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The Degree of Competition in the Malaysian Dual Banking Industry

(Darjah Persaingan dalam Industri Dwi Perbankan di Malaysia)

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ABSTRACT

The purpose of this study is to evaluate the degree of competition in the Malaysian dual banking industry to address the question of whether Islamic banks are able to cope with competition from the well-established conventional banks. The Panzar-Rosse (PR) method has been used to measure the degree of competition in Islamic compared with conventional banking market over the period of 1997-2016. Present study uses static panel data estimation to estimate the developed models. Results from the H-statistics values using total income show that level of competition in the Islamic banking market is more intense than conventional banking market. Hence, providing evidence that Islamic banks are able to compete with conventional banks that have long history of establishment. The H-statistic values using total interest income also indicate the same result, hence supporting the robustness of these results. The findings also show the effectiveness of policy changes adopted by Bank Negara Malaysia in order to increase level of competition in both banking markets. Hence, knowledge on this issue is important to the policy makers for them to formulate new policy regarding banking competition.

Keywords: Bank; competition; market structure; Panzar-Rosse model

ABSTRAK

Tujuan kajian ini adalah untuk menilai darjah persaingan dalam industri dwi perbankan di Malaysia bagi tujuan menjawab persoalan sama ada bank-bank Islam dapat menghadapi persaingan daripada bank-bank konvesional yag kukuh. Kaedah Panzar-Rosse (PR) telah digunakan untuk mengukur darjah persaingan dalam sistem perbankan Islam berbanding perbankan konvensional bagi tempoh 1997-2016. Kajian ini menggunakan kaedah data panel statik untuk menganggarkan model yang telah dibangunkan. Keputusan dari statistik H dengan meggunakan jumlah pendapatan menunjukkan tahap persaingan dalam pasaran perbankan Islam adalah semakin meningkat berbanding pasaran perbankan konvensional. Oleh itu, dapatan ini memberikan bukti bahawa bank-bank Islam mampu untuk bersaing dengan bank-bank konvensional yang telah lama wujud. Nilai statistik H yang dikira dengan menggunakan jumlah pendapatan kadar bunga juga menunjukkan hasil yang sama, seterusnya menyokong keberkesanan keputusan yang telah diperoleh. Hasil kajian menunjukkan perubahan dasar yang telah dilakukan oleh Bank Negara Malaysia telah berjaya meningkatkan tahap persaingan dalam pasaran perbankan. Oleh itu, pengetahuan tentang isu ini adalah penting kepada pembuat dasar untuk merangka dasar baru berkenaan darjah persaingan dalam industri perbankan.

Kata Kunci: Bank, persaingan; struktur pasaran; model Panzar-Rosse

INTRODUCTION

The existence of competition is the key factor in the development of market relations. Many researchers have highlighted on the importance of competition in the financial market particularly in the banking industry. Staroselskaja (2011) defined competition in the banking industry as the process of rivalry between commercial banks and credit institutions to build strong positions in the banking market. Yokoi-Arai and Yoshino (2006) stated that competition is needed to transform efforts and actions of the financial institutions into being more competitive in order to gain better profits and dividend income. Free market economy is analogue to competition and its existence may improve and enhance efficiency of the financial institution and finally enhance a country's economy. Therefore, the restriction of competition leads to the stagnation of the economy, because commercial entities lose the incentives to improve their performance (Rajesh

2009; Staroselskaja 2011). However, competition may also influence the stability of the banking sector where excessive competition may contribute to financial crises. Hence, policymakers should know the extent of competition in the market and its evolution over time.

Banking system is the largest component of the Malaysian financial system. It plays an important role in stimulating the growth of financial sector, stabilizing the economy, as well as in the formulation and implementation of monetary and credit policies in order to achieve financial and economic objectives. Prior to 1997 East Asian Financial Crisis (EAFC), the Malaysian banking system was consisted commercial banks, finance companies and merchant banks licensed under the Banking and Financial Institutions Act 1989 (BAFIA), and supervised by Bank Negara Malaysia. Besides that, the Islamic banks were licensed under Islamic Banking Act 1983. Presently, there are only three types of banking institutions in Malaysia, namely conventional commercial banks, Islamic banks and Investment banks. The implementation of merger program after the 1997 EAFC had changed the financial landscape particularly the structure of the Malaysian banking system. For instance, in 2016, there were only 54 banking institutions in the Malaysian banking sector compared to 88 institutions in 1997 (see Appendix A). Changes in the number of institutions may change the market structure of the banking industry particularly in terms of concentration and competition.

In addition, the study on banking competition in Malaysia is more attractive because Malaysia is the first country that implements dual banking system in which its Islamic banking system operates side by side with the conventional banking system. Further, the changes in regulation regarding the type and scope of operation of Islamic banks particularly after Financial Sector Master Plan (FSMP 2001) have also changed the landscape of Malaysian banking system. The changes in banking operation from Islamic subsidiary (1997-2004) to full-fledged Islamic banks (2005-2016) have given the room to the banks to compete among each other to remain in the market. The Islamic banking system in Malaysia has undergone three phases of development. It began with the first phase (1983-1992), followed by the second phase (1993-2003) and the third phase (2004 onwards). In the first phase, the Islamic banking system was in a monopoly structure where the market was monopolized by the only Islamic bank that existed at that time, i.e. Bank Islam Malaysia Berhad (BIMB). However, the Islamic banking market structure has changed during the development in the second and third phases with the growing number of Islamic banks operating in this market. The number of banks in the Islamic banking system has grown from 2 banks in 1997 to 16 banks in 2016. From the industrial organizational perspective, the increase in the number of banks gives signals to the increased level of competition in the market.

So far, many studies on banking competition have focused on conventional banking market and these studies were conducted by Repon and Islam (2016) for Bangladesh's banking industry, Barros and Mendes (2016) for Angola's banking industry, Kuzucu (2015) for Turkish banking industry and Trung (2014) for Vietnamese banking industry. Meanwhile, limited studies have been conducted on this issue for Islamic banking industry as done by Hakim and Chikr (2014) on Arab GCC's banking industry and Cupian (2017) for Indonesian banking industry. However, the study on banking competition in dual banking that covered both Islamic and conventional banking markets is still limited and needs to be further explored. The studies on dual banking have been done by Turk Ariss (2010) for 13 countries, Weill (2011) for 17 countries and Wahid (2017) for Malaysian banking industry. Moreover, only limited studies had calculated the yearly H-statistics as done by Kuzucu (2015), Weill (2011), Aktan and Masood (2010), Claessens and Laeven (2004), Bikker and Haaf (2002). Hence, this study contributes to the existing literature by providing the direct measure of market competitiveness for both banking systems particularly for emerging economies like Malaysia.

The aim of this paper is to assess the degree of competition in Islamic market compared with the conventional banking market in Malaysia. It is important to know the ability of Islamic banks to compete in the market which is dominated by conventional banks with long history of establishment. Present paper provides useful insight into the assessment of the level of competition in Islamic compared with conventional banking market. This is done by calculating the direct measure of competition for each year using the Panzar-Rosse (PR) method. Furthermore, this study also differs from previous studies because the analysis on concentration and competition includes a relatively large number of years (1997-2016), hence it can provide a significant analysis on the level of competition in the Malaysian dual banking system. Additionally, the implementation of the 2010 Act clearly shows that the issue of competition in the financial system, especially the banking industry, is particularly emphasized. The Malaysian Competition Act 2010 provides the legal framework for curtailing anti-competitive behaviour practices in the financial industry including banking industry. Hence, the knowledge on the degree of competition in the market is very important in order to detect anti-competitive behaviour among the banks in the banking industry.

The remaining discussion of this paper will be organized as follows. Section two briefly reviews the previous studies that examine this issue in various countries. Section three describes the data and methodology used in this study. Section four presents

and analyses the results, and finally section five concludes the paper.

LITERATURE REVIEW

Theoretically, the competitive behaviour of the banking firms can be assessed using two approaches, namely structural and non-structural approaches (Mohammed et al. 2016). Structural approach that uses structural information is employed to examine the nature of competition in the market. Many studies have used concentration ratios to investigate the level of competition in the banking market (Hakim & Chikr 2014; Mohammed et al. 2015, 2016; Repon & Islam 2016). Meanwhile, non-structural approach measures the degree of competition in the market directly without using any structural information about the market. Non-structural approach is employed to measure degree of competition and compensates the shortcomings of structural model based on theoretical and empirical evidences. According to Baumol (1982), the non-structural approach recognizes that the banking firms will react differently depending on the market structure in which they operate. Therefore, the non-structural approach describes the bank revenue behaviour in different market structures, namely perfect competition, monopolistic competition and monopoly markets. The Panzar-Rosse (PR) method is one of the well-known models used to measure competition under the structural approach. Claessens and Leaven (2004) mentioned that the advantages of the PR model are that it uses bank-level data and allows for bank-specific differences in production function. Further, the PR method allows the researchers to study the differences between types of banks such as large versus small banks, foreign versus domestic owned banks and much more. Hence, the use of PR method in this study is appropriate since we intend to assess the degree of competition in Islamic relative to conventional banking market.

PANZAR-ROSSE (PR) APPROACH

The PR method determines the competitive behaviour of banks based on the reduced form revenue function, which is based on cross-sectioned data; and the data requirements (revenues and factor prices) are relatively modest (Panzar & Rosse 1987). Perera et al. (2006) mentioned that the use of the PR model is robust for developed and most developing countries because the firm-level data are readily available for those countries. Besides, the PR model also allows bank specific differences in production function and can be estimated using panel data (Hamza 2011). According to Hamza (2011), PR model is developed to discriminate between the different market structures namely oligopoly, monopolistic competition and perfectly competitive markets. This is done through the reduction of the function at individual income of the bank (Cupian 2017). The PR model uses the firm or bank level data on revenues and factor prices in order to investigate how changes in input prices reflect the revenues earned by a specific bank. This is because the pricing reactions to changes in input prices depend on the market structure in which the banks operate.

The PR method develops the H-statistic to distinguish between different market structures. The value of H-statistic varied for different market structures; where in general, the score of H-statistic ranges between $-\alpha < H \leq 1$. The PR model investigates the extent to which a change in factor input prices is reflected in equilibrium revenues earned by a firm. Under perfect competition, an increase in input prices will raise the marginal cost and total revenue similar to the rise of the costs. Therefore, an increase in input prices will not affect the optimum output levels of the individual banks; hence, H equals to one ($H = 1$). Furthermore, the value of H that lies between zero and unity ($0 < H < 1$) supports the case of monopolistic competition. This is due to the increases in revenues are less than the proportionate changes in input prices caused by inelastic demand condition. Meanwhile, the negative value of $H(H < 0)$ indicates the monopoly or short-run conjectural variations oligopoly. This is because the market outcomes under the monopoly structure are different. The optimality condition for the monopoly suggests that an upward shift in its marginal cost curve will lead to a reduction in both equilibrium output and revenues (Panzar & Rosse 1987).

According to Chan et al. (2007), several assumptions need to be considered in developing the PR model. First, banks are profit maximizing and are treated as single-product firms, which face normal distributed revenue and cost functions. This assumption is consistent with the intermediation approach to banking in which banks are viewed mainly as financial intermediaries (De Bandt & Davis 2000). Second, banks produced their revenues using labour, capital and intermediated funds (mainly deposits) as inputs as proposed in the intermediation approach. Third, higher input prices are not associated with higher quality services that generate higher revenues; where each bank has specific input prices, which indicates that banks are not necessarily price takers in factor markets. Fourth, banks are operating in long-run equilibrium.

EMPIRICAL LITERATURE ON BANKING COMPETITION

The study on competition in developed countries had been explored earlier by Molyneux et al. (1994) for European banking industry, Molyneux et al. (1996) for Japanese banking market, Gelos and Roldos (2002) for European and Latin American countries' banking markets, and Bikker and Haaf (2002) for 23 European and non-European countries. Molyneux et al. (1994) had utilized the PR method for sample of banks in France,

Germany, Italy, Spain and UK for the period 1986-1989. They estimated the H-statistic for each country. The results showed that all those countries' banking markets operated under monopolistic competition structure except for Italy, which operated under monopoly. Bikker and Groeneveld (1998) had assessed empirically the level of competitiveness in 15 European Union (EU) countries' banking markets. The result showed that banks in EU countries operated under monopolistic competition condition. Further, Bikker et al. (2007) had also assessed the level of competition in the banking market of 101 countries over the period from 1986 until 2005. He used both scale and un-scaled total bank revenues as dependent variables. Generally, his findings showed monopolistic competition best describes the market conditions for the banking system in all the countries in the sample except for China.

Besides, a number of studies using PR model had found the evidence of monopolistic competition in many countries, which were classified as emerging markets and developing countries. Among the studies are conducted by Barros and Mendes (2016) for Angola's banking industry covering period 2005 to 2014, Mirza et al. (2016) for Pakistan's banking industry by using quarterly panel data for the period 2004 -2012, Repon and Islam (2016) for Bangladesh's banking industry covering the period 2006-2013, Abdul Kadir et al. (2014) and Sufian and Habibullah (2013) for Malaysian conventional banking market, Gajurel and Pradhan (2012) for Nepalese banking industry and Al Muharrami et al. (2009) for Qatar's commercial banking market.

There are also several studies that examine the dual banking system regarding competition issue. However, the number of studies is still low compared to the studies conducted on this issue in the conventional banking system. Recently, Wahid (2017) investigated the nature of competition in the Islamic compared with conventional banking system in Malaysia. He found that Malaysian Islamic banks were more competitive than their conventional counterparts during the study period from 2004 until 2013. Besides, Turk Ariss (2010) investigated the competitive condition in 13 countries that implement dual banking system covering the period from 2000 to 2006. He concluded that Islamic banking markets were highly concentrated; thus, facing less competitive pressure compared with conventional banking market. Meanwhile, Hakim and Chikr (2014) reported a competitive structure for the conventional banking industry; and in contrast, monopoly structure for the Islamic banking industry during the years of 2005-2010 for the Arab GCC countries. Many of those studies use panel data to measure the degree of competition in full sample or sub period. Hence, they provide single measure of H-statistic to classify the market structure of banking industry. Through such a study, researchers are unable to measure the changes in the degrees of competition through time for the banking industry being studied. Only limited studies provide the measure of competition by yearly basis as done by Kuzucu (2015) who found that level of competition in Turkish banking industry had decreased from 2000-2003 due to economic crisis. Then, after 2003, the level of competition had increased due to economic recovery period and the entries of some foreign banks. Many of such studies are done for conventional banking market (Aktan & Masood 2010; Claessens & Leaven 2004; Bikker & Haaf 2002). However, the study on the degree of competition is still limited for Islamic and dual banking industries. For instance, Weill (2011) has calculated the yearly H-statistic by using data for 17 countries that implement dual banking system and found that Islamic banks are no less competitive than conventional banks. However, Malaysia is not among the focal countries of the study. Therefore, present study may contribute to the existing literature by providing the analysis on competition in the yearly basis particularly for emerging economies like Malaysia.

METHODOLOGY

DATA

In this present study, the data used are of both Islamic and conventional banking firms operating in the dual banking system in Malaysia from 1997 to 2016, including both foreign and domestic banks (see Appendix B and C). The primary source of the financial data is the Bankscope database developed by the Bureau Van Dijk, and supplemented by the published balance sheet and income statement 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 provide almost homogenous services and products. The financial data are expressed in Malaysian Ringgit (MYR) and adjusted for inflation using Consumer Price Index with 2010 basic year. The choice of unbalanced panel data entails the advantage of permitting a greater number of observations to enter estimations. The data used in this study were accordingly adjusted due to differences in the reporting of financial year, financial dates and missing observations. As there is no formal method in dealing with different closing periods, the data were adopted just as they were being reported.

PANZAR-ROSSE METHODOLOGICAL FRAMEWORK

Panzar and Rosse (1987) have developed models that distinguish the structure of an industry in which firms operate, whether it is in the structure of oligopolistic, monopolistic competition or competitive. The PR model assumes that banks are profit maximizing firms, operating in contestable market and banks face conventional cost curves (Mlambo & Ncube 2011). The PR model examines

the effect of the inputs' price variation on the firm's income (Cupian 2017). Hence, it shows the reduced form revenue function with respect to factor prices. The PR model provides the measure of competition known as H-statistic. It is calculated by summing the price elasticity of the inputs used in the empirical model. This study used the intermediation approach to select the inputs and outputs to develop the PR model. Under the intermediation approach, three inputs namely fund, labour and capital are used by the banking firms to generate income.

Equations (1) and (2) show the revenue and cost function faced by a particular bank *j* (Buchs & Mathisen 2005).

$$R_j = R_j(q_j, n, z_j) \quad (1)$$

$$C_j = C_j(q_j, w_j, x_j) \quad (2)$$

Where R = total revenue
C = total costs
q = output
n = number of firms
z = exogenous variable affecting revenue
w = input prices
x = other exogenous variables, with all variables are expressed in logarithms.

Thus, profit is defined as:

$$\pi_j = R_j(q_j, n, z_j) - C_j(q_j, w_j, x_j) \quad (3)$$

Equation (4) implies that, bank *j* maximizes its profits when marginal revenue equals marginal costs, which shows that bank *j* is in equilibrium with the zero profit constraint holds at the market level.

$$\frac{\partial Rj}{\partial R_j(q_j, n, z_j)} - \frac{\partial Cj}{\partial C_j(q_j, w_j, x_j)} = 0 \quad (4)$$

Profit maximizing output is defined as equation (5), with asterisk (*) representing equilibrium values. Then, equation (6) is obtained by substituting (5) into (1) with the assumption that *n* is endogenously determined in the model.

$$q^*_j = q^*_j(z_j, w_j, x_j) \quad (5)$$

$$R^*_j = R^*_j(q^*_j(z_j, w_j, x_j), n^*, z_j) = R^*(z_j, w_j) \quad (6)$$

Market power is measured by the extent to which a change in factor input prices (∂w_j) is reflected in the equilibrium revenues (∂R^*_j) earned by firm *j*. Hence, Panzar and Rosse defined a measure of competition H-statistic as the sum of the elasticities of the reduced form revenues with respect to input prices as shown in equation (7).

$$H = \sum_j \left(\frac{\partial R^* j}{\partial w_j}\right)\left(\frac{wj}{R^*_j}\right) \quad (7)$$

According to Panzar and Rosse, both the sign of the H-statistic and its magnitude are important in specifying the market structure in which the banks operate.

PANZAR-ROSSE MODEL ESTIMATION

The following estimation is obtained by operationalized equation (6) as follows:

$$LR_{jt} = \alpha + \sum_{i=1}^{I} \beta_i LW^i_{jt} + \rho LQ_{jt} + \sum_{k=1}^{K} \sigma_n LZ^k_{jt} + \varepsilon_{jt} \quad (8)$$

With L is the natural logarithm; R is the revenue of bank j at time t and w^i_{jt} is a three-dimensional vector of factor prices for each bank, Q_{jt} is a scale variable, Z^k_{jt} is a vector of exogenous and bank-specific variables that may shift the revenue schedule, α is a constant term and ε_{jt} is the stochastic error term. From equation (8), reduced-form revenue equation for a panel data set of banks can be derived as follows (Cupian 2017; Gasaymeh et al. 2014; Sufian 2011):

$$LREV_{jt} = \alpha_0 + \beta_1 LWL_{jt} + \beta_2 LWD_{jt} + \beta_3 LWK_{jt} + \gamma_1 LASST_{jt} + \gamma_2 LLNTA_{jt} + \gamma_3 LEQTA_{jt} + \varepsilon_{jt} \quad (9)$$

$$LINREV_{jt} = \alpha_0 + \beta_1 LWL_{jt} + \beta_2 LWD_{jt} + \beta_3 LWK_{jt} + \gamma_1 LASST_{jt} + \gamma_2 LLNTA_{jt} + \gamma_3 LEQTA_{jt} + \varepsilon_{jt} \quad (10)$$

where t = each year such as 1997, 1998, …..2016; j = banks such as Maybank, Affin, …..Southern; L for all variables are the natural logarithm; *REV* is ratio of interest revenue plus non-interest revenue over total assets; *INREV* is ratio of interest revenue to total assets; W*L* is price of labour; W*D* is price of fund; W*K* is price of capital; ASST is total assets which is scale variable; *LNTA* is ratio of total loans to total assets; *EQTA* is ratio of equity to total assets and is stochastic error term

This study also intends to calculate the yearly H-statistic for Islamic and conventional banking systems. Hence, the PR model for every year is estimated to gauge the coefficients of input prices for each year. For that reason, this study uses interaction terms for each input price times the dummy for each bank type as done by Weill (2011). The following cross-sectional equations are estimated for each year:

$$LREV_j = \alpha_0 + [\beta_1 LWLI_j + \beta_2 LWDI_j + \beta_3 LWKI_j]Islam + [\beta_4 LWLC_j + \beta_5 LWDC_j + \beta_6 LWKC_j]Conventional + \gamma_1 LASST_j + \gamma_2 LLNTA_j + \gamma_3 LEQTA_j + \varepsilon_i \quad (11)$$

$$LINREV_j = \alpha_0 + [\beta_1 LWLI_j + \beta_2 LWDI_j + \beta_3 LWKI_j]Islam + [\beta_4 LWLC_j + \beta_5 LWDC_j + \beta_6 LWKC_j]Conventional + \gamma_1 LASST_j + \gamma_2 LLNTA_j + \gamma_3 LEQTA_j \quad (12)$$

where j = Maybank, Affin,…..Southern; L is the natural logarithm; WLI, WDI and WKI are prices of labour, fund and capital for Islamic banks, respectively; WLI, WDI and WKC are prices of labour, fund and capital for conventional banks, respectively; Islam and Conventional are dummy variables; ASST is total assets; LNTA is ratio of total loans to total assets; EQTA is ratio of equity to total assets and ε is stochastic error term

VARIABLES

Present study uses two dependent variables namely, LREV and LINREV to estimate the H-statistic. LREV in equations (9) and (11) indicates total revenue, which consists of interest and non-interest revenue. Meanwhile for Islamic banking system, LREV indicates incomes from financing and non-financing activities. The LREV variable is important as banks are now actively involved in income generating activities from non-interest sources. Meanwhile, LINREV consists of revenue or income from interest or financing. The LINREV model as shown in equations (10) and (12) is also estimated for the purpose of robustness, which represents the traditional activity of banks, generating income from financing. Following Cupian (2017) and Sufian (2011), both dependent variables are divided by total assets to account for size differences among the banks.

Panzar-Rosse model in equations (9) to (12) includes three input prices. First, WL is the price of labour represented by the ratio of personnel expenses to total assets. Second, WD is the price of funds that is the amount of income paid to depositors or interest expenses divided by total deposits; the total deposits includes customer funding and short term funding. Third, WK is the price of capital calculated as the ratio of other operating expenses to total assets. Other operating expenses include expenses on fixed assets allocated for all furniture, equipment and bank premises, including depreciation and administration and general expenses. These variables have been used in the banking studies by Cupian (2017), Kuzucu (2015), Turk Ariss (2009), Abdul Majid and Sufian (2007b), Sufian and Habibullah (2013), Abdul Kadir et al (2014) among others. The sign of the coefficients of three input prices is undetermined because it depends upon the structure of the market.

Consistent with previous studies, scale variable, the logarithm of total assets (LASST) is included as a proxy for bank size. Larger banks are expected to have greater products and loan diversifications, thus based on portfolio theory, firm with larger portfolio can diversify risks and earn larger profit (Bhatti & Hussain 2010). The expected sign for this variable can be positive or negative, depending upon the banks of whether they are operating at economies of scale or diseconomies of scale.

Consistent with previous studies, other bank-specific variables are also included in this study such as LNTA , which is measured by ratio of total loans (financing) to total assets. It is used to capture bank- specific risk (Chirwa 2001) and as a proxy for degree of intermediation (Abdul Majid et al. 2007a). It is expected to have positive relationship with bank revenue where higher interest revenue is generated with an increasing level of loans. Besides, the equity to total assets ratio (EQTA) is also included to control the differences in capital structure. This variable is expected to have positive relationship with banks' revenue where well-capitalized bank involved in riskier operations and portfolios, and in the process holds more equity, voluntarily or involuntarily (Abdul Majid & Sufian 2007a). Besides, dummy variable in this study is used to distinguish the type of banks, i.e. whether it operates in the Islamic or conventional banking market. The dummy variable in this study is used to estimate the model in equations (11) and (12). Islam dummy variable equals to one if the bank is Islamic and zero if the bank is conventional. In contrast, conventional dummy equals to one if the bank is conventional and zero if the banks is Islamic. Hence, to measure competition for each bank type for each year, we include interactive terms for each input price and times it with dummy variable for each bank type (Weill 2011).

CALCULATION OF H-STATISTIC

H-statistic is estimated for the whole sample and the yearly basis H-statistic of banks is divided according to their nature of business, i.e. Islamic or conventional system. The H-statistic test is defined as follows:

$$H_t = \sum_{i=1}^{n} \beta_i = 0 \qquad (13)$$

The PR H-statistic is computed as the sum of the input price elasticity of total revenues. Thus, the sum of the coefficients $\beta_1 + \beta_2 + \beta_3$ of the reduced form revenues constitutes the H-statistic for the Malaysian dual banking system. The yearly statistics for Islamic banking market is computed by the sum of coefficients $\beta_1 + \beta_2 + \beta_3$ in equations (11) and (12). Meanwhile, the yearly statistics for conventional banking market are computed by the sum of coefficients $\beta_4 + \beta_5 + \beta_6$ in equations (11) and (12). According to Panzar and Rosse (1987), the H-statistic can reflect the structure and conduct of the market to which the firms belong as shown in Table 1.

TABLE 1. Panzar-Rosse H–Statistic

Values of H	Market Structure
$H \leq 0$	Monopoly, colluding oligopoly, conjectural variations oligopoly
$0 < H < 1$	Monopolistic competition
$H = 1$	Perfect competition or Natural monopoly in a perfectly contestable market

Source: Buchs & Mathisen (2005).

EQUILIBRIUM TEST

One of the crucial assumptions of the PR model is that the banking sector is assumed to be in long run equilibrium, as suggested in previous studies such as Bikker and Haaf (2002), Claessens and Laeven (2004), and Stavarek and Repkova (2011). Thus, the equilibrium test will be carried out with the return on assets (ROA) replacing the bank revenue as the dependent variable in the regression equation as follows:

$$L(1 + ROA_{jt}) = \alpha_0 + \beta_1 LWL_{jt} + \beta_2 LWD_{jt} + \beta_3 LWK_{jt} + \gamma_1 LASST_{jt} + \gamma_2 LLNTA_{jt} + \gamma_3 LEQTA_{jt} + \varepsilon_{jt} \quad (14)$$

$$E = \sum_{i=1}^{3} \beta_i = 0 \quad (15)$$

where ROA is the pre-tax return (profits) on assets. As ROA can take a negative value on occasion, the dependent variable is simply computed as $L(1 + ROA)$ for convenience (Buchs & Mathisen 2005; Casu & Giradone 2006). The -statistic is derived from the equilibrium test and measures the sum of the elasticities of rate of return with respect to input prices (Stavarek & Repkova 2011). Wald test is used to test null hypothesis, E-statistics which implies that the banking sector is in equilibrium. If the null hypothesis is rejected, then the banking sector is said to be in long-run disequilibrium. Table 2 summarizes the discriminatory power of E-statistic.

TABLE 2. Equilibrium test for PR model

E Value	Condition
$E = 0$	Equilibrium
$E > 0$	Disequilibrium

Source: Stavarek & Repkova (2011).

All the econometric models in this study are estimated using pooled cross-section (OLS) and panel estimation approach (fixed and random effects). These approaches have a propensity to correct for the effects of omitted bank specific variables and (or) time varying factors (Perera et al. 2006). This study employed robust standard error regression to overcome heteroscedasticity and autocorrelation problems. Besides, the multicollinearity problem across the cross sections is detected using a variance inflation factor (VIF) test. There is no collinearity problem detected among the variables used in this study if the VIF value is less than five. Further, the data best suit one-way error correction model since unobservable variables are dependent only on the cross-section to which the observations belong.

ANALYSIS OF FINDINGS

DESCRIPTIVE STATISTICS

Table 3 presents the descriptive statistics of variables used for measuring the PR method. The means for most of the variables used in measuring the level of competition are higher for conventional banks compared with Islamic

TABLE 3. Descriptive statistics of variables used in the PR model

Variable	Type of bank	Observed	Mean	SD	Minimum	Maximum
Dependent variable						
LREV	Islamic	293	–3.735931	.6084276	–5.652215	2.933707
	Conventional	479	–3.469412	.4054429	–8.315008	–2.356421
LINREV	Islamic	297	–3.201312	.3848627	–5.40526	–1.836145–
	Conventional	471	–3.635634	.5382552	–9.61685	2.416913
LROA	Islamic	298	.0081445	.0238091	–.3438784	–1.836145
	Conventional	480	.0159136	.0571692	–.0894636	1.218291
Independent Variable - Input						
LWL	Islamic	292	–6.123439	1.294113	–9.11933	–3.315933
	Conventional	476	–4.990093	.4231429	–9.980017	–3.288443
LWD	Islamic	297	–3.781942	.6892082	–9.346059	–2.179923
	Conventional	479	–3.605005	.6035271	–7.260423	–1.86143
LWK	Islamic	294	–5.611466	1.397015	–10.18214	–1.346727
	Conventional	478	–5.066002	.5885126	–10.32991	–3.446878
Independent variable-bank specific factor						
LASST	Islamic	298	3.928211	1.631226	–1.372489	7.349314
	Conventional	480	5.084554	1.630265	1.105799	8.363837
LLNTA	Islamic	297	–.9019156	1.21783	–10.31894	.2286989
	Conventional	479	–.9007953	.9102832	–6.269728	1.915745
LEQTA	Islamic	297	–2.555554	.6310369	–5.212785	–.0320672
	Conventional	479	–2.241793	.6252051	–6.383095	.0188536

TABLE 4. Correlation matrix of independent variables in the PR model

	LWL	LWD	LWK	LAASST	LLNTA	LEQTA
LWL	1.0000					
LWD	0.0251 (–0.0507)	1.0000				
LWK	0.6628 (0.4754)	–0.0519 (–0.0652)	1.0000			
LASST	–0.0427 (–0.1810)	0.0455 (–0.0496)	–0.1651 (0.3382)	1.0000		
LLNTA	0.1498 (–0.0784)	0.3420 (0.1280)	0.4292 (0.1468)	0.3822 (0.4833)	1.0000	
LEQTA	0.2081 (0.4375)	–0.3074 (–0.0707)	0.1483 (0.3429)	–0.6354 (–0.1633)	–0.3086 (–0.0160)	1.0000

Note: Figures in parentheses are correlation matrix for Islamic banking market.

banks. Islamic banks are better in terms of LINREV mean. The difference in means for all of the variables used provides a significant basis to support the notion that Islamic and conventional banks are different. Besides, the correlation matrix in Table 4 shows that the correlations among the explanatory variables do not exceed 0.8, hence multicollinearity may not be a serious problem when estimating the parameters.

PANZAR-ROSSE H-STATISTIC

This study uses both the price and revenue equations as dependent variables. The price equation (LREV) comprises of the interest and non-interest incomes of the banking firm. Meanwhile, the revenue equation is represented by interest income (LINREV). The Breusch-Pagan multiplier test rejected the null hypothesis, hence panel data estimation is appropriate to be used to estimate data for both markets. Models 1 and 2 in Tables 5 and 6 show the PR estimation for conventional banks. According to the Hausman test, the fixed effect (FE) model should be employed to estimate the PR model for conventional banks. For robustness, the estimation of a robust ordinary least square (OLS) model was also reported in this study. Meanwhile, Models 3, 4 and 5 in Tables 5 and 6 are the PR estimation for Islamic banks. The Hausman test failed to reject the null hypothesis, hence both the robust FE and random effect (RE) models were employed to obtain consistent and efficient results. Besides, all of the models used in this study reported VIF values of less than 5, hence all the models are free from multicollinearity problem

The results obtained in Table 5 indicate that only two input price coefficients, namely LWL and LWD are significant and positive in both models for conventional banks. The LWK coefficient is significant in Model 2 only. Meanwhile for Islamic banks, only the price of deposits (LWD) is significant and positively related to revenue. These results imply that an increase in factor prices will lead to higher revenue for banks in the conventional banking market compared with those in the Islamic banking market. The price of labour (LWL) provides the highest contribution to the explanation of bank revenues in conventional banking market. These results contradict Sufian (2011) who reported that the price of fund (LWD) contributes more to conventional banks' revenue. In contrast, the price of fund contributes more to the Islamic banks' revenue. This result contradicts Abdul Majid and Sufian (2007a) who reported that both LWL and LWD contribute more to Islamic banks' revenue. However, the magnitude of contribution of LWD in both banking markets does not differ much. This result suggests that the unit of labour is more important in explaining the variation in total revenue of banks in the conventional banking market, while the price of deposits is important for Islamic banks. Further, the results obtained also support the argument that conventional banks have a competitive advantage compared with their peers in research and development, and are able to recruit qualified employees (Hakim & Chikr 2014).

The results of bank-specific variables in this study reported mixed results for both banking systems. The LASST coefficients are negative in all models, showing that banks in both banking markets face diseconomies of scale. This result implies that larger banks seem to be less efficient compared with smaller banks. However, the LASST coefficients are only significant in Model 1, which provides the evidence that the size of bank is important in influencing the banks' revenue in the conventional banking market. Hence, banks in this market need to operate at an optimal scale to generate high income.

Meanwhile, the positive and significant coefficients of risk (LEQTA) for all models except for Model 2 indicate that banks with high proportions of equity capital in both banking systems are able to generate higher income. Hence, this shows that banks in Malaysia are well-capitalized and efficient in generating revenue. The results are consistent with Sufian (2011) who proposed that well-capitalized banks may be able to survive in the market and it can also guarantee safety for

TABLE 5. Competitive structure using LREV for Islamic and conventional banks (Full sample)

Banking System	Conventional		Islamic		
Variable	(1) FE: LREV	(2) OLS: LREV	(3) FE: LREV	(4) RE: LREV	(5) OLS: LREV
LWL	0.384***	0.318***	0.0669	0.0481	0.0411
	(4.17)	(2.98)	(0.99)	(0.96)	(0.93)
LWD	0.127***	0.186***	0.134**	0.137**	0.140**
	(4.17)	(6.75)	(2.41)	(2.41)	(2.37)
LWK	0.120	0.240**	0.0359	0.0230	0.0147
	(2.02)	(3.06)	(0.53)	(0.34)	(0.22)
LASST	–0.148***	0.0325	–0.0412	–0.0171	0.00444
	(–4.37)	(1.77)	(–1.08)	(–0.57)	(0.15)
LLNTA	0.143***	0.0966**	0.216***	0.219***	0.229***
	(4.47)	(2.22)	(3.68)	(3.85)	(4.10)
LEQTA	0.0819	0.155**	0.232***	0.209***	0.203***
	(1.98)	(2.53)	(3.93)	(3.86)	(3.50)
CONSTANT	0.580	0.273	–1.698***	–2.036***	–2.202***
	(1.63)	(0.64)	(–3.34)	(–4.26)	(–4.54)
N	472	472	284	284	284
Hausman Test	54.26(0.0000)***		6.55(0.3647)		
H-Statistic	0.631	0.744	0.23	0.208	0.195
Wald Test:					
H =1	21.34***	7.63***	76.98***	102.49***	114.95***
H=0	62.56***	64.28***	7.41*	7.08**	6.77**

Notes: Figures in parentheses are t statistics.
*, ** and *** indicate the respective 10%, 5% and 1% significance levels

depositors during unstable macroeconomic conditions. Hence, the existence of well-capitalized banks is important in the banking industry since they can operate better in a competitive market. Besides, the positive and significant coefficient of LLNTA shows that banks with higher proportion of loans in their portfolio may earn higher revenue from financing activities (except for Model 1). This is consistent with the expectation that higher levels of loans will generate higher income. This study provides the evidence that the contribution of loans in generating income is higher for banks in the Islamic banking market compared with those in the conventional market.

Table 6 presents the estimation results of the PR model using interest revenue over total assets as a dependent variable. Similar to the LREV estimation models, the result from the LINREV estimation models seems to suggest that the LWL and LWD coefficients are positive and statistically significant for the models in the conventional market. In the meantime, the LWK coefficient is significant in Model 2 only. In contrast, the only input price that is statistically significant for the Islamic market is LWD. The contribution of price of deposits (LWD) towards revenue is higher in both markets as compared with LWL and LWK. The coefficient of price of labour (LWL) has lost its explanatory power in the LINREV model for the conventional market compared with the LREV model. In addition, the LWD's magnitude of contribution is higher in the conventional banking system compared with the Islamic banking system. Hence, conventional banks are able to generate higher revenue by disbursing more loans to the economy. These findings validate the conclusion made by Gajurel and Pradhan (2012) that the impact of cost of funds seems to be high in interest-based product markets, whereas the impact of labour cost is low. For example, the elasticity of cost of funds ranges from 0.236 to 0.517 in interest- or financing-based markets compared with non-interest markets which ranges from 0.126 to 0.171.

Concerning the impact of bank-specific variables, the LASST coefficients are negatively significant in two models (Model 1 and Model 4) with LINREV as the dependent variable. In contrast to the LREV estimation models, this finding shows that large banks in both markets operate inefficiently compared with small banks. This result provides the evidence that as a whole, the Malaysian banking faces diseconomies of scale in the interest- or financing-income based market. Similar to the LREV estimation models, the coefficients of LLNTA are positive and significant in all LINREV models. The high coefficient values indicate the relative illiquidity of the banks. Meanwhile, LEQTA exhibits a negative sign in

TABLE 6. Competitive structure using LINREV for Islamic and conventional banks (Full Sample)

Banking System	Conventional		Islamic		
Variable	(1) FE: LINREV	(2) OLS: LINREV	(3) FE: LINREV	(4) RE: LINREV	(5) OLS: LINREV
LWL	0.331***	0.287**	0.0299	0.0236	0.0248
	(4.61)	(3.33)	(1.13)	(1.20)	(0.87)
LWD	0.415***	0.517***	0.236***	0.239***	0.242***
	(9.00)	(12.72)	(9.45)	(9.84)	(3.84)
LWK	0.0289	0.119*	0.0202	0.0147	0.0102
	(0.90)	(2.45)	(0.96)	(0.82)	(0.48)
LASST	–0.223***	–0.00315	–0.0406	–0.0362**	–0.0311
	(–5.52)	(–0.24)	(–1.83)	(–2.12)	(–1.76)
LLNTA	0.146***	0.175***	0.230***	0.234***	0.236***
	(3.65)	(4.39)	(8.17)	(8.92)	(3.82)
LEQTA	–0.0232	0.0363	–0.0447	–0.0512	–0.0501
	(–0.44)	(0.73)	(–1.18)	(–1.52)	(–1.68)
Constant	1.359**	1.002	–1.783***	–1.874***	–1.891***
	(2.82)	(1.71)	(–9.69)	(–12.03)	(–7.37)
N	476	476	288	288	288
Hausman Test	133.29 (0.0000)***		2.74 (0.8413)		
H-Statistic	0.775	0.923	0.286	0.278	0.277
Wald Test:					
H =1	6.04*	5.47*	77.03***	550.18***	126.21***
H=0	71.86***	791.16***	12.31**	81.32***	18.62***

Notes: Figures in in parentheses are t statistics.
*, ** and *** indicate the respective 10%, 5% and 1% significance levels

all LINREV models (except Model 2), but the coefficients are insignificant.

Further, the results of equilibrium test show both the Islamic and conventional banking markets are in long-run equilibrium during the sample period. Due to space limitation, the results of the equilibrium test for the Islamic and conventional banking markets are shown in Appendix D. The Wall test fails to reject the null hypothesis of equal to zero ($H = 0$), which suggests the data are in equilibrium. The empirical findings imply that although the Malaysian banking industry had experienced structural changes, the market is in equilibrium in reaction to the institution at different times.

CLASSIFICATION OF MARKET STRUCTURE

The main interest of this study is to investigate the degree of competition in the Malaysian dual-banking system by using the H-statistic obtained from the estimation of the PR model. The estimated H-statistic values are positive and significant in all models. The Wald test in Tables 5 and 6 rejects the hypothesis for the monopoly ($H = 0$) and perfect competition ($H = 1$) market structures. These findings indicate that banks in the market earn their revenue under monopolistic competition conditions where revenues increase less than proportional changes in input prices. Further, the values of H-statistic in all the models ranged between zero and one (i.e. from 0.178 to 0.622); reconfirming the conclusion that banks in the Malaysian dual-banking system operate under a monopolistic competitive environment during the sample period. The results are consistent with previous studies on the Malaysian banking sector (Abdul Majid & Sufian 2007b; Sufian 2011; Sufian & Habibullah 2013) and on the Malaysian Islamic banking industry (Abdul Majid & Sufian 2007a). However, the degree of competition is slightly higher in the conventional banking market than the Islamic banking market. This means that banks in the conventional market face stiffer competition than banks in the Islamic market. Hence, this finding corroborates earlier findings by Hamza and Kachtouli (2014) and Turk Ariss (2010). However, the findings of this study do not support the finding by Wahid (2017) who found that Malaysian Islamic banks operate in a more competitive environment than conventional banks.

The H-statistic values under the LINREV estimations are also positive, but reports higher values than the LREV estimation model. The higher values of H-statistic at 0.775 in Model 1 and 0.923 in Model 2 propose that the conventional banks are more competitive than the Islamic banks in Malaysian dual-banking industry, particularly in the interest- or financing-based market.

The results support the evidence that banks in both banking systems still depend on the traditional loans' market in generating higher income compared with the fee and commission based market. This study provides the evidence that the values of H-statistic in the interest-based market range from 0.277 to 0.923, and ranging from 0.178 to 0.719 in the non-interest based market. These results do not support earlier findings by Sufian and Habibullah (2013) and Sufian (2011) who concluded that the Malaysian conventional banking market has shown a growing interest in the fee and commission based market. However, this finding coincides with Gajurel and Pradhan (2012) who found a higher level of competition among Nepalese banks in the interest income-based market compared with the non-interest income market.

CHANGES IN MARKET COMPETITION

The yearly H-statistic in this study was estimated for Islamic banking, conventional banking and the whole commercial banking industry (full sample) as shown in Table 7. The yearly H-statistic in this study was estimated under two revenue models; LREV and LINREV as shown in equations 11 and 12. Hence, about 120 models were estimated to calculate the yearly statistics for the Malaysian dual-banking system for the period of 20 years. Overall, the H-statistic values for the Malaysian dual-banking system are positive and range between zero and one, except for some years where the values are negative. The positive values of between 0.063 and 0.931 for all bank types and bank years suggest a monopolistic competition structure.

The average value of H-statistic provides the evidence that the degree of competition in the conventional banking market was higher during post-merger (2007-2016) period compared with the during-merger (1997-2006) period under both revenue estimations. The empirical findings corroborate the findings of Abdul Majid and Sufian (2007b) and differed from Abdul Kadir et al. (2014) who reported contrary findings. Meanwhile, the level of competition was enhanced in the Islamic banking market after the restructuring period under the

TABLE 7. Estimation of yearly H-statistic*

Year	LREV		LINREV		Full Sample	
	Islamic	Conventional	Islamic	Conventional	LREV	LINREV
1997	0.771[a]	0.482[c]	0.901[a]	0.821[a]	0.541[a]	0.911[a]
1998	0.661[a]	0.243[b]	0.474	0.123[b]	0.143[b]	0.153[b]
1999	0.232[c]	0.032[b]	0.274	0.214	0.042[c]	0.284
2000	0.801[a]	0.524	0.811[a]	0.674	0.403[b]	0.624
2001	0.203[b]	0.213[b]	0.223[b]	0.314	0.183[b]	0.364
2002	0.334	0.404	0.254	0.434	0.304	0.234
2003	0.103[b]	0.153[b]	0.123[b]	0.203[b]	0.133	0.224
2004	0.404	0.374	0.434	0.444	0.334	0.454
2005	0.123[b]	0.113[b]	0.013[b]	0.063[b]	0.053[b]	–0.0023[b]
2006	–0.103[b]	–0.153[b]	0.144	0.113[b]	0.013[b]	0.184
2007	0.731[a]	0.504	0.734	0.664	0.504	0.634
2008	0.794	0.544	0.911[a]	0.724	0.724	0.824
2009	0.314	0.344	0.404	0.494	0.334	0.514
2010	–0.253[b]	–0.113[b]	0.233[b]	0.434	0.143[b]	0.634
2011	0.253[b]	0.333[b]	0.143[b]	0.223[b]	0.474	0.294
2012	0.233[b]	0.323[b]	0.504	0.544	0.414	0.434
2013	0.931[a]	0.871[a]	0.801	0.821[a]	0.684	0.821[a]
2014	0.821[a]	0.811[a]	0.811	0.811_a	0.664	0.701[a]
2015	0.534	0.544	0.364	0.474	0.324	0.384
2016	0.811[a]	0.764	0.724	0.764	0.764	0.864
Average H-Statistic:						
During Merger		0.353	-	0.340	-	-
Post-Merger		0.493		0.595		
During Restructuring			0.437		-	-
Post-Restructuring			0.482			
During Structural Change					0.204	0.343
Post Structural Change					0.503	0.610

Notes: [a] Wald test for H=1 not rejected
[b] Wald test for H=0 is not rejected
[c] Wald test for H=1 and H=0 is not rejected
*The detailed result for model estimation in each year will be given upon request.

LINREV compared with the LREV model. The negative values of H-statistic for 2005, 2006 and 2010 for both banking markets lead to a conclusion that the merger activities, restructuring of the Islamic banking industry and the global financial crisis had influenced the level of competition and market power in the particular markets. During these periods, the conventional banking market experienced a dramatic decrease in the number of banks and the reduction of customer reliance on banks due to the 1997 EAFC, hence affecting the level of competition in the industry. Meanwhile, the existing Islamic banks were given the license to operate as full-fledged Islamic banks, hence raising the market power of those banks. The values of H-statistic which are less than zero provide the evidence that the banks in both banking markets behaved under a monopoly market structure during this period. In addition, the Wald test for H equals to zero, which was not rejected, also provides evidence of the existence of monopoly power among banks in both banking markets. Similar findings were obtained by Wahid (2017) who reported a decline in the level of competition in both banking systems after the crisis (2010-2013). This was due to policy changes undertaken by the Malaysian Government to facilitate economic growth and in the meantime, ensure the stability of the financial system. Recent trends of H-statistic, particularly after 2013 show that both banking streams operate under a monopolistic competition structure. However, banks in both banking streams had operated in a nearly perfect competition due to the non-rejection of H-statistic equivalent to one for the years 2014 and 2016. The finding provides evidence that the mergers and restructuring of the Malaysian banking industry together with the on-going liberalization had increased the level of competition in the Malaysian dual banking system.

The H-statistic trends are presented in Figures 1, 2 and 3. The changes in H-statistic during the study period provide evidence that merger program, restructuring of the Islamic banking system and liberalization process have altered the degree of competition among banks in the market. As shown in Figures 1 and 2, the level of competition was unstable in conventional banking market during the merger period. It shows that merger activities in the conventional market had altered the level of concentration and competition in the market. However, the degree of competition had increased after the second phase of merger in 2006 until the 2008 global crisis. This is likely because the merger activities had strengthened the position of local banks that were hit by the EAFC crisis. The merger process had resulted in the taking over of problematic banks by large banks with strong financial positions. With this, the banking market was only occupied by highly competitive banks. Thus, the degree of market competition had increased. In the meantime, the increase in H-statistic after 2010 could be due to the impact of entry of foreign banks such as BNP Paribas, Mizuho Bank and National Bank of Abu Dhabi via the liberalization process.

The yearly H-statistic for Islamic banks also moved at the same direction as the conventional banks. In general, the H-statistic trends in Figures 1 and 2 show that the restructuring of Islamic banking operations had decreased the level of competition in the Islamic banking market. As expected, banks in this market obtained

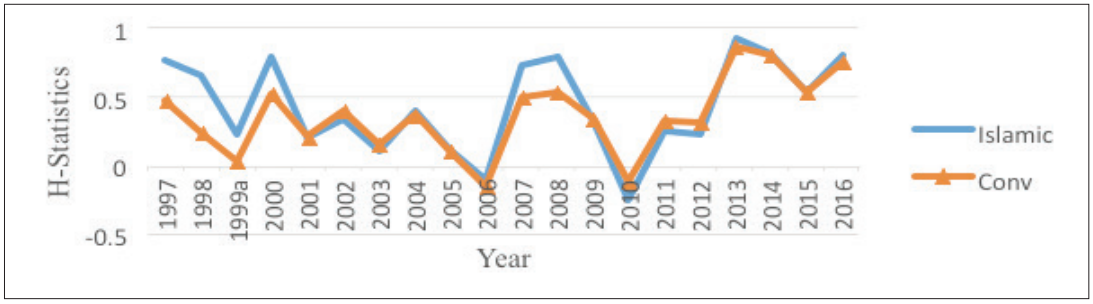

FIGURE 1. H-Statistic Trends for the REV Model

Source: Author's compilation from the calculation of yearly H-Statistic

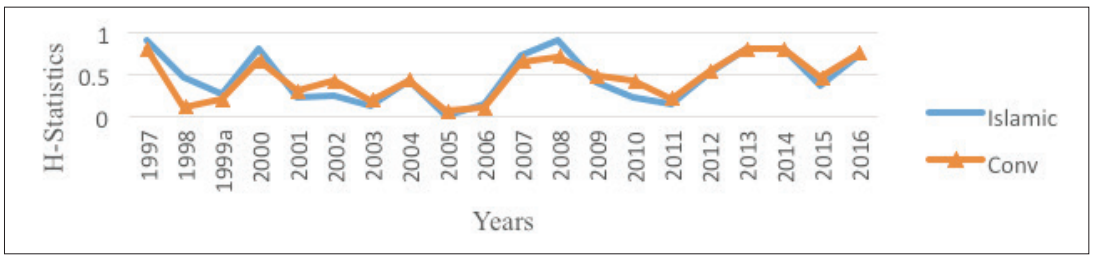

FIGURE 2. H-Statistic Trend for the LINREV Model

Source: Author's compilation from the calculation of yearly H-Statistic

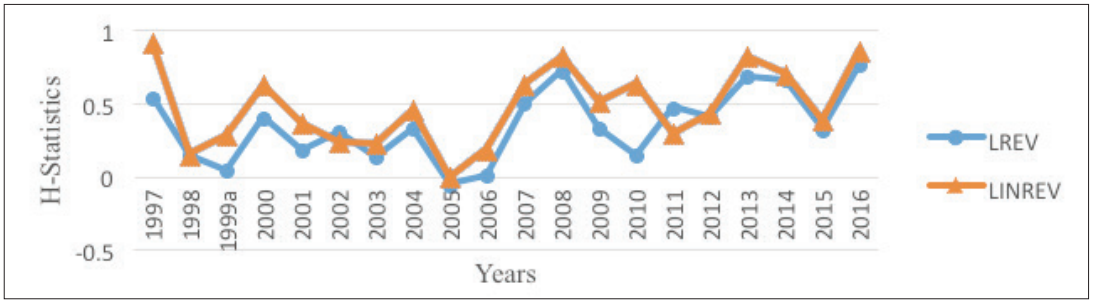

FIGURE 3. H-Statistic Trends for the REV and LINREV Models (Full-Sample)

Source: Author's compilation from the calculation of yearly H-Statistic

market power due to changes in the banking operations from being Islamic subsidiaries to full-fledged Islamic banks. However, the liberalization process had welcomed the entry of *de novo* foreign Islamic banks into the market, hence intensifying the level of competition in the market, particularly after 2005.

The trends in Figures 1 and 2 show that the level of competition is more intense for Islamic banks compared with conventional banks. Weill (2011) also concluded the same result in his study. However, the degree of competition for conventional banks is slightly greater than Islamic banks after the global financial crisis in 2008. The H-statistic trends for banks in both markets after 2010 did not show much difference. This shows that the degree of competition between banks in both markets was at approximately the same level. Besides, the H-statistic trends for the full sample in Figure 3 show that banks in the Malaysian dual banking industry behaved as monopolistically competitive firms, particularly after 2008. The degree of competition in the Malaysian banking industry had reduced rapidly in 2005 due to slower loan growth which hampered the revenue earned by banks in the particular year. Hence, the findings on H-statistic support evidence of the earlier studies that banks in both banking markets behave under monopolistic structure conditions.

CHANGES IN MARKET STRUCTURE

Table 8 shows the changes in market structure in the Malaysian dual banking system. In market studies, changes in market structure indicate changes in the

TABLE 8. Classification of market structure

Year	LREV		LINREV		FULL SAMPLE	
	Islamic	Conventional	Islamic	Conventional	LREV	LINREV
1997	PC	PC/M	PC	PC	PC	PC
1998	PC	M	MC	M	M	M
1999	PC	M	MC	MC	MC	MC
2000	PC	MC	PC	MC	MC	MC
2001	M	M	M	MC	MC	MC
2002	MC	MC	MC	MC	MC	MC
2003	M	M	M	M	MC	MC
2004	MC	MC	MC	MC	MC	MC
2005	M	M	M	M	M	M
2006	M	M	MC	M	M	MC
2007	PC	MC	MC	MC	MC	MC
2008	MC	MC	PC	MC	MC	MC
2009	MC	MC	MC	MC	MC	MC
2010	M	M	M	MC	MC	MC
2011	M	M	M	M	M	MC
2012	M	M	MC	MC	MC	MC
2013	PC	PC	MC	PC	MC	PC
2014	PC	PC	MC	PC	MC	PC
2015	MC	MC	MC	MC	MC	MC
2016	PC	MC	MC	MC	MC	MC

Notes: PC = Perfect Competition; MC = Monopolistic competition; and M = Monopoly.

firm's conduct or action in the market. Most conventional banks acted as monopolistic firms during the merger implementation period that began in 1998 to 2006. Hence, it shows that merger program has increased the market share of domestic banks involved in the program. The level of competition is higher in the credit market (interest based) compared with the overall market. During the earlier period of study, it was found that conventional banks operated in perfect competition market. However, the implementation of merger program has changed the market structure to monopoly and monopolistic. Besides, changes in banking operation from Islamic subsidiary to full-fledged Islamic banks has given the market power to the existing domestic banks in the market. As shown in Table 8, in certain years, banks in the Islamic banking market behave as monopoly firms during post-restructuring period. However, it is anticipated that the level of competition between banks in the conventional and Islamic banking markets is growing. This is due to results of the study that show the existence of perfect competition and monopolistic competition after 2006 and beyond. This situation occurs as the result of the influx of new foreign banks into the Malaysian banking industry through the liberalization process. Changes in market structure for each year under review indicate that banks in both markets will always change their behaviour or conduct in the market. This means that the banking industry in Malaysia is an industry where the rate of dependence among the existing banks is very high; and thus highlights the high degree of competition. The classification of market structure in Table 8 also shows, competition among banks in the industry is increasing especially after the implementation of the Competition Act 2010. In the early stages of the implementation of competition law, this study found that competition among banks in the Islamic banking system was less likely to be due to the fact that large banks had abused the dominant power that they had in the market. However, the competition in both banking systems is seen increasing especially in recent years, especially in 2015 and 2016.

CONCLUSION

Besides measuring the degree of competition using the Panzar-Rosse (PR) method, present study also attempts to calculate the yearly H-statistic to investigate the changes in the degree of competition in Islamic compared with conventional banking industry. Hence, this study provides an essential contribution as the literature that assesses the degree of competition in dual banking market; Islamic versus conventional banking is still lacking. This study provides the evidence that banks in both banking markets operate in monopolistic competition environment for most of the years studied. The values of H-statistic show that the degree of competition in Islamic banking market is slightly higher than conventional banking market. The H-statistic values ranged from –0.253 to 0.931 for Islam Islamic banking market. Meanwhile, it ranged from –0.153 to 0.871 for conventional banking market. It is interesting to highlight that in 2015 and 2016, both banking industries were operating under the monopolistic competition structure except for Islamic banks in REV model. This finding clearly demonstrates the ability of Islamic banks to compete with the established conventional banks. Hence, findings of the present study show that policy changes implemented by Bank Negara Malaysia via banks merger, restructuring of Islamic banking operation and liberalization process have been rewarding and have succeeded in increasing the degree of competition in both banking systems. Besides, research on bank competition involving Islamic and conventional banks can be extended by providing analysis of the impact of Islamic banking competition on the level of competition of conventional banks using samples from cross-countries.

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APPENDIX A

Number of banking institutions in Malaysia

Institutions/Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Commercial Banks	35	35	33	31	25	24	23	23	23	22
Finance Companies[a]	39	33	23	19	12	11	11	6	3	-
Merchant/Investments Banks	12	12	12	12	10	10	10	10	10	10
Islamic Banks	2	2	2	2	2	2	2	2	6	10
Total	88	82	70	64	49	47	46	41	42	42
Institutions/Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Commercial Banks	22	22	22	23	25	27	27	27	27	27
Finance Companies[a]	-	-	-	-	-	-	-	-	-	-
Merchant/Investments Banks	14	15	15	15	15	13	12	11	11	11
Islamic Banks	11	17	17	17	16	16	16	16	16	16
Total	47	54	54	55	56	56	55	54	54	54

Notes: [a] Finance companies started to merge with commercial banks in 2003 and completed in 2006.

Source: Financial Stability and Payment System Report (Various issues); Central bank of Malaysia Monthly Statistical Bulletin (Various issues); Annual Report (Various issues)

APPENDIX B

List of participating Islamic banks and ownership

Bank Name	Ownership
Bank Muamalat Malaysia Berhad[a]	L
Bank Islam Malaysia Berhad[a]	L
Affin Islamic Bank Berhad[b]	L
Alliance Islamic Bank Berhad[b]	L
Asian Finance Bank Berhad[a]	F
Al Rajhi banking and Investment Corporation (Malaysia) Berhad[a]	F
CIMB Islamic bank Berhad	L
EONCAP Islamic Bank Berhad[b, c]	L
Hong Leong Islamic Bank Berhad[b]	L
HSBC Amanah Malaysia Berhad[b]	F
Kuwait Finance House (Malaysia) Berhad[a]	F
Maybank Islamic Berhad[b]	L
OCBC AL-Amin Bank Berhad[b]	F
Public Islamic bank Berhad[b]	L
RHB Islamic Bank Berhad[b]	L
Standard Chartered SaadiqBerhad[b]	F
AmIslamic Bank Berhad	L

Notes: [a] Banks that operate as full-fledged Islamic banks.

[b] Banks that experienced the upgrading process from window based operations to Islamic Banking Scheme (IBS)and then to Islamic subsidiaries or full-fledged Islamic banks.

[c] From 1 November 2011, Hong Leong Islamic Bank has completed Malaysia's first vesting of an Islamic Bank with EONCAP Islamic bank Berhad.

L is local banks and F is foreign banks.

APPENDIX C

List of participating bank in Malaysian banking merger program

Anchor Bank	Target Bank
Malayan Banking Berhad[a]	Pacific Bank Berhad[1]
EON Bank Berhad[a]	Oriental Bank Berhad[2]
CIMB Bank Berhad[a,c]	BSN Commercial Bank[3]
Affin Bank Berhad[a,d]	International Bank Malaysia Berhad[4]
Alliance Bank Malaysia Berhad[a,e]	Wah Tat Bank Berhad[5]
AmBank (M) Berhad[a,f]	Bank Utama Berhad[6]
United Overseas Bank (Malaysia) Berhad[b]	Ban Hing Lee Bank[7]
The Royal Bank of Scotland Berhad[b]	Southern Bank Berhad[8]
Public Bank Berhad[a]	Sabah Bank Berhad[9]
Hong Leong Bank Berhad[a]	PhileoAllied Bank Berhad[10]
RHB Bank Berhad[a]	
Bank of Tokyo Mitsubishi UFJ (M) Berhad[b]	
J.P. Morgan Chase Bank (M) Berhad[b]	
Bangkok Bank Berhad[b]	
The Bank of Nova Scotia Berhad[b]	
Deutsche Bank (M) Berhad[b]	
HCBC Bank (M) Berhad[b]	
OCBC Bank (M) Berhad[b]	
Standard Chartered Bank Malaysia Berhad[b]	
Bank of America Malaysia Berhad[b]	
Bank of China (M) Berhad[b]	
Citibank Berhad[b]	

Notes: [a]Local owned banks
[b]Foreign owned banks;
[c]Previously known as Bumiputera-Commerce Bank Berhad;
[d]Previously known as PerwiraAffin Bank.
[e]Previously known as Multi-Purpose Bank Berhad;
[f]Previously known as Arab-Malaysian Bank.
[1]Merge with Maybank in 2001.
[2]Merge with EON Bank in 2001.
[3]Merge with Affin Bank in 2001.
[4]Merge with Alliance Bank in 2000.
[5]Merge with Hong Leong Bank in 2001.
[6]Merge with RHB Bank in 2003.
[7]Merge with Southern Bank in 2000.
[8]Merge with CIMB Bank in 2006.
[9]Merge with Alliance Bank in 2001.
[10]Merge with Maybank in 2001

APPENDIX D

Results of equilibrium test for Malaysian dual banking using ROA

	Conventional			Islamic		
	(1) FE	(2) RE	(3) OLS	(4) FE	(5) RE	(6) OLS
LWL	0.00898	0.00778	0.00778	0.00138	0.000467	–0.000105
	(0.96)	(1.12)	(1.12)	(1.00)	(0.43)	(–0.08)
LWD	0.0177	0.0179	0.0179	0.00630	0.00651	0.00650
	(1.32)	(1.30)	(1.30)	(1.28)	(1.30)	(1.27)
LWK	–0.00359	–0.00273	–0.00273	–0.00447	–0.00435	–0.00444
	(–1.29)	(–1.10)	(–1.10)	(–1.59)	(–1.58)	(–1.64)
LASST	0.00152	0.00284	0.00284	0.000595	0.000199	0.0000793
	(0.62)	(1.71)	(1.71)	(0.41)	(0.19)	(0.09)
LLNTA	–0.00382	–0.00964	–0.00964	0.0115	0.0114	0.0107
	(–0.59)	(–1.21)	(–1.21)	(1.35)	(1.40)	(1.43)
LEQTA	0.00608	0.00810	0.00810	–0.00208	–0.00189	–0.00135
	(1.35)	(1.82)	(1.82)	(–0.34)	(–0.36)	(–0.30)
Constant	0.109	0.101	0.101	0.0171	0.0147	0.0122
	(1.26)	(1.32)	(1.32)	(1.47)	(1.36)	(1.10)
N	477	477	477	288	288	288
Equilibrium Test: Wald test for E=0	1.00	1.27	1.27	0.84	1.92	0.26

Note: Model (1), (2) and (3) are for conventional market, meanwhile Model (4), (5) and (6) are for Islamic market. The Breusch-Pagan test imply that the panel estimation is more appropriate. The null hypothesis for Hausman test is failed to reject. Hence, both FE and RE are reported. Figures in parentheses are t statistics.