Does Efficiency Matter for Competition? A Case of Dual Banking Industry

(Adakah Kecekapan Penting untuk Persaingan? Satu Kes bagi Industri Dwi-Perbankan)

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ABSTRACT

This study provides new empirical evidence on the link between bank performance measured in terms of efficiency, and the degree of competition in the Malaysian dual banking market which comprises Islamic and conventional banking systems over the period of 1997-2016. The focal point of this study is to investigate whether the type of efficiency matters for banks to remain viable in the highly competitive market. The study is important because it compares the effect of market conditions and banks' conduct on the level of competition for Islamic and conventional banking industries. In this study, we utilize the Panzar-Rosse (PR) H-statistics to represent the competition index. In addition, the Data Envelopment Analysis (DEA) is used to calculate the income and cost efficiencies for the banks in both banking systems. This study employs a panel data model with pooled Ordinary Least Square (OLS) to estimate the relationships of competition index with efficiency scores, concentration indexes, and other bank-specific variables. The estimation results show the existence of a positive relationship between types of efficiency and competition in the dual banking market. This evidence suggests that the existence of an ideal level of concentration and competition is important for banks in adjusting their behavior to suit market conditions and to operate efficiently. Policymakers and regulators may use the knowledge of market structure and performance from this study to formulate policies and strategies that will optimize the number of banks operating in the industry. Policymakers, through Bank Negara Malaysia (BNM), should thus consider the relationship between market structure and bank performance to formulate policies and strategies that will optimize the number of banks operating in the industry.

Keywords: Competition; concentration; efficiency; Islamic banking; Structure-conduct-performance paradigm

ABSTRAK

Kajian ini memberikan bukti empirikal baharu mengenai hubungan antara prestasi bank yang diukur dari segi kecekapan, dan tahap persaingan dalam pasaran perbankan dwi Malaysia, yang terdiri daripada sistem perbankan Islam dan konvensional sepanjang tempoh 1997-2016. Tumpuan utama kajian ini adalah untuk menyelidik sama ada jenis kecekapan adalah penting untuk bank terus kekal dalam pasaran yang sangat kompetitif. Kajian mengenai isu ini adalah penting untuk membandingkan kesan keadaan pasaran dan gelagat bank ke atas tahap persaingan antara industri perbankan Islam dan konvensional. Kajian ini menggunakan statistik-H yang diperolehi daripada model Panzar-Rosse (PR) untuk mewakili indeks persaingan. Sementara itu, Analisis Penyampulan Data (DEA) telah digunakan untuk mengira skor kecekapan hasil dan kos bagi bank dalam kedua-dua sistem perbankan tersebut. Kajian ini menggunakan model data panel iaitu gabungan kaedah kuasa dua terkecil (pooled OLS) untuk menganggarkan hubungan antara indeks persaingan dengan skor kecekapan, indeks penumpuan dan pemboleh ubah spesifik bank yang lain. Keputusan pengangaran model menunjukkan wujud hubungan positif yang signifikan antara jenis kecekapan dan persaingan dalam pasaran dwi perbankan. Bukti ini menunjukkan bahawa tahap penumpuan dan persaingan yang ideal adalah penting bagi bank untuk menyesuaikan tingkah laku mereka agar sesuai dengan keadaan pasaran dan beroperasi dengan cekap. Oleh itu, penggubal dasar khususnya Bank Negara Malaysia (BNM) wajar untuk mempertimbangkan hubungkait antara struktur pasaran dan prestasi bank untuk merangka dasar dan strategi yang akan mengoptimumkan bilangan bank yang beroperasi dalam industri.

Kata Kunci: Persaingan; penumpuan; kecekapan; perbankan Islam; paradigm struktur-gelagat-prestasi

INTRODUCTION

In many countries, as in Malaysia, banking institutions particularly commercial banks are becoming the largest mobilizers of deposits, which provide financing to enterprises and businesses. It is, therefore, necessary for banking institutions to operate efficiently within the existing market structure to guarantee the performance of the banking industry as a whole. As in other countries, the Malaysian financial sector, particularly the banking industry, is also experiencing rapid transformation due mainly to several measures adopted by Bank Negara Malaysia such as deregulation, liberalization, mergers and rationalization process.

In Malaysia, the implementation of the Islamic banking system in 1983 had also contributed to the structural changes in the Malaysian financial system, particularly the banking industry. These transformations had positively affected the development of the Malaysian banking industry, especially in terms of the scope of banking operations, the number of institutions, number of branches, bank ownership and the use of technology. This development had affected changes in the market structure, particularly to the levels of concentration and competition. This, in turn, will affect the performance of those institutions and the banking industry as a whole. Moreover, it is also important to gauge the ability of the banks to operate in a market that is experiencing growing competition. Studies on such capability are therefore important. For instance, the liberalization of the financial sector, as well as mergers between domestic banks, should improve efficiency and increase the level of competition in the banking industry. Many studies have proven that a competitive banking market may encourage banks to operate efficiently in order for them to remain viable in the market.

Competition, concentration, and efficiency are the three aspects often associated with the banking industry. This is in line with the opinion of Beck et al. (2013) who saw competition as the most important driver for financial innovation. In fact, competition in the banking industry is good and beneficial since it can help to accelerate economic growth in this sector, improve the efficiency of the industry as well as enhance consumer welfare. It is also believed that the non-competitive banking market will induce firms to provide inadequate banking services, use a non-optimal allocation of resources and operate in a less efficient manner. Previous findings clearly showed that structural changes in the banking industry had improved the degree of competition in the market (e.g., Barros & Mendes 2016). In addition, banks operating in such a market had also increased their efficiency (Apergis & Polemis 2016). It is necessary therefore for bankers and policy makers to clearly understand the relationship between market efficiency and competition so that they can take appropriate steps to develop the banking industry in their respective markets.

In contrast to previous studies, the present study aims at investigating whether efficiency in banking operations will assist banks to remain viable in a highly competitive market situation. The purpose of this article is to assess empirically the nexus between competition and efficiency of Islamic banking relative to conventional banking. The study will elucidate whether the type of efficiency matters for banks to remain competitive in a highly aggressive market. The question is important for Malaysia since the country practices a dual banking system. Moreover, the Malaysian banking industry had undergone structural changes due to the transformation that occurred in the industry; such as mergers, implementation of dual banking in 1983 and ongoing liberalization process (Mohammed et al. 2016). These changes had effectively altered the market structure of the industry, particularly in terms of concentration and competition, including banks' efficiency. This study as such will contribute to the literature on market structure and performance in dual banking markets, namely between Islamic and conventional banking, that is particularly lacking in Malaysia. Previous studies had basically focused on separate aspects of banking such as competition (Muhamad 2017; Mohammed et al. 2018) or efficiency (Sufian & Kamarudin 2017; Kamarudin et al. 2917; Kamaruddin 2007; Sufian 2007), or on single banking system such as conventional banking (Sufian 2011), or Islamic banking (Ahmad Mokhtar et al. 2008). This study may contribute fresh information on aspects of competition and efficiency in a dual banking market in Malaysia over a period of 20 years.

The remainder of this article is structured as follows: The following Section 2 presents the relevant literature that investigates the link between competition and efficiency. Section 3 provides the data and methodology used in this study. Section 4 discusses the results of the empirical analysis. Finally, this paper concludes in Section 6 along with some policy implications.

LITERATURE REVIEW

The literature on industrial organization indicates that competition increases the efficiency of firms (Tirole, 1998). Theoretically, competition is good because it encourages firms to produce outputs at a minimal cost thus promoting efficiency among firms in the industry. There are two competing hypotheses in the literature on the relationship between competition and efficiency; i.e. the 'competition-efficiency' hypothesis and 'competition-inefficiencies' hypothesis.

HYPOTHESES ON COMPETITION AND EFFICIENCY

The 'competition-efficiency' hypothesis suggests the existence of a positive association between competition and efficiency. This hypothesis is adapted from the

Efficient Structure (ES) hypothesis proposed by Demsetz (1973). According to this hypothesis, a competitive environment in the market is due to the deregulation process. Consequently, it will force firms to minimize costs, offer banking services at lower prices and at the same time, they can earn higher profits. Thus, under this hypothesis, efficient banks with superior management and production technologies will increase in size and market share compared to less efficient banks (Schaeck & Cihak 2008). Thus, banks that are not exposed to competition tend to be less efficient than banks that are subjected to greater competition (Berger & Hannan 1993). Mlambo and Ncube (2011) mentioned that competition may force banks to reduce cost-inefficiency and may result in welfare gains for the public. In addition, Casu and Giradone (2007) emphasized that increased competition would in turn foster efficiency by providing incentives to managers to cut costs in order to remain profitable. This hypothesis is in line with the quiet life hypothesis (QL) which explains the behavior of bank managers who are not working hard to control costs, but they will exercise their market power by setting a price above marginal cost. Hence, their actions may raise the cost of production and hamper cost efficiency and social welfare.

Additionally, the 'competition-inefficiency' hypothesis suggests that competition will lead to a decline in bank efficiency. This hypothesis supports the argument that stronger competition will result in a shorter relationship period between customers and banks. This is because, in a competitive environment, customers have the ability to move to other financial providers. Thus, the screening and monitoring costs of banks decrease due to the reduction in relationship-building activities. The alternative hypothesis thus implies that competition decreases bank efficiency. The banking industry is often associated with asymmetric information theory, and often faces the problems of moral hazards and adverse selection. Banking institutions will, therefore, need a mechanism that may help them to overcome these problems. For instance, banks can improve long-term customer relationships to gather information on their customers. The competition will thus increase the cost of supervision, hence reducing the cost efficiency of banking institutions. This situation mainly occurs in developing countries relative to developed ones. The former countries have a briefer history of market economy and their bank employees normally experienced uncertainties in accounting information and lack the know-how in credit risk analysis (Podpiera et al. 2007).

EMPIRICAL LITERATURE ON COMPETITION AND EFFICIENCY

A number of empirical studies had investigated the relationship between efficiency and competition and various techniques were employed as measures. Many studies used the Panzar-Rosse H-statistics and Lerner index to measure the degree of competition in a country's banking market. While others employed the Data Envelopment Analysis (DEA) method and Stochastic Frontier Analysis to measure bank efficiency.

Mortadza et al. (2019) revealed that Islamic banks were more concentrated and more efficient compared to conventional banks in the QISMUT (Qatar, Indonesia, Saudi Arabia, Malaysia, United Arab Emirates, and Turkey) banking market. This study will provide evidence to support the 'competition-inefficiency' hypothesis for this market. As a proxy for market structure concentration measures the Herfindahl-Hirschman Index was used. Efficiency performance was measured by calculating the pure, technical and scale efficiency scores. However, the relationship between market structure and efficiency was not empirically tested.

Casu and Giradone (2007 & 2009) measured cost efficiency among banks in the European Union commercial banking markets. They showed a negative relationship between competition and cost efficiency as proposed by the ES hypothesis. Their findings thus support the existence of positive causation between market power (Lerner index) and efficiency. Podpiera (2007) and Podpiera et al. (2007) obtained similar results for the Czech banking industry which was consistent with the 'banking specificities' hypothesis which relates that greater competition will reduce the cost efficiency of banks through increased monitoring costs. Moyo (2018) also found similar results with South African banks.

Turk-Ariss (2010b) investigated the relationship between market power and cost and profit efficiencies for commercial banks in 60 countries and within five regions. The Lerner index was used as a proxy for market power for each country while cost and profit efficiencies were measured using the Stochastic Frontier Analysis (SFA) method. The association between market power and efficiency was found to vary with the type of efficiency. He showed that banks with more market power were less cost-efficient but achieved profit efficiency. This market-profit nexus provided evidence against the 'quiet life' hypothesis.

Naceur et al. (2009) studied the effect of deregulation policies on the performance of the banking industries in selected Middle Eastern and North African (MENA) countries for the period 1993-2006. They discovered that banking market development with the low-regulated environment and a highly concentrated banking sector tend to reduce bank efficiency. They thus concluded that the competitive environment in the banking sector contributed to improvement in the efficiency and performance of banks in the MENA countries. Apergis and Polemis (2016), in a similar study on the MENA countries for the period 1997-2011, corroborated the earlier findings.

Giustiniani and Ross (2008) investigated the level of competition and efficiency in Macedonian banking sectors over the period 1997 to 2005 using panel data on 20 commercial banks. They computed the H-statistics by employing the Panzar-Rosse (PR) method and concluded that the structure of the banking industry in Macedonia was monopolistic or a perfect cartel. Moreover, efficiency scores obtained from the Data Envelopment Analysis (DEA) method showed that the Macedonian banks experienced a decline in terms of average efficiency and in the number of efficient banks. They concluded that weak competition among the banks led to a decrease in their efficiency. Mlambo and Ncube (2011) also supported the existence of a positive association between competition and efficiency in the South African banking sector for the period 1999 to 2008.

Hassan et al. (2009) measured cost, revenue and profit efficiencies of eleven countries in the Organization of Islamic Countries (OIC) over the period 1990 to 2005. They investigated the relationship between the size and age of the banks with the level of efficiency. In terms of size, large banks were shown to be more efficient compared to smaller banks in both the Islamic and conventional banking streams. In addition, age analysis showed that profit efficiency scores for new banks were significantly higher than those of old banks. The association between competition and efficiency was not investigated in this study. However, one important question was highlighted; namely, the cost efficiency of banks was due to the best practice of the bank's management. Revenue and profit efficiencies were influenced by external factors such as competition, regulation, growth domestic product (GDP) and macroeconomics. As such, the relationship between competition and various types of efficiency will thus be elucidated in this study.

Buchs and Mathisen (2005) also investigated the nature of competition and efficiency in the Ghanaian banking sector. The sector was considered highly concentrated, less competitive and inefficient due to the poor financial and macroeconomic developments over the period 1999 until 2000. The Panzar-Rosse method was used to examine the level of competition. The study indicated that the market structure in the Ghanaian banking industry could be characterized as monopolistic competition and was slightly less competitive. The reliance of banks on government securities as a source of profit appeared to have restricted competition and foster inefficiency in the banking system. The findings thus supported the positive relationship between competition and efficiency. This relationship, however, was not empirically proven in the study.

Hauner and Peiris (2005) were similarly motivated to investigate banks' efficiency and competition in the Ugandan banking industry. Specifically, this study aimed to evaluate the impact of banking sector reforms in order to improve competition and efficiency. They established

that the level of competition had increased significantly and can be associated with an increasing inefficiency.

Few studies had been conducted to investigate the relationship between efficiency and competition for the Malaysian banking market. Sufian and Abdul Majid (2007) for example, measured the technical, pure technical and scale efficiencies of domestic and Islamic banks in Malaysia over the period 2001 to 2005 by adopting the DEA method. Foreign banks that offered Islamic banking services were found to be more efficient compared to their domestic peers. Additionally, the second stage regression showed that less market power, large banks, foreign ownership, and GDP growth could have stimulated Islamic banks to be more efficient. Poor management was also shown to incur less efficiency. The results provided evidence on the existence of a positive relationship between competition and efficiency. Sufian (2011) investigated the impact of consolidation on competition and efficiency in the Malaysian conventional banking market for the period 1996-2008. The empirical findings established that banks were more efficient and highly competitive during the post-merger period.

Kamaruddin (2007) also revealed that Islamic banking institutions in Malaysia were relatively more efficient at controlling cost than at generating profits over the period 1998 to 2004. Market power was shown to be negatively related to profit efficiency, and the competition was thus concluded to be positively related to profit efficiency. However, the relationship between market power and cost efficiency was not strong due to the insignificant parameter used. Further, the study by Kamaruddin et al. (2008) concluded that the increasingly stronger competition from foreign Islamic banks provided an opportunity for domestic banks to become more efficient than their peers.

Ahmad Mokhtar et al. (2008) investigated the efficiency and competition of Islamic banks in Malaysia with computations on income and cost-efficiency. The link between the two factors was however not empirically tested. Generally, they found that the efficiency of Islamic banks was still lower than the technical and cost efficiencies of conventional banks. However, the former had improved over the study period and full-fledged Islamic banks were found to be more efficient than Islamic windows.

Results from past studies clearly established that the relationship between efficiency and competition could be either positive or negative (Mortadza et al. 2019; Moyo 2018; Ab-Rahim 2017). Most studies recorded that market competition was instrumental in banks improving their operations to increase efficiency. Recent studies had indicated that the degree of competition and the efficiency level of most banks have increased. However, it is also imperative to identify the type of efficiency that may assist banks to enhance their competitiveness in a market that is highly aggressive.

Many past studies in Malaysia had only focused on single banking operations, either Islamic (Ahmad Mokhtar et al. 2008) or conventional (Sufian 2011). In cognizance of this, the present study will address the links between types of efficiency and competition in a dual banking industry over a lengthy period of 20 years (1997-2016). For this purpose, two types of efficiency were used, namely income efficiency (IE) and cost efficiency (CE). The measurement of IE in the banking industry is still rare compared to that for CE and profit efficiency. For instance, Uddin and Suzuki (2014) measured IE to evaluate the performance of Bangladesh's banking industry. Its use in this study can further enrich the findings of empirical research particularly for emerging economies like Malaysia. Further, we used the direct measure of competition, namely H-statistics obtained from the Panzar-Rosse (PR) model as a proxy. The use of the direct measure to represent the market structure in the banking industry is still limited for Malaysia particularly for the Islamic banking industry (Mohammed et al. 2018; Muhamad 2017; Abdul Majid & Sufian 2007). This study can thus provide fresh information since this problem will be investigated in a dual banking system for the first time where Islamic banks operated side by side with conventional ones. The aim of this study is to validate the relationship between competition with cost and income efficiency for banks that operate in Islamic and conventional banking systems regardless of ownership, whether it is domestic or foreign-owned. The study on this issue is important as it investigates how market conditions and bank conduct will intensify or dampen the level of competition among banks operating in the Islamic environment compared to the conventional banking industry.

METHODOLOGY

This section is divided into two parts. The first part briefly describes the data used in this study. The second part explains the estimation models developed to examine the relationship between efficiency and competition.

DATA

In this present study, the data used are sourced from both Islamic and conventional banking firms operating in the dual banking system in Malaysia from 1997 to 2016, and which included both foreign and domestic banks. The primary source of the financial data is the Bankscope database developed by the Bureau Van Dijk, and supplemented by the published balance sheets and income statements provided in the individual bank's annual reports. The sample in this study is limited to Islamic and conventional commercial banks because these banking categories provided almost homogenous

services and products. The financial data are expressed in Malaysian Ringgit (MYR) and adjusted for inflation using the Consumer Price Index (CPI) with 2010 as the basic year.

MEASURING EFFICIENCY

The efficiency of banks in this study was examined using the DEA method originally developed by Farell (1957). The DEA method endeavors to measure efficiency by estimating the optimal level of output subject to the amount and mix of inputs. It constructs the frontier of the observed input-output ratios using a linear programming technique. The efficiency scores in DEA are calculated by solving a linear programming problem to identify how each DMU (decision-making unit) performs in relation to others. DEA, therefore, calculates the relative efficiency of each DMU in relation to all other DMUs by using the actual observed values for the inputs and outputs of each DMU (Sufian & Abdul Majid 2007).

There are two basic models in the DEA technique, namely CCR (Charnes, Cooper, and Rhodes) and BCC (Banker, Charnes, and Cooper) models. The CCR model was developed with an assumption of constant return to scale (CRS). On the other hand, the BCC model has an assumption of variable returns to scale (VRS). The BCC models are able to evaluate return to scale exhibited by the firms, whether increasing, constant or decreasing return to scale. This cannot be done in the CRS model since the output changes proportionally to inputs. The VRS assumptions are therefore used to define the best practice frontier, which guarantees that a bank is only compared with another bank of similar size. The VRS assumptions provide the measurement of pure technical efficiency (PTE), which is the measurement of technical efficiency (TE) devoid of the scale efficiency effect (Sufian, 2011).

The following is a short description of the Data Envelopment Analysis (Sufian et al. 2008). Assume that there are data on K inputs and M outputs for each N bank. For ith bank, these are represented by the vectors x_i and y_i respectively. Let us call the $K \times N$ input matrix $-X$ and the $M \times N$ output matrix $-Y$. To measure the efficiency for each bank, we calculate a ratio of all inputs, such as ($u'y_{i/v}'_{xi}$) where u is an $M \times 1$ vector of output weights and v is a $K \times 1$ vector of input weights. To select optimal weights, we specify the following mathematical programming problem:

$$\min(u\,y_i/v\,x_i),$$
$$u,v$$
$$uy_i/vx_i \leq 1,\ j = 1, 2, \dots N.$$
$$u,v \geq 0 \tag{1}$$

The above formation has a problem of infinite solutions, and therefore we impose constraint $v'x_i = 1$, which leads to:

$$\min(u\, y_i),$$
$$\mu\, \varphi$$
$$\varphi' x_i = 1$$
$$\mu' y_i - \varphi' x_j \le 0 \qquad j = 1, 2, \dots N.$$
$$\mu, \varphi \ge 0 \tag{2}$$

The notation is changed from *u* and *v*, to respectively to reflect transformations. Using the duality in linear programming, an equivalent envelopment form of this problem can be derived:

$$\min \theta$$
$$\theta, \lambda$$
$$y_i + Y\lambda \ge 0$$
$$\theta x_i - X\lambda \ge 0$$
$$\lambda \ge 0 \tag{3}$$

where θ is a scale representing the value of the efficiency score for the ith bank, which will range from 0 and 1. λ is a vector of $N \times 1$ constants. The linear programming has to be solved N times, once for each bank in the sample. To calculate efficiency under the assumption of a variable return to scale, the convexity constraint ($N_1' \lambda = 1$) will be added to ensure that an inefficient firm is only compared against banks of similar size; and therefore provides the basis for measuring economies of scale within the DEA concept.

This study used the input-based orientation as employed by many studies such as Sufian (2011), Uddin and Suzuki (2014) and Ahmad Mokhtar et al. (2008). Similar to such studies in the field, this study had also adopted the intermediation approach to defining outputs and inputs in both income and cost models. It adopted two inputs and two outputs for measuring cost efficiency (CE). The inputs used are total deposits and total overhead expenses which represent total loanable fund and physical capital, respectively (Ahmad Mokhtar et al., 2008; Uddin & Suzuki, 2014). Conversely, net loan and advances (Ahmad Mokhtar et al, 2008), as well as net interest revenue, is considered as output. The price of deposits is calculated by dividing the interest expenses by the total amount of deposits. The price of capital is obtained by dividing the amount of total overhead expenses by the amount of total assets. For measurement of income efficiency (IE) and the inputs are interest expense and other operating expenses while the outputs are interest revenue and non-interest revenue. The measurement of IE in the banking industry is still rare compared to the measurement of CE. Uddin and Suzuki (2014) for instance, measured IE to evaluate the performance of Bangladesh's banking industry.

NEXUS BETWEEN EFFICIENCY AND COMPETITION

The focus of this study is to identify the relationship between concentration and the type of efficiency, namely, income efficiency (IE) and cost efficiency (CE), with the degree of competition in the banking market as shown in Equation (4).

$$L(HREV_{it}) = \alpha + \beta_1 L(CONC_{it}) + \beta_2 L(EFF_{it}) +$$
$$\beta_3 L(ROA_{it}) + \beta_4 L(AGE_{it}) + \gamma_2 L(ZSCORE_{it}) +$$
$$\varepsilon_{it} \tag{4}$$

where $t = 1997, 1998, \dots 2016$; t is the number of periods observed. i = Maybank, Affin,….Southern; i is the total number of banks and L is the natural logarithm. In equation (4), *HREV* is H-statistic obtained from Panzar-Rosse model, *CONC* is concentration measures, *EFF* is the efficiency score, *ROA* is a return on assets, *AGE* is the number of years in operation, *ZSCORE* is a proxy for bank stability, and is an intercept. is regression coefficients and is disturbance term. Following previous studies related to competition and efficiency, we also use the log form model in this study (Apergis & Polemis 2016; Uddin & Suzuki 2014). The log form model generates the desired linearity in parameters and makes data conform to normality.

The two dependent variables used as a measure of competition, namely *HREV* and *HINREV*, which represent the *H*-statistics are calculated respectively using the PR method for total revenue and interest revenue equation model. Total revenue consists of interest and non-interest revenue. Whereas for the Islamic banking system, total revenue indicates incomes from financing and non-financing activities. Interest revenue consists of revenue or income from interest or financing. The H-statistic in this study is obtained from Mohammed et al. (2018). The yearly *H*-statistics for both banking industries lie between zero and one, indicating that monopolistic competition is the appropriate market structure in the Malaysian dual banking industry. Similar findings have also been reported in previous empirical studies, confirming the existence of monopolistic competition structure in the Malaysian Islamic and conventional banking markets (Muhamad 2017; Sufian & Abdul Majid 2007).

The independent variables used in this study consisted of market-specific, bank-specific and financial environment factors. *CONC* stands for market-specific factors representing concentration measures. Four concentration measures are used in this study, namely concentration ratio for two (CR_2), four (CR_4), eight (CR_8) largest banks and Herfindahl-Hirschman Index (*HHI*). The concentration ratio is calculated by summing the market share for the k largest firm in the banking industry. In addition, the *HHI* is computed based on the sum of the squared market shares of all banks in the industry. The data on *CONC* in this study were obtained from Mohammed et al. (2016). *CONC* is expected to give a negative impact on competition as proposed by the structure-conduct-performance (SCP) paradigm. According to this paradigm, the relationship between concentration and competition is negative and this has also been proven by many past studies

(Cupian 2017; Aktan & Masood 2010; Claessens and Leaven 2004).

Bank specific factors are efficiency score, return on assets, age, and *Z*-score. Two types of efficiency scores, IE and CE are used to represent the performance of banks. The impact of efficiency on competition was undetermined; it could be positive as proposed by competition-efficiency hypothesis or negative as proposed by competition-inefficiency. However, the sign for EFF is expected to be positive in this study with the argument that banks operating efficiently may enhance the level of competition in the market. Meanwhile, *ROA* represents the return on assets. This is obtained by dividing pre-tax profit to total assets for each bank. It is hypothesized that banks are able to generate more profit when they operate under the more monopolistic condition as proposed by the SCP paradigm. Thus, the negative sign is expected for the coefficient of profitability in this study. Additionally, *AGE* brings experience in doing business for banks; and thus, its positive impact on efficiency is predicted (Uddin & Suzuki, 2014). The age of each bank in this study represents the number of years the bank operated in the market from the year of its establishment until 2016. The *Z*-score was obtained from Beck and Mohseni-Cheraghlou (2017). This index is used as a proxy for financial environment factors in the Malaysian banking market. The sign for this variable is ambiguous as it depends on the market structure of the particular banking market. According to Schaek and Cihak (2008) and Turk-Ariss (2010a), banking firms in the highly concentrated market are less fragile. This suggests that high competition will lead to banks' instability.

Based on the method as discussed, this study will test two hypotheses; firstly, a higher degree of concentration decreases the level of competition in the market and secondly, the type of efficiency matters in leading towards greater competitive behavior among the banks in the dual banking market. It is expected that the findings of this study may provide new information to the well-known industrial-organizational hypotheses namely, the SCP paradigm and the ES hypothesis.

A total of 32 models were estimated in investigating the links between variables in equation (4) in both banking markets. These were assessed using pooled cross-section namely pooled ordinary least square (OLS) as the null hypothesis for the Breusch-Pagan Lagrange Multiplier failed to be rejected. The nature of this study requires the use of a panel data estimation technique. Hence, the regression results can be subjected to heterogeneity bias due to different parameters across the individuals. All models in this study were therefore estimated with heteroskedasticity and serial correlation robust standard error regression to correct for heteroskedasticity and cross-sectional correlation. In addition, the multicollinearity problem across the cross-sections was detected using a variance inflation factor (VIF) test. Since the VIF value for each model was less than five, it shows that there are no collinearity problems among the variables used in this study. In addition, the model in Equation (4) was estimated using two independent variables namely, *HREV* and *HINREV*. The *HREV* model shows the degree of competition among banks in generating interest and non-interest income. The *HREV* variable measures the competitive behavior among banks, which are now actively involved in the activities that generate income from non-interest sources. Meanwhile, the *HINREV* model was also estimated for the purpose of robustness; which represents the traditional activity of banks that generate income from financing.

EMPIRICAL RESULTS

This section reports the results from the analysis of data based on the research methodology described in the previous section. The first sub-section provides the scores for income and cost-efficiency in both banking markets. In addition, the relationships between different types of efficiency and competition are described in the next sub-section.

EFFICIENCY MEASURE

The efficiency scores in this study were measured using the DEA method for each year under investigation. Income efficiency (IE) determines the proficiency of banks in converting their cost into revenue (Uddin and Suzuki, 2014). Hence, it reflects the ability of banks to minimize the use of inputs in the production of outputs. Overall, the IE scores show that banks operating in the Malaysian banking market had failed to extract maximum income from their adopted inputs. The mean IE of Islamic banks ranged from low 68.9% during the year 2008 to high 90.1% during the year 2002. Meanwhile, the mean IE of conventional banks ranged from low 73.4% during the year 1999 to high 93% during the year 2008. The findings show that most banks in Malaysia are not efficient in utilizing their inputs to generate higher income. Banks that had operated efficiently for over five consecutive years are Bank Islam Malaysia Berhad (2011-2016) and Alliance Islamic Bank Berhad (2005-2016).

Cost efficiency (CE) measures the distance of a bank's cost from the best practice bank's cost if both were to produce the same output bundle under the same market conditions (Berger & Mester 1997; Vander 2002). For example, if the measured CE is 0.90, it implies that the bank is about 90% cost-efficient, or the bank has wasted 10% of its cost relative to a best practice bank. This means that the bank has to use its input more efficiently to gain a reduction of 10% in its cost to reach the minimum cost of the best practice bank.

TABLE 1. Mean for Income Efficiency and Cost Efficiency in the Malaysian Dual Banking Market, 1997-2016

Year	No. of Banks		Income Efficiency (IE)		Cost Efficiency (CE)	
	Islamic	Conventional	Islamic	Conventional	Islamic	Conventional
1997	10	26	0.865	0.863	0.699	0.816
1998	11	29	0.887	0.78	0.68	0.817
1999	11	29	0.702	0.734	0.679	0.695
2000	12	23	0.787	0.813	0.694	0.701
2001	13	21	0.852	0.806	0.417	0.814
2002	13	23	0.901	0.925	0.445	0.729
2003	13	23	0.81	0.852	0.607	0.709
2004	13	23	0.9	0.796	0.747	0.624
2005	16	23	0.825	0.861	0.658	0.641
2006	17	22	0.706	0.857	0.609	0.653
2007	17	22	0.753	0.886	0.649	0.794
2008	17	22	0.689	0.93	0.56	0.847
2009	17	22	0.884	0.881	0.631	0.598
2010	18	22	0.84	0.831	0.805	0.541
2011	16	23	0.826	0.88	0.808	0.475
2012	17	25	0.827	0.851	0.844	0.351
2013	17	25	0.887	0.887	0.813	0.455
2014	17	25	0.851	0.903	0.919	0.535
2015	17	25	0.78	0.875	0.843	0.34
2016	16	25	0.815	0.844	0.723	0.444
Overall Mean			0.819	0.853	0.692	0.623

Source: Efficiency scores obtained from the DEA method.

The IE and CE estimates derived from the DEA model are summarized in Table 1. The average IE scores are greater for conventional banks (85.3%) compared to Islamic banks (81.9%). In contrast, the CE scores are greater for Islamic banks (69.2%) compared to conventional banks (62.3%). These results are in contrast with those of Ahmad Mokhtar et al. (2008) who reported that both the technical and cost-efficiency scores are greater for conventional banks compared to Islamic banks. Therefore, this study provides evidence that the performance of Islamic banks had improved

and they were able to compete with conventional banks, which have a longer establishment history. According to Beck et al. (2013), partnership loans between banks and borrowers, which are based on profit-loss sharing (PLS) are the most common Islamic banking product. Based on the PLS, the risk of business will be shared between banks and borrowers. Therefore, this study provides evidence that contractual relationship, which is based on PLS has enabled the Islamic banks to be more efficient in terms of cost. In contrast, the borrowers alone bare the risk of doing business in the conventional banking
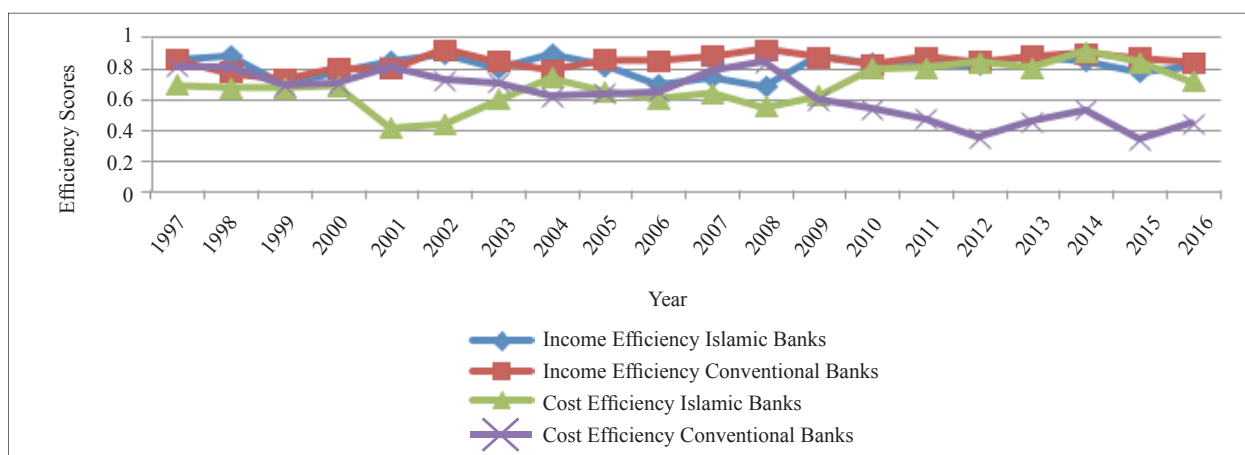

FIGURE 1. The Trend of Income and Cost Efficiency Scores
Source: Computed from the efficiency scores obtained from DEA.

system. Hence, conventional banks are more concerned with their efficiency in generating income compared to managerial efficiency.

The efficiency scores in Figure 1 shows that the IE and CE of Islamic banking had increased particularly following 2010, thus suggesting that Islamic banks had improved their efficiency over the study period. Overall, IE shows increasing trends for both banking markets. However, the scores are higher for the conventional banking market compared to the Islamic one. In contrast, CE is much higher for the Islamic market compared to the conventional. This result provides evidence that Islamic banks experienced higher CE compared to conventional banks. It can thus be predicted that Islamic banks are more efficient in terms of cost as they are relatively smaller in size than conventional banks. However, this finding contrasts those from Ahmad Mokhtar et al. (2008) who found that the CE values for conventional banks are greater than those of Islamic banks. The difference in results obtained from previous studies may, however, be attributed to the difference in the study periods.

NEXUS BETWEEN EFFICIENCY AND COMPETITION

The descriptive statistics of dependent and independent statistics used to measure the impact of concentration and performance on banking competition for conventional and Islamic banking markets are shown in Table 2 and Table 3.

The mean value for the measure of competition shows that the Islamic banking market is highly competitive compared to conventional one for *HREV* value. Both banking markets have approximately the same mean value for the level of competition in the loan or financing market. The mean value for market structure shows that the Islamic banking market is highly concentrated compared to the conventional. Besides, the mean efficiency scores show that Islamic banks are more cost-efficient. In contrast, conventional banks are more efficient in generating income. The mean for age variable shows that on average, conventional banks have more experience in banking operations than Islamic banks since they were long-established.

The correlation matrices for independent variables for conventional and Islamic banking markets are

TABLE 2. Descriptive statistics of variables for conventional banking market

Variable	Obs	Mean	Standard Deviation	Minimum	Maximum
HREV	480	.3685771	.27381	-.153	.871
HINREV	480	.4670667	.2517627	.063	.821
CR_2	480	.3497083	.0207862	.32	.38
CR_4	480	.5573125	.0499318	.46	.64
CR_8	480	.75775	.0637907	.64	.85
HHI	480	1045.167	129.27	811	1227
CE	480	.6212708	.2315415	.028	1
IE	480	.8506521	.1800631	.095	1
ZSCORE	480	13.79482	2.278692	7.528362	18.52821
AGE	480	56.9375	158.0709	0	2000
ROA	480	.0277823	.01435156	-.0683439	.0891965

TABLE 3. Descriptive statistics of variables for the Islamic banking market

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum
HREV	298	.428255	.344493	-.253	.931
HINREV	298	.4639497	.2846357	.013	911
CR_2	298	.419698	.1075104	.28	.75
CR_4	298	.623255	.1042359	.48	.9
CR_8	298	.8411745	.0750059	.71	.99
HHI	298	1459.95	657.0386	900	4017
CE	297	.8183838	.2287553	.057	1
IE	297	.7000168	.2444787	.001	1
ZSCORE	298	14.0671	2.092193	7.528362	18.52821
AGE	298	12.88255	6.753198	0	33
ROA	298	.0200265	.0114783	-.0617335	.0501634

TABLE 4. Correlation matrix of variables for conventional banking market

Variable	CR_2	CR_4	CR_8	HHI	IE	CE	ZSCORE	AGE	ROA
CR_2	1.0000								
CR_4	0.9696	1.0000							
CR_8	0.9570	0.9641	1.0000						
HHI	0.9785	0.9478	0.9160	1.0000					
IE	0.0827	0.1003	0.0761	0.0767	1.0000				
CE	-0.0653	-0.1347	-0.1054	-0.0567	0.1230	1.0000			
ZSCORE	-0.3655	-0.4240	-0.3174	-0.4683	0.0545	0.1577	1.0000		
AGE	-0.3149	-0.3692	-0.3234	-0.3317	0.0279	0.1928	0.3055	1.0000	
ROA	-0.1025	-0.1184	-0.1249	-0.0865	0.2443	0.3615	0.0042	0.1473	1.0000

TABLE 5. Correlation matrix of variables for the Islamic banking market

Variable	CR_2	CR_4	CR_8	HHI	IE	CE	ZSCORE	AGE	ROA
CR_2	1.0000								
CR_4	0.8863	1.0000							
CR_8	0.8609	0.9780	1.0000						
HHI	0.8808	0.9645	0.9620	1.0000					
IE	0.0910	0.1201	0.1314	0.1520	1.0000				
CE	-0.4010	-0.4445	-0.4807	-0.3821	0.1424	1.0000			
ZSCORE	0.4738	0.5353	0.6498	0.6182	0.1306	-0.3522	1.0000		
AGE	-0.0240	-0.0520	-0.0660	-0.0632	-0.1721	-0.0161	-0.1016	1.0000	
ROA	-0.0913	-0.0946	-0.0868	-0.0704	0.2720	0.1464	0.0409	-0.234	1.0000

TABLE 6. Efficiency and competition in the Islamic banking market (*HREV* as dependent variable)

	(1) HREV	(2) HREV	(3) HREV	(4) HREV	(5) HREV	(6) HREV	(7) HREV	(8) HREV
CR_2	-0.425***				-0.465***			
	(-4.63)				(-5.01)			
CR_4		-1.153***				-1.138***		
		(-8.05)				(-7.63)		
CR_8			-1.742***				-1.762***	
			(-8.86)				(-8.21)	
HHI				-0.0196				-0.0639
				(-0.21)				(-0.75)
CE					0.224**	0.210**	0.217**	0.215**
					(2.48)	(2.39)	(2.46)	(2.41)
IE	-0.0137	0.0263	0.00698	-0.0435				
	(-0.12)	(0.24)	(0.06)	(-0.33)				
ROA	0.0992	0.0798	0.0821	0.113	0.0147	0.00873	0.00476	0.0271
	(1.30)	(1.06)	(1.08)	(1.43)	(0.19)	(0.12)	(0.06)	(0.36)
AGE	0.102**	0.0570**	0.0759**	0.138**	0.0816*	0.0426	0.0592	0.117*
	(2.12)	(1.87)	(2.13)	(2.04)	(1.84)	(1.29)	(1.67)	(1.90)
ZScore	-0.966***	-1.177***	-1.010***	-0.781***	-1.070***	-1.249***	-1.093***	-0.904***
	(-15.46)	(-23.40)	(-21.43)	(-9.11)	(-11.98)	(-15.61)	(-14.59)	(-8.30)
Constant	1.463***	1.887***	1.653***	1.450	1.526***	1.929***	1.704***	1.919**
	(5.01)	(6.81)	(5.76)	(1.57)	(5.91)	(7.48)	(6.49)	(2.13)
N	255	255	255	255	255	255	255	255

Notes: *HREV* is the log of *H*-statistics computed using the total revenue model.

The Breusch-Pagan (BP) test for pooled or not to pooled (random effects) for each model has failed to reject the null hypothesis (pooled model), which indicates that the pooled OLS model is more appropriate than random effects. Hence, models (1) to (8) are estimated using the pooled OLS estimation technique. The detailed results for the estimated models are available upon request.

Figures in parentheses are t statistics.

*, ** and *** indicate the respective 10%, 5% and 1% significance level.

TABLE 7. Efficiency and competition in the Islamic banking market (*HINREV* as an independent variable)

	(1) HINREV	(2) HINREV	(3) HINREV	(4) HINREV	(5) HINREV	(6) HINREV	(7) HINREV	(8) HINREV
CR_2	-0.175 (-1.70)				-0.179 (-1.67)			
CR_4		-0.667** (-3.75)				-0.616** (-3.36)		
CR_8			-1.325*** (-5.67)				-1.277*** (-4.74)	
HHI				0.243** (2.59)				0.227** (2.59)
CE					0.189** (2.27)	0.184** (2.23)	0.187** (2.28)	0.174** (2.15)
IE	0.0533 (0.31)	0.0821 (0.47)	0.0778 (0.46)	0.0111 (0.06)				
ROA	0.0463 (0.38)	0.0313 (0.25)	0.0282 (0.23)	0.0673 (0.57)	-0.00829 (-0.07)	-0.0154 (-0.12)	-0.0208 (-0.16)	0.0109 (0.09)
AGE	0.0764 (1.48)	0.0497 (1.13)	0.0479 (1.11)	0.115 (1.61)	0.0572 (0.98)	0.0340 (0.63)	0.0303 (0.57)	0.0970 (1.31)
ZScore	-0.591*** (-6.28)	-0.742*** (-8.95)	-0.694*** (-8.46)	-0.301** (-2.94)	-0.635*** (-6.76)	-0.762*** (-9.37)	-0.726*** (-8.99)	-0.353** (-3.44)
Constant	0.359 (0.81)	0.600 (1.40)	0.554 (1.25)	-2.020* (-2.22)	0.376 (0.88)	0.598 (1.40)	0.565 (1.30)	-1.872 (-2.06)
N	287	287	287	287	287	287	287	287

Notes: *HINREV* is the log of *H*-statistics computed using the interest revenue model.

The Breusch-Pagan (BP) test for pooled or not to pooled (random effects) for each model has failed to reject the null hypothesis (pooled model), which indicates that the pooled OLS model is more appropriate than random effects. Hence, models (1) to (8) are estimated using the pooled OLS estimation technique. The detailed results for the estimated models are available upon request.

Figures in parentheses are t statistics.

*, ** and *** indicate the respective 10%, 5% and 1% significance level.

shown in Table 4 and Table 5. The correlations among structure variables are greater than 0.8, as such these variables could be included in different models in order to investigate the link between competition and concentration. The correlations with other explanatory variables are less than 0.8, hence there is no serious multicollinearity among the variables. The link between efficiency and competition will be analyzed according to Islamic and conventional banking industries.

ISLAMIC BANKING INDUSTRY

The links between efficiency and competition are shown in Table 6 and Table 7. According to the findings, all measures of concentration have a statistically negative impact on bank competition except for *HHI* in *HINREV* model, which shows a statistically positive sign. The findings of the negative sign are consistent with the SCP paradigm hypothesis. This shows that an increase in market concentration will impede the level of competition among banks in the Islamic banking market. This study also presents an interesting result, the positive sign of *HHI* in the *HINREV* model shows that both concentration and competition co-exist in the

Islamic financing market. Hence, the financing market of the Islamic banking industry is considered as a contestable market.

The results of bank efficiency and competition show that only cost efficiency has a positive and significant impact on the level of competition in the Islamic banking market. Hence, Islamic banks that are most cost-efficient are able to operate in a highly competitive market. This finding corroborates with those of Naceur et al. (2009) and Casu and Giradone (2006) who argued that banks in more competitive markets are more efficient. The findings are also in line with Aktan and Masood (2010) and Turk-Ariss (2009) who found that banks operating in more monopolistic environments are less efficient. Hence, Islamic banks need to be efficient particularly in terms of cost in order for them to remain viable in a market with growing competition.

The coefficient of age exerts a positive significant impact on the degree of competition in many models, except for the *HINREV* estimation models. The finding postulates that the experience gained over the years by the banks in conducting business enables them to survive in a highly competitive market. Hence, this finding supports the 'learning by doing' theory where the productive skills and knowledge that managers and workers gained from experience can be used to handle bank operations

TABLE 8. Efficiency and competition in the conventional banking market (*HREV* as dependent variable)

	(1) HREV	(2) HREV	(3) HREV	(4) HREV	(5) HREV	(6) HREV	(7) HREV	(8) HREV
CR_2	6.254***				6.444***			
	(31.27)				(38.16)			
CR_4		4.383***				-4.633***		
		(21.49)				(-24.01)		
CR_8			5.567***				6.037***	
			(26.85)				(30.46)	
HHI				4.005***				4.152***
				(32.47)				(40.86)
CE					0.0238	0.0515	0.120***	0.0231
					(0.78)	(1.78)	(4.44)	(0.98)
IE	0.366***	0.318**	0.316**	0.239**				
	(3.82)	(3.27)	(3.52)	(2.80)				
ROA	0.00650	0.0311	0.0322	0.0363	0.0478	0.0654	0.0591	0.0637
	(0.07)	(0.35)	(0.39)	(0.50)	(0.49)	(0.75)	(0.74)	(0.93)
AGE	0.00795	-0.00151	0.000127	-0.00769	-0.00341	-0.0120	-0.0110	-0.0156
	(0.49)	(-0.10)	(-0.01)	(-0.56)	(-0.25)	(-0.86)	(-0.74)	(-1.11)
ZScore	-0.162	-0.416***	-0.913***	-0.888***	0.196***	-0.124*	-0.638***	-0.695***
	(-1.41)	(-4.25)	(-9.87)	(-10.46)	(4.66)	(-2.40)	(-11.09)	(-15.90)
Constant	6.047***	2.821***	3.104***	-26.33***	5.373***	2.274***	2.602***	-27.81***
	(10.97)	(6.22)	(7.38)	(-29.55)	(10.49)	(4.93)	(6.21)	(-42.91)
N	426	426	426	426	426	426	426	426

Notes: *HREV* is the log of *H*-statistics computed using the total revenue model.

The Breusch-Pagan (BP) test for pooled or not to pooled (random effects) for each model has failed to reject the null hypothesis (pooled model), which indicates that the pooled OLS model is more appropriate than random effects. Hence, models (1) to (8) are estimated using the pooled OLS estimation technique. The detailed results for the estimated models are available upon request.

Figures in parentheses are t statistics.

*, ** and *** indicate the respective 10%, 5% and 1% significance level.

TABLE 9. Efficiency and competition in the conventional banking market (*HINREV* as dependent variable)

	(1) HINREV	(2) HINREV	(3) HINREV	(4) HINREV	(5) HINREV	(6) HINREV	(7) HINREV	(8) HINREV
CR_2	2.518***				2.777***			
	(10.43)				(12.30)			
CR_4		2.034***				2.337***		
		(6.90)				(7.99)		
CR_8			2.141***				2.531***	
			(6.30)				(7.41)	
HHI				1.518***				1.715***
				(7.22)				(8.66)
CE					0.0614	0.0901**	0.0968**	0.0564
					(1.61)	(2.50)	(2.54)	(1.45)
IE	0.325***	0.302***	0.309***	0.284***				
	(4.90)	(4.49)	(4.58)	(4.33)				
ROA	-0.0331	-0.0185	-0.0246	-0.0238	-0.00291	0.00804	0.00194	0.00366
	(-0.73)	(-0.44)	(-0.58)	(-0.59)	(-0.06)	(0.20)	(0.05)	(0.09)
AGE	-0.00677	-0.0120	-0.0106	-0.0125	-0.0175	-0.0226	-0.0213	-0.0225
	(-0.35)	(-0.64)	(-0.55)	(-0.66)	(-1.05)	(-1.34)	(-1.23)	(-1.29)
ZScore	0.626***	0.457***	0.356**	0.371***	0.971***	0.758***	0.634***	0.621***
	(7.18)	(4.57)	(2.97)	(3.61)	(12.19)	(7.47)	(5.13)	(5.53)
Constant	0.0754	-0.874	-1.230**	-12.41***	-0.497	-1.416**	-1.778***	-14.37***
	(0.18)	(-1.97)	(-2.79)	(-9.67)	(-1.24)	(-3.24)	(-4.16)	(-12.53)
N	470	470	470	470	470	470	470	470

Notes: *HINREV* is the log of *H*-statistics computed using the interest revenue model

The Breusch-Pagan (BP) test for pooled or not to pooled (random effects) for each model has failed to reject the null hypothesis (pooled model), which indicates that the pooled OLS model is more appropriate than random effects. Hence, models (1) to (8) are estimated using the pooled OLS estimation technique. The detailed results for the estimated models are available upon request.

Figures in parentheses are t statistics.

** and *** indicate the respective 5% and 1% significance level.

more efficiently so that banks can remain viable in a competitive market.

With regard to the impact of bank stability on competition, this study has found a positive coefficient of *Z*-score in all models that are statistically significant at 1% and 5% levels. The finding provides evidence that stable banks are able to operate in a competitive market. It also supports the argument by Boyd and Runkle (1993) who exerted that banking firms in a competitive market are less fragile. This suggests that Islamic banks' stable position in the market has enabled them to compete and stay in the market, hence reducing bank failures in a growing competitive environment.

CONVENTIONAL BANKING INDUSTRY

The relationships between efficiency and competition are shown in Table 8 and Table 9. All measures of concentration have a statistically positive impact on bank competition, hence providing support to the contestable market theory. Hence, the finding exerts that conventional banks with market power similarly face competition in the market. The finding on concentration and competition corroborates with that of Claessens and Laeven (2004) who showed that contestable market may enhance the level of competition in the banking industry.

Unlike the Islamic banking system, both measures of efficiency in the conventional banking system have a positive impact on the level of competition in the market. The result of the bank's efficiency and competition shows that income efficiency has a statistically positive impact on competition in both HREV and HINREV estimation models. Cost efficiency exerts a statistically positive link with competition in only two models, namely Model 6 (under HINREV estimation) and Model 7 in both estimation models. The empirical findings from this study seem to suggest that managerial ability is important for bank competition. Hence, the ability of banks in generating higher income may provide them the strength to face competition in the market. This finding corroborates with that from Mlambo and Ncube (2011) who showed the same evidence for the South African banking industry. Further, the conventional banks that are efficient in terms of cost are also able to operate in a highly competitive market. This study therefore also provides evidence that banks in a more competitive market are more efficient due to the existence of a contestable market in the conventional banking industry, as proposed by Casu and Giradone (2006).

Surprisingly, the coefficients of ROA and AGE do not provide any significant sign of the competition. The 'learning by doing' theory is not supported in the conventional banking market. The positive significant sign of Z-Score indicates the same conclusion as in the Islamic banking market, that is stable banks are able to compete and stay in the market; hence supporting the argument proposed by Boyd and Runkle (1993).

CONCLUSION AND POLICY IMPLICATION

This study provides empirical evidence on the link between efficiency and competition. The focus of this study is to investigate whether the type of efficiency matters for banks to remain viable in the highly competitive market. Further, to enrich the knowledge on market structure, the present study also investigates the links between competition with concentration and other bank-specific variables. The study on this subject is important as the Malaysian banking industry has experienced structural changes in lieu of the transformation that occurred such as merger programs, implementation of the Islamic banking industry in 1983 and the ongoing liberalization process. All those changes have altered the market structure of the industry particularly in terms of concentration and competition and bank performance in terms of efficiency. This study, therefore, provides an essential contribution to the literature where assessment on the market structure and performance in the dual banking market, Islamic versus conventional, is still lacking.

The nexus of efficiency, concentration, and competition has established the following: Firstly, concentration and competition are negatively related in the Islamic banking market, which thus supports the SCP paradigm hypothesis. Conversely, concentration and competition co-exist in the conventional banking market, hence supporting the contestable market theory. Secondly, the type of efficiency matters in influencing competition, where IE is positively related to competition in the conventional banking market. On the contrary, CE gives a positive impact on the competition of the Islamic banking market. Hence, banks in both markets need to operate efficiently to be more competitive. In conclusion, the empirical findings provide evidence to support the hypotheses developed in this study. The existence of a negative link between concentration and competition supports the SCP paradigm hypothesis; and further provides the evidence to support the first hypothesis of this study. Additionally, the positive link between CE and IE with competition supports the second hypothesis that is the type of efficiency influences competition in different banking markets.

Further, this study has also found a positive relationship between age and competition. Banks with more years of operation are able to face competition in a highly competitive market. However, the coefficients of age are significant in the estimation model for the Islamic banking market only. This finding provides evidence that the experience in banking operation is more important to embryonic Islamic banks and less important to conventional banks, which have a long history of the establishment. This finding shows that the concept of learning by doing is very important for Islamic banks in facing market competition compared to conventional banks. It also shows that the public still doubts the ability of Islamic banks to provide banking services especially

when they are newly established. However, this does not seem to happen to conventional banks whereby new banks will receive a good response even though they are similarly recent in their operation.

Additionally, the empirical findings are of substantial importance for policy makers and bankers. Since the links between concentration and competition are the opposite in both banking markets, the policy makers should introduce policies that encourage the existence of a banking market with an ideal level of concentration and competition. Such a banking industry environment should be promoted to maintain the stability of the Malaysian dual banking system and at the same time enable the banking firms to compete with their peers. Besides, the reputation of Islamic banks in their operation is important in enhancing their ability to compete in the market. Hence, managers of Islamic banks should constantly monitor the services offered to provide a positive market signal to customers and thereby ensuring the survival of the banks in an increasingly competitive market. Evidence from the findings further revealed that Islamic banks are cost-efficient, while conventional banks are income efficient. Hence, bank managers should implement strategies to improve their banks' efficiency to be more competitive and remain viable in the market.

Due to several limitations, the present study may be extended in a variety of ways: First, the results of the study will be more valuable to policy makers if future research on this subject is done according to the ownership of banks, i.e. whether it is foreign or domestically owned. Second, future study should use the Malmquist Productivity Index (MPI) method to examine the sources of total productivity changes in Islamic and conventional banks and further investigate the relationship between competition and performance. Finally, to obtain more significant and representative results, future study should enlarge the sample size in certain areas such as the examination of the market structure and performance of the banking industry in countries that implement a dual banking system.

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