenever possible, we download the annual reports from the website of each Islamic bank to fill in any missing data.

non-operating income scaled by total assets. All variables are winsorized at the 1% and 99% level to mitigate the effect of outliers. Full variable definitions and sources are provided in Appendix A.2.

4. Empirical results

4.1. Descriptive statistics

Tables 1.A and 1.B present descriptive statistics for all variables. We find that Islamic banks are more profitable and more efficient than conventional banks. For example, the PROF1 average is 1.21% for Islamic banks and 1.12% for conventional banks. Similarly, the EFF1 average is 52.36% for the former and 49.06% for the latter. We obtain the same results for PROF2, EFF2, and alternative performance measures. T-tests show that Islamic banks are significantly more efficient than conventional banks in terms of PROF2, EFF1, and EFF2. In addition, we find that Islamic banks are more capitalized than conventional counterparts. Risk- and non-risk-based capital ratios (i.e. Tier 1/rwa, Tier 2/rwa, Total capital/rwa as risk-based ratios and Tier 1/ta, Tier 2/ta and Total capital/ta as non-risk-based ratios) in addition to traditional capital ratios (i.e. common equity/ta and tangible equity/ta) confirm our results. However, we show that capital-like or Tier 2 ratios are higher for conventional banks than for Islamic ones, supporting Song and Oosthuizen (2014) and López-Majía et al. (2014) who observe a rare use of Tier 2 by Islamic banks. We also note that the number of observations varies significantly between risk-based measures and non-risk based measures. For instance, the ratio of Tier1 capital to risk weighted assets (Tier 1/rwa) has 3,692 observations with an average of 24.31% for Islamic banks and 16.81% for conventional banks (well above the minimum 4% capital requirement proposed by the BCBS). Non-risk based capital measures have almost three times as many observations. For instance, the ratio of common equity to total assets has a total of 8,398 observations with an average value of 20.96% for Islamic banks and 13.62% for conventional banks. Table 1.B breaks down the number of observations for the three risk-based capital ratios and traditional capital ratios over time. The number of missing observations between the risk-based capital variables and the common equity to assets ratio stands out. In addition, we can observe that the disclosure of capital ratios increases over time, which reflects bank engagement in adopting the BCBS/IFSB requirements of disclosing capital information.

INSERT TABLE [1] AROUND HERE

4.2. The association between capital, bank profitability, and efficiency: An overview

To consider the effect of capital on bank profitability and efficiency, we regress our profitability and productive efficiency ratios on a vector of eight capital ratios that include Basel risk- and non-risk based capital ratios in addition to traditional capital measures, while controlling for bank level, country, and year fixed effects. Following Demirgüç-Kunt et al. (2013) and Anginer and Demirgüç-Kunt (2014), we use the OLS regression model in Eq. (1). The results are presented in Table (2) for the profitability models and in Table (3) for the efficiency models. [19]

The findings[20] suggest that capital ratios are positively associated with bank profitability and efficiency in all columns except Cols. (2) and (5). Our results show that risk based and non-risk based capital ratios (Cols. (1) to (6)) have a positive impact on the performance of both Islamic and conventional banks. However, we find that Tier 2 ratios have a positive but marginal effect on the profitability of conventional banks while they have no significant effect on the profitability and efficiency of Islamic banks (Cols. (2) and (5)). Finally, traditional capital indicators appear to have a strong positive association with bank profitability and efficiency for both banking systems (Cols. (7) and (8)).

INSERT TABLE [2] AROUND HERE

The reason for choosing several capital ratios and examining their impact on bank performance is that the choice of variables might influence the results (Demirgüç-Kunt et al., 2013; Anginer and Demirgüç-Kunt, 2014). For instance, Haldane (2012) finds that simple non-risk based capital measures outperform risk based capital measures when studying the association between capital and bank failure and calls for simplifying banking regulation. This is also supported by Blum (2008) and Dermine (2015) who suggest a risk independent leverage ratio as a complementary tool to capital ratios based on risk-weighted-assets. Both studies argue that the Basel risk weighting approach is ineffective in dealing with complex financial products such as CDS contracts that allow banks to extend their leverage without any limits. Finally, Arnold et al. (2012) argue that regulators need to distinguish between good quality capital (e.g. the common equity Tier 1 capital ratio) and capital-

[19] We also run regressions by separating Islamic banks from conventional banks and obtain same results. The results are available upon request.

[20] We do not report control variables in Table (2) and Table (3) to save space. Tables with all control variables and explanations are available upon request.

like ratios (or debt ratios; e.g. the Tier 2 capital ratio). They explain that more capital is good but it is important to understand that some capital is better than other capital. Our results suggest that good quality capital such as Tier1, common equity, and tangible equity have a better effect on the profitability and efficiency of Islamic and conventional banks than capital-like ratios such as Tier 2, thus confirming Arnold et al.'s (2012) findings. The results confirm Anginer et al.'s (2013) and Demirgüç-Kunt et al.'s (2013) concerns about the composition of Tier 2 capital and how it may be the reason behind the ineffectiveness of capital ratios in absorbing losses during the subprime crisis. Tier 2 capital includes hybrid capital instruments and subordinated debt and is thus less reliable than tier 1 capital. Our findings are in line with the new BCBS guidelines, i.e. Basel III, that require banks to increase their Tier 1 capital ratio to 6% and maintain a constant Tier 2 capital ratio of only 2%.

Except for the Tier 2 ratios, all capital ratios confirm the public interest and moral hazard hypotheses, suggesting a positive association between capital and bank profitability/efficiency (Banker et al., 2010; Staub et al., 2010; Barth et al., 2013; Rosmie et al., 2014) for both Islamic and conventional banks, thus supporting hypotheses H.1 and H.2. Our results can be interpreted as follows. First, higher capital ratios decrease moral hazard in shareholders' behavior as a response to a more skin in the game policy. It also diminishes bank managers' appetite to engage in riskier activities. Second, a strong capital structure provides strength to banks, especially in developing countries. Well capitalized banks better withstand financial crisis, political instability, and severe economic conditions. These banks have lower concerns of going bankrupt and a lower funding cost than less capitalized banks that have higher leverage, riskier portfolios and higher borrowing costs. Third, better regulation and supervision in the form of higher capital measures create incentives for banks to have better risk management and wiser decisions regarding lending and investment decisions and this does not exclude Islamic banks. Ultimately, these results can be reflected in allocating resources in a more efficient way, resulting in higher profitability and better bank performance.

INSERT TABLE [3] AROUND HERE

The findings also suggest that the impact of capital ratios is more pronounced for conventional than Islamic banks, thus supporting hypothesis H.3 although the F-test (Wald) for the degree of significance between regulatory coefficients of Islamic and conventional banks is not always

significant, especially for the efficiency models. These findings can be explained by several factors. First, depending on the countries in which they are located, Islamic banks either use BCBS as a reference to compute their capital ratios, or employ IFSB principles and adapt BCBS to their specific business model. Applying BCBS requirements for Islamic banks without considering their particularities may reduce the intended effect of capital ratios. Second, Islamic banks lack the experience and expertise regarding the standardization and harmonization of their regulatory requirements and supervisory authorities. Finally, Islamic banks are constrained by the Islamic law and thus cannot benefit from several debt and collateral instruments – incorporated in Tier 2 – compared to their conventional peers, which can be translated into a negative or non-significant impact on their performance.

4.3. The role of bank size and too-big-to-fail banks

To test the impact of capital ratios on the performance of larger banks and too big to fail banks, we include two variables by interacting bank size (size) – using the logarithm of total assets – and a too big to fail dummy (tbtf) – a dummy variable that equals 1 if size > upper quantile (Q75) and 0 otherwise – with our capital ratios. To do this, we use the following regression equation:

$$f(\text{PROF1\&2}, \text{EFF1\&2})_{ijt} = \alpha + \varphi \times \text{bank\_control}_{ijt} + \beta_2 \times \text{IBDV} \times \text{Capital\_ra}_{ijt} \times (\text{size/tbtf}) + \beta_2 \times \text{CBDV} \times \text{Capital\_ra}_{ijt} \times (\text{size/tbtf}) + C_c + Y_Y + \varepsilon_i \quad (2)$$

Table (4) Panel A reports the results for bank size while Panel B provides the results for too big to fail banks. The findings suggest that larger banks with higher capital ratios are more profitable and more efficient (Panel A). The results persist when employing the too big to fail dummy for efficiency models (Panel B) but they are less effective for profitability models especially for Islamic banks. Anginer and Demirgüç-Kunt (2014) argue that larger banks exist in several markets in different countries, engage in non-traditional activities, and tend to have higher profits and thus higher retained earnings in their capital buffer. Accordingly, capital ratios should be positively associated with bank profitability and efficiency. In addition, holding higher capital ratios encourages bank managers to adopt better banking and risk management practices (Hsiao et al. 2010), which translate into a lower risk of financial crises (Banker et al., 2010), better supervision and monitoring (Barth et al., 2013), and thus higher efficiency scores. However, bigger banks might

be more sensitive to capital because they will invest less in riskier portfolios and require more supervision and monitoring. The same rationale applies for Islamic banks. As they become bigger, challenges in term of risk management, investment choices, and *Sharia'a* compliance will become stronger. Accordingly, holding higher capital buffers can become a barrier against investments rather than an insurance policy, which could explain the reduced impact on the profitability ratios.

INSERT TABLE [4] AROUND HERE

4.4. Highly capitalized banks

To further assess the motives behind holding higher capital ratios and their impact on bank performance, we focus on excessively capitalized banks. Berger et al. (2008) provides three arguments for holding excessive capital. First, higher capital ratios reflect higher retained earnings as a precautionary policy against any future equity shortage.[21] Second, banks are more sensitive to factors such a as earnings volatility, depositors, charter values and regulatory policies (e.g. too-big-to-fail) which create incentives for bank managers to adapt their capital ratios according to these factors. Finally, banks that plan to have future mergers prefer to maintain higher capital buffers to ensure regulators' complements and acceptance. As for the impact on bank performance, the literature shows that higher ratios ameliorate bank profitability and efficiency because they create an incentive for bank managers to avoid risk, ameliorate monitoring and supervision of lending activities, lower bank costs (e.g. by raising capital in stress situations) and thus improve bank performance. We define excessive regulatory capital as the value that exceeds the minimum capital requirements explicitly determined by the BCBS. The minimum level is given as a 4% Tier 1 (tier 1/rwa) and an 8% capital adequacy ratio (total capital/rwa) for adequately capitalized banks and a 6% Tier 1 and a 10% capital adequacy ratio for well capitalized banks. Table (5) reports the results following three distinguished definitions of excessive capital. [22] Panel A and Panel B define excessive capital as the difference between the actual capital ratios disclosed by banks in their annual report and the minimum level required by banking regulatory authorities (i.e. the BCBS).

[21] Barajas et al. (2015) argue that there are four factors in corporate finance that make raising equity costly: insufficient information about bank loan portfolios,, favorable conditions regarding the tax treatment of dividends, the existence of a too-big-to-fail policy, and, the use of a deposit insurance scheme. According to the authors, these factors put constraints on Modigliani and Miller's (for more details, see Chami et al. (2001)) theorem that posits that bank capital structure is irrelevant to its value and thus financing bank operations should not be constrained by a bank's equity.

[22] We only present results for the Basel capital ratios. In unreported regressions, we perform similar analyses for other capital ratios and obtain very consistent results. These results are available upon request.

Panel A employs a minimum value of 4% for Tier 1 and 8% for capital adequacy using the international BCBS standards while Panel B employs a minimum value of 6% for Tier 1 and 10% for capital adequacy for well capitalized banks. Finally, Panel C defines excessive capital using a dummy that equals 1 when a capital ratio exceeds its upper quantile (Q75) and 0 otherwise. Our findings show very consistent results. Excessive risk-based capital ratios as defined in Panel A, Panel B and Panel C are positively associated with banks' profitability and efficiency although the results are less significant for Islamic banks, in particular in the profitability models. We conclude that adequately capitalized banks, well capitalized banks, and highly capitalized banks are more likely to have a positive effect on bank performance which reflects good monitoring and supervision and good risk management, thus supporting the BCBS/IFSB argument about capital ratios as a good determinant of bank performance. The findings also confirm hypotheses H1, H2, and H3 although the F-test (Wald) for the degree of significance between regulatory coefficients of Islamic and conventional banks is not always significant.

INSERT TABLE [5] AROUND HERE

4.5. Institutional environment

We further explore the association between capital and bank performance by examining the impact of the institutional environment. Barth et al. (2013) argue that an institutional environment that allows for good regulation, supervision, and monitoring can play a positive role in ameliorating bank efficiency. Anginer and Demirgüç-Kunt (2014) and Anginer et al. (2014) show that institutional environment factors such as information disclosure and the existence of external auditors are important drivers of systemic stability. In this section, we examine the impact of a set of institutional variables, i.e. capital stringency, information disclosure, the existence of external auditors, the fraction of bank ratings in a country, the average tenure of supervision, and overall economic freedom, on the profitability and the efficiency of Islamic and conventional banks. We use Eq. (2) and replace size/tbtf with institutional environment variables. Table (6) reports the results for using (Tier 1 + Tier 2)/rwa in Panel A and (Tier 1 + Tier 2)/ta in Panel B.[23]We only report interaction terms to save space.

[23] In unreported tests, we run the same regressions for other capital ratios and obtain similar findings. The results are available upon request.

Except the United Kingdom, most Islamic banks operate in developing countries where markets are inefficient because of information asymmetries. Thus, we concentrate on information availability and transparency and use three indicators to examine their impact on the capital-performance relationship. The first measure is information disclosure (disclosure), which reflects the transparency and informativeness of bank financial statements. Anginer and Demirgüç-Kunt (2014) ascertain that information asymmetries can channel shocks through the banking system. Capital can work as a safety mechanism against information shocks. Thus, we expect a better impact of capital on bank performance in markets with better information disclosure. Second, we employ two measures of information transparency. The audit variable (audit) examines whether an external audit, i.e. a licensed or certified audit, is required by regulatory authorities to examine bank financial statements. The rated variable (rated) reports the proportion of the ten biggest banks rated by international rating agencies. The results in Table (6) confirm our expectations. The interaction terms are positive and significant despite some insignificant coefficients for Islamic banks in the profitability model. Our results suggest that the role of capital ratios is more pronounced in countries with higher transparency and information disclosures, thus confirming Barth et al.'s (2013) findings.

INSERT TABLE [6] AROUND HERE

We complement our analysis with two measures of the general regulatory environment and one measure of institutional economic development. We use an index of capital stringency (CS), which measures the overall compliance of each country's banking system with the Basel capital guidelines. Higher values indicate greater capital stringency. We also use the average tenure of supervision (ATS), which indicates the average tenure of a professional bank supervisor and thus its experience (Barth et al., 2013). Finally, we employ an index of overall economic freedom computed as the average of ten quantitative and qualitative factors that capture four categories of economic freedom (i.e., the rule of law, limited governance, regulatory efficiency, and open markets). Higher values indicate a better economic environment. The results in Table (6) suggest that the capital-performance relationship is indeed more important in countries with higher capital stringency, regulatory expertise, and favorable economic conditions.

4.6. Extended analysis for Islamic banks: The heterogeneity of prudential regulation

Legulation et al. (2014) argue that the implementation of Basel III will be challenging for Islamic banks. As mentioned in section 2.1, Islamic banks possess investment accounts that require some special treatment in terms of asset weighting. Thus, the new accord will be more complex to adapt to the risk-weighted denominator of the capital adequacy ratio for Islamic banks. Meanwhile, these banks will find no difficulty in complying with the numerator of the capital ratio. Basel III requires banks to enhance the quality of bank capital by increasing the reliance of Tier 1 capital and Islamic banks already have an important fraction of Tier 1 in their numerator compared to conventional banks. Thus, they will find no difficulties in enhancing the quality of their capital.

However, the argument about the particularities of Islamic banks and the importance of using a special regulatory framework (e.g. IFSB, 2010, 2011, and 2013) raise concern about the validity of comparing both systems. Song and Oosthuizen (2014) and Legulation et al. (2014) et al. (2014) ascertain that comparing Islamic banks that apply an IFSB adjustment approach to Islamic and conventional banks that are compliant with the BCBS approach would be inappropriate because the denominator of the capital ratios is not calculated the same way (e.g. Table A.1. in appendix A) and depends on whether the country's regulatory authority follows Basel or IFSB guidelines.

To address this problem, we use hand collected data on whether Islamic banks report their capital adequacy ratios according to the IFSB or BCBS approaches from annual reports, central banks and the IFSB website of 116 Islamic banks. Information is rare for the period before 2006 because most Islamic banks started to report capital adequacy information beginning in 2006 under both the BCBS and IFSB standards. We use two complementary dummies. IFSB is a dummy variable that equals 1 if Islamic banks report their capital ratios (Tier 1 capital and total capital) according to the IFSB approach and 0 otherwise. Basel is another dummy variable that equals 1 if Islamic banks report their capital ratios (Tier 1 capital and total capital) according to the Basel approach and 0 otherwise. We use Eq. (3) to examine how different reporting methods affect the performance of Islamic banks.

$$f(\text{PROF1\&2}, \text{EFF1\&2})_{ijt} = \alpha + \varphi \times \text{bank\_control}_{ijt} + \beta_1 \times \text{Capital\_ra}_{ijt} \times \text{IFSB} + \beta_2 \times \text{Capital\_ra}_{ijt} \times \text{Basel} + C_c + \varepsilon_i \quad (3)$$

We present regression results in Table (7). All four models (i.e. PROF1, PROF2, EFF1 and EFF2) show that the IFSB approach positively affects the association between capital ratios[24] – measured using Tier 1 and total capital ratios – and bank performance (Panel A). However, Islamic banks that report their capital ratios under the Basel approach do not appear to show any significant association with bank performance. If anything, our findings suggest that the estimation method under the IFSB approach is more favorable and positively affects the performance of Islamic banks. These results imply that: i) Islamic banks' particularities have important implications for the way the capital adequacy ratio should be approached; ii) IFSB adjustment methodology should be encouraged and reported by Islamic banks even for those who report their capital measures under the Basel accords; iii) Islamic regulatory organizations such as the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), the Islamic Development Bank (IBD), and the IFSB are called to move forward in regulating Islamic banking institutions with more attention to create an independent regulatory framework that fits Islamic banks instead of only adapting BCBS guidelines; iv) capital adequacy ratios reported under IFSB methodology positively affect Islamic bank performance which coincide with the public interest and moral hazard hypotheses.

INSERT TABLE [7] AROUND HERE

We further examine the impact of IFSB on the determinants of capital ratios and its influence on bank performance by interacting capital ratios with two binary variables. The first variable, member type (member_type), equals 1 if a country's supervisory authority is a full member or an observer member in the IFSB and 0 otherwise. The second variable, non-member (non_member) equals 1 if a country's supervisory authority applies the BCBS framework and does not recognize Islamic banks or explicitly mandates the promotion of Islamic finance and 0 otherwise. IFSB has three membership types: full membership, associate membership, and observer membership. Full members are legislators who are responsible for the supervision of the banking industry and acknowledge and promote Islamic financial services. Associate members are primarily supervisory authorities such as the central bank and monetary authorities, while observer members include other types of financial institutions such as insurance companies, banks, and research institutes. We

[24] We only use the Tier 1 capital ratio and the total capital ratio because both ratios are reported using the risk weighted assets approach. Thus, any concerns about the capital adjustment method should be directly reflected in those ratios.

exclude associate members because they do not differ much from full members while full and observer members target different categories of financial institutions. We believe that being a member (full or observer) in the IFSB helps financial authorities, banks, insurance companies and research centers in better understanding the particularities of Islamic bank. This can be reflected in better supervision, monitoring and regulation, which ameliorate Islamic bank performance. To this end, we use Eq. (4). Results are presented in Table (7), Panel B.

$$f(\text{PROF1\&2}, \text{EFF1\&2})_{ijt} = \alpha + \varphi \times \text{bank\_control}_{ijt} + \beta_1 \times \text{Capital\_ra}_{ijt} \times \text{member\_type} + \beta_2 \times \text{Capital\_ra}_{ijt} \times \text{non\_member} + C_c + \varepsilon_i \quad (4)$$

As anticipated, we find that the capital of banks in countries that have full membership or observer membership in the IFSB have a positive impact on bank performance. According to the IFSB, members can benefit from several features such as the development of the IFSB prudential standards, participation in awareness programs, and technical assistance. Our results clearly demonstrate that being a member in the IFSB ameliorates the effectiveness of bank capital ratios and helps promote the moral hazard and the public interest hypotheses.

4.7. Robustness tests: Subsamples and financial crisis comparison

We now examine any cross-sectional heterogeneity across regions in the association between capital and bank performance. Accordingly, we break down the sample into three subsamples: the Middle East and North Africa (MENA), the Gulf Cooperation Council (GCC), and South East Asia (SEA). We exclude banks in the European Union because there are not enough observations in this region. Table (8), Panel A only reports the results for the GCC region to save space[25] and shows the following: first, the Basel capital ratios (i.e. risk and non-risk based capital ratios or Tier1/rwa and Tier1/ta) and traditional capital ratios (common equity/ta and tangible equity/ta) are positively associated with bank profitability and efficiency in GCC countries while the Basel non-capital ratio or Tier 2 capital is negatively associated with bank efficiency for both bank types. Second, we notice that despite the positive association between capital ratios and bank profitability and efficiency in the MENA and SEA regions, there is some difference between Basel capital ratios and traditional capital ratios for Islamic banks. In other words, we find less evidence of a positive association

[25] Results for the MENA and SEA regions are available upon request.

between capital and Islamic bank performance when using Tier 1/rwa and Total capital/rwa for both regions and especially for the SEA region. According to Haldane (2012), these non-significant results reflect the ineffective role of regulatory measures. He argues that the complexity of banking regulations in addition to information asymmetries shed doubt on the capacity of Basel ratios in reducing risk and ameliorating bank performance. Our results demonstrate that capital ratios could be ineffective for Islamic banks as well. Regional differences in terms of regulatory standards – in particular, the BCBS vs. IFSB implementation dilemma – risk management difficulties and *Sharia'a* compliance interpretation and constraints might explain the less-significant relation between capital and bank performance in the MENA and SEA countries.

INSERT TABLE [8] AROUND HERE

To evaluate the impact of the financial crisis, we run regressions on the periods before (1999 – 2006), during (2007 – 2009), and after the financial crisis (2010 – 2013). Table (8), Panel B only reports the results for the crisis period to save space[26] and continues to show a positive and significant association between capital, profitability, and bank efficiency, especially for the period before and during the financial crisis. The results appear to be less significant after the financial crisis for Islamic banks. In addition, there is weak evidence that complementary capital ratios, i.e. Tier 2 capital, negatively (positively) affect the efficiency of conventional (Islamic) banks before the financial crisis. However, these results become negative for Islamic banks during and after the financial crisis.

Overall, this section shows that various capital ratios (except capital-like ratios) are positively associated with bank performance, thus supporting the public interest and the moral hazard hypotheses. These results must be treated with caution for Islamic banks in SEA countries in the post financial crisis period as the results become less significant.

4.8. Robustness tests: omitted variables[27] and endogeneity concerns

We now address any concerns related to possible omitted variables by including a series of macroeconomic and macro-institutional indexes to examine the robustness of the main results. We

[26] Results for the periods before and after the financial crisis are available upon request.
[27] In other results, we use two alternative profitability and efficiency measures in a first step and four alternative capital measures in a second step. The results and explanations are available upon request.

use the GDP growth rate (gdpg) to control for the economic activity in each country. We also use three measures of the quality of banking regulation from Barth, Caprio and Levien (2013). These measures include: (i) activity restrictions (ar), an index of regulatory barriers against bank engagement in securitized market activities, insurance activities, and real estate investments (Karolyi and Taboada, 2015); (ii) supervisory power (sp), an index of 14 questions that reflect the capacity of a country's regulatory authority to take corrective actions against bank management, bank owners, and bank auditors in all circumstances (Barth et al. 2013); and market discipline and private monitoring (mdpm), a measure that reports the degree to which banks are required to disclose accurate information to the public and whether there are incentives to increase market discipline (Lee and Hsieh, 2013). Finally, we use a variable called young – a dummy variable that equals 1 if bank age is < 10 years and 0 otherwise – to control for bank age and experience (Abedifar et al., 2013).

INSERT TABLE [9] AROUND HERE

Similar to the results reported above, Tables (9) and (10) show the same results. Higher capital ratios are positively associated with the profitability and efficiency of both Islamic and conventional banks. As for additional control variables, we find that younger banks are less profitable and less efficient. Younger banks are less experienced, less reputable, more constrained by regulatory authorities and prefer not to engage in riskier activities compared to mature banks; thus they are less profitable and efficient. Our results also show evidence that the GDP growth rate is positively associated with bank profitability (Barth et al., 2013; Lee and Hsieh, 2013; Ayadi et al., 2015). Accordingly, banks in countries with favorable economic conditions are more profitable. Finally, we find that activity restrictions, market power and private monitoring are positively associated with bank profitability and efficiency. These results demonstrate that more regulatory control, constraints and intervention ameliorate Islamic and conventional bank performance in our sample of 33 countries. As for supervisory power, we find some evidence of a positive relation with bank profitability but a negative impact on bank efficiency.

INSERT TABLE [10] AROUND HERE

Despite the differences in views regarding the importance of using lagged (e.g. Demirgüç-Kunt et al., 2013; Anginer and Demirgüç-Kunt, 2014) versus non-lagged (Banker et al., 2010; Hsiao

et al. 2010; Chortareasa et al., 2012; Barth et al. 2013) independent variables when examining the impact of banking regulation, we hypothesize that regulatory ratios might take more than one year to show any pronounced effect. In addition, a one-year lag in the independent variables reduces any concerns about endogeneity.[28] Therefore, we lag our capital ratios by one year to examine the robustness of our results.[29] Our results, reported in Table (11), are very similar to the results we obtain with our main and alternative performance measures, thus confirming our earlier findings.

INSERT TABLE [11] AROUND HERE

4.9. Other estimation techniques

To further examine the interaction between capital ratios and the performance of conventional and Islamic banks, we extend Eq. (1) and perform truncated regressions in a first step and conditional quantile regressions in as second step. Barth et al. (2013) explain that efficiency scores are truncated below zero and above one hundred. Thus, the error term has double truncation. According to Simar and Wilson (2007), applying a truncated regression permits valid inferences. We use standard maximum likelihood estimation with heteroscedasticity robust standards errors clustered by banks to allow for residuals to be correlated across time and within banks. Our results, reported in Tables (12) and (13), are more pronounced than our earlier findings. The Wald Chi2 tests are highly significant for all models, which indicate that the models are good and appropriate. Finally, we employ a conditional quantile regression[30] because it allows for heterogeneous solutions to our capital proxies by conditioning on bank profitability and efficiency (less profitable/less efficient vs. highly profitable/highly efficient).

INSERT TABLE [12] AROUND HERE

[28] We also apply Instrumental Variables (IV) approach using 2 Stage Least Squares regression (2SLS) on the entire sample of Islamic and conventional banks. As instruments, we incorporate Overall Economic Freedom and the World Governance Indexes for the profitability and the efficiency models, respectively. These results provide additional support for our earlier findings and suggest that results are not driven by endogeneity.

[29] We also used lagged values of the regressors in Tables 4, 5, and 8 and alternative profitability and efficiency measures in Table A.2.1 and obtain very similar results.

[30] Quantile regression results are also robust for outliers and distributions with heavy tails. In addition, quantile regressions avoid the restrictive assumption that the error terms are identically distributed at all points of the conditional distribution.

Figures 1 and 2 plot the estimates for our quantile and least squares regressions for all capital ratios specified in the profitability (PROF1) and efficiency (EFF1) models, respectively.[31] For each covariate, we plot the quantile regression estimates for the capital ratios as a function of quantiles ranging from 0.05 to 0.95 shown as a solid curve. The shaded grey band illustrates the conventional 90 percent confidence interval, estimated using a bootstrapping technique. The long dashed line represents the OLS estimate and the two dotted lines characterize the confidence band.

INSERT TABLE [13] AROUND HERE

Risk- and non-risk based capital measures in addition to traditional capital ratios show that banks with higher capital ratios have higher profitability and efficiency. The findings are more important in magnitude as both performance measures move up towards the upper quantile. Our results can be explained by the fact that more profitable banks tend to hold higher capital buffers as retained earnings (Ariff and Can, 2008). We also note that capital-like ratios (Tier 2 ratios) derived from both risk and non-risk-based measures do not show the same pattern compared to other capital ratios; rather they show a destabilizing effect. Our results confirm the findings of Arnold et al. (2012), who suggest that the use of some capital such as Tier 1 or common equity is better than other capital such as Tier 2 capital.

INSERT FIGURE [1] AROUND HERE

Overall, we conclude the followings i) regulators have higher capital ratios for highly profitable and highly efficient banks; ii) more profitable and more efficient banks might engage in riskier investments to respond to shareholders' demand for higher profits. In fact, regulators are more flexible about the risky position of highly profitable banks as long as they maintain higher capital ratios. iii) In contrast to lowly capitalized banks, highly capitalized banks invest more in credit monitoring, activity supervision, and the competency and productivity of their employees which improves bank efficiency, and iv) quantile plots exhibit very similar patterns regarding the effect of capital ratios on both Islamic and conventional banks.

INSERT FIGURE [2] AROUND HERE

[31] The quantile regression results confirm our earlier findings. We do not report the respective tables to save space; however, they are available from the authors upon request.

5. Conclusion

This is the first study that explores the relation between BCBS/IFSB capital guidelines and the profitability and efficiency of Islamic and conventional banks. In contrast to most studies that use traditional capital ratios, we employ various forms of capital ratios in addition to several profitability and efficiency measures. Our sample consists of 656 banks – including 116 Islamic banks – across 33 countries during the period from 1999 to 2013. Our results suggest that: First, various forms of capital positively affect the profitability and efficiency of both Islamic banks and conventional banks, thus supporting the public interest and the moral hazard hypotheses. Second, capital ratios have a more pronounced impact on the operating performance of conventional banks than for Islamic banks. Third, our results appear to be affected by larger banks, too-big to-fail banks, and highly capitalized banks. In addition, we find that IFSB capital guidelines are more appropriate for the performance of Islamic banks than are BCBS guidelines. Finally, the impact of capital on bank performance is more pronounced in countries with better information disclosure, auditing, and dynamic regulatory authorities. Robustness checks show that our results are consistent when we break down the sample between different regions and time periods. Furthermore, the findings are robust to alternative performance and capital measures, additional control variables, and other estimation techniques.

There are several limitations to our study but three are worth of note. First, there is no prior theoretical or empirical literature that compares the impact of banking regulations in terms of capital ratios on the profitability and efficiency of Islamic banks. While the lack of prior research work makes the contribution of our study unique, it also means that there is no widely accepted standard to estimate the impact of BCBS/IFSB capital ratios on this type of institutions. Second, our sample lacks bank level observations especially for risk-based capital ratios such as Tier 1/rwa and total capital/rwa for both Islamic and conventional banks. Third, we are unable to use market indicators such as stock returns because of a lack of bank observations. Once more data becomes available, future studies should be able to examine the relations between capital and bank performance using reasonably large samples to conduct regressions.

Our work is important given the renewed focus on the regulation of conventional banks. It also poses several questions about the regulatory framework for Islamic banks. Indeed, future work

should determine an appropriate regulatory framework for Islamic banks. Islamic regulatory organizations should use Islamic financial principles and concepts to create their own set of ratios rather than imitating the Basel framework. However, we do not call upon Islamic banks to escape the BCBS/IFSB framework, rather we believe that the existence of IFSB capital guidelines is welcomed and can serve as a cornerstone for more detailed capital guidelines that not only consider the particularities but also the heterogeneity of Islamic banks across countries.

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Tables

Table 1.A
Summary of the descriptive statistics

Label	N	Mean	Median	Std Dev.	Min.	Max.	Islamic banks (IBs) Mean	Conventional banks (CBs) Mean	Two-sample t-test (CB-IB)
Performance variables									
PROF 1	8322	1.14	1.11	2.48	-17.15	16.67	1.21	1.12	-0.77
PROF 2	6717	1.55	1.41	2.52	-9.05	17.46	1.88	1.48	-3.64***
EFF 1	6635	49.56	44.56	25.48	0	100	52.36	49.06	-3.57***
EFF 2	5200	63.11	59.92	24.01	0	100	67	62.52	-4.4***
Alternative performance variables									
NIMP	8195	3.99	3.39	3.24	-6.27	28.23	4.27	3.94	-2.5**
FEEAAP	6669	1.16	0.73	1.42	-0.23	13.32	1.26	1.14	-1.91*
EFF3	6635	56.73	52.12	26	0	100	75.3	53.38	-25.0***
EFF4	5200	69.38	67.36	23.17	0	100	86.37	66.84	-23.43***
Main variables									
Tier 1/rwa	3692	18.34	14.58	12.03	7.51	79.8	24.31	16.81	-10.55***
Tier 2/rwa	3634	2.06	1.38	1.96	0	8.7	1.35	2.24	13.11***
Total capital/rwa	4988	21.23	19.97	12.61	9.43	86	26.23	20.2	-8.53***
Tier 1/ta	3606	12.02	9.47	9.64	3.22	73.86	17.64	10.88	-9.03***
Tier 2/ta	3530	1.44	0.89	1.69	0	11.26	0.95	1.53	10.2***
Total capital/ta	3818	13.33	10.83	9.66	3.57	75.57	18.54	12.34	-8.24***
Common equity/ta	8398	14.82	10.3	14.45	2.64	82.42	20.96	13.62	-12.44***
Tangible equity/ta	8399	14.96	10.53	14.53	2.81	84.4	21.34	13.71	-12.67***
Control variables									
Size	8399	13.95	13.85	2.02	9.69	19.89	13.74	13.99	4.64***
Growth assets	7647	18.26	12.9	30.37	-44.71	220.18	27.04	16.59	-9.44***
Net loans/ta	8280	48.69	50.83	22.95	0.03	98.85	47.78	48.86	1.48***
Fixed assets/ta	8139	1.99	1.22	2.44	0.002	17.23	2.75	1.85	-9.9***
Non-operating income	8193	63.07	66.8	23.37	-21.21	97.85	58.34	64.00	6.63***
Macro-economics and institutional variables									
Young	8399	0.12	0.05	0.32	0	1			
gdpg	495	4.14	4.3	3.96	-33.1	54.15			
ar	495	9.32	10	3.2	4	16			
sp	495	11.27	12	2.16	4	16			
mdpm	495	6.18	6	1.25	3	9			
cs	495	5.82	6	1.25	3	8			
disclosure	495	2.06	2	0.55	0	3			
audit	495	1.93	2	0.29	0	2			
rated	495	17.45	10	27.96	0	100			
ats	495	8.28	8	4.25	2	25			
Eco_index	495	62.5	60.1	11.48	15.6	88.9			
Other variables									
IFSB	33	0.04	0.00	0.2	0	1			
Basel	33	0.96	1	0.2	0	1			
Member type (full member)	33	0.47	0.00	0.5	0	1			
Member type (observer member)	33	0.74	1	0.44	0	1			
Non-member (other than full members)	33	0.52	1	0.5	0	1			
Non-member (other than obs. members)	33	0.26	0.00	0.44	0	1			

Note: The sample covers 656 banks from 33 countries. Variable definitions are available in Appendix A.2.

Table 1.B
Number of banks and years covered in the sample

	Tier 1/rwa		Tier 2/rwa		Total capital/rwa		Common equity/ta	
Year	# CBs	# IBs	# CBs	# IBs	# CBs	# IBs	# CBs	# IBs
1999	45	2	43	2	139	11	377	44
2000	50	3	48	3	154	12	394	48
2001	57	4	57	4	148	13	359	47
2002	77	7	76	7	171	18	371	57
2003	101	16	101	15	185	22	378	60
2004	137	24	136	23	210	26	421	60
2005	168	30	165	28	246	31	469	79
2006	216	49	213	47	283	53	485	90
2007	259	73	256	71	321	74	499	108
2008	282	85	279	84	331	94	508	123
2009	310	95	306	95	358	100	522	131
2010	310	95	304	92	368	100	542	133
2011	302	93	298	91	398	105	569	139
2012	306	88	302	87	420	101	590	139
2013	319	89	313	88	398	98	540	116

Table 2

Capital and bank profitability: Islamic vs. conventional banks

Variables	PROF1 [1]	PROF1 [2]	PROF1 [3]	PROF1 [4]	PROF1 [5]	PROF1 [6]	PROF1 [7]	PROF1 [8]
Tier 1/rwaxIBDV (β_1)	0.027*							
	(0.0155)							
Tier 1/rwaxCBDV (β_2)	0.057***							
	(0.01)							
Tier 2/rwaxIBDV (β_1)		-0.035						
		(0.0758)						
Tier 2/rwaxCBDV		-0.003						
(β_2)		(0.0292)						
Total capital/rwa			0.028**					
xIBDV (β_1)			(0.0123)					
Total capital/rwa			0.052***					
xCBDV (β_2)			(0.0072)					
Tier 1/ta xIBDV (β_1)				0.045*				
				(0.0265)				
Tier 1/ta xCBDV (β_2)				0.088***				
				(0.0165)				
Tier 2/ta xIBDV (β_1)					-0.085			
					(0.1235)			
Tier 2/ta xCBDV (β_2)					0.076**			
					(0.036)			
Total capital/ta xIBDV						0.044*		
(β_1)						(0.0256)		
Total capital/ta						0.083***		
xCBDV (β_2)						(0.0155)		
Common equity/ta							0.043***	
xIBDV (β_1)							(0.0216)	
Common equity/ta							0.065***	
xCBDV (β_2)							(0.0064)	
Tangible equity/ta								0.046***
xIBDV (β_1)								(0.0125)
Tangible equity/ta								0.069***
xCBDV (β_2)								(0.0066)
Constant	-1.946**	0.712	-1.73**	-2.57***	0.555	-1.993**	-2.364***	-2.476***
	(0.8179)	(0.8868)	(0.7315)	(0.924)	(0.9037)	(0.8922)	(0.5819)	(0.5822)
Observations	3261	3213	4433	3312	3247	3513	7203	7203
Country & year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
H0: $\beta_1 = \beta_2$ (F-test)	7.69***	0.19	6.21**	5.78**	1.81	5.34**	3.56*	4.15**
R-squared	0.2267	0.1857	0.1987	0.2226	0.1767	0.2178	0.1813	0.1875
Variables	PROF2 [1]	PROF2 [2]	PROF2 [3]	PROF2 [4]	PROF2 [5]	PROF2 [6]	PROF2 [7]	PROF2 [8]
Tier 1/rwaxIBDV (β_1)	0.043***							
	(0.0152)							
Tier 1/rwaxCBDV	0.06***							
(β_2)	(0.0114)							
Tier 2/rwaxIBDV		0.018						
(β_1)		(0.0867)						
Tier 2/rwaxCBDV		-0.029						
(β_2)		(0.0362)						
Total capital/rwa			0.042***					
xIBDV (β_1)			(0.012)					
Total capital/rwa			0.059***					
xCBDV(β_2)			(0.0087)					
Tier 1/ta xIBDV (β_1)				0.067***				
				(0.0224)				
Tier 1/ta xCBDV				0.092***				
(β_2)				(0.0171)				
Tier 2/ta xIBDV					0.069			
(β_1)					(0.1432)			
Tier 2/ta xCBDV					0.07*			
(β_2)					(0.0415)			
Total capital/ta xIBDV						0.067***		
(β_1)						(0.022)		
Total capital/ta						0.092***		
xCBDV (β_2)						(0.0159)		
Common equity/ta							0.061***	
xIBDV (β_1)							(0.011)	
Common equity/ta							0.073***	
xCBDV (β_2)							(0.0078)	
Tangible equity/ta								0.062***
xIBDV (β_1)								(0.0109)
Tangible equity/ta								0.077***
xCBDV (β_2)								(0.0079)

Constant	-1.833*	1.095	-1.357	-2.694**	0.755	-2.107**	-2.382***	-2.485***
	(1.001)	(1.0969)	(0.9277)	(1.0493)	(1.0968)	(1.0557)	(0.736)	(0.7379)
Observations	2685	2640	3808	2720	2658	2915	6302	6302
Bank level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country & year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
H0: $\beta_1 = \beta_2$ (F-test)	2.47	0.30	2.98*	2.12	0.00	2.50	1.32	1.87
R-squared	0.2736	0.2317	0.2380	0.2831	0.2274	0.2733	0.2185	0.2241

(Continued)

Notes: Variable definitions are available in Appendix A.2. PROF1 is the ratio of net income to three year average assets. PROF2 is the ratio of operating profit to three year average assets. Standard errors are clustered at the bank level and are reported in parentheses below their coefficient estimates.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level

Table 3

Capital and bank efficiency: Islamic vs. conventional banks

Variables	EFF1 [1]	EFF1 [2]	EFF1 [3]	EFF1 [4]	EFF1 [5]	EFF1 [6]	EFF1 [7]	EFF1 [8]
Tier 1/rwaxIBDV (β_1)	0.4***							
	(0.0742)							
Tier 1/rwaxCBDV (β_2)	0.509***							
	(0.0807)							
Tier 2/rwaxIBDV (β_1)		-1.206**						
		(0.5175)						
Tier 2/rwaxCBDV (β_2)		-0.16						
		(0.2439)						
Total capital/rwa xIBDV (β_1)			0.416***					
			(0.0592)					
Total capital/rwa xCBDV (β_2)			0.504***					
			(0.0636)					
Tier 1/ta xIBDV (β_1)				0.59***				
				(0.0881)				
Tier 1/ta xCBDV (β_2)				0.912***				
				(0.134)				
Tier 2/ta xIBDV (β_1)					-0.751			
					(0.8174)			
Tier 2/ta xCBDV (β_2)					0.271			
					(0.3688)			
Total capital/ta xIBDV (β_1)						0.606***		
						(0.0918)		
Total capital/ta xCBDV (β_2)						0.911***		
						(0.1204)		
Common equity/ta xIBDV (β_1)							0.573***	
							(0.0575)	
Common equity/ta xCBDV (β_2)							0.655***	
							(0.0624)	
Tangible equity/ta xIBDV (β_1)								0.572***
								(0.0567)
Tangible equity/ta xCBDV (β_2)								0.669***
								(0.0629)
Constant	2.446	26.621***	-6.165	-5.26	22.234***	-4.419	-8.497	-8.173
	(7.7858)	(8.3823)	(6.8368)	(8.2858)	(8.4446)	(8.1818)	(6.5672)	(6.6006)
Observations	2456	2411	3571	2466	2405	2662	6043	6043
Country & year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
H0: $\beta_1 = \beta_2$ (F-test)	0.182	3.71*	2.02	8.55***	1.59	9.98***	1.62	2.33
R-squared	0.6321	0.617	0.6067	0.6346	0.6054	0.6369	0.5438	0.5449
Variables	EFF2 [1]	EFF2 [2]	EFF2 [3]	EFF2 [4]	EFF2 [5]	EFF2 [6]	EFF2 [7]	EFF2 [8]
Tier 1/rwaxIBDV (β_1)	0.518***							
	(0.0977)							
Tier 1/rwaxCBDV (β_2)	0.734***							
	(0.0819)							
Tier 2/rwaxIBDV (β_1)		-1.197						
		(0.7305)						
Tier 2/rwaxCBDV (β_2)		-0.453*						
		(0.2541)						
Total capital/rwa xIBDV (β_1)			0.487***					
			(0.0793)					
Total capital/rwa xCBDV(β_2)			0.617***					
			(0.0648)					
Tier 1/ta xIBDV (β_1)				0.644***				
				(0.1478)				
Tier 1/ta xCBDV (β_2)				1.146***				
				(0.1462)				
Tier 2/ta xIBDV (β_1)					-1.127			
					(1.016)			
Tier 2/ta xCBDV (β_2)					-0.243			
					(0.3602)			
Total capital/ta xIBDV (β_1)						0.648***		
						(0.143)		
Total capital/ta xCBDV (β_2)						1.047***		
						(0.129)		
Common equity/ta xIBDV (β_1)							0.653***	
							(0.0749)	
Common equity/ta xCBDV (β_2)							0.752***	
							(0.0576)	
Tangible equity/ta xIBDV (β_1)								0.656***
								(0.0745)
Tangible equity/ta xCBDV (β_2)								0.758***
								(0.0578)

Constant	10.264	38.93***	18.286**	13.68*	43.125***	15.613**	14.771**	15.314**
	(7.3938)	(7.543)	(7.064)	(8.2642)	(7.9069)	(7.6859)	(6.3403)	(6.3957)
Observations	2149	2124	3061	2133	2080	2290	4780	4780
Bank level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
H0: $\beta_1 = \beta_2$ (F-test)	5.57**	1.02	3.16*	13.51***	0.78	10.89***	1.61	1.77
R-squared	0.5625	0.5303	0.5596	0.5438	0.501	0.5496	0.5239	0.5247

(Continued)

Notes: Variable definitions are available in Appendix A.2. EFF1 is a basic gross efficiency score model in which we do not control for the risk in bank inputs. EFF2 is a basic gross efficiency score model in which we introduce loan loss provisions to control for risk in bank inputs. Standard errors are clustered at the bank level and are reported in parentheses below their coefficient estimates.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

Table 4

Capital, bank size, and too big to fail banks

Panel A: size															
Variables	PROF1				PROF2				EFF1				EFF2			
	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2
Tier 1/rwaxIBDV	0.158	3261	10.38***	0.221	0.275***	2685	4.25**	0.2697	0.009	2456	2.59	0.5548	0.021***	2149	7.81***	0.5082
	(0.1027)				(0.104)				(0.0063)				(0.0074)			
Tier 1/rwaxCBDV	0.388***				0.428***				0.019***				0.039***			
	(0.0686)				(0.08)				(0.0065)				(0.0062)			
Tier 2/rwaxIBDV	-0.237	3218	0.39	0.1839	0.05	2640	0.13	0.2303	-0.075**	2411	15.44***	0.5606	-0.082*	2124	5.34	0.4911
	-0.4731)				(0.5238)				(0.0351)				(0.0486)			
Tier 2/rwaxCBDV	0.042				-0.131				0.07***				0.031			
	(0.1796)				(0.2116)				(0.0195)				(0.019)			
Total capital/rwa	0.199**	4433	7.47***	0.1958	0.309***	3808	3.72*	0.2375	0.017***	3571	5.46**	0.5351	0.025***	3061	7.25***	0.5179
xIBDV	(0.087)				(0.088)				(0.0049)				(0.0062)			
Total capital/rwa	0.377***				0.439***				0.028***				0.039***			
xCBDV	(0.0529)				(0.0654)				(0.005)				(0.0048)			
Tier 1/ta xIBDV	0.239	3312	6.06**	0.2106	0.396**	2720	1.96	0.2682	0.009	2466	1.71	0.5285	0.018*	2123	8.96***	0.4765
	(0.1771)				(0.1582)				(0.0073)				(0.0103)			
Tier 1/ta xCBDV	0.537***				0.562***				0.021**				0.047***			
	(0.1081)				(0.1152)				(0.0104)				(0.0105)			
Tier 2/ta xIBDV	-0.641	3247	2.46	0.1746	0.211	2658	0.06	0.2254	-0.074	2405	5.87**	0.5278	-0.098	2080	2.74*	0.4605
	(0.7243)				(0.8224)				(0.054)				(0.0676)			
Tier 2/ta xCBDV	0.442*				0.391				0.056**				0.013			
	(0.2429)				(0.2751)				(0.0259)				(0.0243)			
Total capital/ta xIBDV	0.249	3513	5.92**	0.2072	0.406**	2915	2.4	0.2598	0.014*	2662	4.55**	0.5356	0.021**	2290	8.86***	0.4834
	(0.1731)				(0.1566)				(0.0073)				(0.01)			
Total capital/ta	0.524***				0.577***				0.03***				0.047***			
xCBDV	(0.1047)				(0.1084)				(0.0094)				(0.0093)			
Common equity/ta	0.298***	7203	5.26**	0.1799	0.43***	6302	2.74*	0.2185	0.024***	6043	0.42	0.469	0.032***	4780	1.47	0.471
xIBDV	(0.0937)				(0.0841)				(0.0046)				(0.0058)			
Common equity/ta	0.493***				0.564***				0.027***				0.039***			
xCBDV	(0.0465)				(0.0566)				(0.0055)				(0.0048)			
Tangible equity/ta	0.317***	7203	5.92**	0.1859	0.443***	6302	3.5*	0.2238	0.024***	6043	0.72	0.4701	0.032***	4780	1.61	0.4722
xIBDV	(0.0933)				(0.0832)				(0.0045)				(0.0058)			
Tangible equity/ta	0.52***				0.59***				0.028***				0.04***			
xCBDV	(0.0475)				(0.0572)				(0.0055)				(0.0048)			
Panel B: Too big to fail																
Variables	PROF1				PROF2				EFF1				EFF2			
	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2
Tier 1/rwaxIBDV	0.024*	3261	0.03	0.1907	0.025*	2685	0.19	0.2358	0.396***	2456	6.34	0.5836	0.415***	2149	3.32*	0.5171
	(0.0128)				(0.0143)				(0.1187)				(0.1301)			
Tier 1/rwaxCBDV	0.022***				0.019**				0.72***				0.667***			
	(0.0077)				(0.0088)				(0.093)				(0.0867)			
Tier 2/rwaxIBDV	-0.029	3213	0.00	0.1842	-0.017	2640	0.14	0.2312	-0.548	2411	18.22***	0.5711	-0.692	2124	4.56**	0.4981
	(0.0735)				(0.0717)				(0.5663)				(0.9404)			
Tier 2/rwaxCBDV	-0.027				-0.04				2.003***				1.34***			
	(0.0256)				(0.0294)				(0.3533)				(0.3411)			
Total capital/rwa	0.011	4433	0.18	0.1534	0.013	3808	0.61	0.1887	0.364***	3571	6.22**	0.5561	0.369***	3061	2.53	0.5176
xIBDV	(0.0114)				(0.0127)				(0.1092)				(0.1215)			

Total capital/rwa xCBDV	0.007 (0.0059)				0.003 (0.0068)				0.646*** (0.0723)				0.564*** (0.0672)			
Tier 1/ta xIBDV	0.027 (0.0184)	3312	0.06	0.179	0.023 (0.0204)	2720	0.19	0.2306	0.551*** (0.1463)	2466	7.72***	0.5522	0.58*** (0.1548)	2123	5.12**	0.4865
Tier 1/ta xCBDV	0.022* (0.0132)				0.014 (0.0143)				0.996*** (0.1425)				0.967*** (0.1467)			
Tier 2/ta xIBDV	-0.135 (0.0899)	3247	1.23	0.1719	-0.124 (0.0781)	2658	0.85	0.2249	-0.226 (0.8471)	2405	8.48***	0.5367	-0.702 (1.2293)	2080	3.53*	0.4664
Tier 2/ta xCBDV	-0.037 (0.0364)				-0.055 (0.0394)				2.377*** (0.4708)				1.621*** (0.4816)			
Total capital/ta xIBDV	0.016 (0.0161)	3513	0.00	0.1708	0.015 (0.0186)	2915	0.04	0.2165	0.526*** (0.1386)	2662	6.93***	0.5594	0.529*** (0.1559)	2290	3.97**	0.4935
Total capital/ta xCBDV	0.016 (0.0109)				0.012 (0.0123)				0.923*** (0.1153)				0.851*** (0.1146)			
Common equity/ta xIBDV	0.019 (0.0169)	7203	0.10	0.1238	0.017 (0.0156)	6302	0.09	0.1445	0.303** (0.1316)	6043	16.07***	0.4718	0.437*** (0.1273)	4780	6.51	0.4601
Common equity/ta xCBDV	0.024** (0.0094)				0.022* (0.0117)				0.894*** (0.1032)				0.808*** (0.1071)			
Tangible equity/ta xIBDV	0.02 (0.017)	7203	0.06	0.124	0.0168 (0.015)	6302	0.07	0.1445	0.292** (0.1301)	6043	15.87***	0.4717	0.442*** (0.1271)	4780	5.8**	0.4603
Tangible equity/ta xCBDV	0.024*** (0.0092)				0.021* (0.0116)				0.869*** (0.1011)				0.79*** (0.1072)			

(Continued)

Notes: Variable definitions are available in Appendix A.2. PROF1 is the ratio of net income to three year average assets. PROF2 is the ratio of operating profit to three year average assets. EFF1 is a basic gross efficiency score model in which we do not control for the risk in bank inputs. EFF2 is a basic gross efficiency score model in which we introduce loan loss provisions to control for risk in bank inputs. Standard errors are clustered at the bank level and are reported in parentheses below their coefficient estimates.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

Table 5

Highly capitalized banks

Variables	PROF1				PROF2				EFF1				EFF2			
	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2
Panel A: Adequately capitalized banks: Tier1= 4%; CAR=8%																
Tier 1/rwaxIBDV	0.025	3261	6.66**	0.2261	0.041**	2685	2.32	0.2738	0.392***	2456	1.73	0.6321	0.49***	2149	6.18**	0.563
	(0.0166)				(0.0161)				(0.0772)				(0.1021)			
Tier 1/rwaxCBDV	0.059***				0.062***				0.514***				0.753***			
	(0.0097)				(0.0113)				(0.0838)				(0.0835)			
Total capital/rwa	0.026*	4433	4.23**	0.1972	0.039***	3808	2.41	0.2379	0.396***	3571	2.26	0.6068	0.446***	3061	4.06**	0.56
xIBDV	(0.0146)				(0.0139)				(0.0632)				(0.0877)			
Total capital/rwa	0.053***				0.06***				0.513***				0.634***			
xCBDV	(0.007)				(0.0089)				(0.0673)				(0.067)			
Panel B: Well capitalized banks:Tier1= 6%; CAR=10%																
Tier 1/rwaxIBDV	0.024	3261	6.05**	0.2261	0.04**	2685	2.22	0.2739	0.388***	2456	1.69	0.632	0.474***	2149	6.53**	0.5632
	(0.0174)				(0.0167)				(0.0791)				(0.1048)			
Tier 1/rwaxCBDV	0.06***				0.062***				0.517***				0.763***			
	(0.0095)				(0.0114)				(0.0856)				(0.0846)			
Total capital/rwa	0.026*	4433	3.68*	0.1966	0.039***	3808	2.24	0.2378	0.39***	3571	2.31	0.6069	0.433***	3061	4.32**	0.5601
xIBDV	(0.0154)				(0.0145)				(0.0645)				(0.0903)			
Total capital/rwa	0.054***				0.06***				0.516***				0.639***			
xCBDV	(0.0069)				(0.0091)				(0.0685)				(0.0678)			
Panel C: Highly capitalized banks																
Tier 1/rwaxIBDV	0.1	3261	1.303*	0.2068	0.623*	2685	0.37	0.2519	8.591***	2456	0.12	0.6233	10.909***	2149	0.02	0.5495
	(04039)				(0.3643)				(3.1009)				(3.127)			
Tier 1/rwaxCBDV	0.85***				0.857***				7.389***				11.362***			
	(0.1309)				(0.1604)				(1.4429)				(1.5253)			
Total capital/rwa	0.287	4433	1.71	0.1779	0.841*	3808	0.26	0.2185	10.207***	3571	0.24	0.5938	12.08***	3061	0.00	0.55
xIBDV	(0.4791)				(0.4494)				(3.0737)				(3.1024)			
Total capital/rwa	0.938***				1.081***				8.606***				11.9***			
xCBDV	(0.1285)				(0.1726)				(1.4088)				(1.3959)			

Notes: Variable definitions are available in Appendix A.2. PROF1 is the ratio of net income to three year average assets. PROF2 is the ratio of operating profit to three year average assets. EFF1 is a basic gross efficiency score model in which we do not control for the risk in bank inputs. EFF2 is a basic gross efficiency score model in which we introduce loan loss provisions to control for risk in bank inputs. Standard errors are clustered at the bank level and are reported in parentheses below their coefficient estimates.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

Table 6
Institutional environment

Variables	PROF1				PROF2				EFF1				EFF2			
	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2
	Panel A : (Tier 1 + Tier 2)/rwa								Panel B: (Tier 1 + Tier 2)/ta							
Capital ratio	0.004*	3474	3.62*	0.1783	0.006***	2919	1.11	0.2344	0.006	2852	3.03*	0.1895	0.01***	2314	1.22	0.2689
xIBDVxCS	(0.008)				(0.0023)				(0.0044)				(0.0035)			
Capital ratio	0.008***				0.008***				0.012***				0.013***			
xCBDVxCS	(0.0013)				(0.0015)				(0.0028)				(0.0029)			
Capital ratio	0.012*	3385	4.56**	0.1812	0.018***	2830	1.62	0.2379	0.017	2755	1.95	0.1909	0.029***	2217	0.38	0.2719
xIBDVxdisclosure	(0.0072)				(0.007)				(0.0129)				(0.0109)			
Capital ratio	0.024***				0.026***				0.03***				0.034***			
xCBDVxdisclosure	(0.0038)				(0.0044)				(0.0075)				(0.0078)			
Capital ratio	0.013*	3541	4.81**	0.1824	0.019***	2986	1.67	0.2334	0.02	2896	3.63*	0.1965	0.032***	2358	1.2	0.2679
xIBDVxaudit	(0.0072)				(0.0068)				(0.0134)				(0.0113)			
Capital ratio	0.025***				0.026***				0.038***				0.042***			
xCBDVxaudit	(0.0037)				(0.0043)				(0.008)				(0.0084)			
Capital ratio	0.029	2834	0.33	0.1495	0.175*	2328	0.6	0.2074	0.207	2376	0.01	0.1823	0.45**	1881	0.69	0.2638
xIBDVxrated	(0.0975)				(0.0961)				(0.2361)				(0.2151)			
Capital ratio	0.083***				0.104***				0.205***				0.28***			
xCBDVxrated	(0.0213)				(0.0274)				(0.0497)				(0.0944)			
Capital ratio	0.002	1700	0.68	0.1966	0.003	1635	0.01	0.2336	0.005	1231	1.2	0.2277	0.009**	1174	0.06	0.2776
xIBDVxATS	(0.0021)				(0.0021)				(0.0041)				(0.004)			
Capital ratio	0.004***				0.003**				0.009***				0.01***			
xCBDVxATS	(0.0013)				(0.0013)				(0.0031)				(0.0035)			
Capital ratio	0.003*	3539	5.04**	0.1837	0.005***	2984	1.79	0.2361	0.005	2894	3.72*	0.1961	0.008***	2356	1.42	0.2703
xIBDVxentry_req	(0.0018)				(0.0017)				(0.0034)				(0.0029)			
Capital ratio	0.007***				0.007***				0.01***				0.011***			
xCBDVxentry_req	(0.001)				(0.0011)				(0.0021)				(0.0021)			
Capital ratio	0.046**	4133	6.07**	0.1887	0.07***	3509	2.73*	0.2192	0.057	3315	6.09**	0.2112	0.089***	2717	2.65	0.2703
xIBDVxeco_index	(0.0226)				(0.0216)				(0.0386)				(0.0341)			
Capital ratio	0.0866***				0.097***				0.119***				0.129***			
xCBDVxeco_index	(0.0126)				(0.0144)				(0.0248)				(0.0249)			

Notes: Variable definitions are available in Appendix A.2. PROF1 is the ratio of net income to three year average assets. PROF2 is the ratio of operating profit to three year average assets. EFF1 is a basic gross efficiency score model in which we do not control for the risk in bank inputs. EFF2 is a basic gross efficiency score model in which we introduce loan loss provisions to control for risk in bank inputs. Standard errors are clustered at the bank level and are reported in parentheses below their coefficient estimates.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

Table 7

Extended analysis for Islamic banks: BCBS vs. IFSB guidelines

Panel A.: comparing BCBS and IFSB guidelines															
Variables	PROF1				PROF2				EFF1				EFF2			
	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2
Tier 1/rwaxIFSB	0.074*	536	1.4	0.2961	0.056	423	2.59	0.3455	0.268*	345	0.06	0.4327	0.376**	282	0.01	0.418
	(0.043)				(0.0355)				(0.1591)				(0.1637)			
Tier 1/rwaxBasel	0.016				-0.01				0.327*				0.376			
	(0.0204)				(0.0206)				(0.1709)				(0.2327)			
Total capital/rwaxIFSB	0.081**	618	1.22	0.287	0.068**	501	1.12	0.3684	0.257**	422	0.11	0.403	0.357***	341	0.1	0.3963
	(0.0314)				(0.0262)				(0.1214)				(0.1173)			
Total capital/rwaxBasel	0.038				0.031				0.192				0.276			
	(0.0259)				(0.0248)				(0.1461)				(0.2196)			
Panel B : Controlling for countries memberships																
	Full member								Observer member							
Variables	PROF1				EFF1				PROF1				EFF1			
	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2
Tier 1/rwaxmember_type	0.057**	536	5.85**	0.296	0.33***	345	7.05***	0.4376	0.051*	536	1.65	0.2868	0.314***	345	7.57***	0.4378
	(0.0273)				(0.1174)				(0.0264)				(0.117)			
Tier 1/rwaxnon_member	-0.54				-0.223				0.01				-0.528			
	(0.0361)				(0.1888)				(0.0218)				(0.3181)			
Total capital/rwa	0.071***	618	11.57***	0.2946	0.257***	422	0.63	0.4051	0.063***	618	3.48*	0.2808	0.242**	422	5.58**	0.4064
xmember_type	(0.0224)				(0.0892)				(0.0216)				(0.0935)			
Total capital/rwa	-0.044*				-0.057				0.007				-0.542			
xnon_member	(0.0247)				(0.3903)				(0.0219)				(0.328)			

Notes: Variable definitions are available in Appendix A.2. PROF1 is the ratio of net income to three year average assets. PROF2 is the ratio of operating profit to three year average assets. EFF1 is a basic gross efficiency score model in which we do not control for the risk in bank inputs. EFF2 is a basic gross efficiency score model in which we introduce loan loss provisions to control for risk in bank inputs. Standard errors are clustered at the bank level and are reported in parentheses below their coefficient estimates.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

Table 8

Capital and bank profitability / efficiency: A sub-sample comparison

Panel A: GCC countries

Variables	PROF1				PROF2				EFF1				EFF2			
	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2
Tier 1/rwaxIBDV	0.075***	640	2.72	0.3289	0.074***	629	0.35	0.3881	0.733***	618	0.48	0.5457	0.788***	549	0.38	0.4312
	(0.0275)				(0.0256)				(0.1525)				(0.1699)			
Tier 1/rwaxCBDV	0.103***				0.082***				0.605***				0.682***			
	(0.0282)				(0.0246)				(0.194)				(0.1944)			
Tier 2/rwaxIBDV	0.181	638	1.42	0.2788	0.187	627	2.15	0.3306	-1.646**	616	0.19	0.4971	-0.734	549	0.23	0.3726
	(0.1467)				(0.1408)				(0.8225)				(1.0297)			
Tier 2/rwaxCBDV	0.028				0.012				-1.234*				-1.26*			
	(0.0589)				(0.0538)				(0.7256)				(0.728)			
Total capital/rwa xIBDV	0.079***	742	1.34	0.3412	0.078***	731	0.03	0.4012	0.675***	719	0.71	0.5454	0.753***	644	1.05	0.4536
	(0.0249)				(0.0236)				(0.1467)				(0.1489)			
Total capital/rwa xCBDV	0.096***				0.08***				0.545***				0.61***			
	(0.0226)				(0.0198)				(0.1611)				(0.1517)			
Tier 1/ta xIBDV	0.071*	583	5.33**	0.3015	0.092***	572	2.08	0.399	0.701***	563	0.87	0.6126	0.888**	498	0.17	0.4972
	(0.0392)				(0.0281)				(0.1761)				(0.1799)			
Tier 1/ta xCBDV	0.12***				0.118***				0.858***				0.963***			
	(0.0394)				(0.0304)				(0.1915)				(0.2294)			
Tier 2/ta xIBDV	0.174	575	0.33	0.2502	0.219	564	1.07	0.3052	-1.465	555	0.6	0.5719	-0.349	491	0.07	0.4383
	(0.2015)				(0.2051)				(1.1773)				(1.4875)			
Tier 2/ta xCBDV	0.077				0.049				-0.584				-0.737			
	(0.0866)				(0.0795)				(0.5542)				(0.64242)			
Total capital/ta xIBDV	0.074*	636	4.29**	0.3025	0.094***	625	1.35	0.3957	0.779***	615	0.47	0.6217	1.01***	546	0.00	0.5278
	(0.0404)				(0.0292)				(0.1815)				(0.1603)			
Total capital/ta xCBDV	0.114***				0.112***				0.887***				1.023***			
	(0.0365)				(0.0281)				(0.1835)				(0.1863)			
Common equity/ta xIBDV	0.073***	870	2.07	0.2982	0.084***	859	0.8	0.3577	0.684***	835	0.02	0.5466	0.911***	729	0.39	0.5014
	(0.0206)				(0.017)				(0.1242)				(0.1181)			
Common equity/ta xCBDV	0.097***				0.096***				0.662***				0.82***			
	(0.021)				(0.01672)				(0.1969)				(0.1792)			
Tangible equity/ta xIBDV	0.073***	870	2.12	0.3001	0.082***	859	0.81	0.3574	0.654***	835		0.5435	0.902***	729	0.2	0.5035
	(0.0201)				(0.0164)				(0.1261)				(0.1198)			
Tangible equity/ta xCBDV	0.096***				0.094***				0.658***				0842***			
	(0.0208)				(0.0169)				(0.1967)				(0.1755)			

Panel B: During the financial crisis

Variables	PROF1				PROF2				EFF1				EFF2			
	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2
Tier 1/rwaxIBDV	-0.006	1428	21.2***	0.2015	0.013	863	9.14***	0.2669	0.402***	670	0.91	0.6036	0.165	575	3.6*	0.5548
	(0.0124)				(0.0182)				(0.1111)				(0.1987)			
Tier 1/rwaxCBDV	0.044***				0.058**				0.551***				0.548***			
	(0.0118)				(0.0224)				(0.1338)				(0.1286)			
Tier 2/rwaxIBDV	-0.15**	1419	8.1***	0.162	-0.146**	857	6.5**	0.2303	-0.629	664	0.43	0.5856	-1.219	573	2.19	0.5395
	(0.0652)				(0.057)				(0.9389)				(1.1499)			
Tier 2/rwaxCBDV	0.067				0.031				-0.015				0.474			
	(0.0614)				(0.0792)				(0.3483)				(0.3953)			
Total capital/rwa xIBDV	0.01	1787	10.03***	0.1815	0.033*	1185	4.43**	0.26	0.399***	985	6.68**	0.6145	0.389*	816	1.3	0.5763
	(0.0163)				(0.0192)				(0.0734)				(0.2114)			

Total capital/rwa xCBDV	0.051*** (0.011)				0.07*** (0.0173)				0.654*** (0.1007)				0.625*** (0.1097)			
Tier 1/ta xIBDV	-0.002 (0.0168)	1392	24.78***	0.199	0.012 (0.0191)	811	10.3***	0.2691	0.629*** (0.1457)	606	2.84*	0.6183	0.326 (0.2143)	522	5.15**	0.5226
Tier 1/ta xCBDV	0.074*** (0.019)				0.08*** (0.0292)				1.019*** (0.2351)				0.99*** (0.2731)			
Tier 2/ta xIBDV	-0.181 (0.1196)	1379	7.4***	0.1816	-0.068 (0.0862)	801	8.31***	0.2467	0.917 (1.552)	597	0.1	0.5708	0.293 (1.5719)	516	0.26	0.4889
Tier 2/ta xCBDV	0.215** (0.0822)				0.209* (0.1084)				0.403 (0.5815)				1.087 (0.7841)			
Total capital/ta xIBDV	0.005 (0.0172)	1413	19.97***	0.2125	0.19 (0.0198)	826	9.59***	0.2684	0.539*** (0.1395)	624	6.56**	0.6288	0.336* (0.1775)	535	6.25**	0.5351
Total capital/ta xCBDV	0.074*** (0.0169)				0.086*** (0.0259)				1.064*** (0.2132)				0.961*** (0.2411)			
Common equity/ta xIBDV	0.026 (0.0239)	2196	5.74**	0.1572	0.043 (0.0271)	1438	2.55	0.2024	0.695*** (0.1931)	1201	0.05	0.5437	0.643* (0.337)	960	0.01	0.5246
Common equity/ta xCBDV	0.08*** (0.0143)				0.087*** (0.0202)				0.747*** (0.162)				0.604*** (0.1877)			
Tangible equity/ta xIBDV	0.03 (0.0252)	2196	5.86***	0.1659	0.046 (0.0283)	1438	2.88*	0.211	0.722*** (0.1969)	1201	0.14	0.549	0.662* (0.3423)	960	0.01	0.5286
Tangible equity/ta xCBDV	0.086*** (0.0149)				0.096*** (0.0214)				0.811*** (0.1614)				0.649*** (0.1876)			

(Continued)

Notes: Variable definitions are available in Appendix A.2. PROF1 is the ratio of net income to three year average assets. PROF2 is the ratio of operating profit to three year average assets. EFF1 is a basic gross efficiency score model in which we do not control for the risk in bank inputs. EFF2 is a basic gross efficiency score model in which we introduce loan loss provisions to control for risk in bank inputs. Standard errors are clustered at the bank level and are reported in parentheses below their coefficient estimates.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

Table 9

Capital and bank profitability: Additional control variables

Variables	PROF1 [1]	PROF1 [2]	PROF1 [3]	PROF1 [4]	PROF1 [5]	PROF1 [6]	PROF1 [7]	PROF1 [8]
Tier 1/rwaxIBDV (β_1)	0.065*** (0.0247)							
Tier 1/rwaxCBDV (β_2)	0.0745*** (0.0186)							
Tier 2/rwaxIBDV (β_1)		0.159 (0.1477)						
Tier 2/rwaxCBDV (β_2)		0.082 (0.0522)						
Total capital/rwa xIBDV (β_1)			0.059*** (0.0207)					
Total capital/rwa xCBDV(β_2)			0.063*** (0.0118)					
Tier 1/ta xIBDV (β_1)				0.075** (0.0363)				
Tier 1/ta xCBDV (β_2)				0.102*** (0.033)				
Tier 2/ta xIBDV (β_1)					0.169 (0.2687)			
Tier 2/ta xCBDV (β_2)					0.133 (0.0812)			
Total capital/ta xIBDV (β_1)						0.08** (0.0381)		
Total capital/ta xCBDV (β_2)						0.109*** (0.0321)		
Common equity/ta xIBDV (β_1)							0.056*** (0.018)	
Common equity/ta xCBDV (β_2)							0.071*** (0.0101)	
Tangible equity/ta xIBDV (β_1)								0.059*** (0.0174)
Tangible equity/ta xCBDV (β_2)								0.078*** (0.01)
Young	-1.326*** (0.4806)	-1.35*** (0.4749)	-1.211*** (0.4012)	-1.36*** (0.4656)	-1.49*** (0.4648)	-1.181** (0.4837)	-1.053** (0.487)	-1.04** (0.4858)
Gdpg	0.104*** (0.0341)	0.096*** (0.0342)	0.091*** (0.0243)	0.149*** (0.0353)	0.141*** (0.0359)	0.114*** (0.0297)	0.096*** (0.022)	0.094*** (0.0217)
Ar	0.334*** (0.1026)	0.325*** (0.1111)	0.269*** (0.0929)	0.405*** (0.1153)	0.462*** (0.1324)	0.359*** (0.1099)	0.307*** (0.0847)	0.304*** (0.0853)
Sp	0.158 (0.1039)	0.1 (0.0998)	0.062 (0.0516)	-0.019 (0.1213)	-0.001 (0.1907)	-0.032 (0.1262)	0.167** (0.0701)	0.166** (0.0693)
Mdpm	0.912** (0.4398)	0.944* (0.5382)	0.253* (0.139)	1.086** (0.4798)	1.746*** (0.6624)	0.767* (0.4517)	0.179*** (0.0683)	0.163** (0.0694)
Constant	-15.83*** (4.3656)	-8.078 (4.9944)	-10.007*** (2.1422)	-18.166*** (5.2492)	-8.008* (4.1399)	-9.886** (3.9751)	-8.461*** (2.2425)	-8.552*** (2.2598)
Observations	1278	1269	1868	1267	1246	1387	2885	2885
H0: $\beta_1 = \beta_2$ (F-test)	0.27	0.32	0.06	1.09	0.02	1.3	0.88	1.64
Bank_level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.2578	0.2073	0.2326	0.253	0.2129	0.247	0.2105	0.2167

Notes: Variable definitions are available in Appendix A.2. PROF1 is the ratio of net income to three year average assets. Standard errors are clustered at the bank level and are reported in parentheses below their coefficient estimates.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

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Table 10

Capital and bank efficiency: Additional control variables

Variables	EFF1 [1]	EFF1 [2]	EFF1 [3]	EFF1 [4]	EFF1 [5]	EFF1 [6]	EFF1 [7]	EFF1 [8]
Tier 1/rwaxIBDV (β_1)	0.722***							
	(0.1714)							
Tier 1/rwaxCBDV	0.449***							
(β_2)	(0.1202)							
Tier 2/rwaxIBDV		-0.952						
(β_1)		(1.456)						
Tier 2/rwaxCBDV		-0.224						
(β_2)		(0.623)						
Total capital/rwa			0.577***					
xIBDV (β_1)			(0.1295)					
Total capital/rwa			0.362***					
xCBDV(β_2)			(0.0824)					
Tier 1/ta xIBDV (β_1)				0.575***				
				(0.1713)				
Tier 1/ta xCBDV				0.831***				
(β_2)				(0.2043)				
Tier 2/ta xIBDV					-0.334			
(β_1)					(2.4621)			
Tier 2/ta xCBDV					0.252			
(β_2)					(0.732)			
Total capital/ta						0.631***		
xIBDV (β_1)						(0.1721)		
Total capital/ta						0.881***		
xCBDV (β_2)						(0.1762)		
Common equity/ta							0.585***	
xIBDV (β_1)							(0.0944)	
Common equity/ta							0.501***	
xCBDV (β_2)							(0.0943)	
Tangible equity/ta								0.573***
xIBDV (β_1)								(0.0917)
Tangible equity/ta								0.512***
xCBDV (β_2)								(0.0946)
Young	-9.162**	-4.779	-6.904**	-4.268	-5.5*	-4.111	-5.828**	-5.791**
	(4.4598)	(5.1963)	(2.721)	(2.6815)	(3.0436)	(2.5141)	(2.2632)	(2.2301)
Gdpg	0.255	0.137	0.231	0.043	-0.072	0.038	0.023	0.01
	(0.1867)	(0.2169)	(0.1673)	(0.21)	(0.2295)	(0.1974)	(0.1506)	(0.151)
Ar	3.354***	2.666**	2.513***	3.674***	3.454**	3.101***	1.375***	1.395***
	(1.196)	(1.2605)	(0.7381)	(1.1193)	(1.3696)	(0.8138)	(0.409)	(0.4086)
Sp	-4.482***	-5.204***	-0.436	-3.083***	-1.688	-1.881	-0.291	-0.297
	(1.135)	(1.3532)	(0.8017)	(1.0251)	(2.4651)	(1.8197)	(0.5722)	(0.5783)
Mdpm	5.511***	4.993*	1.919	2.27	4.933	5.98	1.389*	1.278
	(1.8012)	(2.5973)	(1.4141)	(2.6316)	(3.9818)	(3.6947)	(0.7657)	(0.7801)
Constant	-14.823	37.673	-42.554**	-4.588	-5.839	-43.36*	-28.781*	-27.566*
	(23.686)	(23.3377)	(17.1916)	(21.3219)	(30.4559)	(22.7179)	(14.6772)	(14.6793)
Observations	783	776	1352	768	750	889	2246	2246
H0: $\beta_1 = \beta_2$ (F-test)	1.86	0.21	2.67	1.58	0.06	2.08	0.57	0.33
Bank_level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.6541	0.6154	0.6414	0.6591	0.6171	0.6681	0.5893	0.5885

Notes: Variable definitions are available in Appendix A.2. EFF1 is a basic gross efficiency score model in which we do not control for the risk in bank inputs. Standard errors are clustered at the bank level and are reported in parentheses below their coefficient estimates.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

Table 11

One year lag – controlling for possible endogeneity

Variables	PROF1				PROF2				EFF1				EFF2			
	Coef.	N	F-test	R^2	Coef.	N	F-test	R^2	Coef.	N	F-test	R2	Coef.	N	F-test	R^2
Tier 1/rwa(-1)xIBDV	0.017	2517	4.56**	0.2517	0.038***	2312	1.18	0.2712	0.339***	2100	2.4	0.6194	0.486***	1854	9.17***	0.5429
	(0.0173)				(0.0165)				(0.0761)				(0.0932)			
Tier 1/rwa(-1)xCBDV	0.045***				0.05***				0.465***				0.753***			
	(0.0446)				(0.0104)				(0.0789)				(0.087)			
Tier 2/rwa(-1)xIBDV	0.025	2778	0.00	0.1931	0.057	2276	1.04	0.2421	-0.041	2064	0.00	0.6085	-0.294	1833	0.03	0.5025
	(0.0566)				(0.0924)				(0.5781)				(0.7836)			
Tier 2/rwa(-1)xCBDV	0.028				-0.034				-0.004				-0.155			
	(0.0293)				(0.0353)				(0.2602)				(0.283)			
Total capital/rwa(-1)	0.023	3835	2.69	0.1995	0.037***	3288	1.38	0.2474	0.34***	3066	3.3*	0.5945	0.469***	2649	4.64**	0.5486
xIBDV	(0.0147)				(0.0141)				(0.063)				(0.0814)			
Total capital/rwa(-1)	0.042***				0.05***				0.457***				0.624***			
xCBDV	(0.007)				(0.0082)				(0.0667)				(0.0671)			
Tier 1/ta(-1) xIBDV	0.029	2804	1.99	0.2046	0.062**	2285	0.43	0.2792	0.493***	2049	6.62**	0.5988	0.6***	1783	13.19***	0.5253
	(0.0343)				(0.0281)				(0.1132)				(0.1594)			
Tier 1/ta(-1) xCBDV	0.061***				0.075***				0.804***				1.118***			
	(0.018)				(0.0174)				(0.1406)				(0.1589)			
Tier 2/ta (-1)xIBDV	-0.01	2747	0.44	0.1794	0.132	2230	0.26	0.2362	0.768	1996	0.46	0.5782	0.258	1746	0.07	0.4848
	(0.1487)				(0.1538)				(0.8691)				(1.1293)			
Tier 2/ta(-1) xCBDV	0.084**				0.06				0.182				-0.048			
	(0.041)				(0.0445)				(0.433)				(0.3415)			
Total capital/ta(-1)	0.03	2981	2.44	0.2063	0.06**	2456	0.86	0.273	0.53***	2220	8.45***	0.6072	0.593***	1933	12.0***	0.5312
xIBDV	(0.033)				(0.0275)				(0.1097)				(0.1476)			
Total capital/ta(-1)	0.063***				0.077***				0.848***				1.03***			
xCBDV	(0.017)				(0.0164)				(0.1342)				(0.1395)			
Common equity/ta(-1)	0.03*	6211	1.67	0.1674	0.051***	5423	0.49	0.218	0.527***	5165	2.73*	0.5286	0.593***	4121	3.23*	0.5112
xIBDV	(0.0157)				(0.013)				(0.0648)				(0.0756)			
Common equity/ta(-1)	0.048***				0.06***				0.646***				0.736***			
xCBDV	(0.0065)				(0.0078)				(0.0673)				(0.0584)			
Tangible equity/ta(-1)	0.032**	6211	1.97	0.1711	0.053***	5423	0.67	0.2215	0.531***	5165	3.42*	0.5299	0.598***	4121	3.14*	0.5106
xIBDV	(0.0155)				(0.0128)				(0.0654)				(0.0753)			
Tangible equity/ta(-1)	0.051***				0.063***				0.661***				0.736***			
xCBDV	(0.0067)				(0.0081)				(0.0678)				(0.0599)			

Notes: Variable definitions are available in Appendix A.2. PROF1 is the ratio of net income to three year average assets. PROF2 is the ratio of operating profit to three year average assets. EFF1 is a basic gross efficiency score model in which we do not control for the risk in bank inputs. EFF2 is a basic gross efficiency score model in which we introduce loan loss provisions to control for risk in bank inputs. Standard errors are clustered at the bank level and are reported in parentheses below their coefficient estimates.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

Table 12

Capital and bank profitability: A truncated regression approach

Variables	PROF1 [1]	PROF1 [2]	PROF1 [3]	PROF1 [4]	PROF1 [5]	PROF1 [6]	PROF1 [7]	PROF1 [8]
Tier 1/rwaxIBDV (β_1)	0.061**							
	(0.0248)							
Tier 1/rwaxCBDV	0.082***							
(β_2)	(0.0184)							
Tier 2/rwaxIBDV		0.061						
(β_1)		(0.151)						
Tier 2/rwaxCBDV		0.062						
(β_2)		(0.0527)						
Total capital/rwa			0.049**					
xIBDV (β_1)			(0.0201)					
Total capital/rwa			0.06***					
xCBDV(β_2)			(0.0117)					
Tier 1/ta xIBDV (β_1)				0.071**				
				(0.032)				
Tier 1/ta xCBDV				0.111***				
(β_2)				(0.0299)				
Tier 2/ta xIBDV					0.085			
(β_1)					(0.289)			
Tier 2/ta xCBDV					0.151*			
(β_2)					(0.0821)			
Total capital/ta xIBDV						0.071**		
(β_1)						(0.0329)		
Total capital/ta						0.109***		
xCBDV (β_2)						(0.0274)		
Common equity/ta							0.055***	
xIBDV (β_1)							(0.0171)	
Common equity/ta							0.07***	
xCBDV (β_2)							(0.0086)	
Tangible equity/ta								0.056***
xIBDV (β_1)								(0.0165)
Tangible equity/ta								0.076***
xCBDV (β_2)								(0.0088)
Constant	-5.693**	1.512	-3.011*	-5.348**	1.464	-3.75**	-2.929***	-3.087***
	(2.4111)	(1.7343)	(1.5554)	(2.1018)	(1.8006)	(1.8976)	(0.9879)	(0.9629)
Observations	1278	1269	1868	1267	1246	1387	2885	2885
H0: $\beta_1 = \beta_2$ (F-test)	1.18	0.01	0.45	2.25	0.06	2.18	0.93	1.84
Bank & country level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wald chi2	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***

Notes: Variable definitions are available in Appendix A.2. PROF1 is the ratio of net income to three year average assets. The estimation is based on the truncated technique regression proposed by Simar and Wilson (2007). Standard errors are heteroscedasticity robust, clustered at the bank level, and reported in parentheses below their coefficient estimates.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

Table 13

Capital and bank efficiency: A truncated regression approach

Variables	EFF1 [1]	EFF1 [2]	EFF1 [3]	EFF1 [4]	EFF1 [5]	EFF1 [6]	EFF1 [7]	EFF1 [8]
Tier 1/rwaxIBDV (β_1)	0.865***							
	(0.1644)							
Tier 1/rwaxCBDV (β_2)	0.493***							
	(0.133)							
Tier 2/rwaxIBDV (β_1)		0.168						
		(1.6031)						
Tier 2/rwaxCBDV (β_2)		-0.355						
		(0.5884)						
Total capital/rwa xIBDV (β_1)			0.674***					
			(0.126)					
Total capital/rwa xCBDV(β_2)			0.417***					
			(0.0837)					
Tier 1/ta xIBDV (β_1)				0.684***				
				(0.1527)				
Tier 1/ta xCBDV (β_2)				0.962***				
				(0.2018)				
Tier 2/ta xIBDV (β_1)					0.572			
					(2.7126)			
Tier 2/ta xCBDV (β_2)					0.306			
					(0.7113)			
Total capital/ta xIBDV (β_1)						0.775***		
						(0.1528)		
Total capital/ta xCBDV (β_2)						1.046***		
						(0.175)		
Common equity/ta xIBDV (β_1)							0.702***	
							(0.0807)	
Common equity/ta xCBDV (β_2)							0.57***	
							(0.0928)	
Tangible equity/ta xIBDV (β_1)								0.682***
								(0.0771)
Tangible equity/ta xCBDV (β_2)								0.58***
								(0.0956)
Constant	-16.337	35.067**	-11.929	-21.491	24.606	-23.656*	-16.285	-15.419
	(15.0814)	(15.3697)	(12.3102)	(13.1235)	(15.5649)	(12.9141)	(10.1394)	(10.0867)
Observations	783	776	1352	768	750	889	2246	2246
H0: $\beta_1 = \beta_2$ (F-test)	3.11**	0.09	3.49*	1.97	0.01	2.64	1.41	0.88
Bank & country level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wald chi2	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***

Notes: Variable definitions are available in Appendix A.2. EFF1 is a basic gross efficiency score model in which we do not control for the risk in bank inputs. The estimation is based on the truncated regression technique proposed by Simar and Wilson (2007). Standard errors are heteroscedasticity robust, clustered at the bank level, and reported in parentheses below their coefficient estimates.

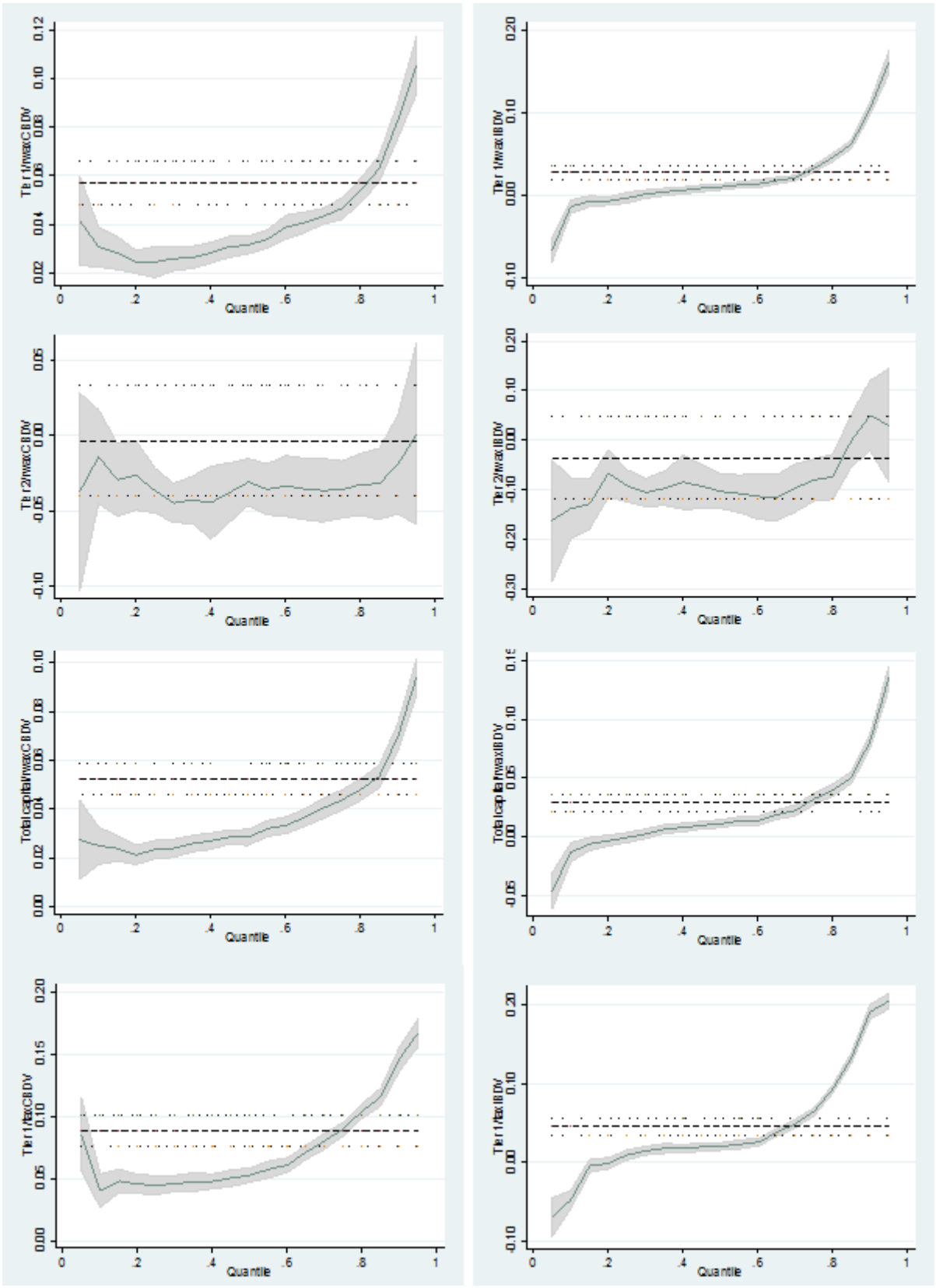
* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

Figures

Fig. 1. Quantile plots for the profitability measure (PROF1)



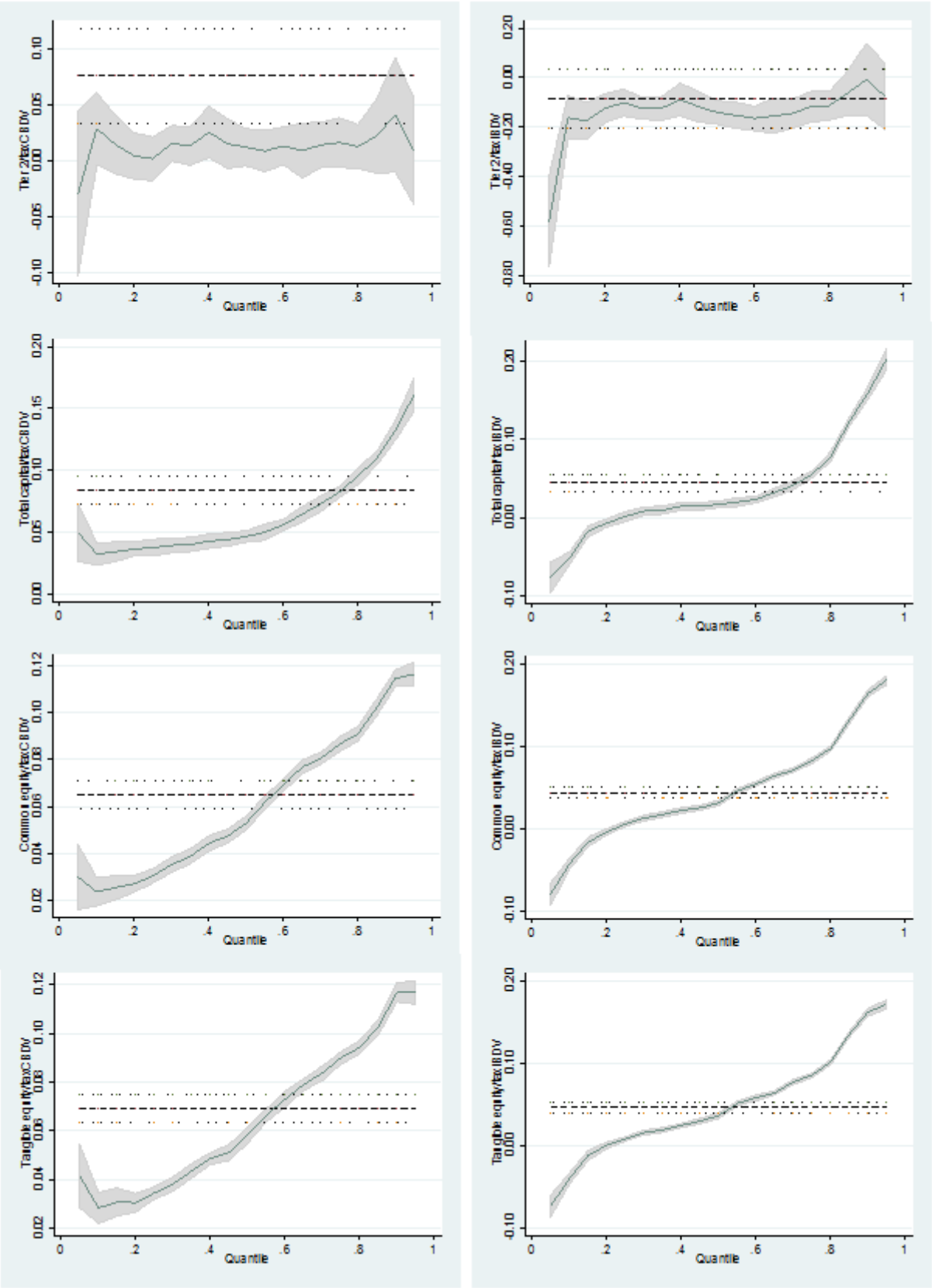
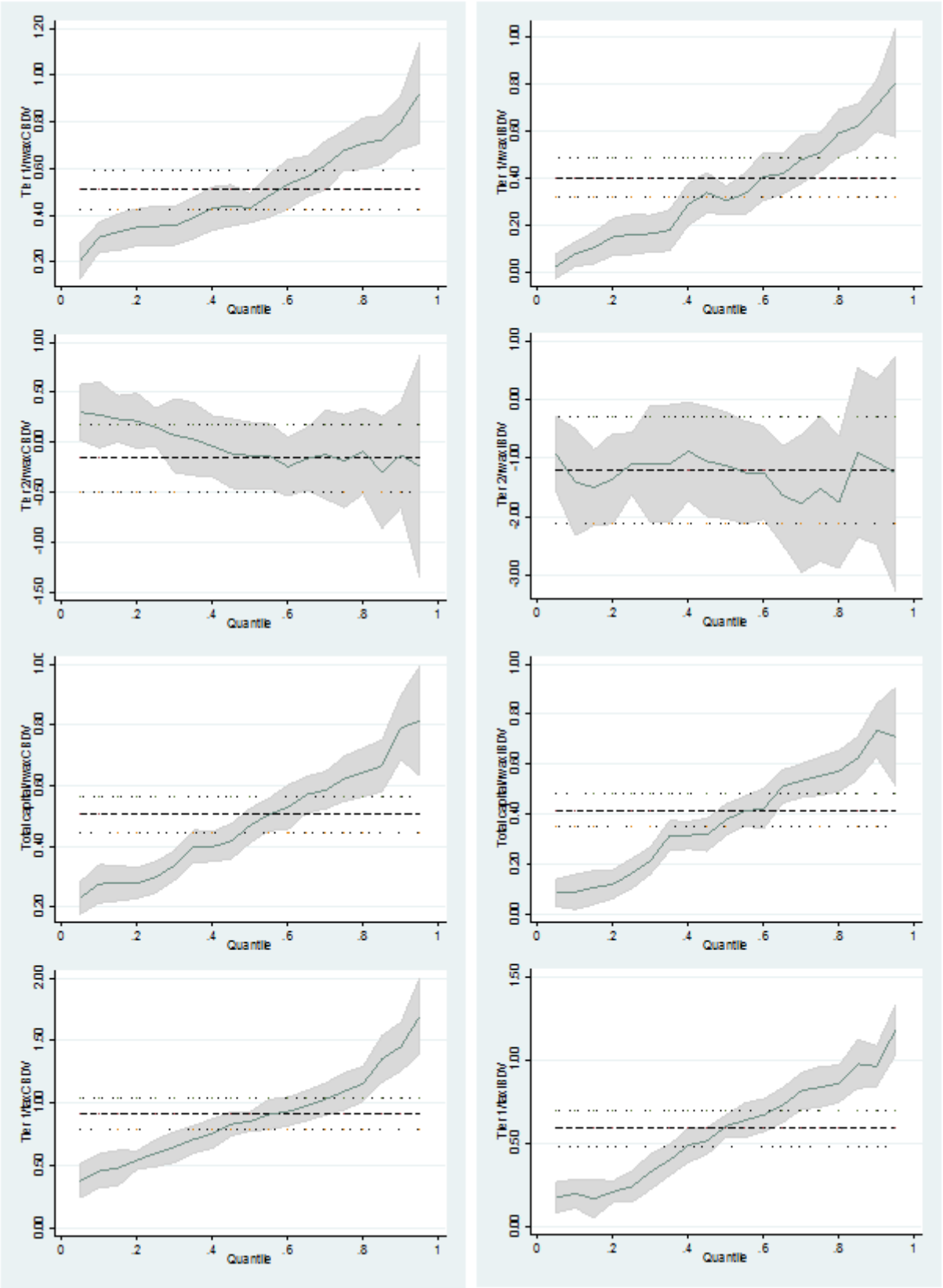
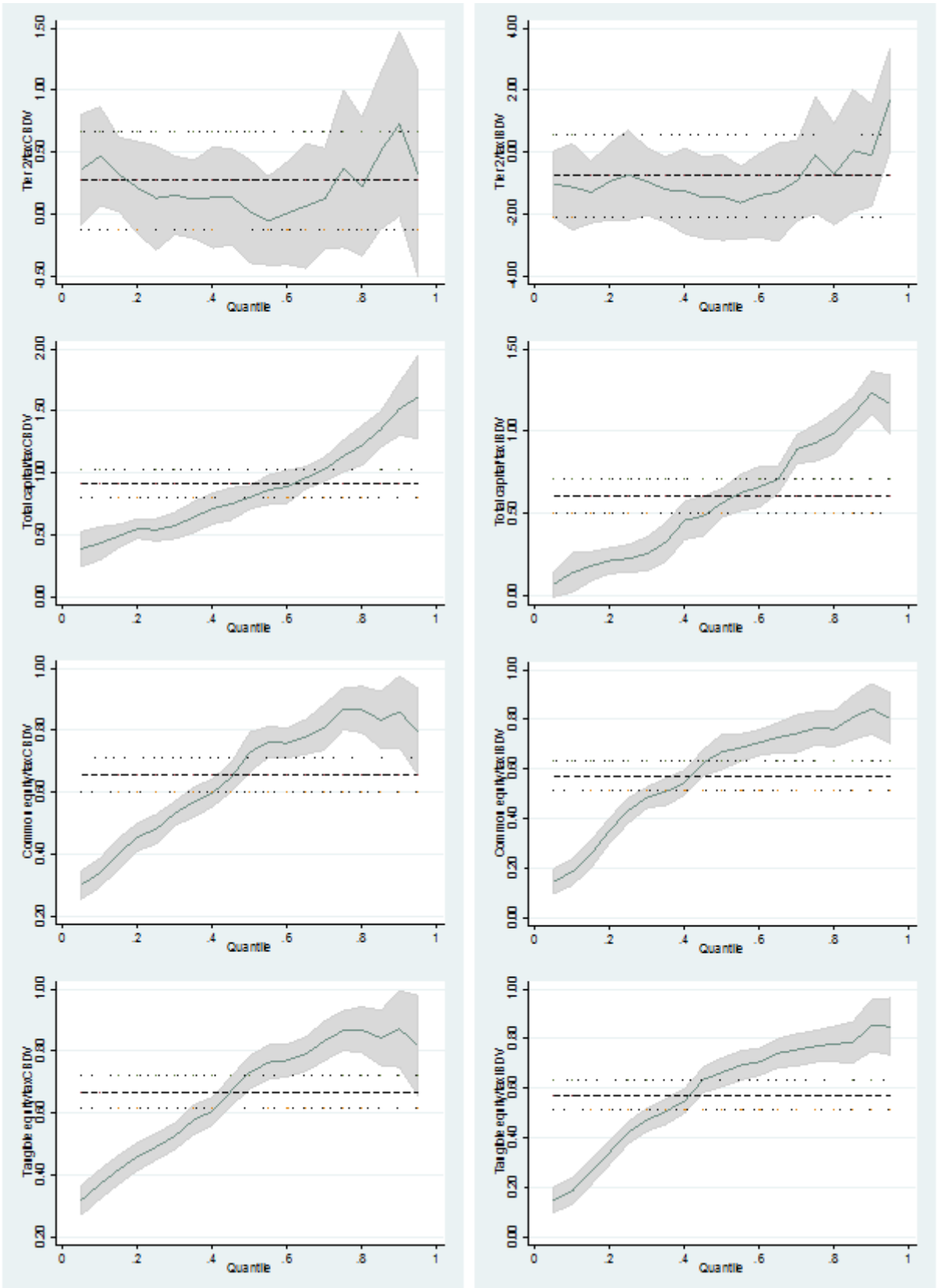

Quantile
Quantile
Quantile
Quantile
Quantile
Quantile
Quantile
Quantile

Fig. 2. Quantile plots for the efficiency measure (EFF1)




Tier 2/TaxCBDV
Tier 2/TaxIBDV
Total capital/TaxCBDV
Total capital/TaxIBDV
Common equity/TaxCBDV
Common equity/TaxIBDV
Tangible equity/TaxCBDV
Tangible equity/TaxIBDV
Quantile

Appendix A

Table A.1. BCBS and IFSB guidelines on bank capital ratios

Conventional banks	Islamic banks
Basel II guidelines (2004) $\text{CAR} = \frac{\text{Tier1} + \text{Tier2} + \text{Tier3}}{[\text{CR} + \text{MR} + \text{OR}].\,\text{RWA}} > 8\%$ $\text{Core Tier1 (CET1)} = \frac{\text{Core Tier1}}{\text{RWA}} > 2\%$ $\text{Tier1} = \frac{\text{Tier1}}{\text{RWA}} > 4\%$ - CR, MR, and OR represent credit risk, market risk, and operational risk, respectively. *Basel III guidelines (2010)* - $\text{CAR} = 8\%$ (4.5 % for common equity Tier 1, 6% for Tier 1, 2% for Tier 2 and no Tier 3). - A new capital conservation buffer (CCB) = 2.5% of RWA to ensure bank capacity to absorb losses during stressful situations (thus, CET1 = 7% (4.5% +2.5%)). - A new countercyclical buffer (CB) that varies between 0 and 2 of RWA depending on economic conditions.	*IFSB guidelines (2005, 2013)* Discretionary formula $\text{CAR} = \frac{\text{Tier1} + \text{Tier2}}{[\text{CR} + \text{MR} + \text{OR}].\,\text{RWA} - [\text{CR} + \text{MR}].\,\text{RWA}_{\text{RIA}} - (1-\alpha)[\text{CR} + \text{MR}].\,\text{RWA}_{\text{UIA}} - \alpha.\,\text{RWA}_{\text{PER \& } IRR}}$ - *RWA* includes all investments financed by the *RIA* and *UIA* supported by investment account holders *(IAH)* - Projects financed by the *RIA* and the *UIA* of *IAH* must be excluded from the calculation of the *CAR* denominator. - *PER* and *IRR* represent Profit Equalization Reserve and Investment Risk Reserve, respectively. - α represents the share of the added value on the real amount of returns on assets financed by the UIA (the extent to which IAHs share bank risk). Its calculation depends on the banking stability in each country. If $\alpha = 0$, IAHs bear all risk and thus a standard formula is incorporated. Standard formula $\text{CAR} = \frac{\text{Tier1} + \text{Tier2}}{[\text{CR} + \text{MR} + \text{OR}].\,\text{RWA} - [\text{CR} + \text{MR}].\,\text{RWA}_{\text{RIA}} - [\text{CR} + \text{MR}].\,\text{RWA}_{\text{UIA}}}$

A.2.Variable definitions and data sources

Variable	Definition	Data Sources
Dependent variables – performance		
1. Profitability model		
Net income to average assets (PROF1)	Bank net income divided as a percentage of three year average assets.	Bankscope
Operational efficiency (PROF2)	Bank operating profits as a percentage of three year average assets.	Bankscope
2. Efficiency model		
Gross efficiency (EFF1)	Bank pure technical efficiency, ranging between 0 and 100. EFF1 is calculated by comparing Islamic and conventional banks to a common frontier. EFF1 does not include loan loss provisions to control for risk.	Authors' calculations based on Bankscope
Gross efficiency including LLP (EFF2)	Bank pure technical efficiency, ranging between 0 and 100. EFF2 is calculated by comparing Islamic and conventional banks to a common frontier. EFF2 includes loan loss provisions to control for risk.	Authors' calculations based on Bankscope
3. Alternative profitability & efficiency models		
Net interest margin (EFF3)	Bank interest income minus bank interest expenses as a percentage of earning assets.	Bankscope
Fee income to average assets (EFF4)	Non-insurance related operating fee and commission income earned on commercial banking, investment banking, custodial and trust activities divided by three years average assets.	Authors' calculations based on Bankscope
Net efficiency (EFF3)	Bank pure technical efficiency, ranging between 0 and 100. EFF3 is calculated by comparing each bank category (i.e. Islamic and conventional banks) to its own efficiency frontier. EFF3 does not include loan loss provisions to control for risk.	Authors' calculations based on Bankscope
Net efficiency including LLP (EFF4)	Bank pure technical efficiency, ranging between 0 and 100. EFF4 is calculated by comparing each bank category (i.e. Islamic and conventional banks) to its own efficiency frontier. EFF4 includes loan loss provisions to control for risk.	Authors' calculations based on Bankscope
Independent variables		
1. Capital ratios		
Tier 1/rwa	This measure of capital adequacy measures Tier 1 capital divided by risk-weighted assets computed under the Basel rules. Banks must maintain minimum Tier 1 capital of at least 4%.	Bankscope
Tier 2/rwa	This measure of capital adequacy measures Tier 2 capital divided by risk-weighted assets computed under the Basel rules.	Authors' calculations based on Bankscope
Total capital/rwa	This ratio is the capital adequacy ratio. It is the sum of bank Tier 1 plus Tier 2 capital as a percentage of risk-weighted assets. This ratio must be maintained at a level of at least 8% under the Basel II rules.	Bankscope
Tier 1/ta	This measure of capital adequacy measures Tier 1 capital divided by total assets.	Authors' calculations based on Bankscope
Tier 2/ta	This measure of capital adequacy measures Tier 2 capital divided by total assets.	Authors' calculations based on Bankscope
Total capital/ta	This measure is bank Tier 1 plus Tier 2 capital divided by total assets.	Authors' calculations based on Bankscope
Common equity/ta	Bank common equity includes common shares and premium, retained earnings, reserves for general banking risks and statutory reserves divided by total assets.	Authors' calculations based on Bankscope
Tangible equity/ta	Bank tangible equity divided by total assets. This measure removes goodwill and any other intangible assets from both the equity and the asset side of the bank balance sheet.	Authors' calculations based on Bankscope
2. Bank control variables		
Size	The natural logarithm of total assets.	Authors' calculations based on Bankscope
Growth assets	The current year growth rate of bank total assets compared with the previous year's total assets.	Bankscope
Net loans/ta	The share of net loans as a percentage of total assets.	Authors' calculations based on Bankscope
Fixed assets/ta	Bank fixed assets as a percentage of total assets.	Authors' calculations based on Bankscope
Non-operating income	Total non-interest operating income as a percentage of total assets.	Authors' calculations based on Bankscope
Islamic bank dummy variable (IBDV)	A dummy variable that equals 1 for Islamic banks and 0 otherwise.	Authors' calculations based on Bankscope
Conventional bank dummy variable (CBDV)	A dummy variable that equals 1 for conventional banks and 0 otherwise.	Authors' calculations based on Bankscope
Islamic financial services board (IFSB)	A dummy variable that equals 1 for Islamic banks that reports their regulatory capital ratios under IFSB standards and 0 otherwise.	Annual reports, Central Banks and IFSB website.
Basel	A dummy variable that equals 1 for Islamic banks that reports their regulatory capital ratios under BCBS standards and 0 otherwise.	Annual reports, Central Banks and IFSB website.
3. Country control variables		

Variable	Definition	Data Sources
Young	Young bank dummy that takes the value of one if the bank is operating for less than ten years, and zero otherwise.	Authors' calculations based on Bankscope and banks' websites
gdpg	The annual percentage growth rate of a country's GDP.	World Development Indicators (WDI)
Member type	A dummy variable that equals 1 if a country's supervisory authority (for full membership) and financial institutions (for observer membership) is a member in the IFSB and 0 otherwise.	IFSB website
Non member	A dummy variable that equals 1 if a country's supervisory authority reports its capital standards under BCBS guidelines without any considerations for Islamic banks.	Countries' Central Banks
Ar	Activity restrictions is an index of bank engagement in securities activities, insurance activities and real estate activities. The index ranges between 1 and 4 and represents unrestricted, permitted, restricted, and prohibited activities with higher values indicating higher restrictions.	Banking regulation and supervision database, World Bank; Barth et al. (2001, 2006, 2008, 2013)
sp	The variable is based on surveys by Barth et al. (2000, 2003, 2008, see details therein). It increases by 1 if the answer is yes to questions 1–14 of their survey with no increase if the answer is no. The variable thus ranges between 0 and 14 with greater values indicating more supervisory power: (1) Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? (2) Are auditors legally required to communicate directly to the supervisory agency any presumed involvement of bank directors or senior managers in illicit activities, fraud, or insider abuse? (3) Can supervisors take legal action against external auditors for negligence? (4) Can the supervisory authorities force a bank to change its internal organizational structure? (5) Does the institution disclose off-balance-sheet items to supervisors? (6) Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? (7) Can the supervisory agency suspend directors' decisions to distribute dividends? (8) Can the supervisory agency suspend directors' decisions to distribute bonuses? (9) Can the supervisory agency suspend directors' decisions to distribute management fees? (10) Can the supervisory agency supersede bank shareholder rights and declare the bank insolvent? (11) Does banking law allow a supervisory agency or any other government agency (other than a court) to suspend some or all ownership rights at a problem bank? (12) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than a court) supersede shareholder rights? (13) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than a court) remove and replace management? (14) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than a court) remove and replace directors?	Banking regulation and supervision database, World Bank; Barth et al. (2001, 2006, 2008, 2013)
mdpm	Market discipline and private monitoring is an indicator of disclosing transparent information to the market. The variable is based on surveys by Barth et al., (2000, 2003, 2008, see details therein). It increases by 1 if the answer is yes to questions 1–7 of their survey with no increase if the answer is no. The opposite occurs for questions 8 and 9. The variable thus ranges between 0 and 9 and includes 9 questions with higher values indicating adequate information disclosure and market discipline: (1) Is subordinated debt allowed (or required) as capital? (2) Are financial institutions required to produce consolidated accounts covering all bank and any non-bank financial subsidiaries? (3) Are off-balance-sheet items disclosed to the public? (4) Must banks disclose their risk-management procedures? (5) Are directors legally liable for erroneous/misleading information? (6) Do regulations require credit ratings for commercial banks? (7) Is an external audit by a certified/licensed auditor mandatory for banks? (8) Does accrued, unpaid interest/principal on non-performing loans appear on the income statement? (9) Is there an explicit deposit-insurance protection system?	Banking regulation and supervision database, World Bank; Barth et al. (2001, 2006, 2008, 2013)
cs	This variable is based on surveys by Barth et al. (2000, 2003, 2008, see details therein). The variable increases by 1 if the answer is yes to questions 1–6 of their survey with no increase if the answer is no. The opposite occurs for questions 7 and 8. The variable thus ranges between 0 and 8 and addresses 8 questions with higher values indicating greater stringency: (1) Is the minimum required capital asset ratio (risk weighted) in line with the Basel guidelines? (2) Does the ratio vary with market risk? (3–5) Before determining minimum capital adequacy, are any of the following deducted from the book value of capital: (a) the market value of loan losses not realized on the financial	Banking regulation and supervision database, World Bank; Barth et al. (2000, 2003, 2008)

Variable	Definition	Data Sources
	statements, (b) unrealized losses on securities portfolios, and (c) unrealized foreign exchange losses? (6) Have regulatory/supervisory authorities verified the sources of funds to be used as capital? (7) Can assets other than cash or government securities provide the initial or subsequent injections of capital? (8) Can borrowed funds provide the initial disbursement of capital?	
Disclosure	This variable is based on surveys by Barth et al. (2000, 2003, 2008, see details therein). The variable increases by 1 if the answer is yes to the three following questions: (i) Does the income statement includes accrued or unpaid interest or principal in non-performing loans? (2) Are banks required to produce consolidated financial statements? (3) Are bank directors legally liable if information disclosed is erroneous or misleading? The variable thus ranges between 0 and 3 with higher values indicating more informative bank account.	Banking regulation and supervision database, World Bank; Barth et al. (2000, 2003, 2008)
Audit	This variable is based on surveys by Barth et al. (2000, 2003, 2008, see details therein). It indicates whether an external auditor (licensed or certified auditor) is required to examine bank financial statements. The variable thus ranges between 0 and 2 with higher values indicating more informative bank account.	Banking regulation and supervision database, World Bank; Barth et al. (2000, 2003, 2008)
Rated	The proportion of ten biggest banks rated by international rating agencies.	Banking regulation and supervision database, World Bank; Barth et al. (2000, 2003, 2008)
ats	The average number of years the current supervisor has been appointed	Banking regulation and supervision database, World Bank; Barth et al. (2000, 2003, 2008)
Eco_index	Overall economic freedom is an index computed as the average of 10 quantitative and qualitative factors that capture 4 categories of economic freedom including: (1) the rule of law, (2) limited governance, (3) regulatory efficiency, and (4) open markets.	The Heritage Foundation 2015 index of economic freedom