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The Determinants of The Bank Regulation and Supervision on The Efficiency of Islamic Banks in Different Country's Income Level*

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Abstract

This study investigates the impact of the country's governance on the revenue efficiency of 108 Islamic banks from 26 countries offering Islamic banking and finance products services. The technical efficiencies of individual Islamic banks have been analyzed using the Data Envelopment Analysis method. The data will be pooled across the selected countries and utilize the intermediation approach. The Ordinary Least Square estimation method is employed to examine the impact of country supervision and regulation on the technical efficiency of Islamic banks. As robustness check, the study examines the impact of the level of bank regulations and supervision on the efficiency of Islamic banks operating in different income-level countries. The results found that the stricter the supervisory power, the less strict capital requirement, the tighter the restrictions on non-banking activities, and the stricter the private monitoring enhance statistically significantly the level of efficiency of Islamic banks. In upgrading the regulations and supervision of the Islamic banks, the existing regulatory framework based on the Basel Committee on Banking Supervision (BCBS) must be complemented with the prescriptions on Islamic banking or Shariah compliance diligently, so that the Islamic banks could be regulated accurately and further improve the technical efficiency of their operations.

Keywords: Supervision, Bank Regulation, Islamic Banks, Data Envelopment Analysis, Country Income Level

JEL Classification Code: G20, G21, G28

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1. Introduction

The "Islamic window" operation is an important factor that has contributed to the popularity of Islamic banking and accelerated its development and growth. The UK Islamic Finance Secretariat (UKIFS) has reported that worldwide, *Shariah*-compliant assets have grown in value from US$1,357 billion in 2011 to US$1,900 billion at the end of 2016 (Figure 1). For the time from 2012 to 2015, global assets of Islamic finance grew by 40% with the leading players being Saudi Arabia, Iran, Malaysia, UAE, Qatar, Kuwait and Bahrain (Figure 2).

Like other financial institutions, risk is among the main challenges (Duong et al., 2020) and likewise it needs to be addressed properly by Islamic banks to make sure that they operate efficiently. Islamic banks' activities differ in substance and in form from conventional banks' operations and they, thus, face a different risk profile. Basel II identified three types of risk exposures for conventional banks: credit risk, market risk and operational risk. Credit risk is the default payment risk and risk weights are assigned based

on the counterparty risk. Market risk results from the risk of losses in on- and off-balance sheet positions arising from movements in market prices. It applies to the portfolio of financial instruments held by the bank and is composed of four elements, namely, interest rate risk (further divided into specific and general market risk), equity position risk, foreign exchange risk, and commodity risk. Finally, operational risk represents the risk of loss resulting from inadequate internal processes.

Among the nature of operations in Islamic financial institutions, the majority of them are based on profit and loss sharing; as such it is perceived that such transactions pose lower risk. Qureshi (1984) claims that equity-based financing will increase the exposure of the Islamic bank to risks. Existing research on the relationship between different types of regulations, supervisory practices and bank performance is rather limited and focuses on individual countries (Barth et al., 2004; Beck et al., 2006; Berger et al., 2008). Hence, despite a few recent efforts to reveal the impact of regulations on bank efficiency, there is a lack of a comprehensive analysis. In addition, to the best knowledge of this researcher, there is a scarcity of studies, especially cross-country studies, that have examined the effect of bank regulations and supervision on the efficiency of Islamic banks. In any case, the majority of the studies that examine the effect of banks' regulations and supervision on conventional banking efficiency remain inconclusive. Islamic regulatory organizations such as the Islamic Financial Services Board (IFSB) and the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) have released several regulatory guidelines that fit the Basel I and Basel II frameworks to Islamic banks' specificities, however, while regulatory guidelines are set to regulate Islamic banks' activities, not much empirical research has examined whether Islamic banks should be regulated in the same way as conventional banks, as catered by Basel II.

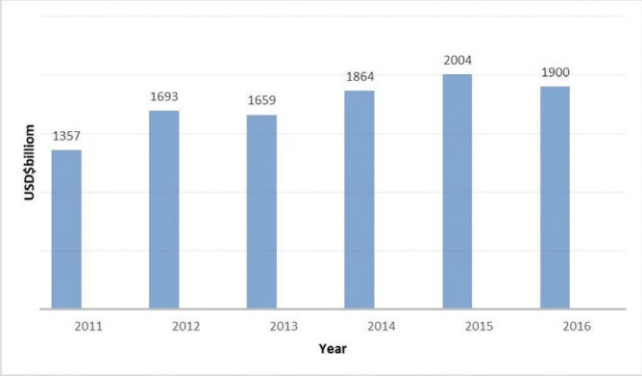

Figure 1: Global Assets of Islamic Finance

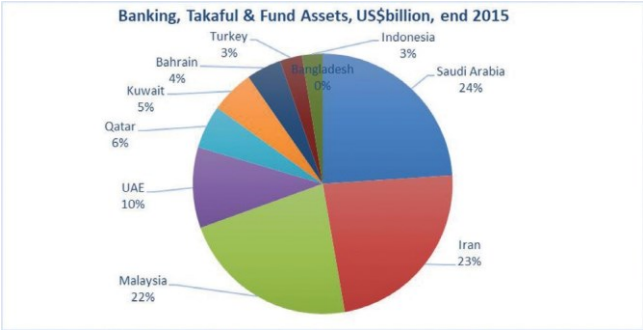

Figure 2: Islamic Finance by Country

2. Literature Review

Berger and Humphrey (1997) investigated the level of efficiency of the financial institutions by employing efficient frontier methods like DEA. Berger et al. (1993b) believe that efficient banks can expect to improve their profitability, offer better prices and enhance service quality for consumers and all these could result in more funds being intermediated (Alam et al., 2020).

Many studies have sought to explore the issue of banking efficiency or inefficiency. While some scholars have focused solely on those factors specific to banks, others have also taken into consideration environmental factors. Factors that are usually associated with banks are size, profitability, capitalization, and loans to assets (Ariff & Can, 2007; Ataullah & Le, 2006; Casu & Molyneux, 2003; Sufian & Habibullah, 2010).

Furthermore, Casu and Girardone (2004) and Pasiouras (2008b) investigated the existence of banks from Turkey, Italy, and Greece in the international marketplace. Recently, it has been seen that scholars have considered the influence of environmental, economic and regulatory factors in their study of banking efficiency (parametric studies by Berger and Mester, 2003, and non-parametric studies by Lozano-Vivas et al., 2002).

Factors that are country-specific encompass market concentration, presence of foreign banks, ratio of private investments to GDP, fiscal deficits to GDP, and GDP growth (Ataullah & Le, 2006; Hauner, 2005). Pasiouras (2008a) investigated the effect of regulatory requirements and supervision in relation to capital criteria, private supervision, bank's' operations, deposit insurance options, supervisory power, and bank's participation in the industry towards the bank's efficiency.

There were numerous studies focusing on the regulations and supervision of the financial institutions (Idris et al., 2016). Studies conducted by Worthington (1999) on banks in Australia and Mukherjee et al. (2001) on banks in US found that the regulations and supervision do not make any

difference in productivity growth among the banks located in different states. This infers that the geographical boundaries do not bring any moderating influence between the regulations and supervision on the banks in different states. Delis et al. (2008) also studied the impact of regulations and supervision towards the productivity growth in banking. The regulations are proxied in terms of incentives promoting private monitoring, restrictions on certain banks' activities and has positive impact on productivity, however, the capital requirements and official supervisory power do not statistically bring significant impact on productivity growth. Gonzalez (2005) has examined the impact of regulations on the risk-taking behavior of banks while Grifell-Tatje and Lovell (1996) in their study of Spanish savings banks found that the deregulations can have a negative influence on bank productivity. Although Basel II is primarily intended for 'internationally active banks' among the G–10 countries, many countries have announced their intention to adopt the Basel II Capital Accord.

3. Data and Methodology

We gather data on 108 Islamic banks from 26 countries during the period from 2004 to 2010. The primary source of financial data is the BankScope database while the IMF Financial Statistics (IFS) and the World Bank World Development Indicator (WDI) databases are the main source for the macroeconomic and market indicators. We retrieve the account for Basel II's pillars on bank regulations and supervision the study follows the regulations and supervision variables from Barth et al. (2004). The data for regulations and supervision variables are provided by the World Bank through two set of surveys, which are the World Bank Regulations and Supervision Survey (2008) to cover the data from 2004 to 2007 and the World Bank Regulations and Supervision Survey (2011) to cover the data from 2008 to 2010.

The advantages of this database are its wide coverage (more than 100 countries) and it also measures many aspects of the regulatory environment. The data will be pooled across the selected countries utilizing the intermediation approach with assumption that all banks will have certain amount of regulated framework and all will have to utilize capital, assets and some form of liabilities to function (Ismail et al., 2014). The data cover the period from 2004 up to 2010.

3.1. Data Envelopment Analysis

The Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH) are the two major non-parametric methods to measure efficiency. Casu and Molyneux (2003) highlighted the fact that the non-parametric approach employs mathematical programming to develop the production frontier, and the efficiency of a particular firm is evaluated before the construction of the production frontier. This approach is developed on the basis of efficiency concept, which is similar to the microeconomic theory. The non-parametric approach is an input-specific model that is commonly employed in analyzing technical efficiency. The efficiency scores are computed by developing the efficient production frontier (a convex hull) that comprises "the best practice" DMUs in an industry and compares other DMUs in the industry to that frontier. The firms operating on the frontier are fully efficient and the production function will provide an efficiency score of one on the production frontier. The DMUs that are below the frontier with efficiency score of less than one to zero are considered inefficient (Thanassoulis, 2001). Inefficiency of a DMU is evaluated as the distance in inputs and outputs between the DMU itself and its projection on the convex hull. The further away a DMU is from the frontier, the more inefficient it is. This is a popular approach employed to analyze empirical efficiency, particularly in the production of multiple outputs with multiple inputs by DMUs. The DMU has the efficiency of scale when operating in the range of CRS. Charnes et al. (1978) were the first to use the term "DEA" whereby they introduced a model that had an input-oriented and assumed CRS. This method is named after the researchers (Charnes-Cooper-Rhodes) and is referred to as the CCR model. The DEA method permits an evaluation of the technical efficiency performance of an existing technology in relation to an ideal, best practice or frontier technology (Coelli et al., 1998; Al-Lamy, 2018) to frontier, which refers technology or production frontier that shows the most technically efficient mix of inputs and outputs.

3.2. The Choice of Approach, Inputs, and Outputs Variables

The DEA method was chosen for this current research primarily due to the fact that there is no necessity to specify functional form or distributional forms for errors. Furthermore, this is a popularly adopted approach (e.g., Aly et al. 1990; Bhattacharyya et al., 1997; Drake & Hall, 2003; English et al., 1993; Favero & Papi, 1995; Katib, 1999). Mokhtar et al. (2008) examined 47 research reports on bank efficiency and discovered that the DEA method has been proven to be a widely-used and accepted tool for the purpose of measuring the technical efficiency of a bank. Drake and Hall (2003) highlighted the fact that the DEA approach does not require the specification of the cost function or the use of input price data. Application of the DEA method is either input orientated or output orientated. The former attempts to lower input usage for a set level of output while the latter involves raising the output level without altering the input usage (Casu & Molyneux, 2003).

Our analysis uses a variant of the intermediation approach. The intermediation approach is based on the theory of financial intermediation proposed by Allen and Santomero (1998) that views banks as intermediaries of financial services that transfer and convert financial assets from a surplus of deficit units (Ismail et al., 2017; Bakri et al., 2016). This approach assumes that banks collect deposits from customers, using labor and capital to transfer into loans and other earning assets (Sealey & Lindley 1977). The intermediation approach is very popular in DEA efficiency analysis and most widely used in the banking literature (Kwan 2006; Paradi et al., 2011; Tahir & Bakar 2009). Berger and Humphrey (1997) have argued that the intermediation approach is the most appropriate since it is inclusive of interest expense as compared to the production approach which known to have limitation as it excludes interest expense, which are considered an important element in banking operations.

3.3. Multivariate Panel Regression Analysis

In the second stage, an investigation of the possible determinants of technical efficiency scores of Islamic banks is undertaken. The modeling framework is built from the approaches suggested by Chortareas et al. (2011) and we follow the regulatory and supervision variables of Barth et al. (2008, 2013). We consider three broad categories: the characteristics of the individual banks (Bank-Specifics), the characteristic of macroeconomics (Country-Specifics), and the characteristics of banking regulations and supervision (Basel II' pillars). We incorporate $Bank\ Specifics_{j,t}$ vector for bank-specific variables, $Country\ Specifics_t$ vector for country specific controls and $Bank\ Regulations\ and\ Supervision_t$ vector to account for Basel II's pillars on bank regulations and supervision variables. The variables in the vectors are as follows:

$$Bank\ Specifics_{j,t} = \ln (SIZE_{j,t+} + EQASS_{j,t} + LOANSTA_{j,t} + LNIETA_{j,t})$$

$$Country\ Specifics_t = \ln (GDP_t + INFL_t + CR3_t + Z\text{-}SCORE_t)$$

$$Bank\ Regulations\ and\ Supervision_t = \ln (SPOWER_t + CAPRQ_t + PRMONIT_t + ACTRS_t)$$

Where, *j* denotes *bank*, *t* denotes for time period, $Bank\ Regulations\ and\ Supervision_t$ denotes vector of bank regulatory, $Bank\ Specifics_{j,t}$ denotes vector of bank-specific variables and $Country\ Specifics_t$ denotes vector of country-specific control variables or macroeconomic and financial markets condition. We use log-linear form for the variables similar as De Bandt and Davis (2000) and Staikouras et al. (2008) among others. According to them, the log-linear form is at advantages as it typically improves the regression's goodness of fit and may reduce simultaneity bias.

To investigate the determinants of Islamic bank's efficiency, we construct a model as follow:

$$TE_{j,t} = \beta_1 \sum_n^4 Bank\ Specifics_{j,t} + \beta_2 \sum_n^4 Country\ Specifics_t + \beta_3 \sum_n^4 Bank\ Regulation\ and\ Supervision_t + \varepsilon_{j,t} \quad (1)$$

Where $TE_{j,t}$ is the Technical Efficiency, $Bank\ Specifics_{j,t}$ is a vector of bank specific characteristics, $Country\ Specifics_t$ is a vector of macroeconomic and financial market condition variables, $Bank\ Regulation\ and\ Supervision_t$ is a vector to account for Basel II's pillars on bank regulations and supervision, *n* is number of observation, $\varepsilon_{j,t}$ is the error term, and the subscripts '*j*' and '*t*' represent individual financial institutions and time period, respectively.

Expanding the *Model 1*, we are going to estimate regression models, which are:

$$(TE)_{j,t} = \alpha + \beta 1 \ln(EQASS)_{j,t} + \beta 2 \ln(LOANSTA)_{j,t} + \beta 3 \ln(TA)_{j,t} + \beta 4 \ln(NIETA)_{j,t} + \Upsilon 1 \ln(GDP)_{j,t} + \Upsilon 2 \ln(INFL)_{j,t} + \Upsilon 3 \ln(CR3)_{j,t} + \Upsilon 4 \ln(Z\text{-}SCORE)_{j,t} + \delta 1 \ln(SPOWER)_{j,t} + \delta 1 \ln(LCAPRQ)_{j,t} + \delta 1 \ln(LACTRS)_{j,t} + \delta 1 \ln(LPRIMON)_{j,t} + \varepsilon_{j,t} \quad (2)$$

3.4. Bank Efficiency and Countries Income Classifications

The efficiency of the banking institutions is related to the growth rate especially in low- and middle-income countries (IMF,2005). Beck et al. (2013) explained that economic factors associated with growth differ across the countries with different incomes level, and they find that the efficiency of the financial sector is related to the growth rate. The income classification made by the World Bank separates countries into three groups according to gross national income per capita. The country groups are: high-income countries with a GNP per capita in 2011 higher than $9,386; middle-income countries with a GNP per capita between $766 and $9,385; and low-income countries with a GNP per capita of less than $765 (World Development Indicators 2011). Beck et al. (2006) point out the financial systems and standard indicators of financial intermediary across the world deepened over the past decades along many dimensions. However, progress has been uneven across income groups. The deepening has been concentrated in high-income countries, while there has been no significant deepening in middle- and low-income

countries. They emphasized that various economic and institutional features are different between low-, middle- and high-income countries. Countries with higher income per capita are expected to have a banking system that operates in a mature environment resulting in more competitive interest rates, profit margins and efficiency levels (Dietsch & Vivas, 1996). Compared to middle and high-income countries, low-income countries are characterized by higher banking sector risk, lower degrees of international integration, and smaller overall banking systems .One reason for the differences between high and low-income countries in terms of macroeconomic stability may thus be differences in the structure of banking systems because the banking systems in lower-income countries are typically smaller and less open than those in developed countries (Claessens et al., 2011).

Asongu (2010) pointed out that financial intermediary inefficiency is felt more in low-income countries than in their middle-income counterparts when trade accounts open could be captured from the perspective that banks of latter countries play a greater role in the financing of activities (Widarjono et al., 2020) resulting from trade openness than those of low-income countries. According to Oluitan's (2012) study on the level of inefficiency of the financial sector in Africa based on the income classification of the countries shows that much of the inefficiency within the continent is attributable to the low-income countries. The efficiency of the middle-income countries is even higher than the average within the continent. Oluitan (2012) highlighted the importance of income classification and suggests that the poor level of development of the financial sector in the low-income economies is a major factor for inefficiency of the banking sector. Beck et al. (2013) emphasized that the concentration level of banking sector is negatively correlated with the countries income levels while (Detragiache et al., 2005) find that the banking efficiency is negatively correlated with concentration level of the banking sector. According to Beck et al. (2006), the bank concentration level is negatively correlated with the income level of the countries hence the banks are more efficient in high- and upper-middle-income countries because highly concentrated banking sector might result in lack of competitive pressure to attract savings and channel them efficiency to investors. Cocoresse Pellechia (2010) explained that competition increases bank efficiency. According to Hauner and Peiris, (2005), low level of competition has been associated with low bank efficiency in many low-income countries.

Beck et al. (2013) found that there is a higher degree of foreign bank penetration in low and middle-income countries as compared to high-income countries both in terms of number and assets of foreign banks. Abel et al. (2017) pointed out that the banking and financial systems in low-income countries and middle-income countries are less open internationally compared to higher-income countries. In terms of bank ownership, Dietrich and Wanzenried, (2011) found that the public ownership of banks is higher in low-income countries than in middle- or high-income countries, as 20% of all banks in low-income countries are either fully or partially owned by the state. Beck et al. (2013) explained public bank assets constitute over 70% of commercial bank assets in low-income countries, their share is around 40% in middle income and 0% in high-income countries. This is also supported by Barth et al. (2013) who found that the public banks assets constituted in commercial banks assets in are highest in low-income countries and lowest in high-income countries.

4. Empirical Results

The impact of the bank regulations and supervision on the efficiency of Islamic banks operating in countries with different levels of income could have been different. The heterogeneity in relative profitability, concentration level, the degree of foreign bank penetration and the ownership of the banks across countries with different income levels is pervasive and shows a considerable variation and hence, could impact the level of efficiency of the banks. Beck et al. (2013) explained that economic factors associated with growth are differ across the countries with different incomes level and they find that the efficiency of the financial sector is related to the growth rate.

The income classification made by the World Bank separates countries into three groups according to gross national income per capita: high-income countries with a GNP per capita in 2011 higher than $9,386, middle-income countries with a GNP per capita between $766 and $9,385, and low-income countries with a GNP per capita of less than $765 (World Development Indicators 2011).

For the sake of checking the robustness of the results, we have performed similar regression models by performing an interaction of the bank regulations and supervision variables, which are supervisory power variable (SPOWER), capital requirement variable (CAPRQ), activity restrictions variable (ACTRS) and private monitoring variable (PRIMON) against the countries income levels dummies which are high-income (hic), middle-income (mic) and low-income (lic) countries.

Multivariate Regression of Model control for countries income levels:

$$
\begin{aligned}
(TE)_{j,t} = {} & \alpha + \beta 1 \ln(EQASS)_{j,t} + \beta 2 \ln(LOANSTA)_{j,t} \\
& + \beta 3 \ln(TA)_{j,t} + \beta 4 \ln(NIETA)_{j,t} + \Upsilon 1 \ln(GDP)_t \\
& + \Upsilon 2 \ln(INFL)_t + \Upsilon 3 \ln(CR3)_t \\
& + \Upsilon 4 \ln(Z\text{-}SCORE)_t \, \delta 1 + \ln(SPOWER)_t \\
& + \delta 2 \ln(CAPRQ)_t + \delta 3 \ln(LACTRS)_t \\
& + \delta 4 \ln(LPRIMON)_t \, \varphi 1 + \ln(SPOWER + \\
& \qquad *Dummyic)_t \\
& + \varphi 2 \ln(CAPRQ*Dummyic)_t \\
& + \varphi 3 \ln(LACTRS*Dummyic)_t \\
& + \varphi 4 \ln(LPRIMON*Dummyic)_t + \varepsilon_{j,}
\end{aligned}
$$

$_t$

Table 1: Panel Regression Analysis: Robustness Check for High-Income Countries

	Pooled OLS	Fixed Effect	Random Effect
Constant	2.2746 (1.44)	61.4674*** (5.31)	2.0265 (0.86)
Lloansta	0.1532*** (4.50)	0.0781 (1.56)	0.1395*** (3.44)
Leqass	-0.1367** (-2.21)	0.2028* (1.82)	-0.0075 (-0.10)
Lnieta	-0.1995*** (-3.66)	-0.1641** (-2.27)	-0.2473*** (-4.04)
Lnta	0.0320* (1.70)	0.1655* (1.71)	-0.0056 (-0.18)
Linfl	-0.1363*** (-3.20)	-0.0854* (-1.90)	-0.1591*** (-3.85)
Lngdp	-0.1097*** (-2.76)	-2.5077*** (-5.37)	-0.1144* (-1.79)
Lcr3	-0.2417 (-1.37)	-0.1534 (-0.44)	-0.0025 (-0.01)
Lzsore	0.1269* (1.79)	-0.2069 (-1.59)	-0.0767 (-0.82)
Lspower	0.156**	0654	0.303*
Lcaprq	0.070 (1.82)	0.040 (1.20)	0.127 (3.40)
Lactrs	0.398 (1.82)	0.181 (0.88)	1.261 (2.20)
Lprimon	0.895* (2.31)	0.0170 (0.06)	0.425* (1.26)
Ihiclspower	0.1350*** (3.45)	-0.1708 (-0.38)	0.1471** (2.22)
Ihiclcaprq	-0.1042 (-2.19)	-0.0600 (-0.42)	-0.0312 (-0.42)
Ihiclactrs	0.1201*** (3.15)	-0.0788 (-0.31)	0.1286** (1.99)
Ihiclprimon	0.1448*** (3.15)	0.0240 (0.04)	0.1666** (2.13)
BP-LM	131.70***	-	-
Hausman	-	-	76.42***
R^2	0.3023	0.0092	0.2567
Adjusted R^2	0.2870	-	-
Root MSE	0.70993	-	-
F-statistic	19.74***	8.32***	-
Wald Chi Square	-	-	67.71***
No of observation	420	420	420

* Note Value in parenthesis () are t statistic except for FE, it is z statistic.
***, ** and * indicates significant at 0.01, 0.05 and 0.10 level respectively.

Table 2: Panel Regression Analysis: Robustness Check for Middle-Income Countries

	Pooled OLS	Fixed Effect	Random Effect
Constant	0.8227 (0.53)	61.3597*** (5.16)	0.8038 (0.34)
Llonansta	0.1666*** (4.81)	0.0769 (1.54)	0.1500*** (3.65)
Leqass	-0.0565 (-0.93)	0.2088* (1.88)	0.0587 (0.77)
Lnieta	-0.2175*** (-3.83)	-0.1622** (-2.25)	-0.2563*** (-4.15)
Lnta	0.0456** (2.41)	0.1712* (1.77)	0.0060 (0.19)
Linfl	-0.2241*** (-5.67)	-0.0829* (-1.77)	-0.1680*** (-4.02)
Lngdp	-0.0878** (-2.20)	-2.5067*** (-5.24)	-0.1000 (-1.53)
Lcr3	-0.0565 (-0.33)	-0.1471 (-0.43)	0.1667 (0.68)
Lzsore	0.1157 (1.58)	-0.2177* (-1.69)	-0.0838 (-0.88)
Lspower	0.156** (2.36)	0.654 (0.53)	0.303* (1.74)
Lcaprq	-0.2236** (-3.16)	-0.0683 (0.75)	-0.2264** (-3.11)
Lactrs	0.3806* (1.96)	-0.0717 (4.55)	0.1061* (0.85)
Lprimon	-0.936* (-4.31)	-0.0170 (-0.06)	-0.6665 (-2.66)
Imiclspower	-0.0110 (-0.32)	-0.0743 (-0.24)	0.0121 (0.21)
Imiclcaprq	-0.1152*** (-2.69)	0.1037 (0.83)	-0.1501** (-2.27)
Imiclactrs	-0.0391 (-1.13)	-0.1541 (-0.34)	-0.0466 (-0.77)
Imiclprimon	-0.0392 (-0.87)	-0.1070 (-0.32)	-0.0409 (-.0.53)
BP-LM	142.06***	-	-
Hausman	-	-	74.54***
R^2	0.2843	0.0137	0.2397
Adjusted R^2	0.2686	-	-
Root MSE	0.71904	-	-
F-statistic	18.10***	8.32***	-
Wald Chi Square	-	-	61.29***
No of observation	420	420	420

* Note Value in parenthesis () are t statistic except for FE, it is z statistic.
***, ** and * indicates significant at 0.01, 0.05 and 0.10 level respectively.

Table 3: Panel Regression Analysis: Robustness Check for Low-Income Countries

	Pooled OLS	Fixed Effect	Random Effect
Constant	1.4628 (0.83)	60.1304*** (5.35)	1.9372 (0.75)
Lloansta	0.1721*** (4.99)	0.0780 (1.56)	0.1532*** (3.75)
Leqass	-0.0577 (-0.99)	0.2037* (1.83)	0.0424 (0.57)
Lnieta	-0.2226*** (-4.04)	-0.1647** (-2.28)	-0.2557*** (-4.15)
Lnta	0.0450** (2.40)	0.1639* (1.69)	0.0014 (0.05)
Linfl	-0.1741*** (-4.13)	-0.0852* (-1.89)	-0.1690*** (-4.08)
Lngdp	-0.1032** (-2.35)	-2.4614*** (-5.37)	-0.1243* (-1.77)
Lcr3	-0.0955 (0.53)	-0.1163 (-0.33)	0.0873 (0.35)
Lzsore	0.0821 (1.02)	-0.2305* (-1.74)	-0.1178 (-1.16)
Lspower	0.156** (2.36)	0.654 (0.53)	0.303* (1.74)
Lcaprq	-0.2236** (-3.16)	-0.0683 (0.75)	-0.2264** (-3.11)
Lactrs	0.3806* (1.96)	-0.0717 (4.55)	0.1061* (0.85)
Lprimon	-0.936* (-4.31)	-0.0170 (-0.06)	-0.6665 (-2.66)
Iliclspower	-0.0940 (0.81)	-0.5792 (-0.45)	-0.1798 (-0.97)
Iliclcaprq	-0.1484 (1.03)	0.0758 (0.45)	-0.1144 (-0.81)
Iliclactrs	-0.0953 (0.90)	2.4285 (0.45)	-0.1749 (-1.03)
Iliclprimon	-0.1196 (-0.83)	-0.5792 (-0.45)	-0.2188 (-0.93)
BP-LM	143.94***	-	-
Hausman	-	-	73.14***
R^2	0.2833	0.0122	0.2390
Adjusted R^2	0.2676	-	-
Root MSE	0.71955	-	-
F-statistic	18.01***	8.33***	-
Wald Chi Square	-	-	61.37***
No of observation	420	420	420

* Note Value in parenthesis () are t statistic except for FE, it is z statistic.
***, ** and * indicates significant at 0.01, 0.05 and 0.10 level respectively.

Bank regulations and supervision vector, clearly suggest that the impact of SPOWER variable is positive toward the efficiency of the Islamic banks operating in Asia and high-income countries. On the other hand, there is a negative impact of capital requirement towards the efficiency of the Islamic banks that are operating in the middle-income countries. The activity restrictions and private monitoring impact is positive on Islamic banks operating in high-income countries. The findings in our study illustrate that in high-income countries, the stricter the supervisory power, the tighter the restrictions on non-banking activities and the stricter the private monitoring could statistically significantly enhance the level of efficiency of Islamic banks. Meanwhile, in middle-income countries, the stricter the capital requirement could statistically significantly decrease the level of efficiency of Islamic banks. The impacts of higher supervisory power in the Asia and high-income countries have been shown in our study as an important determinant for improving the Islamic bank efficiency. We found that there is statistically significant evidence that higher capital requirements are negatively associated with the efficiency of Islamic banks that are operating in middle-income countries where the study revealed that Islamic banks are less technically efficient given the stringent rules on capital requirement.

Our study provides evidence that in high-income countries, the stricter restrictions on non-bank activities, which are insurance, securities and real estate activities tend to produce more efficient banks (Bakri et al., 2018). Banking organizations with a variety of nontraditional activities tend to be less transparent than others, which makes it difficult for the market to discipline their risk taking. The mix of banking and non-banking activities would lead to the formation of huge entities that can be extremely difficult to monitor or to discipline. Therefore, policymakers of these countries should enhance the level of restriction on Islamic bank's activities, which meaning that government should prevent the Islamic banks from heavily participating in securities, insurance and real estate activities in order to increase the level of efficiency (Bakri et al., 2017). Strict restriction of bank engaging in these activities can reduce the conflicts of interest with their fundamental business and risk from various activities. The strict activity restrictions also could improve the risk management of banking organizations by focusing their activities solely on the traditional banking business with exposure only to risks inherent in these activities. The impacts of higher private monitoring in high-income and Asia countries have been shown in our study as an important determinant for improving the Islamic bank efficiency.

5. Conclusion

To check for the robustness of the results, we have performed a number of sensitivity analyses. The findings from our study have shown that the impact of the bank regulations and supervision on the efficiency of Islamic banks operating in different region and different country's income levels have been different. Factors such as economic structure and regulation, historical background, degree of liberalization, social norms, and interpretation of the religious guidelines are differing between regions. Chan and Karim, (2010) emphasize that the effect of macro-economic factors such as GDP per capita, market concentration, and trade openness on bank efficiency differs across region. The banks perform differently in their financial intermediation function across regions and could be due to growth divergences across the regions where some region have been experiencing steady growth while some region has remained anemic. Beck et al. (2013) point out that various economic and institutional features are different between low- middle- and high-income countries. Countries with higher income per capita are expected to have a banking system that operates in a mature environment resulting in more competitive interest rates, profit margins and efficiency levels (Dietsch & Vivas, 1996).

Lastly, bank regulations and supervision vector clearly suggest that the impact of SPOWER variable is positive on the efficiency of the Islamic banks operating in Asian and high-income countries. On the other hand, there is a negative impact of capital requirement on the efficiency of the Islamic banks that are operating in the middle-income countries and MENA countries. The activity restrictions and private monitoring impact is positive on Islamic banks operating Asia and high-income countries.

The findings in our study illustrate that in Asian and high-income countries, the stricter the supervisory power, the tighter the restrictions on non-banking activities, and the stricter the private monitoring could statistically significantly enhance the level of efficiency of Islamic banks. Meanwhile, in Middle East and Africa (MENA) and middle-income countries, the stricter the capital requirement could statistically significantly decrease the level of efficiency of Islamic banks. The impacts of higher supervisory power in the Asian and high-income countries have been shown in our study to be an important determinant for improving the Islamic bank efficiency. We found that there is statistically significant evidence that higher capital requirements are negatively associated with the efficiency of Islamic banks that are operating in MENA and middle-income countries where the study revealed that Islamic banks are less technically efficient given the stringent rules on capital requirement. Excessive regulations may have adverse effects on Islamic banks in MENA and middle-income countries where the higher the capital requirement against specific assets will increase the cost of funds for the banks.

Our study provides evidence that in high-income and Asian countries, the stricter restrictions on non-bank activities, which are insurance, securities and real estate activities, tend to produce more efficient banks. In our study, the empirical findings clearly suggest that there is a significant and positive impact of restricting the non-banking activities such as securities, insurance and real estate activities towards the efficiency of the Islamic banks operating in high-income countries. The national regulatory authorities of Islamic banks in high-income countries need to put more restriction on the activities pertaining to securities activities to increase the efficiency levels. The Islamic banks in high-income countries need to put more restriction on the activities pertaining to real estate activities to increase the efficiency levels. The higher restrictiveness imposed on the banks in engaging in real estate activities would prevent banks from exercising inappropriate influence over the commercial sector and intended to prevent banks from engaging in risky business that would lead to deteriorating the performance of the banks. The impacts of higher private monitoring in high-income countries have been shown in our study as an important determinant for improving the Islamic bank efficiency. A greater level of private monitoring will enhance the level of efficiency of Islamic banks in high-income countries in our study and this finding is consonant with Pasiouras et al. (2009) where they suggest that the private monitoring approach can enhance market discipline and thus improved private governance of banks and consequently, promotes bank performance.

In a nutshell, we conclude that the stricter the supervisory power, the less strict capital requirement, the tighter the restrictions on non-banking activities, and the stricter the private monitoring could statistically significantly enhance the level of efficiency of Islamic banks. In enhancing the regulations and supervision of the Islamic banks, the existing regulatory framework based on the Basel Committee on Banking Supervision (BCBS) must be complemented with the prescriptions on Islamic banking or *Shariah* compliance diligently, so that the Islamic banks could be regulated accurately and further improve their technical efficiency.

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