

## Concentration and Competition in Dual Banking Industry: A Structural Approach

*(Penumpuan dan Persaingan dalam Industri Dwi Perbankan: Pendekatan Berstruktur)*

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### ABSTRACT

*The purpose of this paper is to investigate the evolution of market concentration and competition in Malaysian dual banking industry for the period of 1997-2013. This study utilized structural approach to investigate changes in the market structure particularly the level of concentration and competition that contributed by several structural changes which take place in the dual banking system. According to structural approach, concentration plays an important role in examining the link between concentration and competition. Therefore, present paper utilized the structural approach to measure various concentration indexes to provide significant evidence on the changes in the market structure of Malaysian banking industry for the largest available data set of 1997-2013. Pearson correlation analysis was also used to examine the consistency of those various measures used in this study. The paper found evidence that structural changes have altered the market structure of the banking industry which comprises of Islamic and conventional banking system. The results also indicate that dual banking industry operates in the monopolistic competition structure. Therefore, concentration indexes can be used by authorities to decide on the optimal number of banks operating in the industry.*

*Keywords: Bank; competition; concentration measures; Malaysia; market structure*

### ABSTRAK

*Tujuan kajian ini adalah untuk mengkaji evolusi penumpuan pasaran dan persaingan dalam industri dwi perbankan di Malaysia bagi tempoh 1997-2013. Kajian ini menggunakan pendekatan berstruktur untuk mengkaji perubahan struktur pasaran terutamanya tahap penumpuan dan persaingan yang disumbangkan oleh beberapa perubahan struktur yang berlaku dalam sistem dwi perbankan. Menurut pendekatan berstruktur, ukuran penumpuan memainkan peranan penting dalam mengkaji hubungan antara penumpuan dan persaingan. Oleh itu, kajian ini menggunakan pendekatan berstruktur untuk mengukur pelbagai indeks penumpuan untuk memberikan bukti signifikan berkenaan perubahan struktur pasaran industri perbankan Malaysia bagi set data terpanjang, 1997-2013. Analisis korelasi Pearson juga digunakan untuk menguji konsistensi pelbagai ukuran yang digunakan dalam kajian. Kajian ini menemui bukti bahawa perubahan struktur telah mengubah struktur pasaran industri perbankan yang terdiri daripada sistem perbankan Islam dan konvensional. Keputusan juga menunjukkan bahawa industri dwi perbankan beroperasi dalam struktur pasaran persaingan bermonopoli. Oleh itu, indeks penumpuan yang diperoleh dalam kajian ini boleh digunakan oleh pihak berkuasa untuk membuat keputusan berkenaan bilangan optimum bank yang beroperasi dalam industri.*

*Kata kunci: Bank; persaingan; ukuran penumpuan; Malaysia; struktur pasaran*

### INTRODUCTION

The study on concentration and competition is essential to the economy because both reflect the activity of economic agents. For instance, information on concentration and competition can be used by firms to make business decisions of whether to merge, shut down existing firm or re-organize production activities (Hennesey & Lapan 2007). Meanwhile, governments use the information to formulate economic policy.

Many studies have been carried out by researchers on the issue of concentration and competition, especially in the banking industry. The study on concentration and competition in the banking system is important because both may affect the stability and soundness of the banking system. The proponents of banking concentration suggests that banking system with highly concentrated is recommended because banking system with few large banks is less fragile (Beck, Demirguck Kent & Levine 2003), easy to monitor (Beck et al.

2003) and operate efficiently (Demerguek-Kunt & Levine 2000). In contrast, the opponents of banking concentration suggests that banking market with competitive edge enhance social economic welfare, less fragile due to the concept of “too big to fail” and easy to monitor (Smith 1998). Therefore, the knowledge regarding the actual level of concentration and competition in the banking system is important. It is because structural changes that taking place in the banking system has change the market structure of the industry which alter the level of concentration and competition in the particular industry.

Several studies have been done to investigate the impact of structural changes on the level of concentration and competition. For instance, Rezitis (2010) found that mergers and acquisitions has increased level of concentration in the Greek banking industry. The same conclusion reported by others for different countries such as Casu and Giradone (2006) for 15 European countries; Abdul Kadir et al. (2014) and Abdul Majid and Sufian (2007b) for Malaysian conventional banking market. Besides, financial liberalization also has change the market structure of the nations’ banking industry as reported by Sharma and Bal (2010) for India and Turk-Ariss (2010) for 13 countries that implement dual banking system. In addition, development and the use of information technology in the banking operation also has changed the level of concentration and competition in the banking market (Gajurel & Pradhan 2012; Sharma & Bal 2010). Malaysian banking system has also experienced various transformations that contribute to the structural changes in the country’s banking market. Generally, there are four major sources that contribute towards such changes namely; the implementation of the Islamic banking system since July 1983 (Husain, 2002) and the changes in Islamic banking regulation (Mohammed et al. 2015); banks consolidation through merger and rationalization process (Abdul Majid & Sufian, 2007b); liberalization and globalization (Abdul Majid & Sufian, 2007a; Ahmad Mokhtar, Abdullah & Alhabshi 2008) and finally, technological advancement (Bank Negara Malaysia 1999). The changing of the economic environment along with these major changes exposes the Malaysian banks towards 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. Therefore, it is important to us to know the actual level of concentration and competition in Malaysian banking industry.

Moreover, the analysis of market structure in this study is interesting because our intention is to analyse the nature of concentration and competition in a dual banking system, where Islamic system operate side by side with the conventional system. Admission of Islamic banks into the banking industry has changed the market structure of nations’ banking sector as reported by

Hakim and Chkir (2014), Turk Ariss (2010) and Ahmad Mokhtar et al. (2008). Countries such as Malaysia, Indonesia, Kingdom of Saudi Arabia, United Arab Emirates, Kuwait, and Oman implement dual banking system. However, the studies on this issue for both banking markets are still limited and need additional evidence. According to Muhammad and Abida (2016), the Islamic banking system are owned by a local bank. The question is whether they are able to face competition in a market dominated by conventional banks. Therefore, a study on concentration and competition issues in the banking system, particularly in Malaysia, is important in evaluating the ability of Islamic banks to compete within the hegemony of conventional banks. The analysis of competitiveness is important in providing useful insights on the readiness of these embryonic Islamic banks to face market competition compared to matured conventional banks that have long history of operation. Information regarding the competitiveness of the industry is necessary especially to the policy makers in formulating policies that can promote competitive behaviour among the banks in the banking industry. This is because banking industry is the heart of national economic development. Even more importantly, the information concerning the degree of concentration can be used by the authorities to determine the optimal number of banks operating in an industry; that is not too much or too little, as expressed by the proponents of banking concentration theory.

Most previous studies on this issue only focus on single banking system, i.e. Islamic banking (Abdul Majid & Sufian 2007a; Mohammed et al. 2015) or conventional banking (Gajurel & Pradhan 2012; Sharma & Bal 2010). Although recently, there are researchers such as Hakim and Chikr (2014) and Uddin and Suzuki (2014) that examine both banking system. But, the study on both banking stream is still limited particularly for emerging economy like Malaysia. Besides, many studies use structural approach and adopt two well-known traditional concentration measures, namely Herfindahl-Hirshman index (HHI) and concentration ratio of  $k$  largest firm ( $CR_k$ ) in investigating the level of competition in the banking market. However, the measures of concentration are many such as entropy index, Hannah and Kay index and comprehensive concentration index, but rarely used by the researchers particularly in the industrial studies. Sharma and Bal (2010) mentioned that different measures have different roles in explaining concentration; and this depends on several aspects, for instance the relative impacts of large and small banks, impact on the number of firms in an industry (reflecting the impact of new entry) and impact on the size distribution among the firms. Moreover, there is no single concentration measure that can capture everything that happened within the industry; and single measure of concentration is not the best method due to complexity of business (Curry & George 1983; Kwoka Jr 1985). Hence, the use of various measures of

concentration will provide better representation on the level of concentration and competition in the market as done in this paper.

Henceforth, this paper attempts to evaluate and compare the impact of structural changes driven by several sources specifically on the level of competition in the Malaysian dual banking system which covered two different banking systems, namely Islamic and conventional banking. This study will highlight and enrich the use of other potential measures of concentration which is rarely used by many researchers. Furthermore, this study also differs from other studies because the analysis on concentration and competition includes a relatively large number of years (1997-2013), hence can provide a significant analysis on the evolution in 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 view of the structural approach and the use of this approach in previous studies. 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 ON STRUCTURAL APPROACH

The literature on the measurement of competition which assesses the competitive behaviour of the banking firms in the banking market can be divided into two main streams, namely structural and non-structural approaches. According to Bain (1951), structural theories examine the nature of competition in an industry from its structural characteristics such as concentration, firm's market share, number of firms and condition of entry. Hence, he confirmed the association between competition and the structure of an industry. Meanwhile, non-structural approach measures the level of competition in the market directly without using any structural information about the market. Hence, in order to accomplish with the objective, present study uses structural approach to measure the level of concentration and competition. It is because, structural measures of concentration can be used to link competition to concentration directly; where lower level of concentration gives signal of high competition in the market and vice versa. Further, by using structural measures we are able to investigate the changes (evolution) in the market structure of an industry for each year compared to non-structural approaches which needs many variables particularly the inputs variable of the banking firms. Therefore, structural approach is more appropriate because it uses the structural features in an industry compared to non-structural approach which focus on factors other than

market structure that affect competition (Seelanatha 2010; Uddin & Suzuki 2014).

According to industrial organizational theory, the Structure-Conduct-Performance paradigm (SCP) and efficient structure hypothesis (ESH) are the two well-known structural approaches that have been used in most of the literature. However, the SCP paradigm has been used extensively by researchers in order to investigate the link between concentration and competition under the structural approach (Deltuvaite, Vaskelaitis & Pranchkeviciute 2007; Duncan & Langrin 2004; Nabieu 2013; Sahoo & Mishra 2012). Hence, present paper also uses this paradigm to investigate the link between concentration and competition. Under this paradigm, the aim is to measure the impact of concentration on competition in an industry. For instance, several studies had been done for the banking industry on this issue due to the changes in the market structure contributed by several structural changes (Hakim & Chikr 2014; Sharma & Bal 2010; Uddin & Suzuki 2014). The framework of SCP paradigm is derived from the neo-classical analysis of markets and known as traditional hypotheses. It is also known as 'Structural Model' because the arguments in this hypothesis are based on the market structure of the banking firms. This hypothesis was first tested by Bain (1951) who found that increased concentration lead to higher profit. Theoretically, the SCP paradigm is based on the assumption that concentration weakens competition by fostering collusive behaviour among the firms in the market; hence is also known as collusion hypotheses. In other words, the SCP paradigm postulates negative link between concentration and competition.

Staroselskaja (2011) described competition in the market as a situation where rivalry between two or more commercial entities exist. Further, Staroselskaja (2011) defined competition in the banking industry as the process of rivalry between commercial banks and credit institutions in gaining strong positions in the banking market. Perera, Skully and Wickramanayake (2006) mentioned that banking competition theory attempts to explain how banks as firms react optimally to their environment. Hence, both concentration and competition are important in defining the market structure of an industry. According to Bikker and Bos (2005), structural changes in the banking market bring two types of impact namely; subsequent impact and final impact. Subsequent impact of the structural changes can be seen in many aspects particularly on the level of concentration and competition in the market. While, the final impact of the structural changes can be seen in terms of efficiency, cost reduction and profitability of the banks. Many studies have utilized the structural approach in order to investigate the subsequent impact of structural changes on the market structure of banking industry (See Table A1 in Appendix). Structural changes may increase or decrease the level of concentration and then continually alter the level of competition in the market. For instance, merger

and acquisition has increased the level of concentration in the country's banking market as reported by Abdul Kadir et al. (2014) and Abdul Majid and Sufian (2007b) for Malaysian conventional banking market; Chan, Schumacher and Tripe (2007) for New Zealand banking market; Duncan and Langrin (2004) for Jamaican banking industry. Hence, merger and acquisition has decreased the level of competition in the market by promoting the existence of dominant or large banks in the country's banking market.

Besides, many studies found that liberalization and the use of technology advancement in the banking operations has decreased the level of concentration and increased level of competition in the banking market. For instance, Repon and Islam (2016) have provide such evidence for Bangladesh banking industry; Bod'a (2014) for Slovakian banking industry; Sharma and Bal (2010) for Indian banking industry; Gajurel and Pradhan (2012) for Napalese banking industry. Recently, there are studies that have been done to investigate the nature of concentration and competition in two different banking system namely, Islamic and conventional banking system. Study by Hakim and Chikr (2014), found that conventional banking market is more concentrated compared to Islamic banking market for Arab GCC countries. In contrast, Turk-Ariss (2010) found reverse result where Islamic banking market is more concentrated compared to conventional banking market for 13 countries that implement dual banking system. Hence, by comparing two banking system, we are able to investigate the ability of Islamic banks to face competition with its conventional counterparts which have long experience of operations in the industry.

Further, in structural model, concentration ratios take a central position in order to describe the market structure and continually investigate the linkages between concentration and competition in particular industry (See Table A1 in Appendix). Many studies in the banking industry use concentration measures of total assets, total deposits and total loans to investigate the market structure of the banking industry in many countries (Abdul Kadir et al. 2014; Bod'a 2014; Davcev & Hourvoulides 2013; Hakim & Chikr 2014; Rinkeviciute & Martinkute-Kauliene 2014). However, many researchers utilized only two traditional measures, namely  $CR_k$  and HHI in their studies (Abdul Kadir et al. 2014; Iuga 2013; Repon & Islam 2016). Besides, there are studies that utilized more than two measures as done by Hakim and Chikr (2014), Bod'a (2014) and Sharma and Bal (2010). But, the use of other measures of concentration is still limited and need to be explored further particularly for industrial studies as covered in the present study. Furthermore, the analysis of concentration and competition in this study focuses on two banking system which is less explored by most researchers. Hence, this study may provide knowledge on the level of concentration and

competition in the dual banking market in which both may give significant impact on bank's efficiency and the welfare of society.

## METHODOLOGY

### DATA

Present study uses the data of both Islamic and conventional banking firms operating in the dual banking system in Malaysia from 1997 to 2013, including both foreign and domestic banks (see Table A2 and A3 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 sheet and income statement provided in the individual bank's annual reports. The Islamic and conventional banking industry in Malaysia has experienced structural changes due to liberalization, merger and the upgrading of the Islamic banking system from window based operation to subsidiary and then to full-fledged Islamic banks. The domestic conventional banks in this sample include both anchor and target banks which involve in the merger process particularly after 1997 East Asian Financial Crisis (EAFC). As for the Islamic bank, we decided to include only the domestic anchor banks which have been involved in the upgrading process. The target banks are not included due to data limitation. Thus, both banking system has different period of study. For the conventional banks the period of study is between 1997 to 2013, and Islamic banks cover the period between 2000 to 2013. The selection of the sample banks is considered appropriate based on the definition of relevant market. The banking market in this study is accurately defined because the selected banking firms supply the products and services that are close substitutes. Besides, concentration measures in this paper is calculated based on the formulas presented in the following section by using Excel.

### CONCENTRATION MEASURES

There are several measures that can be applied to investigate the competitive condition in the banking market under the structural approach. The calculation of various measures is important due to the different characteristics of the measures. Adelman (1969) proposed that the only use of concentration measures is to test a hypothesis about competition. Waldman and Jensen (1998) mentioned that the crucial issue in examining the concentration measures is the definition of the market. The samples of this study were well defined with the assumption that the banking institutions supply products and services that are close substitutes to each other. The measures of concentration in this study are divided into two categories; namely absolute

and relative measures of concentration. Both measures show different features. For instance, absolute measure of concentration emphasized on the number of firms and the market share that the firms have in the particular market. In contrast, relative concentration measures focus on the disparities in the sizes of the firms operating in the industry. Compare to the actual number of firms, the size distribution and disparities in the distribution become a good and important indicator of market concentration. Hence, this study applied both measures to get an accurate analysis on competitive environment in the Malaysian banking industry due to changes in market concentration. Further, concentration measures in this study were calculated by using total assets of both banking stream since it represents size of the banking market.

ABSOLUTE MEASURES

*Concentration Ratio (CR)*

According to Harrison and Rude (2004), concentration ratio is a simple measure that addresses an inequality dimension, by stressing the relative position of the largest firm. CR measure is appropriate at showing the dominance of the top firms in an industry but it does not address the features of the entire market. For instance CR<sub>3</sub> measures the market share of the three largest firms, while CR<sub>8</sub> measures the market share of the eight largest firms. It is calculated as follows:

$$CR_k = \sum_{i=1}^k s_i \tag{1}$$

Where,  $s_i$  is the market share of  $i$ 'th largest bank in the industry.

The range of  $CR_k$  is between zero and one. Theoretically, there is no rule to determine the value of  $k$ , therefore, the number of banks included in the measurement of CR is a rather arbitrary decision. In this study, the CR<sub>1</sub>, CR<sub>2</sub>, CR<sub>4</sub> and CR<sub>8</sub> will be calculated.

*The Herfindahl-Hirshman Index (HHI)*

HHI is computed based on the sum of the squared market shares of all firms in the industry as shown in the formula below:

$$HHI = \sum_{i=1}^N s_i^2 \tag{2}$$

Where  $s_i$  is the market share of firm  $i$ ,  $N$  is the total number of firms in the industry. The major benefit of the HHI is that it measures the market share of all firms in the industry by giving more weight to larger firms. The value of HHI can range from zero to one, or zero to ten thousand if percentages are written as a whole number. A high number of HHI indicates a high degree of concentration or decrease in the level of competition; and a low number is indicative of a high degree of competition (Nawrocki & Carter, 2010).

*Entropy Index (ENT)*

The ENT index is used to measure the degree of competitiveness within an industry; i.e. high entropy value indicates high the degree of competitiveness. According to Nawrocki & Carter (2010), the entropy measure is accepted in the economics literature as a measure of competition. The formula to measure ENT is given as follows (Bikker & Haaf 2002; Deltuvaite et al. 2007; Horowitz & Horowitz 1968; Nawrocki & Carter 2010):

$$ENT = - \sum_{i=1}^N s_i \ln s_i \tag{3}$$

Where  $s_i$  is the market share of firm  $i$ ,  $N$  is the total number of firms in the industry and  $\ln$  is the natural logarithm function. It approaches zero if the underlying market is monopoly; and reaches highest value,  $ENT_{MAX} = \ln N$ , when the market shares of all banks are equal or market concentration is lowest. The entropy measure is able to reflect the differences in concentration of market power as well as differences in the number of firms in the industry. For instance, the smaller  $ENT$  value in industry X indicates less competition in that industry compared to industry Y, although industry X has significantly more firms.

*Comprehensive Concentration Index (CCI)*

Bod'a (2014) mentioned that CCI emphasizes on the role of dominant (largest) bank in the market and simultaneously accounts the contribution of other banks to concentration. The CCI is given as follows:

$$CCI = s_1 + \sum_{i=2}^N s_i^2 (1 + (1 - s_i)) \tag{4}$$

Where  $s_1$  is the market share of leading bank and  $\sum_{i=2}^N s_i^2 (1 + (1 - s_i))$  is the summation of the squares of the proportional size of each bank, weighted by a multiplier which reflects the proportional size of the rest of the banks in the industry. The first term captures the magnitude of larger (dominant) banks, whilst the second term emphasizes on the relative dispersion of other sizes of banks in the same industry. The index is unity in the case of monopoly and it is higher than the dominant bank's absolute percentage share for a market with greater number of banks (Bikker & Haaf 2002).

*Hannah And Kay Index (HKI)*

Hannah and Kay index is a weighted sum of all market shares of all firms in an industry. According to Lipczynski, Wilson & Goddard (2005), Hannah and Kay (1977) index generalizes the HHI as follows:

$$HK(\alpha) = \sum_{i=1}^N s_i^2 \tag{5}$$

Where  $\alpha$  is the parameter to be selected,  $\alpha$  should be greater than zero but not equal to one because  $HK(1) = 1$  for any firm size distribution. The choice of  $\alpha$  is left

to the investigator. However, Hannah and Kay (1977) suggested a value ranging between 0.6 and 2.5 points (Meilak 2008). As suggested by Bikker and Haaf (2002), we choose two values of  $\alpha$ , namely  $\alpha = 1.5$  and  $\alpha = 2.5$ .

#### The $U$ Index

The  $U$  index was proposed by Davies in 1979 in which the calculation of this index allows flexibility in the weight given the inequality or the number of banks in the market (Bikker & Haaf 2002). The  $U$  index is defined as:

$$U = \left( \sum_{i=1}^N s_i \left( s_i n \frac{\alpha - 1}{\alpha} \right) \right)^\alpha \quad (6)$$

As proposed by Bikker and Haaf (2002), the  $U$  index in this study is calculated with  $\alpha = 0.5$ ,  $\alpha = 1$ ,  $\alpha = 2$  and  $\alpha = 3$ .

#### Hause Indices ( $H_m$ )

Calculation of this index also depends on a parameter that captures the effects of collusion in an oligopoly model. The formula of  $H_m$  is given as follows:

$$H_m = (\alpha, \{s_i\}) = \sum_{i=1}^N s_i^{2 - (s_i(HHI - s_i^2))^\alpha} \quad (7)$$

Where  $HHI$  is the Herfindahl-Hirschman index and is the parameter capturing the degree of collusion. Following to Bikker and Haaf (2002), the calculation of the  $H_m$  index in this study will be done for three values, those are  $\alpha = 0.25$ ,  $\alpha = 1$  and  $\alpha = 2$ . The index equals to one in monopoly case, and it converges to zero for an infinite number of equally sized banks.

#### Hall and Tidemann Index ( $HT$ )

This index was developed by Hall and Tidemann in 1967 (Bikker & Haaf 2002). Calculation of this index emphasizes on the need to include the number of banks because it reflects the entry condition into a particular industry. The formula is given as follows:

$$HT = 1 / \left( 2 \sum_{i=1}^N i s_i - 1 \right) \quad (8)$$

Where the market share of each bank is weighted by its rank in order to ensure that the emphasis is on the absolute number of banks, and that the largest bank receives weight  $i = 1$  in which the banks ordered in a descending order. The  $HT$  index ranges between zero and unity, it is close to zero for an infinite number of equal-sized banks and reaching unity in the case of monopoly (Bikker & Haaf 2002).

#### Rosenbulth Index ( $RI$ )

According to Hause (1977) the value of Rosenbluth index is heavily influenced by the size of small banks, hence it is sensitive to changes in the size distribution of smaller banks where the weighting scheme starts with the smallest banks. The formula of  $RI$  is given as follows:

$$RI = \frac{1}{2C} \quad (9)$$

$$C = \sum_{i=1}^N i s_i - 1/2 \quad (10)$$

The value of  $RI$  ranges from zero to one, it reaches zero for an infinite number of equal-sized bank; and equals to unity for a monopoly market. The term  $i s_i$  indicates market shares that are multiplied by the rank of banking firms.

#### Herfindahl-Hirshman Index of Competition ( $HHIC$ )

Nawrocki and Carter (2010) mentioned that the  $HHI$  is subtracted from 1 in order to convert it to a competition measure that can be compared to the entropy measure as follows:

$$HHIC = 1 - HHI \quad (11)$$

The  $HHIC$  ranges between zero and one. A value equals to zero indicates a monopoly market structure. However, a value equals to one means a competitive market structure.

### RELATIVE MEASURES

#### Gini Coefficient ( $G$ )

The Gini coefficient measures inequality among the values of a frequency distribution; for example, whether the size distribution of banking firms equal or unequal in the distribution. This index is not widely used compared to other measures of concentration like  $CR$  and  $HHI$  specifically in the banking industry. However, according to Gilbert (1984), Gini coefficient is widely used in US studies of bank concentration (Sharma & Bal 2010). The benefit of this index is that it gives a useful insight into market structure which cannot be inferred from absolute measures of market structure such as concentration ratios (Sharma & Bal 2010). The index can be calculated using the formula as follows (Lipczynski et al. 2005):

$$G = \left\{ \frac{\sum_{n=1}^N \sum_{i=1}^n s_i}{0.5(N+1) \sum_{n=1}^N s_i} \right\} - 1 \quad (12)$$

The value of  $G$  ranges from zero to one. The maximum possible value of  $G$  ( $G = 1$ ) shows that the market is dominated by one dominant firm, while the minimum value of  $G = 0$  indicates the case of  $N$  equal-sized firms.

#### Variance of the Logarithms of Firm Sizes ( $VL$ )

In statistics, variance provides a standard measure of dispersion or inequality within any data sets (Lipczynski et al. 2005). The  $VL$  values can be used to analyse the inequality in the firm size distribution of a particular industry.  $VL$  is defined as follows (Lipczynski et al. 2005):

$$VL = \left( \frac{1}{N} \right) \sum_{i=1}^N [\log_e(s_i) - s]^2 \quad (13)$$

$$s = \left( \frac{1}{N} \right) \sum_{i=1}^N \log_e(s_i) \tag{14}$$

To calculate the VL value, the banks' data will be transformed into logarithmic form to reduce or eliminate the skewness in the original distribution of the banking firm in the market; which may be consisting different sizes of banks such as large banks, medium-sized banks and small banks.

*Relative Entropy (REnt)*

According to George, Joll and Lynk (1992), the absolute value of the entropy index is affected by the number of firms in the industry. Hence, relative measure of entropy (R) can be used to compare the degree of competition between industries containing different number of firms as in this study. It is calculated as follows:

$$REnt = \frac{ENT}{\ln N}$$

Relative entropy of zero and one indicates monopoly and competitive market structures, respectively.

FINDINGS

ANALYSIS ON MARKET CONCENTRATION

Trends of market concentration measures indicate the market power or firm's anti-competitive behaviour in the

market; and are useful in classifying the market structure of the banking industry. According to Bod'a (2014), low concentration indicates competitive market; whereas, high concentration indicates that the market is monopolistic or oligopolistic. The absolute and relative measures can be further classified into two specific measures, namely positive and negative measures. Positive measures of concentration show an increase in concentration index when concentration rises. Meanwhile, negative or inverse measures of concentration show a decline in the value of concentration index when concentration increases. All the measures in this study are positive measures except for Entropy and relative entropy (REnt) which are known as inverse measures.

CR<sub>k</sub> and HHI are absolute concentration measures frequently used in many previous studies (Abdul Majid & Sufian 2007a, 2007b; Al-Muharrami, Matthews & Khabari 2006; Turk-Ariss 2009). As shown in Table 1, concentration ratios (CR<sub>1</sub>, CR<sub>2</sub>, CR<sub>3</sub> and CR<sub>4</sub>) for large banks in the conventional banking market showed an increasing trend due to new plans of merger announced in January 2001, i.e. after 1997 East Asian Financial Crisis (E AFC). The CR<sub>2</sub> estimates increased to 0.36 in 2001 (from 0.32 in 1997), whilst CR<sub>4</sub> increased to 0.55 in 2001 (from 0.46 in 1997). Forced merger in the banking sector had reduced the number of banking firms from 32 in 1997 to 26 in 2013. Present study found that the increase in concentration was much higher in the second phase of merger which involved merger between banks and their finance company subsidiaries. This finding is in

TABLE 1. Absolute measures of concentration in conventional banking market

Year	CR1	CR2	CR3	CR4	CR8	HHI	ENT	CCI	RI	HT	HHIC
1997	0.20	0.32	0.40	0.46	0.64	811	2.92	0.28	0.07	0.07	0.92
1998	0.20	0.33	0.41	0.48	0.65	833	2.67	0.28	0.07	0.08	0.92
1999	0.20	0.33	0.44	0.51	0.68	859	2.57	0.29	0.07	0.08	0.91
2000	0.23	0.36	0.47	0.55	0.74	1046	2.28	0.33	0.09	0.10	0.90
2001	0.23	0.36	0.46	0.55	0.74	1056	2.27	0.33	0.10	0.11	0.89
2002	0.22	0.33	0.42	0.51	0.70	954	2.21	0.31	0.09	0.10	0.90
2003	0.21	0.32	0.42	0.52	0.72	956	2.16	0.31	0.09	0.10	0.90
2004	0.20	0.32	0.43	0.52	0.72	945	2.18	0.30	0.09	0.10	0.91
2005	0.21	0.34	0.44	0.53	0.73	982	2.18	0.31	0.10	0.11	0.90
2006	0.21	0.35	0.48	0.57	0.77	1058	2.06	0.33	0.11	0.12	0.89
2007	0.21	0.36	0.49	0.57	0.77	1105	2.07	0.33	0.10	0.12	0.89
2008	0.17	0.34	0.46	0.58	0.77	1163	2.17	0.31	0.10	0.11	0.88
2009	0.20	0.35	0.49	0.57	0.78	1066	2.06	0.33	0.11	0.12	0.89
2010	0.20	0.35	0.48	0.57	0.78	1046	2.07	0.32	0.11	0.12	0.90
2011	0.25	0.38	0.50	0.59	0.82	1215	1.98	0.36	0.12	0.12	0.88
2012	0.21	0.35	0.47	0.58	0.82	1105	2.00	0.34	0.11	0.12	0.89
2013	0.21	0.38	0.50	0.61	0.83	1162	1.91	0.35	0.12	0.12	0.88

Notes: CR = concentration ratio, HHI = Herfindahl-Hirschman index, ENT = entropy index, CCI = comprehensive concentration index, RI = Rosenbulth index, HT = Hall dan Tidemann index, HHIC = Herfindahl-Hirschman index of competition

Source: Authors calculations

line with Abdul Majid and Sufian (2007b) who reported similar trend in concentration during the merger period. This finding is also consistent with theory that horizontal mergers between firms of the same industry may accelerate concentration process due to the replacement of two firms with one large firm (George et al. 1992).

Besides, the changes in  $CR_1$  also provide information on the position of leading firms in the Islamic banking market, in which in 2004 Maybank Islamic had become a major industry player replacing the position held by Bank Islam Malaysia Berhad since 1983. These changes provide the evidence that the increasing market power is in the hand of new full-fledged Islamic bank. Prior to 2004, Maybank<sup>1</sup> operated as one entity; then its Islamic banking subsidiary had obtained a license from Bank Negara Malaysia (BNM) to operate as a full-fledged Islamic bank under the Financial Sector Master Plan (Bank Negara Malaysia 2001).

Gwin (2001) and Elmas and Degirmen (2009) had proposed on the use of  $CR_4$  to classify the market structure of an industry as a benchmark. According to them, market can be classified as weak oligopoly if the  $CR_4$  is greater than 40 but less than 60 and strong oligopoly if  $CR_4$  is greater than 60 but less than 90. The values of  $CR_4$  which is greater than 40 and less than 90 indicate that both banking markets are in oligopoly structure. The increasing values of  $CR_4$  from 0.46 (1997) to 0.61 (2013) shows that the market structure of conventional banking system has changed from weak oligopoly to strong oligopoly; providing evidence on the existence of dominant domestic banks with competitive edge. In contrast, changes in the structure of Islamic banking market is more proper, evolution from one stage to another stage has given the room to Islamic banks, particularly domestic banks to face competition in the industry (see Table 2). The Islamic banking industry is of weak oligopoly with decreasing trend in concentration, particularly after 2005, i.e. prior to the influx of foreign Islamic banks into the industry. This finding is similar to the study of Abdul Majid and Sufian (2007a) which found decreasing trends in  $CR_2$  and  $CR_5$  for Islamic banking industry from 2001 until 2005. The changes in  $CR_k$ s support the growing competitive environment in the Malaysian Islamic banking market compared to conventional banking market.

Generally the trends of HHI for total asset in conventional banking market had slightly increased during the investigated period. In contrast, the scores were decreasing in the Islamic banking industry as shown in Table 2. The changes in the bank's total asset indicate the changes in their positions relative to their size. In other words, it shows the market power gained by the banks through their size in the market. The value of HHI illustrates increasing level of concentration in the conventional banking market, whilst lower concentration in the Islamic banking market. However, the HHI value increased by 17 percent in 2011 and this might due to

the completion of acquisition of EONCAP Islamic Bank by Hong Leong Islamic Bank. This finding provides evidence that the first consolidation process in the Islamic banking market increased the level of concentration in the market. This is because the calculation of HHI is sensitive to the number of the banking institutions operating in the market. This result contradicts the study of Turk-Ariss (2010) which reported higher concentration in the Islamic market compared to conventional market for 13 countries which implemented dual banking system from 2000 to 2006. However, the result may be influenced by the selection of small sample for Islamic banks in each country compared with conventional banks, which reflect the embryonic stage of Islamic banking industry.

The scores of HHI ranged from 811 to 1,215 and 900 to 4017 for both conventional and Islamic banking markets, respectively. The large range in the HHI showed a significant decrease in the degree of concentration of the Islamic banking system compared to conventional banking system. This was due to the changes in the scope of banking operations as well as the liberalization process which occurred mainly after 2004. However, the HHI scores in 2013 indicated that Islamic banking market was highly concentrated compared to conventional banking market. The scores were 1162 and 1347 for conventional and Islamic banking market, respectively. Yet, according to the new guideline of merger issued by US Department of Justice Federal Trade of Commission (2010), HHI of below 1500 shows that both markets are in un-concentrated market structure; in which the market has low level of concentration with growing competitive pressure.

We used the maximum<sup>2</sup> value of ENT as a benchmark to investigate the level of competition in both banking markets. The ENT value of 2.92 before the 1997 crisis indicated high level of competition in the conventional banking market due to the large number of banks operating in the particular market. However, during the merger phase (1998-2006), the entropy values showed decreasing trend, reaching 2.06 in 2006. As shown in Table 1, the value of ENT was decreasing but not far from the maximum value for the particular years, hence providing evidence of growing competition in the conventional banking market. In contrast, the changes of the ENT value in the Islamic banking market are more obvious compared to the changes in the conventional banking market (see Table 2). Changes in Islamic banking's regulation from interest free banking scheme (1993 – 1998) to Islamic Banking Scheme (1998 – 2004) had increased the bank's capabilities to compete as shown by the increase in the ENT value from 1.36 (1997) to 1.86 (1999). The implementation of interest free banking by BNM in March 1993 has given the opportunity to the existing conventional banks to offer Islamic bank products and services. However, the scheme has revisited and was replaced with Islamic Banking Scheme (IBS) in December 1998 where all Islamic windows were required



TABLE 2. Absolute measures of concentration in Islamic banking market

Year	CR1	CR2	CR3	CR4	CR8	HHI	ENT	CCI	RI	HT	HHIC
1997	0.61	0.75	0.84	0.90	0.99	0.4017	1.36	0.67	0.48	0.52	0.6
1998	0.50	0.66	0.82	0.86	0.98	0.3073	1.57	0.61	0.36	0.69	0.69
1999	0.37	0.57	0.68	0.73	0.94	0.2109	1.86	0.51	0.26	0.26	0.79
2000	0.32	0.51	0.65	0.75	0.97	0.1800	1.95	0.47	0.23	0.23	0.82
2001	0.28	0.49	0.64	0.74	0.93	0.1700	2.05	0.44	0.21	0.21	0.83
2002	0.26	0.48	0.62	0.71	0.90	0.1600	2.06	0.43	0.20	0.20	0.84
2003	0.25	0.48	0.61	0.72	0.90	0.1600	2.12	0.42	0.19	0.19	0.84
2004	0.25	0.44	0.56	0.66	0.84	0.1400	2.20	0.40	0.17	0.17	0.86
2005	0.24	0.42	0.53	0.62	0.85	0.1300	2.25	0.38	0.16	0.16	0.87
2006	0.20	0.33	0.45	0.54	0.80	0.1000	2.49	0.32	0.12	0.12	0.9
2007	0.17	0.30	0.40	0.50	0.71	0.0900	2.61	0.28	0.10	0.10	0.91
2008	0.15	0.28	0.39	0.48	0.73	0.0900	2.61	0.27	0.10	0.10	0.91
2009	0.16	0.29	0.42	0.53	0.76	0.0900	2.57	0.29	0.11	0.10	0.91
2010	0.18	0.33	0.45	0.55	0.78	0.1000	2.53	0.3	0.12	0.12	0.9
2011	0.24	0.38	0.48	0.58	0.81	0.1165	2.26	0.35	0.13	0.11	0.88
2012	0.25	0.39	0.49	0.57	0.83	0.1191	2.42	0.36	0.13	0.12	0.88
2013	0.30	0.41	0.51	0.59	0.83	0.1347	2.36	0.39	0.14	0.13	0.87

Notes: CR = concentration ratio, HHI = Herfindahl-Hirschman index, ENT = entropy index, CCI = comprehensive concentration index, RI = Rosenbulth index, HT = Hall dan Tidemann index, HHIC = Herfindahl-Hirschman index of competition

Source: Authors calculations

to upgrade the Islamic banking unit to Islamic banking division in order to expand the Islamic banking industry. Hence, the changes in the Islamic banking regulation has resulted in the significant increase of banking institutions that offer Islamic banking services and further dropped the monopoly status of two full-fledged Islamic banking which highlighted the increase in the level of competition in the particular industry. Further, this value showed increasing trend, reaching the score of 2.25 in 2005. Thus, it shows growing competitive edge due to the expansion in Islamic banking industry; achieved through improvements in its operation, particularly for domestic Islamic banks and the growing number of foreign banks in this industry. The findings on ENT in this study are in line with Sharma and Bal (2010) which also reported increasing competitive edge in the Indian banking industry due to liberalization and development of information technology.

The findings using the entropy index corroborated with the findings based on HHI<sup>3</sup>. The HHI scores indicate concentration level, whilst the value of ENT specifies the competition level in the banking sector. Hence, both HHI and ENT can be utilized to investigate the relationship between competition and concentration in the Malaysian dual banking system. The trends of HHI and ENT in Figure 1 show negative relationship between concentration and competition in both conventional and Islamic banking markets. The trends of HHI and entropy index for conventional banking market show increasing

level of concentration due to merger and rationalization processes after the 1997 financial crisis. From 2006 until 2009, competition and concentration coexisted; the increased concentration was due to the increase in market power among the large domestic banks in the conventional market as a result of merger exercises. Whereas, the slight increase in the level of competition was contributed by the increase in the use of information technology in providing banking services<sup>4</sup>. Further, the 2007-2008 financial crisis contributed to the slight decrease in the level of concentration and competition. The level of concentration in the banking market increased, but there was a slight decrease in competition in 2011 due to the completion of acquisition process of EON Bank by Hong Leong Bank Berhad. However, active liberalization process with the increasing entry of foreign banks in the Malaysian banking market had decreased the concentration level after 2011; indicating growing competition in the conventional banking market<sup>5</sup>.

Compared to conventional banking industry, the negative link between concentration and competition is more obvious in the Islamic banking industry. Institutional development and changes of operations from Islamic subsidiary to full-fledge Islamic banks decreased the market power of the leading firms and create healthy competition among the banks in the industry. Further, substantial increase in the level of competition, particularly after 2005 was due to increased participation of foreign banks in the

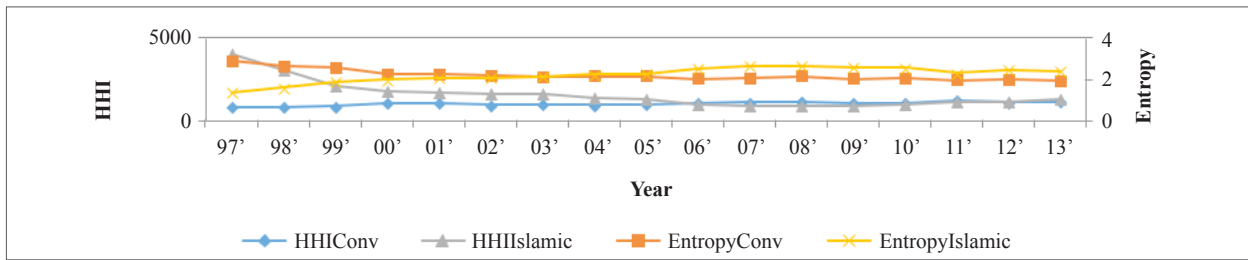


FIGURE 1. HHI and Entropy Index of total assets in Malaysian dual banking industry  
Source: Table 1 and Table 2

industry through liberalization process. Moreover, as in conventional market, advancement in information technology also provides the room for stiffer competition in this market.

Interestingly, the CCI values during the investigated period exceeded the absolute market shares of leading banks in both markets, indicating the emergence of the role of small and medium-sized banks in the Malaysian dual banking system. The findings based on an analysis which utilized CCI shows the structure of the banking market is between oligopoly and competition; hence, it is closer to monopolistic competition. Detailed analysis on the bank's market shares shows the increasing role of foreign banks in the conventional banking market. In contrast, medium and small sized domestic banks have started to play an important role in the Islamic banking system. However, the role of foreign banks in this market is not to be undermined.

In general, the RI values showed that the trends of concentration in both markets are adversely related. Those values reported decreasing and increasing trends for Islamic and conventional banking markets, respectively. In calculating RI, smaller firms will be given larger ranking which tends to increase their contribution to the index (Moschandreas 2000). Hence, the RI index is sensitive to the changes in the market shares of small banks. The calculated RI index shown in Table 2 indicates that in the earlier period of study the role of small and medium sized banks in the Islamic banking market was still lacking. Although, the market shares of those banks are of larger weightage, their contribution to concentration was still small. However, after 2005, the weighted market shares of small and medium sized banks contributed a significant value in the measuring of concentration due to their function as full-fledged Islamic banks. Henceforth, the findings support the emergence of small and medium-sized banks in the banking system to ensure the accessibility of banking services to all economic agents.

The situation is the opposite in conventional banking market. During economic crisis in 1997, the contribution of medium sized banks toward concentration was more significant. The merger exercises had forced the small banks to merge with larger banks, hence reducing the number of small banks in the market. The role of small

banks during the merger period was small compared to large and medium sized banks although they have the larger weightage. Thus, the directive of merger by the government is effective at maintaining stability in the banking system which was fragile during the crisis. The role of small scale banks, post-merger, had improved as shown by a small increase in the RI values particularly after 2006.

In contrast, the calculation of HT gives a large weightage to larger banks as HHI. Interestingly, calculation of this index emphasizes on the need to include the number of banks because it reflects the entry condition into a particular industry. As shown in Table 1, the HT values remained unchanged in the conventional banking market particularly after 2006. It shows that the market power held by the large banks is not threatened by the entry of foreign banks into the market. On the other hand, the declining trend of HT values in Table 2 demonstrates that the drop in the market power held by the larger banks in the Islamic banking industry is due to liberalization process; which welcomes the entry of new foreign banks into the Islamic banking industry.

Besides, the HHIC values for Islamic banking market show an evidence of rising competition in the market. However, although the level of competition in the conventional banking market indicates decreasing trends, the values were still high (close to one). Findings based on HHIC showed that the level of competition in the Islamic banking market is slightly more intense compared to conventional market.

The increasing trend of Hause index (see Table 3) shows the growing market power among the domestic banks due to merger program in the conventional banking market. However, the gradual increase in the Hause index supports the evidence of growing competition in the conventional banking market which was due to liberalization process that opens up the market to the entry of foreign banks. In contrast, the changes in regulation of Islamic banking industry have transformed the market structure of this industry from highly concentrated to lower concentrated market (see Table 4). Thus, may promote and increase competitive pressure among the players in the particular market. As a conclusion, the decreasing trend of the Hause index for Islamic banking market shows the evidence of growing

TABLE 3. Absolute measures of concentration in conventional banking market

Year	Hause a= 0.25	Hause a =1	Hause a =2	U index a =0.5	U index a= 1	U index a = 2	HKI a= 1.5	HKI a=2.5	HKI a=3	Bank
1997	0.15	0.08	0.08	0.18	0.08	0.06	0.26	0.03	0.01	32
1998	0.15	0.08	0.08	0.18	0.08	0.06	0.26	0.03	0.01	32
1999	0.16	0.09	0.09	0.18	0.09	0.06	0.27	0.03	0.01	30
2000	0.19	0.11	0.10	0.20	0.10	0.08	0.30	0.04	0.02	24
2001	0.20	0.11	0.11	0.21	0.11	0.08	0.30	0.04	0.02	22
2002	0.18	0.10	0.10	0.20	0.10	0.06	0.29	0.04	0.01	24
2003	0.18	0.18	0.10	0.20	0.10	0.06	0.29	0.03	0.01	24
2004	0.18	0.10	0.09	0.21	0.09	0.05	0.29	0.03	0.01	23
2005	0.19	0.10	0.10	0.21	0.10	0.04	0.29	0.04	0.01	23
2006	0.20	0.11	0.11	0.21	0.11	0.06	0.31	0.04	0.02	22
2007	0.20	0.11	0.11	0.21	0.11	0.06	0.31	0.04	0.02	22
2008	0.20	0.10	0.10	0.21	0.10	0.05	0.30	0.04	0.01	22
2009	0.20	0.11	0.11	0.21	0.11	0.06	0.31	0.04	0.02	22
2010	0.20	0.11	0.10	0.21	0.10	0.05	0.31	0.04	0.01	22
2011	0.23	0.12	0.12	0.21	0.12	0.10	0.33	0.05	0.02	23
2012	0.21	0.11	0.11	0.20	0.11	0.07	0.32	0.04	0.02	26
2013	0.22	0.12	0.12	0.20	0.12	0.08	0.32	0.04	0.02	26

Notes: Hause = Hause index for a = 0.25, 1 and 2, U index for a = 0.5, 1 and 2, HKI = Hannah and Kay index for a = 1.5, 2.5 and 3.

Source: Authors calculations

TABLE 4. Absolute measures of concentration in Islamic banking market

Year	Hause a= 0.25	Hause a =1	Hause a =2	U index a =0.5	U index a= 1	U index a = 2	HKI a= 1.5	HKI a=2.5	HKI a=3	Bank
1997	0.54	0.41	0.4	0.29	0.40	1.62	0.58	0.40	0.30	12
1998	0.47	0.32	0.31	0.29	0.31	0.76	0.51	0.31	0.20	12
1999	0.37	0.22	0.21	0.29	0.21	0.25	0.43	0.21	0.11	12
2000	0.33	0.19	0.18	0.28	0.18	0.66	0.40	0.18	0.09	13
2001	0.31	0.17	0.16	0.28	0.17	0.60	0.39	0.17	0.08	13
2002	0.30	0.17	0.16	0.28	0.16	0.58	0.38	0.16	0.07	13
2003	0.29	0.16	0.16	0.28	0.16	0.56	0.37	0.16	0.07	13
2004	0.27	0.15	0.14	0.28	0.14	0.51	0.36	0.14	0.06	13
2005	0.25	0.14	0.13	0.27	0.13	0.49	0.35	0.13	0.05	14
2006	0.20	0.10	0.10	0.24	0.10	0.42	0.30	0.10	0.04	17
2007	0.17	0.09	0.09	0.24	0.09	0.36	0.28	0.09	0.03	17
2008	0.17	0.09	0.09	0.24	0.09	0.36	0.28	0.09	0.03	17
2009	0.18	0.09	0.09	0.24	0.09	0.38	0.29	0.09	0.03	17
2010	0.19	0.10	0.10	0.24	0.10	0.41	0.30	0.10	0.03	17
2011	0.22	0.12	0.12	0.24	0.12	0.48	0.32	0.12	0.05	16
2012	0.22	0.12	0.12	0.24	0.12	0.49	0.32	0.12	0.05	16
2013	0.24	0.14	0.13	0.24	0.13	0.56	0.34	0.13	0.06	16

Notes: Hause = Hause index for a = 0.25, 1 and 2, U index for a = 0.5, 1 and 2, HKI = Hannah and Kay index for a = 1.5, 2.5 and 3.

Source: Authors calculations

competitive pressure on the Islamic banking market compared to the conventional market due to several structural changes.

Generally, the values of HKI for both  $\alpha$  as shown in Table 3 and 4 indicate that the degree of concentration is increasing in the conventional banking system, but decreasing in the Islamic banking system. However, the

rate of increase or decrease is larger for  $\alpha$  with small value. This finding shows the increasing role played by the small and medium-sized banks in the Malaysian dual banking system. These findings demonstrate the importance of having different sizes of banks to achieve an optimal level of concentration and competition in the banking market.

In the conventional banking market, the forced merger involved banks with financial problem merging with the healthier banks. Hence, the effect of the merger to market concentration is rather small as shown by the small decrease in the U index. In contrast, change in the scope of operation among the Islamic banks and the entry of foreign banks had decreased the level of concentration in the Islamic banking market. Briefly, U values indicated a higher level of competition in Islamic compared to the conventional banking system.

The values of relative concentration measures for both markets are shown in Table 5. According

TABLE 5. Relative measures of concentration in Malaysian dual banking industry

Year	Conventional			Islamic		
	Gini	VL	REnt	Gini	VL	REnt
1997	0.51	1.26	0.84	0.69	3.56	0.55
1998	0.48	1.42	0.77	0.63	2.34	0.63
1999	0.59	1.37	0.76	0.55	2.05	0.75
2000	0.53	2.06	0.72	0.45	2.22	0.76
2001	0.51	1.82	0.73	0.51	1.76	0.8
2002	0.58	2.29	0.70	0.48	1.85	0.8
2003	0.51	2.34	0.68	0.48	1.29	0.83
2004	0.58	2.34	0.7	0.36	0.81	0.86
2005	0.59	2.33	0.7	0.45	1.25	0.85
2006	0.61	2.47	0.67	0.43	1.34	0.88
2007	0.61	2.25	0.67	0.35	0.53	0.92
2008	0.6	2.13	0.70	0.35	0.52	0.92
2009	0.62	2.38	0.67	0.38	0.62	0.91
2010	0.61	2.28	0.67	0.41	0.66	0.89
2011	0.68	9.64	0.63	0.46	1.23	0.8
2012	0.70	7.20	0.63	0.46	1.34	0.85
2013	0.63	6.21	0.59	0.48	1.54	0.83

Notes: VL = variance of the logarithms of firm sizes, REnt = relative entropy

Source: Authors calculations

Gini coefficient indicator proposed by Marginean and Toma (2011), the market structure of Islamic banking industry had changed from highly concentrated to medium concentrated market. However, the change is the opposite in the conventional banking market, that is, it changed from medium concentrated to highly concentrated market. Lorenz curve in Figure 2 demonstrates that the size distribution among Islamic banks is getting smaller; the scatter plot for 1996 is close to one but for 2006 the plot is quite far from one<sup>6</sup>. This results show that the structural changes in the Islamic banking industry have reduced the inequality in size distribution among the Islamic banks, hence providing evidence to the increasing level of competition in the particular market.

Lorenz curve in Figure 3 for conventional banking market shows that merger has widened the inequality among the small and medium-sized banks compared to large banks. Henceforth, competition is more intense among large banks compared to small banks. This finding indicates that the merger exercise increases competition among the large banks but decreases the level of competition among the small and medium sized banks. Further, recent trends (see scatter plot for 2013) show that on-going liberalization process has increased inequality particularly among the small and medium-sized conventional banks. This might due to the entry of foreign banks with small scale operation such as BNP Paribas, National Bank of Abu Dhabi and India International Bank Berhad.

The findings on Gini coefficient corroborated our earlier findings that competition among banks in the Malaysian banking market is segmented between two different sizes of banks, namely large banks and medium-sized banks (including small banks). This finding provides the evidence on the need to have banks of various sizes in order to achieve an ideal level of concentration and competition in the nation's banking market. Hence, competition and concentration should

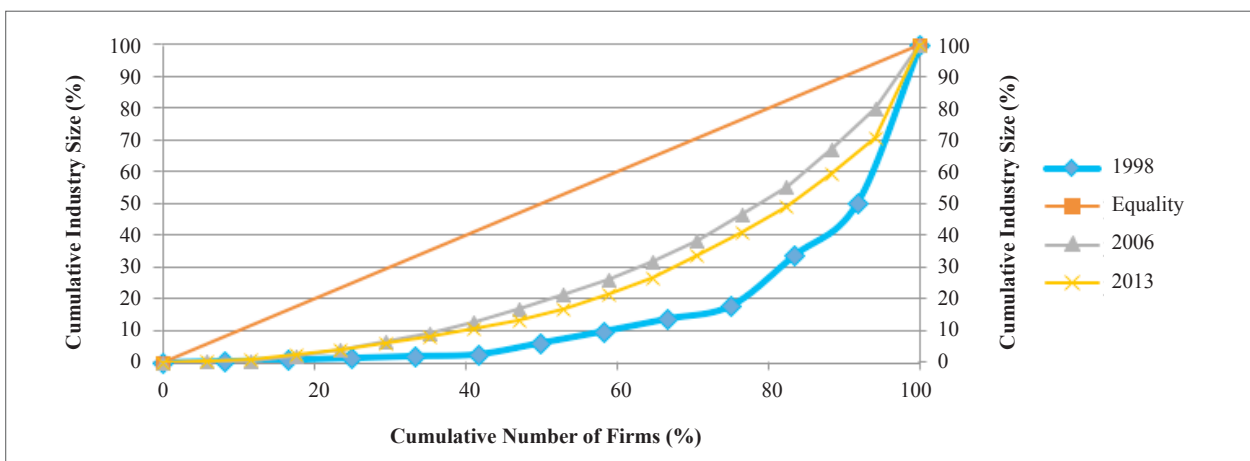


FIGURE 2. Lorenz Curve of assets in Islamic banking system  
Source: Table 5

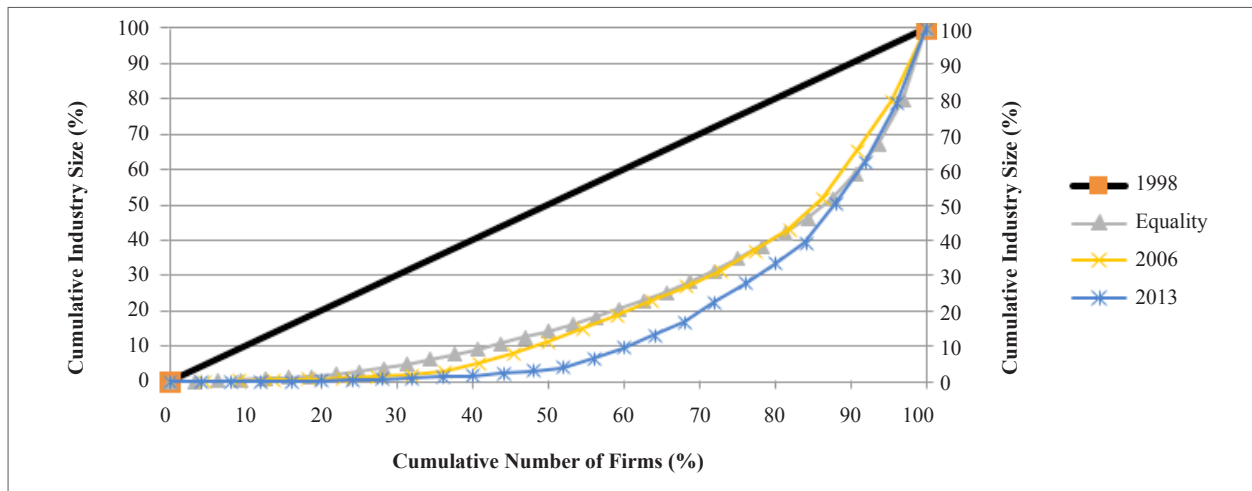


FIGURE 3. Lorenz Curve of asset for conventional market  
Source: Table 5

co-exist in the market as suggested by Baumol (1982) through contestable market theory.

Further, the findings based on VL suggested the same conclusion as Gini. According to the VL values, the level of competition is more intense in the Islamic banking market compared to conventional banking market. The study found that the merger exercise and on-going liberalization had increased inequality among banks with different sizes in the conventional market; but decreased the inequality among banks in the Islamic banking market. However, recent trends show that the inequality among banks in the conventional banking market particularly after 2010 has widened. These findings have raised the question of whether the increasing gap in the firm size distribution will contribute to the destabilization of the banking sector as happened in 1997 when crisis hit.

According to George et al. (1992) the absolute value of the entropy index is affected by the number of firms in the industry. Hence, relative measure of entropy (R) was used in the present study to compare the degree of competition due to different number of banks operating in both banking markets. The average value of R was 0.70 for conventional banking market, whilst it reached 0.81 for the Islamic banking market. This result indicates that the conventional banking market is more concentrated compared to Islamic banking market. However, average R for both markets shows the evidence of growing competition in those markets.

ANALYSIS ON MEASURES OF CONCENTRATION

Assessment of Different Concentration Measures

Hannah and Kay (1977) had suggested four general criteria to assess different concentration measures (Lipczynski et al. 2005). First, a concentration curve that is above another represents a higher level of concentration. Second, concentration will increase

if market share transferred from small to large firms. Third, the entry of new firms with market share below the threshold will decrease concentration. In contrast, the exit of incumbent firm with market share below the threshold will increase concentration. Fourth, a merger between two firms will increase concentration.

As discussed in the findings, most of the absolute concentration measures in the conventional banking market showed an increase in the degree of concentration due to merger exercise in the market. The CR, HHI and CCI values during the study period had met those criteria. Forced merger had reduced the number of small banks and increased the number of large banks in the Malaysian banking sector. The increasing trends for all the CRs, HHI and CCI in Table 1 indicate that the concentration of market power among the large banks was due to merger activity. This indicates the transfer of market shares from small to large banks. The merger exercise in the conventional banking system has resulted in the emergence of leading banks in the Malaysian banking industry. This finding supports the argument of Beck et al. (2003) who stated that banking system with few large banks is less fragile. As evidence, domestic banks were not seriously hit during the 2008 crisis as shown by the small decrease in the concentration indexes (particularly CR<sub>1</sub>, CR<sub>2</sub> and CR<sub>3</sub>). Those banks were able to manage their financial positions without government’s intervention in the financial sector as before. In contrast, the decreasing values of CR, HHI and CCI in the Islamic banking market indicate the decreasing role of dominant banks in the market. Changes in the scope of operation from Islamic banking subsidiary to full-fledged Islamic banks had promoted the emergence of domestic banks with various sizes which intensified the level of competition in the market.

Further, changes in CR values in the present study were due to changes in the market shares among the larger firms in the k group. Values of CR<sub>k</sub>s in 2013

showed that the market shares of Malaysian conventional banking industry is controlled approximately 21 percent by one dominant bank and 3 fairly larger banks, each at approximately 10 percent. Further, the increasing values in CR and HHI showed that the market shares of the large firms were not affected despite the entry of foreign banks into the market. Besides, single dominant bank controlled about 30 percent of market shares in the Islamic banking market and about 10 to 12 percent being controlled by another 3 large banks. Besides, the value of CCI which is greater than CR1 shows the importance of varied sizes of banks operating in the banking industry. Different-sized banks are needed in order to achieve an ideal level of competition and concentration in the banking market. Besides, the changes in RI and HTI values showed that the contributions of those indices towards concentration are small in both markets. Hence, providing evidence that competition in the Malaysian banking market is segmented between two groups of banks with different sizes; namely smaller and medium-sized banks, and between the large banks.

*Consistency of Concentration Measures*

The Pearson correlation analysis had been used in the present study to investigate the consistency of various concentration measures. Moreover, the correlation analysis validated the findings of this study regarding concentration and competition as discussed earlier. Pearson correlation analysis between CRs showed that the leading role in both banking markets is concentrated in the hands of large banks. Based on the principal component analysis as shown in Figure 4, the Islamic banking market is dominated by a single dominant bank; that is Maybank Islamic. Meanwhile, market concentration in

TABLE 6. Pearson correlation for concentration measures

Measures <sup>1</sup>	Correlation Coefficient
CR1	0.009
CR2	-0.485*
CR3	-0.733**
CR4	-0.847**
CR8	-0.722**
HHI	-0.779**

Notes:

<sup>1</sup> Show the measures for both Islamic and conventional markets.

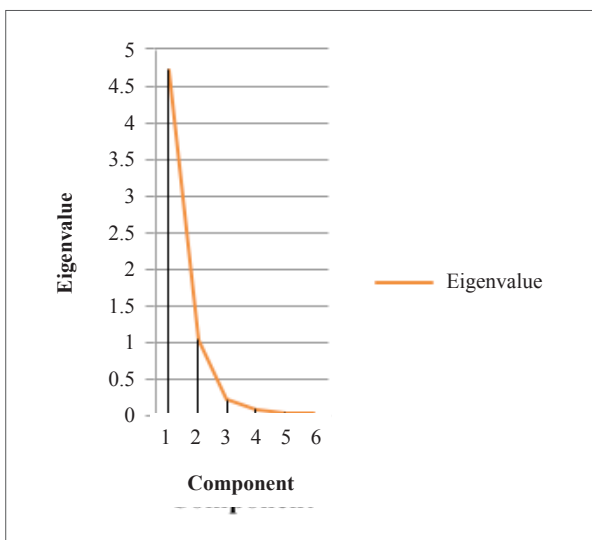
\*Correlation is significant at the 0.05 level (2-tailed)

\*\* Correlation is significant at the 0.01 level (2-tailed)

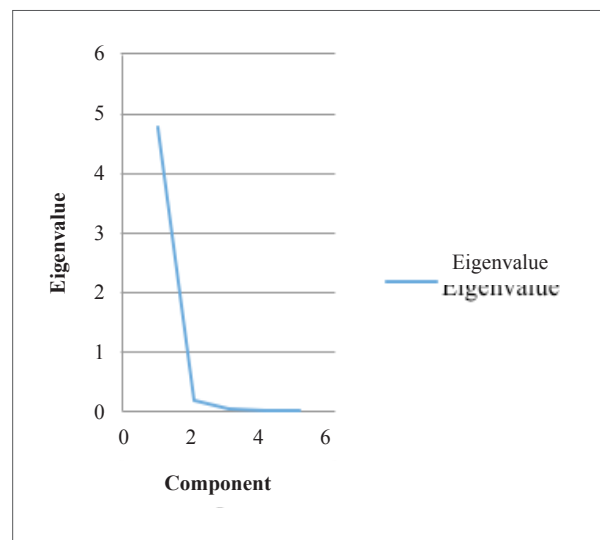
Source: SPSS outputs.

the conventional banking system is in the hands of two dominant banks, namely Maybank and Public Bank.

Table 6 shows the relationship of concentration measures in both Islamic and conventional banking markets. The significant negative correlation coefficients indicated that the trends of concentration in both markets are adverse. In the earlier period of study, Islamic banking market was highly concentrated. In contrast, conventional banking market showed low level of concentration. However, revolutionary changes via several transformations had altered the level of concentration in both markets. The level of concentration in Islamic banking market had declined, whereas there was an increasing trend in conventional market. This finding in line with Hakim and Chkir (2014) who found similar trend of concentration in the Arab GCC banking industry. Moreover, the correlation analysis between CRs and HHI in both markets validated our earlier findings on concentration measures.



(a) Conventional Market



(b) Islamic Market

FIGURE 4. Scree plot for conventional and Islamic banking market

Source: SPSS outputs

TABLE 7. Classification of market structure using CR<sub>2</sub>

Benchmark for CR <sub>2</sub> (%)	Classification of Market Structure
CR <sub>2</sub> < 20	Monopolistic Competition
20 < CR <sub>2</sub> < 40	Weak Oligopoly - existence of dominant firm with some market power
40 < CR <sub>2</sub> < 60	Strong Oligopoly – existence of dominant firm with high market power
CR <sub>2</sub> > 60	Monopoly

Source: Developed by authors

A significant positive correlation between CR and HHI showed that market concentration in the dual banking system was due to the market power held by large banks. Generally, there is a significant positive correlation between HHI and all the CRs except for CR<sub>1</sub> for conventional banking system. As shown in Table A4 (see Appendix), the HHI values in Islamic banking market were contributed by CR<sub>1</sub>, and CR<sub>4</sub> in the conventional banking market. This finding showed that despite after 30 years of operation, the Islamic banking market is still dominated by one major bank; even though the level of competition in this market has intensified. We found the highest correlation coefficient between HHI and CR<sub>1</sub>, which was at 0.982. Despite an increase in concentration in the conventional market, the competition is still intense due to the competition between various sizes of banks as indicated by the significant positive correlation between CR<sub>4</sub> and CR<sub>8</sub> with HHI. Based on this result, we suggested that for the Islamic banking system to be more competitive, the role of large banks in this market need to be encouraged. Based on this result, this study proposed to the utilization of CR<sub>2</sub> to classify the market structure particularly for the emerging or developing economies like Malaysia which has small number of large banks operating in the banking system as shown in Table 7.

Further, a significant positive correlation between the HHI, CCI, HTI and RI reinforced the findings regarding the roles played by small and medium-sized banks in the Malaysian dual banking system. The positive correlation between CR<sub>1</sub> and CCI proved that market power in the Islamic banking system is in the hand of a dominant firm with correlation value approaches one (0.972) compared to the conventional banking system which showed relatively weak correlation at 0.560. The emergence of dominant banks in the banking system may affect the degree of oligopoly or the extent of interdependence among banks in the industry. In other words, banks with relatively large market shares may trigger fierce competitive.

Therefore, all banks regardless of their sizes have to compete among themselves as to gain better position in the market. The correlation values between CRs and RI showed that the roles of small and medium sized banks in the conventional banking market are more prominent compared to Islamic banking system. The value of correlation coefficients between HT and RI also support this finding. Competition among various sizes of

banks can be intensified by technological developments because it may benefit small banks more than large banks (George et al. 1992). Therefore, small banks may compete effectively with large banks; and this might reduce the concentration level in the market. Besides, high correlation between CRs with CCI, HTI and RI showed that the market concentration of major banks had not been threatened by the entry of foreign banks into the Malaysian dual banking market.

The signs of correlation coefficients among the relative measures of concentration are consistent with theory (see Table A5 in Appendix). The Gini and VL measures had significant positive relationship with concentration. In contrast, the REnt measure had significant negative relationship with concentration. A significant negative correlation between the number of banks with Gini and VL confirmed that an increase in the number of Islamic banks is able to reduce the size disparity between banks in the Islamic banking system. Meanwhile, a significant positive relationship between the numbers of banks and REnt indicates that an increasing number of banks had intensified the competition among themselves in the Malaysian dual banking system. Generally, the CRs in this study have significant relationship with all the relative measures. This finding postulates that as concentration increases, disparity among banks will also increase. Therefore, inequality between banks can be reduced by promoting competition among banks in the industry via technological advancement, as indicated by the negative sign of correlation coefficient between CRs and REnt which is statistically significant. Similar trend can also be found between HHI and CCI with the relative measures in both markets. However, those relationships are much stronger in the Islamic compared to conventional banking system.

#### *Relation Between Concentration And Competition*

The SCP paradigm postulates that high concentration among the firms in the market will lead to anti-competitive behaviour. Hence, we were interested to test the hypothesis that higher level of concentration will lead to lesser competitive behaviour in the market. We used both Entropy and REnt values as proxies for competition in the market. Meanwhile, the measures of concentration are represented by CRs, HHI and CCI. Tables A4 and A5 (see Appendix) show a significant negative relationship between Entropy and REnt with various measures of concentration. Hence, we concluded that there is

statistically negative association between concentration and competition in the Malaysian dual banking. Our finding agrees with Deltuvaite et al. (2007) who had similar conclusion for the Lithuanian banking industry. As expected, the negative relationship was much stronger in the Islamic compared to conventional banking system. It is consistent with the earlier discussion whereby the evolution of concentration in Islamic banking industry is more obvious compared to conventional banking. Although level of competition in both market tended to be equal particularly after 2010, we found that competition was more intense in the Islamic compared to conventional banking market.

### CONCLUSION

The intention of the present study is to investigate the competitiveness of the banking industry in the Malaysian dual banking industry which encompasses Islamic and conventional banking system. Unlike previous studies, this study had used various measures of concentration as proposed in the industrial organization theory in order to obtain a true picture on the level of concentration and competition in the Malaysia dual banking system. The study on this issue has attracted our attention because Malaysian banking system had undergone several structural changes which alter the level of concentration and competition in the industry. Moreover, a long period of study from 1997 to 2013 had allowed us to conduct a significant analysis on the level of concentration and competition in the Malaysian dual banking system. We also performed Pearson correlation analysis to validate the consistency of calculated concentration measures in this study.

The analysis of the results in this study has led to some conclusions; first, absolute measures of concentration shows level competition is rapidly intensifying in the Islamic banking system compared to the conventional banking system. The values of concentration measures provided the evidence on the presence of monopolistic competition in the Malaysian dual banking system. Second, the measures of CCI and HKI show the involvement of banks of different sizes is essential in achieving an optimal level of concentration and competition in the dual banking system. Third, the structural changes taking place in the Malaysian dual banking system have led to the emergence of domestic banks with dominant power as shown by the values of  $CR_3$  and  $CR_4$ . Fourth, the entry of new foreign banks and the increased utilization of information technology have intensified the level of competition in the Malaysian dual banking industry. Fifth, our findings on concentration measures show that most of the measures such as  $CRs$ , HHI, and CCI are consistent and have at least met three of the criteria proposed by Hannah and Kay (1977). Sixth, recent trends on relative measures show the inequalities

among banks in the conventional banking market is getting larger compared to Islamic banking market.

The findings in this paper give several important policy implications; firstly, banks in the Malaysian banking system need a market environment that promotes enough degree of concentration and competition in the banking market. Hence, the existence of contestable market environment will promote profitable and efficient banks. Second, despite traditional measures  $CR$  and HHI, other measures of concentration are needed in the analysis of market structure in view that different measures provide different insights and conclusion about concentration particularly, concerning the various sizes of banks. Third, in ensuring the stability of the banking system, this is the time for authorities to review the optimal number of banks that suits a small economy like Malaysia. Concentration measures can be used to find the optimal number of banks that should operate in the banking industry.

Finally, the findings on this paper are interesting and should be expanded. It is suggested that further analysis on market structure could be done by looking at its impact on efficiency and profitability of the banking sector. This study also suggests that future studies on market structure should explore the use of other measures of concentration in classifying the market structure of an industry accurately.

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### ENDNOTES

- 1 Before 2004, the major player in the Islamic banking industry was BIMB. Maybank became the major player in this industry after 2004. The changes in the leading banks were due to the up-grading of Islamic banking system from subsidiary to full-fledged Islamic banks. As a result, BIMB became the second largest player in the industry until 2008. From 2009 onwards, CIMB replaced the position of BIMB as a second largest bank, whereas BIMB and Public Islamic positioned themselves as the third and fourth largest players in the industry, respectively.
- 2 The maximum value of  $E_H$  was also calculated to obtain the level of concentration and competition in the banking market. The maximum value,  $E_{MAX}$  indicates the market structure with low level of concentration, where all banks have equal share, hence they operate in the highly competitive market. The values of the  $E_{MAX}$  are not reported due to space constraint.
- 3 The entropy index assigns greater weight to small banks, whilst the HHI assigns greater weights to large banks.
- 4 Advances in information technology (IT) help the development of new payment system with electronic



- delivery mechanisms, product innovation and services had changed the supply pattern of banking transactions.
- 5 The newly operated foreign banks in Malaysia are BNP Paribas, Sumitomo Mitsui Banking Corporation Malaysia Berhad, India International Bank Malaysia Berhad, Mizuho Bank Malaysia Berhad, National Bank of Abu Dhabi Malaysia Berhad and Industrial and Commercial Bank of China.
  - 6 A three-year period had been chosen to analyse the size distribution of banks in the Islamic banking industry, namely 1997, 2006 and 2013. The 1997 scatter plot shows the initial distribution of banking firms in the earlier period of study. Meanwhile, the scatter plot for 2006 showed the size distribution among the banks in the earlier stage after changes in their operations from IBS to full-fledged Islamic banks together with the liberalization process in the industry. Meanwhile, the scatter plot for 2013 showed that the recent trend of bank's size distribution was due to several structural changes in the industry.

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## APPENDIX

TABLE A1. Selected previous study utilized structural approach in banking industry

Study	Countries	Measures	Results
Repon and Zahidul Islam (2016)	Bangladesh	CR <sub>k</sub> and HHI	Low concentration which imply high competition
Bod'a (2014)	Slovak	CR <sub>k</sub> , HHI, HTI, CCI and CV for Loan and TD	Concentration is lower – monopolistic competition.
Rinkeviciute and Martinkute-Kauliene (2014)	Lithuania	CR <sub>k</sub> and HHI for TA	Higher concentration (2011-2013)
Hakim and Chikr (2014)	Arab GCC countries	CR <sub>k</sub> , HHI and Entropy for TA, TL and TL.	Conventional banking industry more concentrated compared to Islamic banking industry
Abdul Kadir et. al. (2014)	Malaysia	CR <sub>k</sub> and HHI for TA, TD and TL	Increasing trend in concentration measures after the completion of merger and consolidation process.
Sufian and Habibullah (2013)	Malaysia	CR <sub>k</sub> and HHI for TA, TD and TL.	Increasing trend in concentration measures during the post-merger period.
Iuga (2013)	European Union Countries	CR <sub>k</sub> and HHI for TA	Overall, European banking market is not very concentrated.
Davcev and Hourvoulides (2013)	FYROM	CR <sub>k</sub> and HHI for TA	Higher concentration
Staroselskaja (2011)	Lithuania	CR <sub>k</sub> and HHI for TA	Decreased concentration; increased competition
Stavarek and Repkova (2011)	Czechoslovakia	CR <sub>k</sub> and HHI for TA	Decreasing trend in concentration
Rezitis (2010)	Greek	CR <sub>k</sub> and HHI for TA	Higher concentration
Sharma and Bal (2010)	India	CR <sub>k</sub> , HHI, CCI, Entropy and Gini for TA.	Concentration decreased which reflect increasing degree of concentration.
Turk-Ariss (2010)	13 countries operates dual banking system	CR <sub>k</sub> and HHI for TA, TD and loan	Concentration higher in Islamic market Vs. conventional
Gajurel (2010)	Nepal	CR <sub>k</sub> and HHI for TA, TD and TL	Lower concentration; growing competition
Abdul Majid and Fadzlan (2007a)	Malaysia	CR <sub>k</sub> and HHI for TA and TL	Decreasing trend of concentration in Islamic banking market
Abdul Majid and Fadzlan (2007b)	Malaysia	CR <sub>k</sub> and HHI for TA, TD and TL	Merger has increased concentration in Conventional banking market
Al-Muharrami et. al (2006)	Arab GCC country	CR <sub>k</sub> and HHI for TD	Lower concentration; growing competition
one (2006)	15 European Union Countries	CR <sub>k</sub> and HHI for TA	Higher concentration due to consolidation process
Bikker and Haaf (2002b)	23 industrialized countries	CR <sub>k</sub> and HHI for TA	Concentration lower in the market with large number of banks More large banks – higher concentration More small banks – low concentration

Notes: CCI = comprehensive concentration index, CR<sub>k</sub> = concentration ratio of k firms, CV = coefficient of variation, HHI = Herfindahl Hirshman index, HTI = Hall-Tidemann Index, TA = Total Asset, TD = Total deposit, TL = Total Loan.

Source: Develop by authors.

TABLE A2. 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 SaadiqBerhad <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 Bank with EONCAP Islamic bank Berhad.

L is local banks and F is foreign banks.

*Source:* Develop by authors.

TABLE A3. 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, c</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>	PhileoAllied 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 PerwiraAffin 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>6</sup> Merge with RHB Bank in 2003.

<sup>2</sup> Merge with EON Bank in 2001.

<sup>7</sup> Merge with Southern Bank in 2000.

<sup>3</sup> Merge with Affin Bank in 2001.

<sup>8</sup> Merge with CIMB Bank in 2006.

<sup>4</sup> Merge with Alliance Bank in 2000.

<sup>9</sup> Merge with Alliance Bank in 2001.

<sup>5</sup> Merge with Hong Leong Bank in 2001.

<sup>10</sup> Merge with Maybank in 2001.

*Source:* Develop by authors.

TABLE A4. Pearson correlation for absolute concentration measures in Malaysian dual banking industry

Measures	CR1	CR2	CR3	CR4	CR8	HHI	ENT	CCI	RI	HT	HHIC
CR1	1	.959**	.928**	.895**	.832**	.982**	-.946**	.972**	.971**	.898**	-.981**
CR2		1	.278	.166	.230	.258	-.233	.560*	.288	.216	-.211
CR3			1	.990**	.932**	.962**	-.992**	.996**	.968**	.874**	-.962**
CR4				1	.821**	.821**	-.613**	.889**	.766**	.701**	-.761**
CR8					1	.939**	-.988**	.988**	.951**	.889**	-.940**
HHI						1	-.768**	.883**	.853**	.851**	-.821**
ENT							1	.969**	.933**	.853**	-.917**
CCI								1	.919**	.913**	-.926**
RI									1	.753**	-.826**
HT										1	-.894**
HHIC											1

Notes:

\*Correlation is significant at the 0.05 level (2-tailed)

\*\* Correlation is significant at the 0.01 level (2-tailed)

Source: SPSS outputs.

TABLE A5. Pearson correlation for relative measures in Malaysian dual banking industry

	Measures	Gini	VL	REnt	NumBanks
Gini	Islamic Banking	1.000	.922**	-.945**	-.693**
	Conventional Banking	1.000	.734**	-.746**	-.382
VL	Islamic Banking	.922**	1.000	-.947**	-.737**
	Conventional Banking	.734**	1.000	-.697**	-.139
REnt	Islamic Banking	-.945**	-.947**	1.000	.754**
	Conventional Banking	-.746**	-.697**	1.000	.608**
NumBanks	Islamic Banking	-.693**	-.737**	.754**	1.000
	Conventional Banking	-.382	-.139	.608**	1.000
CR1	Islamic Banking	.935**	.931**	-.981**	-.738**
	Conventional Banking	.105	.503*	-.245	-.172
CR2	Islamic Banking	.918**	.926**	-.961**	-.890**
	Conventional Banking	.524*	.642**	-.655**	-.396
CR3	Islamic Banking	.897**	.903**	-.940**	-.912**
	Conventional Banking	.698**	.553*	-.765**	-.586*
CR4	Islamic Banking	.864**	.887**	-.917**	-.925**
	Conventional Banking	.733**	.607**	-.876**	-.663**
CR8	Islamic Banking	.835**	.890**	-.863**	-.916**
	Conventional Banking	.801**	.720**	-.918**	-.636**
HHI	Islamic Banking	.919**	.914**	-.973**	-.761**
	Conventional Banking	.687**	.658**	-.820**	-.697**
CCI	Islamic Banking	.923**	.934**	-.970**	-.869**
	Conventional Banking	.670**	.746**	-.846**	-.613**

Notes:

\*Correlation is significant at the 0.05 level (2-tailed)

\*\* Correlation is significant at the 0.01 level (2-tailed)

Source: SPSS outputs.