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The Structure-Performance Nexus and Efficiency in the Malaysian Banking Sector

Rafik Harkati
Syed Musa Alhabshi
Salina Kassim

Abstract: The debate on whether Islamic banks (IBs), given their unique attributes and business model, outperform their conventional counterparts in the context of a dual banking system has been ignited, with no conclusive evidence yet reached. This study conducts a comparative empirical analysis of performance between IBs and conventional banks (CBs) in the dual banking system of Malaysia. It investigates whether banks' performance in Malaysia has been driven by market structure or efficiency. It also investigates whether bank managers have been demotivated and settled for a quiet life due to market power or have been aggressive due to the search for efficiency and market share. Further, it investigates how concentration within one sector influences its counterpart's performance. Generalised Method of Moments (GMM) and Data Envelopment Analysis (DEA) techniques are employed. The findings revealed that Efficient Structure (FS) and Structure-Conduct-Performance (SCP) hypotheses are rejected for all categories. The Quiet Life Hypothesis (QLH) is accepted for CBs, implying persistency of profits and validity of the Relative Market Power (RMP) hypothesis; however, it is rejected for IBs, implying IBs' pursuit of market power. Islamic banking sector structure showed no influence on the performance of both IBs and CBs, while CBs negatively influenced the performance of both types of banks and the sector at large. Policy markets can capitalise on the findings, regulators, and banks' managers to promote performance, efficiency, and set merger policies.

Keywords: Performance, structure, efficiency, market power, quiet life, dual banking system.

JEL Classification: C5, D4, G2, G21, G34

Dr. International Islamic University Malaysia, rafikharkati@gmail.com, 0000-0002-8339-1806
Assoc. Prof., International Islamic University Malaysia, syedmusa@iium.edu.my, 0000-0001-8274-9944
Prof., International Islamic University Malaysia, ksalina@iium.edu.my, 0000-0002-7514-8750

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Introduction

Several stakeholders are keenly interested in bank performance, especially in countries with two different banking systems. Knowing the forces driving banks' performance allows many stakeholders to set and change their policies to achieve their interests. In most Muslim countries, banking systems have been heading towards duality, which, in turn, changed the financial structure of the banking landscape of these countries. A dual banking system is unique given the coexistence of two different types of banks within the same environment. Malaysia has successfully established one of the world's deep-rooted Islamic finance jurisdictions, which has been experiencing rapid development. It is also considered the pioneer in setting up a full Islamic financial system alongside the conventional one (Global Islamic Finance Report, 2017).

In recent years, Islamic banking in Malaysia has become a significant component of the banking industry. This can be observed through its persistent upward trend apace with its market share increase (Global Islamic Finance Report, 2017). Assets of both Islamic banks (IBs) and windows in Malaysia have been expanding with an increase of 9.3% between 2Q2016 and 2Q2017. This expansion boosted the domestic market share by 1.1%. With a view to sustaining the attained growth, the Islamic banking industry concentrates on technology-oriented business diversification (Islamic Financial Services Board, 2018). The share of the Islamic banking industry in Malaysia amounted to 24.9% of the entire banking pool of assets as of 2Q2017, compared to 23.8% in 2016 (IFSB, 2018). However, it reached 30% in 2017 when the assets of development finance institutions (DFIs) are included in the pool (IFSB, 2018). In 2Q2018, the assets increase was estimated at 10.8%. This promoted the Islamic banking industry share, estimated at 26.5% of the entire commercial banking sector (IFSB, 2019).

Conventional banks in Malaysia have the lion's share of the banking market through parent banks or subsidiaries. Possumah and Ahmat (2018) and Ariff (2017) stated that the Islamic subsidiaries of CBs dominate the Islamic banking system in the loan and deposit markets and in terms of total assets. However, the Association of Islamic Banking Institutions Malaysia (AIBIM) anticipate that the Islamic banking sector is heading towards a 40% share of the banking assets by 2020 (Islamic Finance Knowledge Repository, 2018). However, according to current market circumstances, 40% was not achieved by 2020.

It is inevitable for banks that operate within a dual banking system to adapt to the unique environment to survive and sustain, especially banks with minimal

history and experience and low competition power. The structure, efficiency, and conduct of one type of bank are expected to shape and direct the conduct of its counterpart, given its relative newness and low competition power. CBs in Malaysia have long enjoyed significant market share, thereby rendering them more competitive and profitable.

Accordingly, questions must be asked regarding the dominance of conventional banks, particularly total assets, what drives Islamic banks to perform, and the role of efficiency and structure in driving performance.

Four prominent hypothetical bases are employed to investigate the key factors that drive banks' performance, namely Structure-Conduct-Performance (SCP), Efficient Structure (ES), Relative Market Power (RMP), and Quiet Life Hypothesis (QLH).

Unlike previous studies, this study is conducted within a dual banking system, where CBs are well-established, whereas IBs[1] have only existed for around five decades, with increasing signs of competitiveness and resilience year by year. Given the insufficient empirical evidence on the dynamics and nature of CBs coexistence with IBs, this study unveils the influence of conventional banking concentration on IBs performance and the sector at large. It also contributes to whether Islamic banking concentration matters for the performance of CBs. Second, by virtue of its unique principles, this study provides evidence on whether IBs are more efficient than CBs in light of the efficiency-performance nexus and QLH.

Literature Review

Malaysian Dual Banking System and Efficiency

In the aftermath of the Asian crisis, Asian economies were forced to rectify the defects of their banking systems exposed by the crisis. Many commercial banks plunged into financial distress and insolvency. The crisis was attributed to numerous factors, chief among them the steep currency depreciation from Thailand's currency devaluation initiative in the beginning of the second half of 1997, the incentives of

1 It has been only five decades when Islamic banking started introducing itself to the world, its operating principles are thoroughly different from those of its conventional counterpart which has resilient and strong foundations owing to it being in existence for so long. Islamic finance is being ruled and guided by means of Shariah law, especially what's pertinent to commerce-based transactions. Shariah law prohibits interest (Riba), uncertainty (Gharar), gambling (Maysir), it also prohibits involvement in pork, alcohol, prostitution, entertainment and indecent media (Habib, 2018).

over-saving and low consumption, resources misallocation out of favouritism, the overwhelming problem of non-performing loans out of mismanagement, and inconsiderate lending by financial institutions. In most emerging markets, including Malaysia, banking systems witnessed dramatic movements of capital flows owing to liberating financial systems, high levels of economic freedom, technology, and innovations in the financial markets (Detragiache & Gupta, 2004). These changes transformed the banking landscape in those emerging banking markets. In the context of Southeast Asia, particularly Malaysia, authorities opined that quickening the merger process was the best practice for financial reform in the hope of achieving high efficiency and speedy recovery of the banking system (Bank for International Settlements, 2001). While some countries like Thailand, Indonesia, and South Korea opted to go for International Monetary Fund (IMF) bailouts, Malaysia turned down the impositions of IMF and forced local banks to merge as single entities.

The merger initiative is expected to boost efficiency and performance, induce banks to get rid of inefficient management, change financial institutions structurally, and most importantly, realise banking system stability. However, Berger (2003) argued that costs could be burdensome, resulting in inefficiency. Notwithstanding, mergers lead to a more concentrated banking system, less competition, and higher market power, and therefore likely to hamper efficiency improvement initiatives. In 2009, the merger program decreased the number of commercial banks to 22, whereas the number of IBs increased to 15 due to penetration (Ab-Rahim and Chiang, 2016). As of 2016, the Malaysian banking system comprised 26 commercial banks and 17 IBs. According to the Financial Sector Blueprint 2011 – 2020, the financial system grew 3.4 times more than the level of gross domestic product (GDP) in 2010, Bank Negara Malaysia (BNM) anticipated that it would grow six times as high as GDP by 2020 while boosting its contribution to GDP by 10-12% (its contribution in 2010 was 8.6%). Accordingly, achieving these projections necessitate financial institutions to perform efficiently to realise BNM's vision.

Further, efficiency and concentration determine the commercial banks' performance. A study conducted by Ab-Rahim and Chiang (2016) comprised eight banks covering the period from 2000-2011 and revealed that concentration in the Malaysian banking system is dwindling, allowing more space for competition. It also showed that the Malaysian banking industry could reduce its inputs by 60% to operate on the efficient frontier. However, there were contradictions as they reported a positive impact of concentration represented by the Herfindahl-Hirschman Index (HHI) and concentration ratio of the largest three banks (CR3). It was then stated that SCP is rejected, which is inconsistent which the assumption of the SCP paradigm (a positive relationship between HHI and performance). The study should

have also distinguished between market power (at the individual level) and concentration across the banking industry to determine which is the outcome of the other. Consequently, the findings are questioned.

Wahid (2016) compared the efficiency of IBs and CBs in Malaysia from 2004-2013. On a small-scale basis, the technical efficiency of CBs is distinguishable and greater than that of IBs. However, when banks are compared on a large scale, IBs' efficiency is higher than large CBs. The size of banks was favourable for IBs as it improves efficiency and did not hamper CBs' efficiency. Asset quality, capitalisation, inflation and post-crisis dummy were found to negatively impact both banks' efficiency. Whereas non-interest income, GDP, and pre-crisis dummy variables were captured to impact the efficiency of both types of banks positively.

Rodoni et al. (2017) contrasted the efficiency and performance of IBs in Pakistan, Malaysia and Indonesia from 2009-2013 using the DEA approach and Malmquist Index (MI) and found that Islamic banks in Malaysia suffer from inefficiency, yet its efficiency range was between 92% and 95% better than that of Indonesia which was between 87%-97%. IBs' efficiency in Pakistan ranged from 99.3%-100%. They did not reach 100% efficiency due to technological reasons. Ibrahim (2020), in the context of the Malaysian dual banking system, found that CBs outperformed their Islamic counterparts. He also pointed out that the penetration of IBs led to lower bank profitability. However, he stated that the existence of IBs in Malaysia reduces risk and enhances the efficiency of banks.

Relevance of Performance to Market and Bank Indicators

For promising performance, banks must consider various factors simultaneously to stand on the key factors influencing their performance. In other words, observing the surroundings in and out of the bank paves the way toward maximising profit and cost-efficiency. In a dual banking system, banks must observe the circumstances given that two different types of banks operate side by side. This duality suggests that coexistence requires adapting to the unique banking landscape. In literature, four prominent theoretical foundations are used to determine the forces around which performance revolves. Bain's (1951) paradigm (SCP) connotes a positive association between concentration and performance. A higher level of concentration gives rise to collusive activities and barriers to entry (Molyneux and Forbes, 1995) and, therefore, higher (monopolistic) profits. Recent studies provided evidence supporting SCP (Tan et al., 2017; Khan et al., 2018; Hoang et al., 2020). In contrast, other studies refuted the SCP premise (Ab-Rahim and Chiang, 2016; Sarpong Kumankoma et al., 2018; Doyran & Santamaria, 2019; Hoang et al., 2020). Hence,

in light of the SCP paradigm, a positive relationship between concentration (HHI) and performance is due to collusive conduct among dominating banks which leads to superior profits. From here, the first hypothesis is as follows:

H1. Concentration exerts a significant positive influence on banks' performance.

H1.1. Given the dominance of CBs over the banking industry, the concentration of CBs is expected to influence the performance of IBs negatively due to market power and competition pressure.

Secondly, the RMP hypothesis implies that profitability is not imputed to collusive activities among the largest banks (structure); instead, it is the outcome of large firms' considerable market shares (MSs). Only those large firms with apparently distinguishable products can price those products (exercise market power) and hence make abnormal profits (Shepherd, 1982). Accordingly, a bank's efficiency and market power are cancelled out when MSs positively impact profitability (Chortareas et al., 2011). RMP has been investigated in the context of several banking systems. The findings of recent studies can be grouped into two groups. The first group concluded that RMP holds (see, e.g., Camino-Mogro and Bermúdez-Barrezueta, 2019; Doyran and Santamaria, 2019; Haghnejad et al., 2020), while the second group refuted RMP (Otero et al. 2019; Hoang et al., 2020). Accordingly, under the presumption of the RMP hypothesis, only large efficient firms (banks in our case) hold the greatest MSs and are characterised by product differentiation and their ability to set prices owing to the market power they enjoy. In the case RMP holds, HHI would not influence performance. Therefore, the second hypothesis is as follows:

H2. MS exerts a significant positive influence on banks' performance.

Thirdly, contrary to SCP, Demsetz's (1973) ES hypothesis challenges the SCP argument. Although SCP holds that performance is the outcome of structure (concentration), ES maintains that efficiency dynamics within a competitive market postulate that firms with high efficiency are highly competitive, generate elevated profits and increase market share. This, in turn, causes markets to concentrate. As the market becomes concentrated and efficient owing to the dominance of efficient firms, anti-concentration procedures would no longer be needed as they impede economic growth. ES has been investigated in several banking contexts, and the results are contradicting. The first group found evidence supporting the hypothesis (Sarpong-Kumankoma et al., 2018; Camino-Mogro & Bermúdez-Barrezueta, 2019; Hoang et al., 2020), while the other concluded that the ES hypothesis does not hold (Garza-García; 2012; Doyran and Santamaria, 2019; Hoang et al., 2020).

According to Demsetz (1973), when ES holds, the impact of market share and concentration on performance would be considered misleading because it is efficiency that explains profitability and increases market share. In plain language, ES is an alternative for RMP and SCP. ES holds if a positive relationship between the two efficiencies and performance is captured. It postulates that efficient firms generate higher profits. Given that efficiency is broken down into Pure Technical Efficiency (PTE) and Scale-Efficiency (SE), two hypotheses are formed under this basis.

H3.1. PTE influences banks' performance positively owing to superior management and efficient production operations. This allows efficient banks to increase their market share at the expense of other banks with less efficiency.

H3.2. Scale-efficiency assumes that better performance is not attributed to superior management and production operations but to economies of scale. Hence, economies of scale result from relatively low incurred costs leading to higher profits, then more market share at the expense of other banks' inefficiency. Consequently, SE influences performance positively.

Finally, Hicks's (1935) QLH poses an opposing argument to ES and implies that firms with considerable market share set aside a portion of profits it earns out of non-contestable pricing as a recline to indulge in a relaxed life where cost-efficiency is no longer one of the main concerns of managers. This hypothesis is included in the paradigm of market power. When QLH holds, the positive linkage between structure and profit is offset because what is earned out of pricing is depleted by poor efficiency. Therefore, what demonstrates the fragility of the linkage between structure and profit in many banking systems can be attributed to QLH. Under QLH, firms may opt to pursue a sluggish life/management due to its managers' preferences of pursuing other activities or maintaining market power rather than attempting to increase efficiency. However, previous studies contradict this. Some studies confirmed the validity of QLH (Doyran & Santamaria, 2019; Saeed et al., 2020 ; Haghnejad et al., 2020), while others refuted it (see, e.g., Huang et al., 2018; Liem, 2019). This hypothesis reflects the inefficiency of managers and their short-sightedness. They use the firm's market power of price setting owing to their large size to earn higher gains. Therefore, given the nature of the Malaysia dual banking industry, where CBs dominate the banking landscape and IBs are in pursuit of more market share, the fourth hypothesis is formed as follows:

H4. CBs are expected to be quieter than IBs owing to their MSs. QLH is valid when the persistency of profit is observed. In our case, it will be observed through the significant positive influence of both lagged dependent variables, namely, Re-

turn on Assets (ROA) and Return on Equity (ROE) and the MSs on performance.

In investigating the efficiency-performance nexus, the study divides efficiency into pure technical efficiency (PTE) and scale-efficiency (SE). In the non-parametric technique of DEA, PTE reveals the efficiency of managerial performance (Epure and Lafuente, 2015) as to how efficiently it transforms inputs into outputs. It is captured through a variable return to scale (VRS). Whereas according to Charnes et al. (1978), SE assumes that all firms run at an optimal scale. If this holds, banks will manage to generate higher unit profits at a lower cost. The division of constant return generates SE to scale (CRS) by VRS. Accordingly, high-efficiency banks generate higher profits owing to their ability to capture uneven MSs, such that CRS presumes no relationship between efficiency and operation scale.

Studies in Malaysia's dual banking system remain limited, especially employing SCP, ES, RMP, and QLH simultaneously to identify the key factors that influence the performance of two different types of banks, in addition to ascertaining how the dominant one impacts and directs the performance of the other. The limited number of studies that investigated CBs and IBs used old data. This study attempts to enrich the existing studies in dual banking systems by providing empirical evidence on the ignited debate regarding which bank outperforms its counterpart.

Data, Model Specifications and Methodology

Data

The bank-level variables used in the study are collected from the FitchConnect database and country variables from the World Bank. The panel sample covers 43 Malaysian commercial banks from 2011-2017. The sample comprises 17 IBs and 26 CBs with 290 yearly observations.

Model Specifications and Methodology

Generalised Method of Moments (GMM)

We use the dynamic Generalised Method of Moments (GMM) technique to estimate the dynamic models and the impact of the variables of interest on performance[2]. This technique is used to inculcate the unobserved effects of the lagged variable (endogenous) (Roodman, 2009), and it also allows for the use of an instrumental variable (Blundell and Bond, 1998). Additionally, the technique is employed

2 To find out more on how to decide between system and difference GMM, see Bond et al. (2001).

when dealing with short macro panel data to avoid inconsistent estimates. System GMM introduced by Arellano and Bover (1995) and Blundell and Bond (1998) is used to estimate the model with ROA as a dependent variable. This is because the detection of downwards biases of standard errors in difference GMM as the value of the lagged variable coefficient lies quite close or lower than its value in the Fixed Effect model. In other words, it demonstrates a random walk (Bond et al., 2001). This technique efficiently controls for differences in estimators, endogeneity, and biasness of omitted variables and offers the level form moment conditions and flexibility to the variance-covariance structure. In contrast, difference GMM by Arellano-Bond (1991) is used to estimate the model with ROE as a dependent variable. This is because of the detection of upwards biases of standard errors in System GMM as the value of the lagged variable coefficient in System GMM is lower or very close to its value in the Fixed Effect model (Bond et al., 2001). Difference GMM is preferred when standard errors are detected to be upward biased. The two models for the dynamic panel data analysis are presented in Eqs. (1) and (2) as follows:

$$ROA_{i,t} = \alpha_{i,t} + \beta_1 ROA_{it-1} + \beta_2 HHI_i + \beta_3 MS_{it} + \beta_4 ESX_{it} + \beta_5 ESS_{it} + \beta_6 \text{ EQ/TA} + \beta_7 NPL_{it} + \beta_8 \text{ Netloans/TA} + \beta_9 INTR_{it} + \beta_{10} GDP_{it} + \beta_{11} Dummy\ own + \mu_i + \varepsilon_{it} \quad \textbf{(1)}$$

$$ROE_{i,t} = \alpha_{i,t} + \beta_1 ROE_{it-1} + \beta_2 HHI_i + \beta_3 MS_{it} + \beta_4 ESX_{it} + \beta_5 ESS_{it} + \beta_6 \ EQ/TA + \beta_7 NPL_{it} + \beta_8 \ Netloans/TA + \beta_9 INTR_{it} + \beta_{10} GDP_{it} + \beta_{11} Dummy\ own + \mu_i + \varepsilon_{it} \quad \textbf{(2)}$$

ROA	Performance measure; return on assets (Ab-Rahim and Chiang, 2016; Khan and Hanif, 2019).
ROE	Performance measure; return on equity (Ab-Rahim and Chiang, 2016; Khan & Hanif, 2019; Hoang et al., 2020).
HHI	Concentration measure; HHI is the sum of squared market shares (assets) in each period (Ab-Rahim and Chiang, 2016; Sarpong-Kumankoma et al., 2018; Doyran and Santamaria, 2019).
MS	Market power measure; Market share (MS) is computed as each bank's total assets divided by the total assets of all banks in the market each year (Khan and Hanif, 2019; Doyran & Santamaria, 2019).
Net Loans/TA	Liquidity risk measure; net loans over total assets (Doyran & Santamaria, 2019; Saeed et al., 2020).
NPL	Credit risk measure; non-performing loans over total loans (Dong et al., 2017; Ibrahim, 2020).

EQ/TA	Capitalisation measure (Wahid, 2016; Dong et al., 2017; Khan et al. 2018; Ibrahim, 2020).
ESX	X-efficiency (pure technical efficiency) (Epure & Lafuente, 2015; Wahid, 2016; Doyran &Santamaria, 2019).
ESS/SE	Scale-efficiency (Epure & Lafuente, 2015; Wahid, 2016; Doyran & Santamaria, 2019).
Dummy own	1 if the bank is foreign, and 0 if the bank is local.
GDP growth	Annual GDP growth (studies widely use this variable as a control variable).
Real Interest rate	Real interest rate is the lending interest rate adjusted for inflation (Rashid & Jabeen, 2016; Doyran & Santamaria, 2019).
t and *i*	Denote time and individual bank, respectively.
+	Denote unobserved specific time-invariant effect and disturbance term, respectively.

Bank-level variables enter the equation as endogenous variables, whereas GDP growth and IR enter as exogenous variables.

Data Envelopment Analysis

Data Envelopment Analysis' (DEA) non-parametric approach is employed in the study to compute efficiency scores. In this study, technical efficiency (TE) is disentangled from pure technical efficiency (PTE) and scale-efficiency (SE/ESS). In other words, both efficiencies are presented in scores computed based on the DEA approach. DEA computes the relationships between decision-making units (DMU) where various inputs and outputs permit the juxtaposition of heterogeneous units. Efficient banks are supposed to be spotted on the efficient production frontier. According to Cook et al. (2014), this frontier line is labelled as the line of best practice. The idea behind disentangling TE is to distinguish between the impact of managerial performance and economies of scale[3]. VRS linear programming is specified in Eq. (3) as follows:

3 For further details, refer to Coelli et al. (1998).

$$\text{Min}_{\theta y}\theta,$$

$$\text{st} : -y_i + Y_\lambda \geq 0$$

$$\theta x_i - X\lambda \geq 0 \quad \textbf{(3)}$$

$$N1' = 1$$

$$\lambda \geq 0,$$

where θ ranges between 0 and 1, it represents bank's efficiency score. λ is a vector of N×1 constants. y represents the output vector for the ith DMU. Y represents the matrix of outputs of the other DMUs and the number of DMUs ranges from I = 1,..., n. x represents a vector of input of the ith DMU, whereas X represents the input matrix of the other DMUs. In order to get scores efficiency for CRS based on Eq. (3), convexity constraint λ = 1 is omitted. When SE (CRS/VRS) equals unity, the bank is efficient in CRS and VRS. On the other hand, the bank is not scale-efficient when SE is less than unity.

Efficiency scores are computed using total costs ((sum of total interest expense, administrative expenses, and personnel expenses) and deposits as inputs (Chortareas et al., 2011; Garza-García, 2012; Doyran & Santamaria, 2019). Whereas for outputs, we employ total loans[4] and other earning assets (Garza-García, 2012; Otero et al., 2019). Table 1 reports summary statistics of inputs and outputs used to compute efficiency scores in DEA. Generally, mean and standard deviation values of inputs and outputs of CBs exceed those of IBs. This is mainly due to the CBs being larger than that of IBs, possessing high market power, and being more concentrated than IBs.

4 It is noteworthy to mention that in the context, Islamic banks "loans" are thought of as "financing" because Islamic banks do not engage with interest-based activities as interest is prohibited. However, throughout the paper the word "loan" is used for both.

Table 1

DEA Input/Output Descriptive Statistics

Variable	Mean	Std. Dev	Min	Max	N. Obs
All banks					
Inputs					
Total costs	2122.294	3860.531	1.22	26311.2	290
Deposits	52990.44	94174.62	0	574252	290
Outputs					
Total loans	43379	80110.54	0	493845.1	290
Other earning assets	1.761724	6.609432	-1.4	53	290
Islamic Banks					
Inputs					
Total costs	951.2582	1073.484	12.13	6271.6	114
Deposits	25354.44	31856.08	115.05	182691	114
Outputs					
Total loans	20805.02	29712.5	47.51	163555.1	114
Other earning assets	0.2561404	1.222723	-1.4	10	114
Conventional Banks					
Inputs					
Total costs	2880.807	4732.478	1.22	26311.2	176
Deposits	70891.02	114765.9	0	574252	176
Outputs					
Total loans	58000.78	97372.16	0	493845.1	176
Other earning assets	2.736932	8.291169	0	53	176

Note: numbers are in 000.000

4. Results and Discussions

Descriptive Statistics

Table 2

Descriptive Statistics of Variables Used in the Models

Variable	Mean	Std. Dev	Min	Max	N. Obs
ROA					
All Banks	.0065046	.0104326	-.100639	.0220286	290
Islamic	.0044134	.0128646	-.100639	.0155036	114
Conventional	.0078591	.0082572	-.0549055	.0220286	176
ROE					
All Banks	.0844202	.0664031	-.3243466	.226827	290
Islamic	.081288	.0747862	-.3243466	.2156455	114
Conventional	.086449	.060496	-.0628797	.226827	176
HHI					
HHI All Banks	.1027989	.0089369	.0956925	.126835	290
HHI Islamic	.1400212	.0123744	.1190961	.1602944	114
HHI Conventional	.1434023	.0107431	.1316386	.1699592	176
MS					
All Banks	.0241379	.0438691	.0000129	.262611	290
Islamic	.0614035	.0701326	.0003694	.3171544	114
Conventional	.0397727	.0646545	.0000152	.3083038	176
Loans/Assets					
All Banks	.5553664	.2171719	0	1.262909	290
Islamic	.6589172	.1165596	.2039056	1.262909	114
Conventional	.4882938	.2400105	0	.7760131	176
NPL					
All Banks	740.2049	1530.792	0	11555.98	290
Islamic	284.7225	290.1907	0	1717.328	114
Conventional	1035.233	1895.46	0	11555.98	176
Net loans/Assets					
All Banks	0.54357	0.214376	0	1.256963	290
Islamic	0.64171	0.124922	0.10678	1.25696	114
Conventional	0.480005	0.235543	0	0.769444	176
ESX					
All Banks	.4424725	.2264395	.017321	1	290
Islamic	.6088458	.1294348	.342122	1	114
Conventional	.5293932	.3111441	.017321	1	176
ES/ESS					
All Banks	.8476305	.1691246	.151231	1	290
Islamic	.9703572	.1007191	.249623	1	114
Conventional	.7229949	.2326028	0	1	176
EQ/TA					
All Banks	.1410062	.1452838	.0432357	.9945995	290
Islamic	.0947204	.0613328	.0432357	.4496335	144
Conventional	.1709867	.1735764	.0575469	.9945995	176
GDP growth	5.226662	.6043972	4.22	6.007	290
Real Interest rate	2.49289	1.53986	-.4718686	4.430296	290

Note: numbers are in 000.000

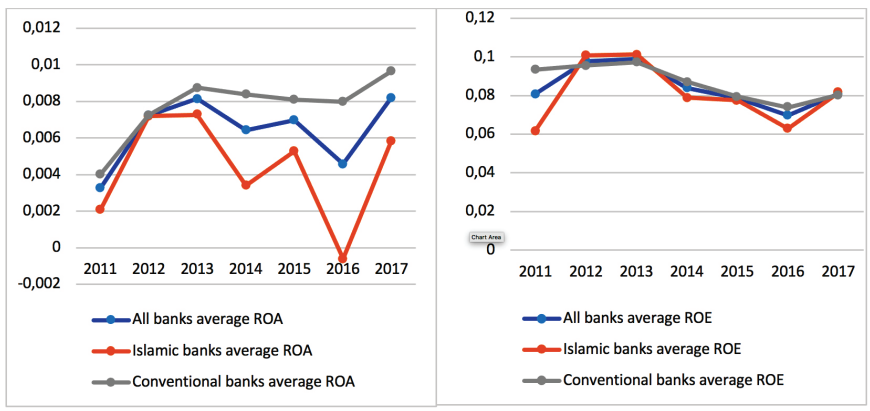
Table 2 reports descriptive statistics of the variables used in Eqs. (1) and (2). The mean of ROA and ROE for CBs (0.0079, 0.086) is higher than that of IBs (0.0044, 0.081) and the industry (0.0065, 0.084). This implies that CBs are considerably using their assets more profitably than IBs. In contrast, both types of banks use their equity similarly productively under ROE. Concerning their standard deviation, CBs showed a less dispersed ROA and ROE (0.008, 0.06) than IBs (0.013, 0.075). The HHI mean value of CBs (0.143) is slightly higher than that of IBs (0.14), with both industries experiencing moderate concentration conditions. The mean value of MS for IBs (0.061) is higher than that of CBs (0.40). This implies that the market power of IBs in the industry is increasing compared to previous years. AIBIM (2018) anticipates IBs to possess a 40% market share by 2020; however, this is currently out of reach, yet this could be obtained in the near future. Based on loan figures, IBs deem to have more assets tied up in loans (financing) with a mean of (0.64) compared to (0.48) for CBs; however, the standard deviation for CBs (0.24) is almost twice that of IBs (0.13). This difference could be attributable to heterogeneity among CBs. The mean value of NPL for CBs (1035) is extremely higher than that of IBs (284). This implies that CBs may face a higher credit risk than IBs. This is not surprising as CBs activities are interest-based as compared to IBs that mainly rely on equity. However, when observing the standard deviation of NPL for CBs and IBs, it seems that this difference could be attributable to heterogeneity among CBs as their standard deviation is extremely high (1895) compared to IBs (290). As for efficiency, IBs tend to exhibit higher mean values for ESX and SE scores (0.61, 0.97) as compared to CBs (0.53, 0.72). This may imply that IBs are more efficient than CBs.

Fig. 1 presents ROA and ROE mean values trends for the industry. IBs' ROA shows an increase for the first year (2011-2012), from 0.002 to 0.0072, then a decreasing fluctuating trend for 2012-2016, from 0.0072 to -0.0006. In contrast, CBs' ROA experienced an increasing trend for the first two years (2011-2013), from 0.004 to 0.0087, then a slightly decreasing trend from 2013-2016, from 0.0087 to 0.008. Both banks' ROA exhibited an increase for the last year (2017) with a sharp increase for IBs from -0.006 to 0.0059. Generally, CBs exhibit better performance throughout the study. This is apparent when considering ROA. Both banks have improved their performance as of 2016, especially in the case of IBs, as they witnessed a sharp decrease in ROA in 2015-2016; however, they bounced back quickly starting in 2016. With respect to the ROE trend, the trend is almost identical for both banks. It increased in the first year (2011-2012) from 0.062 to 1.009 for IBs, and from 0.093 to 0.096 for CBs. In the second year (2012-2013), it remained stable for both types of banks, in the range of 0.096-0.097 for CBs and 1.009-1.01 for IBs. Then it showed a decreasing trend for both for 2013-2016, from 0.097 to 0.074 for CBS,

and from 1.009 to 0.063 for IBs. In the last year (2016-2017) both banks' performance bounced back, from 0.074 to 0.080 for CBs, and from 0.063 to 0.082 for IBs. Under both ROA and ROE trends, after a decrease during 2015, CBs and IBs started recovering, particularly IBs. This can be attributed to management and practices improvements, better risk control, and more rigorous customer-related procedures.

Figure 1

Performance Measures (ROA & ROE)



Note: ROA & ROE are the averages of each year for all banks

As shown in Fig. 2, CBs' HHI was slightly higher than IBs' HHI in the first year (2011) at 0.169 and 0.16, respectively. For 2012, HHI decreased for both banks from 0.169 to 0.131 for CBs, and from 0.16 to 0.119 for IBs. For the rest of the period (2013-2017), IBs' HHI was stable in the rage of 0.135-0.15. In contrast, CBs' HHI was stable for 2013-2015 in the range of 0.135-0.143. It increased for the remaining two years (2015-2017) from 0.143 to 0.147. Both markets experienced moderate concentration during the period of study. These results are in line with Sufian and Shah Habibullah (2013).

Figure 2

Concentration Index (HHI)

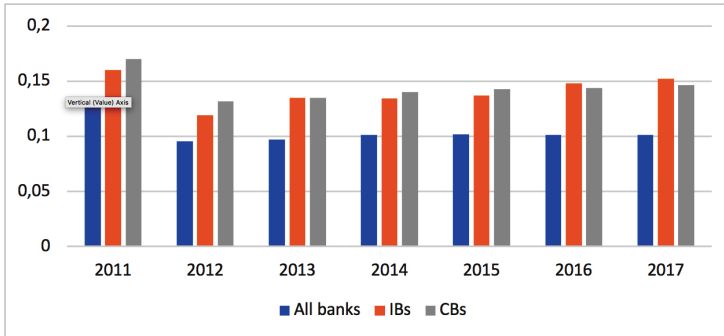
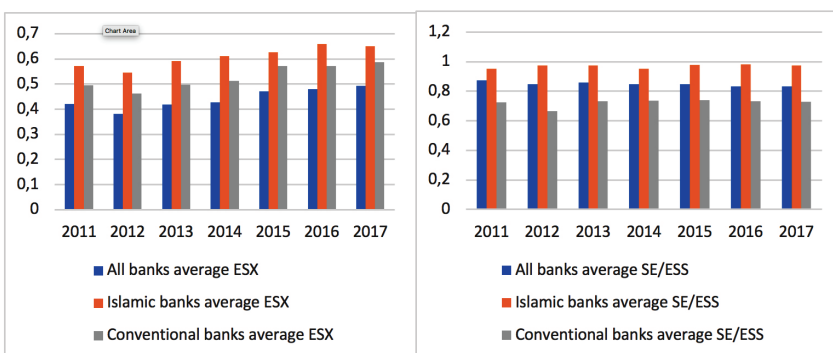


Fig. 3 demonstrates ESX and ESS for the industry. Corresponding with Table 2 (descriptive statistics), IBs exhibit higher efficiency scores for both types of efficiencies. IBs' ESX exhibited an increasing trend for the entire study period, from 0.57 to 0.651 compared to CBs (0.50-0.59). On the other hand, ESS for IBs was roughly stable in the range of 0.95-0.97. Similarly, CBs exhibit a roughly stable trend in the range of 0.726- 0.729. These results concur with Mortadza et al. (2019), who found that IBs are more efficient than CBs in Malaysia.

Figure 3

X-Efficiency/Pure Technical Efficiency (ESX) and Scale-Efficiency (ESS)

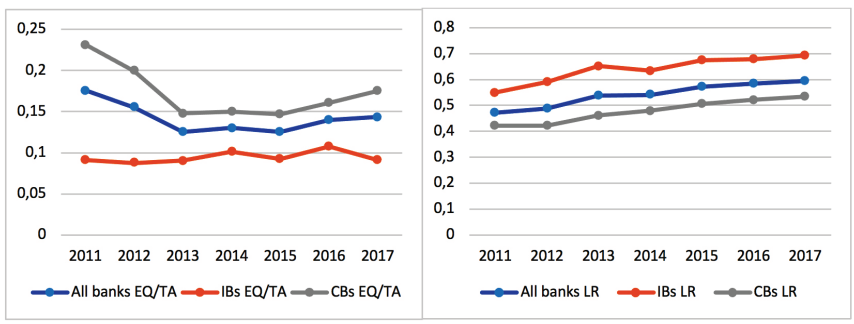


Note: X-efficiency and scale-efficiency are the average efficiencies of all banks each year.

Based on Fig. 4, while the trend of EQ/TA decreased for the first two years (2011-2013) from 0.23 to 0.148, it was relatively stable for IBs in the range of 0.091-0.0908. Then for the period 2013-2015 the trend was stable for CBs in the range of 0.148-0.174, whereas for IBs it was also relatively stable in the range of 0.0908-0.092. During the last two years (2015-2017) CBs capitalisation increased from 0.174 to 0.175, while it decreased for IBs in the last year from 0.108 to 0.092. Under EQ/TA trend, it can be concluded that CBs are more capitalised than their IBs counterparts. Regarding liquidity risk (Net loans/TA), IBs seem to have more assets tied up in loans (financing), implying that IBs are less liquid than their CBs counterparts.

Figure 4

Liquidity Risk, LR, (Net loans/Assets), and Equity/Assets (EQ/TA)



Note: LR and EQ/TA are the average of all banks each year.

Tables 3 and 4 report the Ordinary Least Squares (OLS), Fixed Effect (FE), and Generalised Method of Moments (GMM) estimations based on which the study decided between system and difference GMM.

Table 3

Decision on Difference and System GMM (ROA)

Sector	Lagged DV	Pooled OLS	Fixed Effect	One-step Diff. GMM	Two-step Diff. GMM
All banks	L.ROA	0.225	-0.139	-0.43	-0.40
IBs	L.ROA	-0.25	-0.21	-0.263	-0.315
CBs	L.ROA	0.34	0.097	0.096	0.127
Decision	We conclude that System GMM is superior to Diff. GMM for the three categories. This is because the coefficient of lagged DV in Diff GMM is lower than the Fixed Effect, which implies that difference GMM generates downward bias in standard errors (Bond et al., 2001).				

Note: DV = dependent variable

Table 4

Decision on difference and System GMM (ROE)

Sector	Lagged DV	Pooled OLS	Fixed Effect	One-step Diff. GMM	Two-step Diff. GMM
All banks	L.ROE	0.526	0.036	0.019	0.086
IBs	L.ROE	0.18	-0.032	0.038	0.098
CBs	L.ROE	0.72	0.34	0.48	0.43
Decision	We conclude that Diff. GMM is superior to System GMM for the three categories. This is because of the coefficient of lagged DV in Diff. GMM is greater than that in the Fixed Effect model, which implies that standard errors in System GMM are biased upwards (Bond et al., 2001).				

Note: DV = dependent variable

Table 5 reports GMM estimation results for the industry. The consistency of the results depends on the absence of second-order autocorrelation (AR2), the number of instruments being less than the number of groups, the insignificance of the Hansen test, and the significance of the Wald test. All conditions are met for the three categories, thereby establishing the consistency of the results for both ROA and ROE models. Based on the impact of the lagged DV, profits persist in the case of CBs, given that the lagged DV exerts a significant positive impact on performance (0.247 and 0.437 at 5% and 1% significance levels for ROA and ROE, respectively). In contrast, profits do not show persistency in the case of IBs. SCP is rejected for the three categories as HHI is found to exert a significant

negative impact on the industry and CBS performance (ROA and ROE). However, it is insignificant for IBs. The RMP hypothesis holds for CBs (only ROA) but does not for IBs. This implies that CBs mainly generate profits based on their market power instead of concentration. However, in the Islamic industry, RMP relatively holds for ROE at a 10% significance level. As for efficiency, the ES hypothesis does not hold for the three categories implying the invalidity of the assumption that higher efficiency leads to higher profits. The only exception is at the industry level, where ES holds in light of scale efficiency, implying that in the Malaysian banking industry at large, the MS counts in improving performance. As hypothesised above, CBs' market share turns out to be a very significant determinant of performance, unlike IBs that are still searching for further market share. This is supported by the relative significant positive impact of MS on ROE (0.336 at a 10% significance level).

Table 5

System and Difference GMM Results

Variable	All Banks		Islamic Banks		Conventional Banks	
	ROA (1)	ROE (2)	ROA (3)	ROE (4)	ROA (5)	ROE (6)
ROA_{t-1}	-0.05		0.88		0.274	
	(-0.25)		(1.07)		(2.54)**	
ROEt-1		0.014		-0.33		0.473
		(0.06)		(-0.90)		(3.42)***
HHI	-0.423	-3.81	-0.385	2.19	-0.561	-5.76
	(-2.58)**	(-3.59)***	(-1.63)	(1.23)	(-2.80)***	(-4.09)***
MS	0.079	2.92	-0.11	0.336	0.031	0.393
	(1.39)	(2.30)**	(-2.75)***	(1.70)*	(2.99)***	(0.38)
Netloans/ assets	0.0078	0.11	0.065	0.029	0.0012	0.127
	(1.29)	(2.47)**	(2.01)**	(0.50)	(2.07)**	(2.88)***
NPL	-0.000001	-0.0000006	0.00002	-0.0000123	-0.0000007	-0.00000074
	(-1.80)*	(-2.04)**	(3.11)***	(-0.38)	(-2.89)***	(-0.96)
EQ/TA	-0.018	-0.10	0.114	-0.841	-0.0082	-0.061
	(-2.96)***	(-2.05)**	(-1.91)*	(-3.44)***	(-1.91)*	(-1.89)*
ESX	-0.0039	-0.072	-0.039	-0.051	-0.0058	-0.0266
	(-0.53	(-2.08)**	(-1.48)	(-1.43)	(-1.74)*	(-0.77)
ESS	-0.0013	0.11	-0.048	-0.084	-0.000176	0.0255
	(-0.17)	(3.78)***	(-1.14)	(-2.61)***	(-0.48)	(0.92)
GDP growth	0.0009	0.0039	0.0021	-0.0088	0.000176	0.010
	(0.89)	(0.86)	(0.74)	(-2.18)**	(0.19)	(1.58)
Real interest rate	0.00039	0.00010	0.0018	-0.0117	-0.00036	0.004
	(0.51)	(0.03)	(0.79)	(-2.39)**	(-0.49)	(0.61)
Ownership	0.00096		0.0037		0.0007	
	(0.48)		(1.05)		(0.79)	
Wald test	51.72	172.12	4783.92	2199.76	583.63	1140.11
	(0.0000)	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
AR2	0.90 [0.369]	0.62 [0.534]	1.20 [0.229]	-0.98 [0.326]	-0.70 [0.481]	0.41 [0.682]
Hansen test	13.13	2.61	1.26	2.03	9.15	2.17
	[0.359]	[0.455]	[0.262]	[0.566]	[0.517]	[0.538]
Instruments/ groups	25/43	14/43	14/17	16/17	23/26	14/26
Obs	246	203	97	97	150	124

Notes: HHI and MS are calculated based on three categories, all banks, IBs, and CBs separately.
P-value for AR2 and Hansen test is in square brackets.
z statistics values are in parentheses.

***, ** and * indicate significance level at 1%, 5%, and 10%, respectively.

Net loans to total assets generally exert a significant positive impact on performance for the three categories. The impact is higher for CBs. This indicates that CBs are more liquid than IBs (see Fig. 4), which is supported by Suppia and Arshad (2019). In contrast, EQ/TA places a significant negative impact on performance for the three categories, which could be attributed to the fact that higher capital causes banks to take less risk minimising profits or may be attributable to opportunity cost. The impact is very high under the ROE model for IBs (-0.841 at 1%), suggesting that funding is costly for IBs. NPL was found to exert a statistically significant impact under the ROA model at a 1% level, negative for CBs (0.0000007) and positive for IBs (0.00002). However, the impact is very "*week*". For CBs, this indicates that NPL lessens revenues via increased provisions or write-offs. This is in line with Ibrahim (2020), whereas for IBs, this indicates that NPL costs are possibly passed to customers. Real interest rate and GDP generally are not significant determinants of performance.

The QLH hypothesis presumes that both profit persistency and RMP hold. If QLH holds for CBs, it means that they are experiencing a sluggish life due to what their share of market power. This sense of false comfort caused CBs' managers to relax their efforts in pursuing efficiency. In contrast, QLH does not hold for IBs, implying that IBs' managers are actively pursuing further market penetration to increase their influence on the industry's dynamics. This is supported in Fig. 3 where IBs exhibited higher ESX and ESS compared to CBs. SCP invalidity is supported by Ab-Rahim and Chiang (2016) for Malaysia and Khan and Hanif (2019) for Pakistan. Finally, we conclude that CBs are quieter than IBs. The ownership dummy variable is insignificant in all models indicating no difference in performance between local and foreign banks.

Table 6 reports the impact of different concentrations (HHIs) on IBs' performance (ROA and ROE). The results are consistent given that AR2, Hansen, Wald test and instruments/groups conditions are met. In line with expectation and what is stated in the sub-hypothesis H1.1, CBs HHI and industry HHI negatively influence IBs performance under both ROA and ROE. IBs' performance is not influenced by concentration in the Islamic banking industry. This is not surprising since IBs are still searching for more market power through increasing their market share (penetration), which will enable them to play an influential role in the industry.

Table 6

Impact of Different Concentrations on IBs' Performance

Sector	HHI sector (1)		HHI Isl (2)		HHI Con (3)	
	ROA	ROE	ROA	ROE	ROA	ROE
IBs' performance	-1.44 (-2.12)**	-3.40 (-2.03)**	-0.38 (-1.63)	2.19 (1.23)	-1.71 (-3.43)***	-2.73 (-2.14)**
Wald test	1377.38 (0.0000)	12348.11 (0.0000)	4783.92 (0.0000)	2199.8 (0.0000)	413.04 (0.0000)	1654 (0.0000)
AR2	0.87 [0.383]	0.60 [0.547]	1.20 [0.229]	-0.98 [0.326]	1.06 [0.289]	1.24 [0.214]
Hansen test	0.16 [0.685]	2.08 [0.354]	1.26 [0.262]	2.03 [0.566]	2.95 [0.229]	1.88 [0.171]
Instru/groups	14/17	15/17	14/17	16/17	15/17	14/17
Obs	97	97	97	97	97	97

Notes: the models are run using all variables; however, we only report the coefficient of different concentrations (HHI). HHI sector: concentration in the entire sector, HHI Isl: concentration in the Islamic sector. HHI Con: concentration in the conventional sector. *** and ** indicate significance level at 1%, 5%, respectively. z statistic values are in parentheses. P-value for AR2 and Hansen test is in square brackets.

Table 7 reports the impact of different concentrations (HHIs) on CBs' performance. The results are consistent since AR2, Hansen, Wald test, and instruments/groups conditions are satisfied. In line with expectation and what is presumed in the sub-hypothesis of H1.1, IBs HHI does not impact the CBs' performance. This is consistent as CBs dominate and hold most of the banking market share. Consequently, HHI in the Malaysian banking sector pertains to CBs concentration.

Table 7

Impact of Different Concentrations on CBs' Performance

Sector	HHI sector (1)		HHI Isl (2)		HHI Con (3)	
	ROA	ROE	ROA	ROE	ROA	ROE
CBs' performance	-0.33 (-2.06)**	-3.82 (-3.55)***	0.094 (1.10)	0.28 (0.61)	-0.56 (-2.80)***	-5.76 (-4.09)***
Wald test	256.51 (0.0000)	494.44 (0.0000)	80.87 (0.0000)	96.97 (0.0000)	583.63 (0.0000)	1140.11 (0.0000)
AR2	-0.83 [0.408]	0.20 [0.844]	-1.12 [0.265]	-0.75 [0.454]	-0.70 [0.481]	0.41 [0.682]
Hansen test	6.68 [0.572]	12.18 [0.143]	3.54 [0.316]	6.75 [0.15]	9.15 [0.517]	2.17 [0.538]
Instru/groups	19/26	19/26	14/26	15/26	23/26	14/26
Obs	124	124	124	124	150	124

Notes: the models are run using all variables; however, we only report the coefficient of different concentrations (HHI). HHI sector: concentration in the entire sector. HHI Isl: concentration in the Islamic sector. HHI Con: concentration in the conventional sector. *** and ** indicate significance level at 1%, 5%, respectively. z statistic values are in parentheses. P-value for AR2 and Hansen test is in square brackets.

Conclusion

This study empirically and comparatively analysed the performance of CBs and IBs under four prominent hypotheses: SCP, ES, RMP, and QLH. The study employed a sample of 43 Malaysian commercial banks, 26 conventional and 17 Islamic, from 2011-2017. The study employed two techniques to conduct this comparison, the DEA approach and the GMM technique. The analysis revealed the following findings: invalidity of SCP and ES for both types of banks under both ROA and ROE models. RMP holds for CBs in both models while found invalid for IBs in the ROA model but holds under the ROE model. QLH holds for CBS while it does not for IBs, implying that CBS are quieter than IBs. By and large, it is the market power that dominantly determines performance in the industry. These findings offer deep insights into dual banking in Malaysia.

At the bank level, IBs are encouraged to boost their market share to get along with their counterparts. Given the efficiency of IBs, this will cause efficiency to pay off as a determinant of performance. It will broaden their long-run vision. CBs' managers are encouraged to improve efficiency through efficient utilisation of their inputs and do not only count on market power.

For policymakers, the findings suggest that mergers (concentration) in Malaysia are motivated by market power given the invalidity of ES and the validity of RMP, especially in the case of the dominant banks, CBs. Therefore, the nature of monopolistic price setting suggests that policymakers consider the implications of merger policies concerning antitrust procedures.

Researchers are encouraged to investigate allocative efficiency for both banks concerning how banks can make effective choices regarding inputs versus prices to minimise production costs. In other words, to develop measures for efficient decision-making using Stochastic Frontier Analysis (SFA). They are encouraged to construct the so-called Financial Performance Index (FPI) based CAMEL' ratios, which consider asset quality, earning, capital adequacy, liquidity, and one more component, sensitivity to risk. This will facilitate further insights.

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