

## Impact of Structural Changes on Bank Competition in Dual Banking Industry

(Kesan Perubahan Struktur terhadap Persaingan Bank dalam Industri Perbankan Dwi)

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### ABSTRACT

The banking industry in Malaysia has undergone a change in its market structure, especially in terms of competition due to several factors such as the implementation of the merger program, restructuring of the Islamic banking operations, liberalization and technological advancement. Therefore, this study is conducted to measure the changes in the degree of competition in the Malaysian dual banking due to structural changes occurring in the industry. The Panzar-Rosse (PR) method has been used to measure the degree of competition in the Malaysian dual banking market for the period 1997-2016. Present study uses static panel data estimation to estimate the developed models. The value of H-statistics indicates that Islamic and conventional banks operate in monopolistic competition market structure. The findings show that structural changes have increased the level of competition in the Malaysian banking industry. The results of the study show that policy changes made by Bank Negara Malaysia have improved the level of competition in the Islamic and conventional banking markets. Knowledge of competitive issues is crucial so that policy makers may formulate new policies for the banking industry that suit the current market structure.

*Keywords:* Bank; competition; Islamic banking; market structure; Panzar-Rosse model.

### ABSTRAK

Industri perbankan di Malaysia telah mengalami perubahan dalam struktur pasaran terutamanya dari segi darjah persaingan kesan daripada beberapa faktor seperti pelaksanaan program merger, penstrukturan operasi perbankan Islam, liberalisasi dan kemajuan teknologi. Oleh itu, kajian ini dibuat untuk mengukur perubahan darjah persaingan dalam industri dwi perbankan di Malaysia kesan daripada perubahan struktur yang berlaku dalam industri berkenaan. Kaedah Panzar-Rosse (PR) telah digunakan untuk mengukur darjah persaingan dalam industri dwi perbankan di Malaysia bagi tempoh 1997-2016. Kajian ini menggunakan data panel statik untuk menganggarkan model yang telah dibentuk. Nilai statistik H yang diperoleh menunjukkan bank-bank Islam dan konvensional beroperasi dalam struktur pasaran persaingan bermonopoli. Hasil kajian mendapati perubahan struktur telah meningkatkan tahap persaingan dalam industri perbankan di Malaysia. Keputusan kajian menunjukkan perubahan polisi yang dilakukan oleh Bank Negara Malaysia telah berjaya meningkatkan darjah persaingan dalam pasaran perbankan Islam dan konvensional. Pengetahuan tentang isu persaingan sangat penting supaya pembuat polisi boleh menggubal dasar baru bagi industri perbankan yang sesuai dengan struktur pasaran semasa.

*Kata kunci:* Bank; persaingan; perbankan Islam; struktur pasaran; model Panzar-Rosse

### INTRODUCTION

Structural changes refer to the economic situation that will alter the conduct of banks in the industry, consistent with the changes in the market structure. Hence, structural changes may alter the market structure of an industry. From the industrial organizational perspective, changes in the market structure can be examined based on the levels of concentration and competition in the industry. The industry's structure is considered stable, but it can be transformed by changes in economic policy, regulation, technology and buyer needs. These transformations are known as structural changes. They alter the conventional elements of market structure, such as firm size distribution, numbers of firms and firm ownership structure. Most countries in the world regardless of their economic status,

i.e. developed, developing or least developed countries experienced a rapid transformation in their financial sectors particularly banking industry due to structural changes. Malaysia has also been not left behind in facing this wave of change.

Staroselskaja (2011) defined competition in the banking industry as the process of rivalry between commercial banks and credit institutions to build strong position in the banking market. Banking institutions are always competing with each other to increase their service quality. The existence of competitive environment encourages commercial banks to be more innovative in selling their products and services to gain customer satisfaction and remain in the market. Therefore, the restriction of competition leads to stagnation of economy, because commercial entities lose the incentives to improve

their performances (Rajesh 2009; Staroselskaja 2011). For instance, the market-seeking behavior especially expanding abroad by some banking firms is one of the signals of global competition, which is a result of liberalization process.

Structural changes in the banking industry have given a significant implication to the level of concentration and competition in the banking market. Sources of structural changes in the banking industry are implementation of merger program, liberalization process and technological advancement (Apergis & Polemis 2016; Barros & Mendes 2016; Mirza et al. 2016; Perera, Skully & Wickramanyake 2006; Seelanatha 2010). For instance, Mirza et al. (2016) found that deregulation and liberalization have intensified the level of competition in the Pakistan's banking industry. Besides, Rezitis (2010) found that merger and acquisitions had increased the level of concentration in Greek banking industry, hence reducing the level of competition in the market. Further, Gajurel and Pradhan (2012) reported that development and use of information technology in banking operation had promoted competitive environment in the Nepalese banking industry.

Studies on the level of competition in the Malaysian banking system are more interesting as the implementation of the Islamic banking system as well as the restructuring of Islamic banking operations have also changed the degree of competition in the industry. If reviewed, most studies on competition issues only focus on conventional banking system (Aktan & Masod 2010; Bikker & Haaf 2002; Claessens & Leaven 2004; Kuzucu 2015). Limited studies have been conducted on this issue in the Islamic banking system (Cupian 2007). Moreover, studies involving both banking systems, namely Islamic and conventional are rather limited (Turk Ariss 2010; Weill 2011) and Malaysia is not the focal country in both types of studies.

Henceforth, the present paper attempts to evaluate and compare the impact of structural changes on the level of competition in the Malaysian dual banking system which covered two different banking systems, namely Islamic and conventional banking. Therefore, this study may provide evidence on the current level of competition in the Malaysian dual banking industry; particularly the nature of competition in Islamic banking industry, which is considered as embryonic industry compared with the conventional system with long history of operation. To date, only one study has been made on the issue of competition in the Islamic banking system in Malaysia. The study was made by Abdul Majid and Sufian (2007a), covered the period 2001-2005. Meanwhile, competition issue in the dual banking system in Malaysia was done by Wahid (2017) and covered the period 2004-2013 with a focus on the impact of economic crisis towards the degree of competition in the Islamic and conventional banking systems. Different from previous study, the focus of this study is to examine the impact of structural changes such as merger and acquisitions, restructuring of banking

operations and ongoing liberalization on the degree of competition in the Islamic and conventional banking markets. Furthermore, this study also differs from other studies because the analysis on the state of competition includes a relatively large number of years (1997-2016), hence providing a significant analysis on the changes of the market structure of Malaysian dual banking system which is driven by several structural changes.

The remaining discussion of this paper will be organized as follows. Section two briefly reviews the theoretical and empirical literature related to competition issue in the banking industry. Section three describes the data and methodology used in this study. Section four presents and analyzes the results, and finally section five concludes the paper.

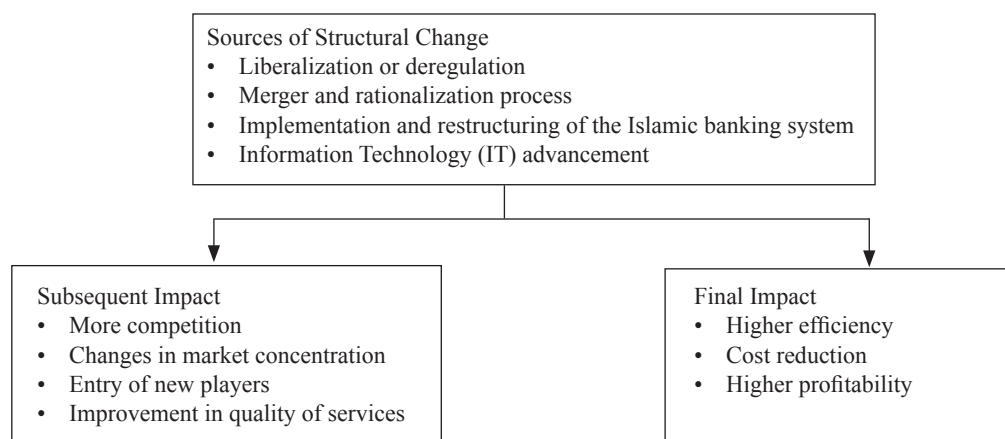
## LITERATURE REVIEW

Review of literature in this study focuses on two aspects. The first part focuses on structural change that has taken place in the Malaysian banking market. The second part discusses the previous studies that examine the issue of competition in the banking industry.

## SOURCES OF STRUCTURAL CHANGE

According to Bikker and Bos (2005), structural changes in the banking market will bring two types of impact namely; subsequent impact and final impact. Subsequent impact of the structural changes can be seen from many aspects, particularly market concentration and level of competition in the market. Meanwhile, the final impact of the structural changes can be seen in terms of efficiency, cost reduction and profitability of the banks. This study attempts to investigate the subsequent impact of structural changes by focusing on the issue of competition in the banking market. The sources of structural change and the impact on Malaysian banking market are shown in Figure 1.

There are four sources that contribute to the structural changes in the Malaysian banking industry. Abdul Majid and Sufian (2007b) provided the evidence that merger among banks has decreased the level of concentration in the Malaysian conventional banking market. Further, liberalization and globalization have increased the level of competition in the Islamic banking market (Abdul Majid & Sufian 2007a). Meanwhile, Hussain (2002) mentioned that the implementation of dual banking system has also altered the market structure of Malaysian banking industry. Finally, technological advancement in providing banking services has also altered the market structure in the industry. According to Hawkins and Mihaljek (2004), the use of new technology affects the structure and performance of the banking industry in emerging markets particularly through its impact on the costs and the determination of optimal scale.



Source: Author's compilation from Bikker & Bos 2005

FIGURE 1. Sources and impact of structural change in Malaysian Banking Market

The banking industry in most of developing economies has been experiencing fundamental changes in their market structures since the 1997 East Asian Financial Crisis (EAFC). The mergers among the Malaysian banking institutions were done through two phases (Abdul Majid & Sufian 2007b). The merger exercise was undertaken to strengthen the banking sector which was hit by the 1997 EAFC. The focus of the mergers was to merge the small financial institutions with the bigger ones, known as 'anchor' banks. Meanwhile, banks and their finance-company subsidiaries were instructed to merge in the second phase of merger. Hence, the merger process had reduced the number of financial institutions operating in the industry from 88 institutions in 1997 to only 54 institutions in 2016.

The liberalization and deregulation also contribute to the changes in the market structure and performance of the nation's banking system as well as to the Malaysian banking market structure (Abdul Majid & Sufian 2007a; Ahmad Mokhtar, Abdullah & Alhabshi 2008; Duncan & Langrin 2004; Murjan & Ruza 2002; Sharma & Bal 2010). Malaysia has adopted the gradualist and progressive approach to liberalize its financial market. Under the gradualist approach, the liberalization process of the financial system was done in phases, in tandem with the capability and ability of the institutions in the system to absorb the changes without affecting the financial stability; this is then followed by the gradual opening of the financial system (Njie 2006). The main objective for liberalizing the financial system is to attract foreign participation into Malaysian financial sector. Malaysia believed that the opening up of the domestic financial system to foreign competition would create a more efficient, competitive and market-driven financial sector (BNM 1999). The wave of liberalization in both conventional and Islamic banking markets has increased the number of foreign players in the Malaysian banking system from 13 in 1995 to 24 in 2016.

Malaysia had implemented Islamic banking system since 1983 but its implementation became more

pronounced since 1993 where conventional banks were permitted to offer Islamic windows under interest free banking scheme. Hussain (2002) mentioned that one of the important reasons for Malaysia adopting dual banking system is to increase the number of players instantly, where this will result in an increase of competition among the banks in the market. At the end of 2016, there were 16 Islamic banks in the Malaysian banking industry, compared with only two banks from 1993 until 2004. Further, the restructuring of Islamic banking operation from Islamic subsidiary to full-fledged Islamic banks has also improved the competitiveness of the market.

Besides, advancement in technology is the means to enjoying economies of scale in production, developing new product and services, creating knowledge, as well as instilling product quality and services efficiency (Selamat, Jaafar & Boon 2009). As in other sectors, the banking sector has also benefited from rapid technological advancement. Hawkins and Mihaljek (2004) mentioned that the use of new technology affects the structure and performance of the banking industry in emerging markets particularly through its impact on the costs and the determination of optimal scale. Therefore, financial institutions especially banking institutions have begun to invest heavily in information technology to enhance their customer service in order to remain competitive in the market (Gajurel 2010; Sharma & Bal 2010; Wong et al. 2006). The use of technology in delivering banking services increased the number of bankable customers. For instance, the number of subscribers of internet banking had increased by 66.5 percent between 2012 (13,678) and 2016 (22,774) (BNM 2016).

#### EMPIRICAL LITERATURE ON COMPETITION ISSUE

Issue on competition is important and has gained special attention by the industrial organizational studies. It has been researched extensively since 1980s until now. According to Perera et al. (2006) banking competition

theory explains how banks react optimally according to market condition. The literature on the measurement of competition in the banking market can be categorized into two main streams, and those are structural and non-structural approaches. The structural approach measures competition based on the structure-conduct-performance (SCP) paradigm and the efficient structure (ES) hypothesis. On the other hand, non-structural approach uses the New Empirical Industrial Organization (NEIO) approaches to analyze the competitive behavior among the banking firms in the absence of structural measure or without using the explicit information about the structure of the market.

Non-structural approach to measure degree of competition 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 relates the bank revenue behavior in different market structures, namely perfect competition, monopolistic competition and monopoly markets. Compared with structural approach, the non-structural approach is able to measure the degree of competition in the market directly without using any structural information about the market. This is one of the important advantages of non-structural approach and is more appropriately used in investigating the relationship between concentration and competition; particularly due to the existence of contestability in the market. Contestability of the market will cause the firms to face higher level of competition, although the market is highly concentrated. The well-known model under the non-structural approach is the Panzar-Rosse (PR) model.

Claessens and Leaven (2004) mentioned that the advantages of the PR model are that it uses the bank-level data and allows for bank-specific differences in production function. The PR method determines the competitive behavior 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. The PR model uses the firm or bank-level data on revenue and factor prices in order to investigate how changes in input prices reflect the revenues earned by a specific bank.

The PR method develops the H-statistics (H) to distinguish between different market structures. The value of H-statistics varied according to market structure where in general, the score of H-statistics lies between  $-a < H \leq 1$ . The PR model investigates the extent to which a change in factor input prices is reflected in the 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 because the increases in revenues are less than the proportionate changes in input prices caused by inelastic demand. 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).

A number of studies using PR model had found the evidence of monopolistic competition in many countries' banking markets particularly for emerging markets as done by Repon and Islam (2016), Trung (2015), Hakim and Chkir (2014), Sufian and Habibullah (2013). Claessens and Laeven (2004) did a major study on the competition issue. They had investigated the competitive condition in 50 countries including developed and developing countries using the PR method for the period from 1994 until 2001. They found that banking system with greater foreign bank participation and fewer restrictions on activities may enhance the degree of competitiveness in the market.

Casu and Giradone (2006) examined the relationship between competition, concentration and efficiency in 15 EU countries for the period from 1997 to 2003. They were motivated to study the issue of competition due to the deregulation process in the financial sectors in the EU countries. The deregulation aimed to remove the entry barriers and create a level playing field among the banking firms, where this will foster competition and efficiency among the banking institutions.

Perera et al. (2006) investigated the impact of financial deregulation and market liberalization on the nature of competition in South Asian banking markets. The values of H-statistic showed that the banks in South Asian markets operated under monopolistic competition during the period from 1995 to 2003. Furthermore, the H values for Bangladesh and Pakistan showed that the level of competition was greater in the traditional interest-based product markets. In contrast, the domestic banking firms in India and Sri Lanka faced greater competitive pressure in the fee-based product market.

Murjan and Ruza (2002) assessed the competitive nature of the Arab Middle Eastern (AME) banking markets using bank data of nine countries; which were grouped into different economic spectrums, oil-producing and non-producing countries. The AME region experienced dramatic changes in the banking system as results of globalization, the Gulf War (1990-1991) and the economic strategy to redirect their resources toward development instead of military spending. Furthermore, different levels of regulations have also resulted in different levels of competition in both country groups. The results of H-statistics showed that the banks in AME region behaved under the conditions of monopolistic competition.



However, the values of H-statistics were higher for non-oil countries than those of Gulf countries; indicating that the deregulation taking place in those countries had helped to promote higher degree of competition in the countries' banking systems.

Yeyati and Micco (2007) had investigated the effects of consolidations and entry of foreign banks on competition in eight Latin American countries by using the PR method. They found that increased concentration did not weaken banking competition in those particular countries. Generally, the calculated H-statistics rejected the hypotheses that  $H = 0$  for monopoly and  $H = 1$  for perfect competitive in all cases. These results indicated that commercial banks in those countries behaved as monopolistic competition firms.

Limited studies have been done on the competition issue for Islamic banking industry. Al-Muharrami, Mattheva and Khabari (2006) showed the evidence of growing competitive environment in the Gulf Cooperation Council (GCC) countries' banking markets due to the declining trends of concentration ratios. The H values, which were greater than zero and less than one, indicate that the banks in the GCC countries operated under monopolistic competition structure. Specifically, the results of the PR model were mixed. For instance, perfect competition structure was reported for Kuwait and Saudi Arabia, monopolistic competition for Bahrain and Qatar and monopolistic structure for Oman. These findings suggested that the GCC banking market should develop a competitive environment in facing the global banking competition as proposed by World Trade Organization (WTO).

Turk-Ariss (2010) had conducted an interesting study by investigating the competitive condition in two banking systems namely, Islamic and conventional banking systems. The bank samples in this study were selected from 13 countries, which implemented dual banking system from 2000 to 2006. The calculated H-statistics indicated that both the Islamic and conventional banking markets operated under monopolistic competition structure. However, he concluded that Islamic banking markets are highly concentrated; thus, facing less competitive pressure as opposed to conventional banking market. However, Hakim and Chikr (2014) had found different results from the work of Turk Ariss (2010). They also made a conclusion that, from the global perspective Islamic banks are still in the embryonic stage even in the Muslim countries. Thus, Islamic banking industry must invest more in the innovation of Islamic financial products. They suggested that banks in the GCC countries to develop competitive structure in their banking industries as to face competition from international banks.

Wong et al. (2006) reported that market liberalization and bank consolidation had changed the competitive environment of the Hong Kong banking industry. They carried out a research to examine the changes in the level of competition from 1991 until 2005, particularly after 2001 where the interest rate deregulation together with

other liberalization moves had been fully completed. For that reason, they put an effort to measure the H-statistics for three time intervals, i.e. from 1991 to 2005, 1991 to 2001 and 2001 to 2005. The empirical results showed that the degree of competition was fairly high during the period from 1992 to 2002. Meanwhile, the overall competitive condition from 1991 to 2005 indicated that Hong Kong banking industry could be characterized as monopolistic competition.

Besides, Abdul Majid and Sufian (2007a) also measured the competitive behavior for a sample of 17 domestic and foreign Islamic banks in Malaysia over the period from 2001 to 2005. They calculated the H-statistics using PR method to investigate the competitive structure of Malaysian Islamic banking industry due to the ongoing liberalization process specifically in the Islamic financial market. They found the H-statistics to be between zero and one, which indicates that the Islamic banking industry in Malaysia operated under monopolistic competition structure. Abdul Majid and Sufian (2007b) also investigated the condition of competition in the Malaysian conventional banking system due to merger and consolidation. They found that conventional banking market also operated under the monopolistic competition from the banks' data of 1998-2005. The level of competition was higher during the post-merger period when compared with pre-merger period.

Sufian and Habibullah (2013) also did another study to investigate the impact of financial consolidation on the degree of competition in the Malaysian conventional banking market covering the period of 1996-2008 by utilizing the PR method. They had divided the samples into three sub-periods, which comprised of 1996-2008 (all years), 1996-2000 (pre-merger), and 2001-2008 (post-merger). They found that the level of competition was higher during the pre-merger than the post-merger period, which is different from Abdul Majid and Sufian (2007b). Using the same approach, Abdul Kadir et al. (2014) investigated the competitive condition in the Malaysian conventional banking market for the period 1996-2009. They were motivated to evaluate the impact of consolidation process on concentration and competition in the Malaysian banking market. They found that concentration had increased after the second phase of consolidation, hence level of competition was lower during post-merger period. They also concluded that further merger in the banking industry without opening the market, will lead to anti-competitive behavior. Wahid (2017) calculated the H-statistics for Malaysian Islamic and conventional banking markets. Results from the PR model suggested that Malaysian Islamic banks were more competitive than their conventional counterparts. However, the degree of competition in both markets had increased tremendously during the study period (2004-2013).

As discussed above, there are number of studies that evaluate the nature of competition in the banking industry due to several structural changes. However, the study on

this issue for the dual banking industry is still limited and need further exploration. Hence, present study will contribute to the existing literature on this issue for both Islamic and conventional banking markets.

## 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 Tables A1 and A2 in Appendix). 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 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 domestic conventional banks in this sample include both anchor and target banks which involved in the merger process particularly after 1997 East Asian Financial Crisis (EAFC). Meanwhile, the Islamic banks include only the domestic anchor banks, which have been involved in the upgrading process.

### EMPIRICAL MODEL

*Panzar-Rosse Model* The reduced form revenue equations that we used to estimate the PR model are as follows:

$$LREV_{jt} = \alpha_0 + \beta_1 LPL_{jt} + \beta_2 LPD_{jt} + \beta_3 LPK_{jt} + \gamma_1 LASST_{jt} + \gamma_2 LLNTA_{jt} + \gamma_3 LEQTA_{jt} + \varepsilon_{jt} \quad (1)$$

$$LINREV_{jt} = \alpha_0 + \beta_1 LPL_{jt} + \beta_2 LPD_{jt} + \beta_3 LPK_{jt} + \gamma_1 LASST_{jt} + \gamma_2 LLNTA_{jt} + \gamma_3 LEQTA_{jt} + \varepsilon_{jt} \quad (2)$$

Where  $t$  = the period observed such as 1997, 1998, ... 2016;  $j$  = individual bank such as Maybank, Affin Bank, ... Southern Bank;  $L$  is 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;  $PL$  is price of labour;  $PD$  is price of fund;  $PK$  is price of capital;  $ASST$  is total assets which is scale variables;  $LNTA$  is ratio of total loans to total assets;  $EQTA$  is ratio of equity to total assets and is stochastic error term.

This study uses two dependent variables namely,  $LREV$  and  $LINREV$  to estimate the H-statistics.  $LREV$  in equation (1) indicates total revenue which consists of interest and non-interest revenues while for Islamic banking system,  $REV$  indicates incomes from financing and non-financing activities. Meanwhile,  $LINREV$  in equation (2) consists of revenue or income from interest or financing. The  $LINREV$  model is also estimated for the purpose of

robustness which represents the traditional activity of banks, generating income from financing. The dependent variables are divided by total assets to account for size differences among the banks. Besides, the independent variable used in the PR model classified into two categories namely input variables and bank-specific variables.

Three input variables are used to estimate the PR model (Abbasolu, Aysan & Gunes 2007; Cupian 2017; Kuzucu 2015; Sufian & Habibullah 2013; Turk-Ariss 2009). The price of labour,  $PL$  is represented by the ratio of personnel expenses to total assets. Second,  $PD$  is the price of funds, which is the amount of income paid to depositors or interest expenses divided by total deposits; the total deposits include customer funding and short term funding. Third,  $PK$  is the price of capital calculated as the ratio of other operating expenses to total assets. The sign of the coefficients of three input prices is undetermined because it depends upon the structure of the market.

Consistent with previous studies, other bank-specific variables are also included in this study such as the logarithm of total assets ( $ASST$ ) as a proxy for bank size. Larger banks are expected to have greater products and loan diversifications; thus, may earn larger profit (Bhatti & Hussain 2010). The expected sign for this variable can be positive or negative, depending on whether the banks operating under economies of scale or diseconomies of scale. The second bank-specific variable is measured by ratio of total loans to total assets ( $LNTA$ ), where it is used to measure the elasticity of banks towards loan financing (Sufian 2011). 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 a positive relationship with bank revenue where well-capitalized banks are involved in riskier operations and portfolios, and as such more equities are being held voluntarily or involuntarily in the process (Abdul Majid et al. 2007a)

*Calculation of H-Statistics* H-statistics are estimated for selected sub-samples to capture the period for structural changes that happened in the Malaysian dual banking market; Islamic and conventional. The H-statistics test is defined as follows:

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

The PR H-statistics are computed as the sum of the input price elasticity of total revenue. Thus, the sum of the coefficients of the reduced-form revenue constitutes the H-statistics for the Malaysian dual banking system. The H-statistics can reflect the structure and conduct of the market to which the firms belong to as shown in Table 1.

*Equilibrium Test* One of the crucial assumptions of the PR model is that the banking sector is assumed to be in long-run equilibrium. This assumption suggests that competitive capital markets will equalize risk-adjusted rates of return across banks. This means that in long-run

TABLE 1. Panzar-Rosse H-statistics

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, the rates of return should be uncorrelated with the input prices (Stavarek & Repkova 2011). Thus, the equilibrium test will be carried out with the return on assets (ROA) which replaces bank revenue as the dependent variable in the regression equations as follows:

$$L(1+ROA_{jt}) = \alpha_0 + \beta_1 LPL_{jt} + \beta_2 LPD_{jt} + \beta_3 LPK_{jt} + \gamma_1 LASST_{jt} + \gamma_2 LLNTA_{jt} + \gamma_3 LEQTA_{jt} + \varepsilon_{jt} \quad (4)$$

$$E = \sum_{i=1}^i \beta_i = 0 \quad (5)$$

where  $ROA$  is the pre-tax return (profits) on assets. As  $ROA$  can take on negative values on occasion, the dependent variable is simply computed as  $L(1+ROA)$  for convenience (Buchs & Mathisen 2005; Casu & Giradone 2006). The statistics, derived from the equilibrium test, measures the sum of the elasticities of rate of return with respect to input prices (Stavarek & Repkova 2011). The long-run equilibrium exists if the statistics equal to zero, while when is less than zero, it reflects disequilibrium. Wald test is used to test null hypothesis that the 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.

## RESULTS

This section reports the results of our analysis. Due to space limitation, the results for descriptive statistics and correlation matrix are not provided in this paper. Generally, the means for all variables used in this study reported higher value for conventional banks compared with Islamic banks. The difference in means for all the variables used provides a significant basis to support the notion that Islamic and conventional banks are different. Besides, the correlation matrices among the explanatory variables do not exceed 0.8, hence multicollinearity may not be a serious problem when estimating the parameters.

### IMPACT OF STRUCTURAL CHANGES ON COMPETITION

Analysis on the changes in the degree of competition in this section will be conducted according to the type of banking system; whether Islamic or conventional.

*Conventional Banking Market* To analyze the potential impact of the merger and acquisition on the level of

competition among conventional banks, the PR model for conventional banks was estimated based on different periods; during the merger period (1997-2006) and post-merger period (2007-2016). The Breusch-Pagan multiplier test rejected the null hypothesis, hence panel data estimation is appropriate to be used to estimate data for  $LREV$  model. According to the Hausman test, the fixed effect (FE) model should be employed to estimate the PR model for conventional banks. This test rejected the null hypothesis that states coefficients of the random effect estimators are the same with the coefficients of the fixed effect estimators. This study reported a FE model with robust standard errors to overcome the both heteroscedasticity and autocorrelation problems. Meanwhile, the Breusch-Pagan Langrange Multiplier test shows that the pooled (OLS) estimation is appropriate for  $LINREV$  model. Table 2 reports the estimation results for the best models.

TABLE 2. Competitive structure of conventional banks during and post-merger

	During Merger (1997-2006)		After Merger(2007-2016)	
	(1) FE: LREV	(2) OLS: LINREV	(3) FE: LREV	(4) OLS: LINREV
LPL	0.392*** (3.21)	0.134* (2.55)	0.398** (3.50)	0.409*** (3.95)
LPD	0.156*** (3.57)	0.495*** (6.09)	0.151*** (2.92)	0.345*** (4.53)
LPK	0.0584 (1.11)	0.0138 (0.63)	0.0752 (0.94)	0.0255 (0.40)
LASST	-0.0157 (-0.22)	-0.146 (-1.70)	-0.227*** (-3.24)	-0.202** (-2.31)
LLNTA	0.126* (2.42)	0.111*** (3.26)	0.153*** (3.16)	0.124** (2.52)
LEQTA	0.108 (1.47)	-0.0340 (-0.58)	0.0376 (0.81)	-0.00202 (-0.03)
Constant	-0.150 (-0.27)	0.199 (0.59)	0.816 (1.89)	1.312 (1.98)
N	241	242	235	234
H-statistics	0.606	0.643	0.624	0.780
Wald Test:				
H=1	8.02***	16.57***	53.77***	3.04
H=0	19.01***	53.77***	32.88***	38.08***

Notes: Figures in parentheses are t statistics.

\*, \*\* and \*\*\* indicate the respective 10%, 5% and 1% significance levels

The H-statistics are higher for traditional interest-based market (*LINREV*) than overall market (*LREV*). This finding contradicts the studies done by Sufian and Habibullah (2013) and Sufian (2011) who found reverse results. The values of H-statistics are higher during the post-merger period for both estimation models. Level of competition has increased by 21.3% in *LINREV* estimation model between both periods of estimations. The finding reconfirms the finding of Abdul Majid and Sufian (2007b) who reported a higher level of competition during the post-merger (56.9%) period compared with the pre-merger period (53.1%). A higher level of competition during the post-merger period might have been the result of liberalization process which encouraged the influx of new foreign banks into the Malaysian banking industry, particularly after 2010. In addition, the use of advanced technology in banking activities has also changed the market structure of the industry towards being a market with a higher level of competition.

The positive value of H-statistics that ranged between zero to one gives a conclusion that the conventional banking market operates under monopolistic competition condition. Hence, the Wald test rejects the null hypothesis of  $H = 0$  and  $H = 1$ . However, the failure to reject the null hypothesis for  $H = 1$  in Model 4 suggests that the conventional banks had operated in a perfect competition condition during the post-merger period under the interest revenue estimation. This could be due to the increase in the number of banks offering loans plus the facility to access bank loan services through the use of latest technology that facilitates loan applications. Hence, this study is able to provide evidence that structural changes in the conventional banking market have increased the level of competition in the particular market.

The coefficients of the price of labor and deposits reported the expected positive sign and are statistically significant in all models, implying that an increase in factor costs lead to a higher total revenue. This is consistent with the findings of previous studies (Sufian 2011; Sufian & Habibullah 2013). Among the inputs, labor input gains in magnitude in *LREV* and *LINREV* models for both merger periods. Hence, the results provide the evidence that personnel costs had been the main element of bank's production function and contributed more in increasing the revenue of banks. The significant positive coefficients of *LLNTA* at various significance levels in all models provide the evidence that conventional banks were able to earn higher revenue by disbursing more loans. Besides, the coefficient of assets (*LASST*) shows a negative sign and is statistically significant during the post-merger period. Hence, providing the evidence that the negative sign of assets may be due to bureaucracy as proposed by Eichengreen and Gibson (2001). The results also show that that large banks in the conventional market had experienced diseconomies of scale in their operations, particularly during the post-merger period which had led to a decrease in the revenue gained by the banks.

*Islamic Banking Market* Different from conventional banking market, the H-statistics for Islamic banking market are calculated by dividing the sample to two sub-periods; the first covers the restructuring period (1997-2004) where the Islamic banks started operating as Islamic subsidiaries in the banking system, and the second period covers the year 2005 to 2016 where the Islamic banks were given the license to operate as full-fledged Islamic banks. Hence, changes in the scope of operations from subsidiary to full-fledged Islamic banks together with the ongoing liberalization process in the period had altered the level of competition in the Islamic banking market. The PR models for both periods were estimated using different methods of estimation. The model used for the restructuring period was estimated using the OLS method since the Breusch and Pagan Lagrangian multiplier test had failed to reject the null hypothesis for pooled OLS. In contrast, this study fails to reject the null hypothesis for pooled OLS for the second period. Hence, the panel data estimation approach is suitable to be used to estimate the PR model by using the fixed and random effect models. The Hausman test had also failed to reject the null for the random effect model. Hence, both FE and RE models were used to get consistent and efficient results. The best-fit models for the Islamic banking industry are presented in Table 3.

As shown in Table 3, the estimated values for H-statistics for both periods are positive and range from 0.129 to 0.360. The H-statistics for the *LINREV* estimation model are higher compared with those of the *LREV* estimation model, suggesting that Islamic banks face stiffer competition in the financing market than the total market. However, growth of competition is greater in the *LREV* model in comparison to the *LINREV* estimation model. Levels of competition had increased by 134% and 91.8% in the *LREV* and *LINREV* estimation models, respectively. Hence, this shows that Islamic banks are facing stiffer competition in both traditional and fee-based markets. If anything could be delved, the increase in the level of competition in this market could possibly be due to the impact of the entry of *de novo* foreign Islamic banks into the industry. Undoubtedly, changes in the scope of operation, especially domestic banks which are now operating as full-fledged Islamic banks have intensified the level of competition in the market. Additionally, the use of the latest technology in offering banking services has also reinforced the competitive environment in this market.

The Wald test rejects the hypothesis for the market structure of perfect competition or monopoly, except for Model 1. Hence, it can be concluded that bank revenues in the Islamic banking industry are to be earned under monopolistic competition conditions. It is interesting to see that during the restructuring period, the Wald test had failed to reject the null of  $H = 0$  in the *LREV* estimation model. This indicates that the Malaysian Islamic banks earned their revenues under monopoly conditions during the restructuring period. In addition, the small values of



TABLE 3. Competitive structure of Islamic banks during and post-restructuring

	Islamic Subsidiary		Full-Fledged Islamic Banks			
	(1) OLS: LREV	(2) OLS: LINREV	(3) FE: LREV	(4) FE: LREV	(5) FE: LINREV	(6) FE: LINREV
LPL	0.0251 (0.32)	0.0491 (1.19)	0.0855* (2.17)	0.0631* (1.97)	0.0402 (1.39)	0.0265 (1.33)
LPD	0.102 (1.55)	0.132 (1.82)	0.157*** (4.09)	0.147*** (3.91)	0.265*** (9.42)	0.273*** (10.11)
LPK	0.00174 (0.02)	0.00174 (0.05)	0.0997* (2.59)	0.0916* (2.56)	0.0543 (1.94)	0.0515* (2.10)
LASST	0.00239 (0.06)	-0.0477* (-2.95)	-0.127* (-2.07)	-0.0319 (-0.70)	-0.0114 (-0.26)	0.00182 (0.07)
LLNTA	0.227* (2.56)	0.170* (2.45)	0.333*** (5.51)	0.278*** (5.20)	0.351*** (7.99)	0.338*** (9.22)
LEQTA	0.228* (2.66)	-0.0623 (-1.30)	0.221* (2.43)	0.236** (2.86)	0.122 (1.85)	0.0834 (1.53)
Constant	-2.422** (-3.58)	-2.242*** (-9.05)	-0.741 (-1.75)	-1.391*** (-4.16)	-1.096*** (-3.56)	-1.326*** (-6.17)
<i>N</i>	88	91	196	196	197	197
H-statistics	0.129	0.183	0.343	0.302	0.360	0.351
Wald Test:						
H = 1	120.12***	188.54***	146.05***	182.78***	81.72***	319.86***
H = 0	2.64	9.43**	39.63***	34.21***	81.72***	93.40***

Notes: Figures in parentheses are t statistics.

\*, \*\*, and \*\*\* indicate the respective 10%, 5% and 1% significance levels

Models (1) and (2) cover the period during the restructuring of the Islamic banking industry.

Models (3) to (6) cover the period after restructuring where the Islamic banks operate as full-fledged Islamic banks.

H-statistics during the restructuring period are due to the lesser number of Islamic banks operating in the market throughout that period.

All the input prices show a positive relationship with bank revenue. However, the coefficients of the inputs are significant only in the second period. Among the inputs, price of deposit gains its magnitude in both the *LREV* and *LINREV* estimation models. It is interesting to note that, the price of capital is significant in all models in the second period, except for model 5. This might be due to the increase in capital expenditure by the banks in the upgrading of their operations from being Islamic subsidiaries to full-fledged Islamic banks. Hence, capital expenditure is also contributing to the increase in bank revenue during the restructuring period. Overall, the findings on the input prices corroborate with the findings by Abdul Majid and Sufian (2007a).

The coefficients of *LASST* are negatively significant in Models 2 and 3; hence showing that the Islamic banking market in Malaysia faces diseconomies of scale. The positively significant coefficients of *LLNTA* in this study reconfirmed the result obtained by Abdul Majid and Sufian (2007a). Hence, implying that banks with higher fraction of loans in the composition of total assets may generate higher income or revenue. The coefficients of *LEQTA* are positive and significant for only the *LREV* estimation model. This result suggests that banks with higher capital

ratios may generate higher income. However, the result contradicts with Abdul Majid and Sufian (2007a) who found a negative sign for the *LEQTA* variable.

*Analysis on Competition* As shown in Tables 2 and 3, structural changes have increased the level of competition in both banking markets. For instance, the H statistics during the merger are less than the post-merger H statistics, hence providing evidence that the ongoing liberalization process in conventional banking increases the level of competition in the market. Theoretically, merger may decrease the level of competition in the market. Further, the value of H statistics shows that the level of competition is more intense in the Islamic than conventional banking market. In reference to the *LREV* model in Tables 2 and 3, the growth of changes in the level of competition in the Islamic banking market is 166% compared with conventional banking market which is only at about 3%. This finding demonstrates the ability of Islamic banks to compete in the banking industry which is controlled by conventional banks. The findings also show that changes in the scope of banking operations from Islamic subsidiary to full-fledged Islamic banks have increased the ability of the banks to compete in the banking industry particularly with conventional banks. Therefore, the existence of more Islamic banks should be encouraged as to increase the degree of competition in the Malaysian banking industry.

*Equilibrium Test Result* The results for equilibrium test are shown in Table 4. The Wald test for testing the null hypothesis was not rejected in all models at all significance levels. Hence, these results lead to the

conclusion that both the Islamic and conventional banking markets are in long-run equilibrium for the sample period. The results state that input prices are not related to industry return.

TABLE 4. Results of equilibrium test for structural change using ROA

	Conventional		Islamic	
	(1) During Merger: OLS	(2) Post-Merger: OLS	(3) During IS: OLS	(4) Full-Fledged: OLS
LPL	0.0130 (0.94)	0.00411 (1.11)	-0.00128 (-0.83)	0.000654 (0.48)
LPD	0.0325 (1.30)	0.00312 (1.44)	0.000429 (0.46)	0.00940 (1.49)
LPK	0.000304 (0.07)	-0.00284 (-1.10)	-0.000754 (-0.66)	-0.00903 (-1.93)
LASST	0.00762 (1.65)	0.00101 (1.90)	-0.00169*** (-3.06)	-0.00146 (-0.55)
LLNTA	-0.0338 (-1.42)	-0.00143 (-0.60)	0.000765 (0.84)	-0.00753 (-0.91)
LEQTA	0.0187*** (2.79)	-0.000846 (-0.37)	0.00506*** (3.32)	0.0186 (1.75)
Constant	0.176 (1.58)	0.0221 (1.62)	0.0186** (3.03)	0.00207 (0.10)
<i>N</i>	242	235	91	197
Equilibrium Test: Wald test for $E = 0$	1.27	1.29	1.78	0.05

*Note:* Models (1) and (2) are for conventional market, meanwhile Models (3) and (4) are for Islamic market. The Breusch-Pagan test had failed to reject the null hypothesis, hence robust pooled OLS estimation is reported. Figures in parentheses are t statistics. \*\* and \*\*\* indicate the respective 5% and 1% significance levels.

## CONCLUSION

Structural changes in the Malaysian banking industry have altered the level of competition in the Islamic and conventional banking markets. The major sources of structural changes that had taken place in the Malaysian dual banking industry were merger and acquisition, restructuring of the Islamic banking operation and ongoing liberalization process during the study period. The changing economic environment along with these major changes have exposed the Malaysian banks to increased competition, not only from foreign banks but also from other domestic financial institutions such as non-bank financial intermediaries and financial markets as well. The 1997 EAFC had revealed the structural weakness of Malaysian financial sector, particularly the banking industry. For instance, before the crisis, Malaysian banking industry was highly fragmented with huge number of banks. Besides, the development of financial sector under Financial Sector Master Plan (2001) has also reshaped the Malaysian financial landscape particularly the market structure of the banking industry. Hence, Bank Negara Malaysia has implemented several policy changes in order to increase the level of competition among the banks in the industry.

We employ the Panzar-Rosse model to measure the changes in the degree of competition in the Islamic and

conventional banking markets due to several structural changes. Based upon the empirical results, our study concludes that structural changes in the Malaysian dual banking industry have intensified the level of competition among the banks in the Islamic and conventional banking markets. The Wald test shows that banks in both markets operated in the monopolistic competition market structure. The increasing value of H-statistics during the structural period also implies that banks in both markets are operating in a competitive environment. These findings indicate that the restructuring of Islamic banking operation and liberalization process have proved to be a success as they improved the competitiveness of the banks. Also, the implementation of the merger program by Bank Negara Malaysia through two phases does not impede the level of competition in the banking industry. Hence, these results provide the evidence on the success of policy changes implemented by the regulatory authorities in the Malaysian banking market. The findings show that the growth of competition is more intense in the Islamic banking market. This gives a signal to policy makers that now is the time to allow the Islamic banks to operate independently without the control of their parent banks which are conventional practitioners. Besides, bank managers should constantly monitor the services offered as to provide a positive market signal to customers; and thereby ensuring the survival of their banks in the increasing competitive market. Hence,

bank managers need to update their knowledge on the latest technology in their efforts to expand the banks' markets and increase user access to the banking services offered.

The discussions on competition issues will be more interesting if the analysis is based on bank ownership, i.e. whether they are foreign or domestically owned. Hence, the discussion on competition issue will be more valuable to policy makers and bank managers if future research on this issue is done according to the ownership of banks in both banking markets.

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## APPENDIX

TABLE A1. List of participating Islamic banks and ownership

Bank Name	Ownership
Bank Muamalat Malaysia Berhad <sup>a</sup>	L
Bank Islam Malaysia Berhad <sup>a</sup>	L
Affin Islamic Bank Berhad <sup>b</sup>	L
Alliance Islamic Bank Berhad <sup>b</sup>	L
Asian Finance Bank Berhad <sup>a</sup>	F
Al Rajhi Banking and Investment Corporation (Malaysia) Berhad <sup>a</sup>	F
CIMB Islamic Bank Berhad	L
EONCAP Islamic Bank Berhad <sup>b,c</sup>	L
Hong Leong Islamic Bank Berhad <sup>b</sup>	L
HSBC Amanah Malaysia Berhad <sup>b</sup>	F
Kuwait Finance House (Malaysia) Berhad <sup>a</sup>	F
Maybank Islamic Berhad <sup>b</sup>	L
OCBC Al-Amin Bank Berhad <sup>b</sup>	F
Public Islamic bank Berhad <sup>b</sup>	L
RHB Islamic Bank Berhad <sup>b</sup>	L
Standard Chartered Saadiq Berhad <sup>b</sup>	F
AmIslamic Bank Berhad	L

Notes: <sup>a</sup> Banks that operate as full-fledged Islamic banks.

<sup>b</sup> 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.

<sup>c</sup> From 1 November 2011, Hong Leong Islamic Bank has completed Malaysia's first vesting of an Islamic L is local banks and F is foreign banks.

TABLE A2. List of participating bank in Malaysian banking merger program

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

Notes: <sup>a</sup> Local owned banks;

<sup>b</sup> Foreign owned banks;

<sup>c</sup> Previously known as Bumiputera-Commerce Bank Berhad;

<sup>d</sup> Previously known as Perwira Affin Bank.

<sup>e</sup> Previously known as Multi-Purpose Bank Berhad;

<sup>f</sup> Previously known as Arab-Malaysian Bank.

<sup>1</sup> Merge with Maybank in 2001.

- <sup>2</sup> Merge with EON Bank in 2001.
- <sup>3</sup> Merge with Affin Bank in 2001.
- <sup>4</sup> Merge with Alliance Bank in 2000.
- <sup>5</sup> Merge with Hong Leong Bank in 2001.
- <sup>6</sup> Merge with RHB Bank in 2003.
- <sup>7</sup> Merge with Southern Bank in 2000.
- <sup>8</sup> Merge with CIMB Bank in 2006.
- <sup>9</sup> Merge with Alliance Bank in 2001.
- <sup>10</sup> Merge with Maybank in 2001.