

## Competition in the Malaysia's Banking Industry, Quo Vadis

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### ABSTRACT

This paper reports new findings on the degree of competition in banking industry during a recent eight years after a banking sector consolidation. A conventional theory holds any consolidation should lead to banking concentration, which impairs price competitiveness and risk. We apply the Panzar-Rosse non-structural test as well as Lerner Index to measure competition. The former measures industry competition by summing the elasticities of interest revenue with respect to factor prices, a method not yet widely applied, and indeed not for an industry ex post the consolidation. The main finding is that the banking sector is not operating either under perfect nor monopolistic competition: the competitive environment is more like a cartel with low H-statistic. Lerner Index, which is a measure over time, indicates slowly increasing competition perhaps due to the learning effect from adjusting to post-consolidation realities, and the 2008 global banking crisis. Lerner index contrasts with the trending behavior, which shows declines from a high Index value of 0.435 in 2010 to a low of 0.168 in 2014. Malaysia's banking industry benefitted from cartel-like environment by trading-off the costs of competitive banking before 2002/4 with cartel-like industry structures, which is moving away from lack of competition towards more competition especially in recent years.

**Keywords:** Malaysian banking system, competition, Panzar-Rosse model, market structure, Global financial crisis, Lerner Index

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## INTRODUCTION TO BANKING INDUSTRY COMPETITION

Ever since 1957, Malaysian banking sector had periodic instability when it experienced a large number of low-capitalized financial deposit-taking firms which buckled often during bad years, leading to a number of banking failures. This state of affair was to be tamed by a consolidation exercise in 2002. Hence the motivation of the researchers is to add new findings on competitiveness using two separate constructs, not yet applied to the case in point for the most recent regulatory period.

This paper's sole aim is to apply a refined measure of competitiveness (Panzar-Rosse, 1997) as well as Lerner Index (1934) to measure how good is the banking system in a middle-income economy, which has successfully restructured in 2002/3 a diverse banking sector to improve efficiency for the sake of gaining financial stability. The competitive measures applied are refined, and has yet been applied to the study of banking sector competitiveness particularly to study post-consolidation behavior using more recent data. Promotion of competitiveness plays an important crucial role in any economy for the effective allocation of financial resources in the economy and for lowering the cost of stakeholders. Nothing is known about the competitiveness of banking system ex post consolidation of banks in Malaysia. As key determinants of economic growth and development, competitive banks exert a strong influence on asset transformation as well as in providing low cost payment system and to act as a transmission channel for monetary policy to also secure financial stability.

Over the last decade, long since the infamous Asian Financial Crisis, the banks are said to have been transformed into a more resilient and competitive industry. This is the often-repeated claims of national central banks not to forget the self-congratulating international regulators, the IMF. The banking industry in the tested economy, which has witnessed many ups and downs in different periods, continues to grow to be a vital sector in the economy if one measures the level of funding from this source for economic development over the six decades as reported in national statistics. A large number of intermediation institutions has been persuaded, some would say cajoled, to form a limited number of banks with larger capital bases to prevent the perennial failures of banks in the history of banking in this country.

Bank Negara Malaysia (BNM) reports that for 2014, a decade after the consolidation exercise, the banking industry is reported to have a net profit RM32 billion with a 8 per cent contribution to the national income. The amount of deposits and loans supporting the economy were RM1,642 billion and RM1,318 billion respectively in that year. The banking system is liquid for an economy of this size (2004 GDP: RM1,106 billion) with M3 money stock of RM1,554 billion (BNM, 2014). Expressed as percentage of total GDP, these are impressive numbers, indicating the resilience of the industry as the main purveyors of money to the economy.

In the late 1990s, BNM proposed a major restructuring plan to transform the banking industry into a more competitive structure so as to enable the banks to compete with foreign banks on the basis of known evidence (Berger *et al.*, 2008). Foreign banks play critical role in this economy since foreign capital and technology are major contributors for the economic development of this country transformed from a largely agricultural and mineral exporter in the 1970s to industrial goods exporter. Competition has become a crucial issue to focus on,

at the stage of selling this idea of banking consolidation to the public, from the year of the proposed merger and consolidation to be completed in 2003.

Theoretical literature (Bikker & Haaf, 2002a) would suggest that consolidation would lead to concentration in the industry, which is likely to promote industry structure away from perfect competition at least in the short run. It would be reasonable to want to assess changes in the competition, and in efficiency of banking industry in the post-consolidation period to assess if the regulator's claim of improved efficiency has taken place in the period ex post the consolidation. This will add useful information for making informed decisions by stakeholders, also for understanding the role of banks for economic growth, for productivity, for promotion of financial stability and consumer welfare. The competition of a bank is defined as in the H-index statistics proposed by Pazar-Rosse (1987) (P-R model). Assessing the competitiveness of banks will indicate whether the improvement in efficiency of banks is attained in the immediate period after consolidation.

There are several ways to measure the competitiveness of banks. One of them is the so-called structural approach which is based on the structure-conduct-performance (SCP) paradigm that uses market structure measures such as concentration ratios, number of banks or Herfindahl indices. The actual market shares can be measured by these indicators without including the competitive behavior of banks. These are the approximate estimates as these do not include the banks with different ownership which might have different behaviors and not able to compete directly with each other in the banking industry. Besides, the competitive conduct of banks is not measured at the margin. Another methodology includes the measures that estimate the competition in specific markets with application of bank-level data and specific assumptions on the behavior of banks. The Lerner index, Panzar-Rosse H-statistic as well as the Boone indicator, fall into this category. Besides, competition may be reduced due to the ongoing process of mergers and consolidations among banks. We employ a P-R model to empirically estimate the competitive behavior of banks in Malaysia.

The rest of the paper is constructed as follows. Section 2 is meant to provide some background information on the current structure and trend of banking system in the period 2006-14. In Section 3, we summarize a brief review of related literature on measurement issues in the P-R model. Section 4 is an explanation of the data and the methodologies used in the research. The results are presented and discussed in Section 5 while Section 6 concludes the paper.

## **OVERVIEW OF MALAYSIAN BANKING SYSTEM**

The country's financial system has been established over many years. The financial sector is structured into: Financial Institutions; and Financial Markets. Banking System and Non-bank Financial Intermediaries are structured as Financial Institutions under the local banking laws. On the other hand, there are four major markets classified as financial markets, which are Capital Market, Derivatives Market, Money & Foreign Exchange Market and Offshore Market.

The banking system, which holds 67 per cent of the total assets in the financial system, is made up of: the Central Bank, which is the BNM; commercial banks including banking

and finance companies; and other financial institutions such as discount houses, merchant banks, the representative offices of foreign banks and the offshore banks in the International Financial Center in Labuan. Bank Negara has been authorized to regulate and supervise the banking system of the country. This is given under the Financial Services Act (2013), and the Islamic Financial Services Act (2013) and the regulations made there under. With respect to offshore banks, they are supervised by the laws applying to the Labuan Offshore Financial Services Authority (LOFSA).

The financial system remained resilient during the global financial crisis in 2009. Some attribute this to the restructured banking that had been carefully put in place some 5 years prior to the crisis. Also, liquidity and capitalization of banking institutions and insurance companies had been and increased and well-managed as well as organized. The banks had also taken timely measure in the early 2008 to shore up the capital, which served to prevent the restriction in lending during the crisis. The growth in loan during that time expanded to 8.7 per cent. BNM had also taken precautionary measure to widen the guarantee on deposits in order to expand the access to the liquidity facilities. As a result, a high level of confidence in the system was sustained and the funding can still be accessed throughout the period of the crisis. None of the banking facilities provided by the central bank has been drawn during this period. Banks were very effective in taking the proactive approach to restructure facilities with the borrowers. Obviously this was quite possible given the restructured banks were better capitalized, and the banks did not have exposure to the source of the crisis, the collateralized debt obligations.

Despite of the struggling economy, when economic production has to decline when demand in developed countries dropped in the crisis period from the financial crisis, credit flows to small and medium enterprises (SMEs) were maintained and the guarantee schemes were also used to support the economy. Meanwhile, Islamic finance industry continued to remain strong in the market in spite of the financial crisis. Islamic securities have increasingly become an important component of global financial system: in this economy it constitutes a quarter of the system. Its significant contribution to the global growth and financial stability has been recognized. Over the past years, Islamic finance was reinforced by the government to promote the location of this market as an international center for the issuance of securities. The innovation is Islamic finance such as Shari'ah-compliant commodity trading platform was also introduced during that period (Safari, *et al.*, 2014).

Recently, the country's prudential framework, surveillance frameworks and the arrangement and processes in supervision have been enhanced. With the completion of the 10-year Financial Sector Masterplan (FSMP), the government implemented a new blueprint to outline the revolution of the financial sector from year 2011 till the end of another decade.

The main organizations with responsibility for policymaking and supervision of the financial system are the Ministry of Finance (MOF) and the BNM. The BNM was established in 1959. BNM is responsible for printing and issuing bank notes, formulating monetary policies, supervising and examining financial institutions, managing the country's foreign exchange rates and supporting the establishment of a payment system. The banking sector is regulated by BAFIA and the Financial Institution Act 2014, which was first enacted in 1988. These define the commercial banks and describes the types of businesses the banks may engage in: (BNM, 2010).

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Table 1: Banking System, Network and Workforce

	2010	2011	2012	2013	2014
Number of institutions	55	56	56	55	54
Commercial Banks	23	25	27	27	27
Investment Banks	15	15	13	12	11
Islamic Banks	17	16	16	16	16
Office Network	2,312	2,345	2,481	2,479	2,494
Commercial Banks	2,006	2,050	2,056	2,029	2,045
Investment Banks	133	133	148	135	135
Islamic Banks	2,102	2,147	2,171	2,177	2,192
Number of banks with internet service	26	27	28	31	31
Number of employees	120,580	125,065	126,902	125,071	124,986
Commercial Banks	103,093	106,274	107,541	106,006	106,783
Investment Banks	8,972	9,577	9,610	8,814	8,801
Islamic Banks	8,515	9,214	9,751	10,251	9,402

Source: BNM (2014)

There are currently 27 commercial banks (excluding 17 Islamic banks). Of the 27, 19 are locally incorporated foreign banks. In 2014, total assets held by financial institutions is estimated to be RM 2,442.29 billion (BNM, 2014).

Table 2: Brief on Malaysian Banking Industry (2014)

Banking system <sup>1</sup> : Income and Expenditure	For the calendar year				
	2010	2011	2012	2013	2014p
	RM million (or otherwise stated)				
Interest income	65,681.90	73,681	83,760.10	83,079.30	89,564.50
Less: Interest expense	31,331.30	38,918.20	46,292.90	43,621.40	48,010.40
Net interest income	34,350.60	34,762.80	37,467.30	39,457.80	41,554.00
Add: Fee-based income	8,562.60	8,951.80	9,125.50	9,617.60	10,165.50
Less: Staff cost	11,467	12,841.90	13,810.30	13,561.50	13,702.60
Overheads	12,209.40	11,751.10	12,666.50	13,383.70	14,221.80
Gross operating profit	19,236.90	19,121.60	20,116	22,130.20	23,795.10
Less: Impairment <sup>2</sup> and other provisions	4,366.90	2,835.60	1,501.90	2,427.10	1,469.10
Gross operating profit after provision	14,870	16,2860	18,614.10	19,703.10	22,326
Add: Other income	8,088.70	9,909.60	10,604.90	10,054.50	9,694.90
Pre-tax profit	22,958.70	26,195.60	29,219	29,757.60	32,020.80
Pre-tax profit / Average assets (%)	1.50	1.60	1.60	1.50	1.50
Pre-tax profit/Average shareholders' funds (%)	16.60	17.40	17.40	15.90	15.20

Table 2 (Cont.)

Pre-tax profit/Average employee (RM'000)	193.50	213.30	231.9	236.20	256.10
Cost incurred per ringgit of revenue earned (sen)	46.40	45.90	46.30	45.60	45.50
Cost incurred per ringgit of net interest income (sen)	68.90	70.70	70.70	68.30	67.20
Overheads to staff cost (%)	106.50	91.50	91.70	98.70	103.80
Staff cost per employee (RM'000)	96.60	102.70	108.80	108.40	109.60

<sup>1</sup> Includes Islamic banks.

<sup>2</sup> Refers to individual and collective impairment provisions in accordance with the Guidelines on Classification and Impairment Provisions for Loans/ Financing.

Note: Figures may not necessarily add up due to rounding.

According to Bank Annual Report (2014), 77.25 per cent of the banking industry is represented by commercial banks, with Malayan Banking remaining the dominant player in term of total assets (RM640.3 billion). Public Bank, CIMB and RHB commercial banks are also large banks in the industry. The main services that commercial banks provide are mobilizing savings in the forms of deposits and provision of loans. In recent years, commercial banks have been competing competitively to enlarge their market shares by improving the quality of services and facilities through increasing the numbers of ATM, giving attractive promotions, providing electronic banking services and diversifying banking services that are offered.

Local banks have dominated the market. On the other hand, 10 per cent of the total assets of banking system come from the foreign banks that operate locally while 3.5 per cent of the total liabilities of the banking systems are from the foreign funding accounts (BNM, 2014). Almost all banks operate in Kuala Lumpur and some other major cities. The foreign bank branches aim to serve the multinational corporations, which have a very strong creditability or organizations of the same nationality. Matsushita (Malaysia) Bhd may choose to do business with Japanese Banks such as the Bank of Tokyo-Mitsubishi UFJ (Malaysia) Berhad, the Mizuho Bank (Malaysia) Berhad or Sumitomo Mitsui Banking Corporation Malaysia Berhad.

Therefore, these foreign banks are able to capture the market share from the foreign corporations. However, as mentioned in the section above, a majority of banking businesses is still maintained by the domestic banks, which is revealed from the size and scale of the banks.

### Changes in the structure of the Malaysian Banking System

In 1958, Malaysia accepted the International Monetary Fund's Articles of Agreement and deregulated some measures in the financial system. The buying and selling of shares started in 1870. A stockbrokers' association, called the Malayan Stockbrokers Association, was formed in 1937. Public trading of shares was undertaken in 1960 on the initiative of the BNM. In the same year, the Association was reorganized and became the Malayan Stock Exchange. In 1963, the Exchange was reorganized and renamed as the Stock Exchange of Malaysia. Two years later, it was renamed as the Stock Exchange of Malaysia and Singapore and later in 1973, the Kuala Lumpur Stock Exchange (KLSE). In order to boost the growth of the economy, the government has established in 1993 the International Banking Facility (IBF), which is an

offshore financial market. The purpose of IBF was to facilitate the flow of foreign capital and increase the needs of domestic investment. It encouraged Malaysian companies to borrow a large amount of money from foreign countries. Since the interest rate was lower than Ringgit currency, most of these loans were in US dollar.

During 1987-97, the economy experienced growth of close to 9.3 per cent per year (ADB, 2014). With low cost but productive labor force and country's good infrastructure, it attracted foreign direct investment to build plants in order to export products to other developed countries. As the country became more confident about their economic status, the government increased spending on infrastructure, so local banks provided financing for the infrastructure projects and real estate investments. When the economy entered a recession in 1998 during the Asian Financial Crisis, this led to the sharp increase in the non-performing loans (NPLs) in the banking industry.

In 1998, Malaysia's economic activity contracted by 5.3 per cent following a decline in its exports. This reduction in exports led to the Ringgit pegging to US dollar to be changed. Thus started to devaluation of the currency in order to promote exports. As local companies needed to earn ringgit to repay the loans in dollars, this created larger and heavier debts for these companies. For these reasons, the country went through a big economic crisis in 1997-9. Foreign investors lost their confidence in the economy, so they withdrew hugely their investments. Moreover, the Ringgit depreciated from RM2.50/ US dollar to RM3.80/US dollar in 1997 (ADB, 2011).

Many companies with high debts were bankrupted and this caused thousands of people to become unemployed. Consequently, the government used foreign exchange reserves to protect the Ringgit from speculation, by lowered interest rate to stimulate the economy. During the financial crisis 1997-98, a large amount of non-performing loans affected the commercial banks badly. The firms had to tighten their lending policies. Realizing the importance for better financial information, credit report agencies were then established by the government and the financial sector. As a result, during the period 1999-06, the country recovered from the economic crisis. Economic growth rate averaged at 5.7 per cent per year during the following period (ADB,2011).

Although the Global Financial Crisis (2008) impacted many countries negatively, including both advanced and developing ones, it had little impact on Malaysia (BNM, 2010). It was because its involvement was very little in the financial derivatives based on sub-prime mortgages. Based on lessons learned from the Asian financial crisis 1997, BNM was able to manage the financial services sector very well. Besides, it had also undertaken effective measures by avoiding interruption. Other than that, banks and insurance companies remained well capitalized and liquid. Also, no obvious vulnerabilities were shown in corporate balance sheets. Additionally, government guarantee and credit-enhancing schemes had benefited the SMEs. Although household debt had been increasing, part of it was contributed to promote home ownership. Nonetheless, no signs of strains were shown in the serving debt and in property markets.

## RESEARCH ON BANKING INDUSTRY COMPETITION

Based on the existing theory, the markup of prices over marginal costs can be used directly to infer the degree of competition between banks (Lerner, 1934). In practice, however, the implementation of this measure is often difficult or even impossible due to insufficient detailed information on the prices and cost of bank products. The literature suggests a number of indirect approaches to assess the competitive environment in which financial intermediaries operate. These approaches can be categorized into two main streams: structural and non-structure techniques.

Structural measures may be divided into two major strands: the formal and non-formal frameworks. The most commonly used non-formal structural measures are from the Structure-Conduct-Performance (SCP) paradigm and the efficiency hypothesis (EH). The SCP hypothesis, which stems from Bain (1951) postulates that more concentrated markets are more collusive. On the other hand, the EH, which originally in Demestz (1973) and Peltzman (1977) proposes the existence of positive correlation between the degree of market competition and the overall concentration level faced by banks.

Despite the lack of formal back-up in micro-economic theory, these two hypotheses have often been employed in the banking industry. These give policy makers measures of market performance and structure, as well as their likely interrelationship. For instance, the empirical evidence in Bikker & Groeneveld (1998) has shown concentration impacts on competitive structure in individual EU countries and in the EU as a whole during the period 1989-1996. Their results endorsed the common view that concentration impairs competitiveness. Besides, SCP paradigm is also employed by Bikker & Haaf (2002a) in another research, which is based on a panel data of 23 industrialized countries inside and outside Europe over a period of 10 years. Their analysis is then extended by Corvoisier (2002) to the banking industry of euro area countries from the year 1993 till 1999.

In our research, we propose that the competition, especially in sections where informational asymmetries or geographic proximity are vital (loans and demand deposit), may be significantly reduced by the ongoing process of banking mergers and consolidations in countries, while efficiency structure has significantly escalated in others (savings and time deposits). In addition, Rozas (2007) searched for evidence for EH focused on a sample of Spanish savings and commercial banks. In response to the empirical and theoretical imperfection attributed to the structural stream, three non-structural paradigms of banking competitive behaviour have been introduced within the developing New Empirical Industrial Organization framework. This new category consists of the models developed by Iwata, Bresnahan & Panzar-Rosse (hereinafter I-P-R).

A reduced-form equation is then used in the latter approach to estimate the relationship between banking revenues with a vector of input prices and other controlling variables. H-statistic is another measure of competition which is based on the sum of elasticities of income in respect of input cost per unit. Different situations may arise from the estimation of H-statistic. For instance, if the value of H-statistic is negative, the market structure of the bank is either neoclassical monopolist or cartel-like oligopolistic. If the value is between 0 and 1, the bank is characterized as monopolistic competitor. Lastly, a bank is operating as a

competitive price-taking bank if the value equals unity. Therefore, H-statistic is employed under the assumption that when there is a change in input costs, different pricing strategies will be used by banks depending on the market structure in which they operate.

Given its simplicity, transparency and without considering efficiency, this technique has become a widely-applied method in empirical bank studies (but not in Malaysia). In addition, the availability of data becomes much less of a constraint, as revenues are more probable to be observable compared to output prices necessary if other techniques are used. Furthermore, by not requiring a locational market definition a priori, the potential bias caused by the misspecification of market boundaries is avoided.

The works presented by Bikker & Groeneveld (1998), Bikker & Haaf (2002a, b), Mamatzakis, Staikouras & Koutsomanoli-Fillipaki (2005), Al-Muharrami, Matthews & Khabari (2006), Bikker, Shaffer & Spierdijk (2009), Kasman (2010) and Delis (2012) are based on the first category which is known as multi-country approach. Bikker & Haaf (2002a) helped to prove that the banking markets in 23 industrialized countries earn interest and total revenue under the market structure of monopolistic competition. The empirical study of Staikouras & Koutsomanoli-Fillipaki (2006) shows that, during the period of 1998 to 2002, the countries in Southeastern European region such are operating under monopolistic condition. The same empirical results are also shown in the studies of Bikker & Haaf (2002b), Bikker & Groeneveld (1998), Al-Muharrami, Matthews & Khabari (2006), Kasman (2010) and Delis (2012).

Indeed, this conclusion recognizes the existence of product differentiation is the most plausible for characterizing the market structure and interaction between banks. Although the core business of banks is fairly homogeneous, they still tended to differentiate their products in terms of quality by advertising. For the studies that apply P-R method, monopolistic competition is found to be the prevailing outcome of western European countries (Bikker & Haaf, 2002b).

The investigation of competitive condition in individual countries is included in a second category of studies: (Yuan, 2006; Deltuvaite, Vaskelaitis & Pranckeviciute, 2007; Gischer & Stiele, 2008; Boucinha & Ribeiro, 2009; Delis & Matthews, 2010; Shin & Kim, 2013). Yuan (2006) examines the Chinese banking industry competitiveness during 1996-2000: the level of competition is high even before its accession to the World Trade Organization. More than 400 savings banks in German are examined by Gischer & Stiele (2008) who find banks are earning interest and revenue under the structure of monopolistic competition. The result also indicates that market power of small banks seems to be higher than is the case for larger institutions. Boucinha & Ribeiro (2009) and Mlambo & Ncube (2011) provided supporting results for Portuguese and South Africa respectively.

Delis & Matthews (2010) and Shin & Kim (2013) show the market structure of Korean banking sector is monopolistic competition. However, the degree of competition has improved after the actions taken by Korean government in a bank restructuring/consolidation during the Asian Financial Crisis. Competition in banking industry has become higher after bank consolidation and a reduction in the number of banks, a result similar to that of Malaysia. The banks are then operating to maximize their interest revenues.

Finally, the topic of banking competition in emerging economies has come to attention of scholars. The competitive condition was analyzed in 14 Central and Eastern European countries for the period, 1993 to 2000 (Yildirim & Philippatos, 2007). It was shown in studies

that, among these 14 countries, the market structure of banking industry can be characterized as perfect competition or monopoly. These findings are also supported by Gelos & Roldos (2004) as well as Suleyman Sah University (2012). Finally, the banking sector of South Eastern European region is proven to be operating under the conditions of monopolistic from 1998 to 2002 (Mamatzakakis *et al.*,2005).

## DATA AND METHODOLOGY

### Data and variables

We collected data from annual reports which are available on the official websites of 11 major banks in Malaysia in the period 2006-2014. These 11 banks represented more than 87 per cent of Malaysia's banking industry assets (BNM, 2014), therefore, researching this sample is close to researching the whole Malaysia's banking industry.

Studies have shown proof of efficiency as being affected by the choice of variables by researchers because the selection of variables is limited due to lack of data for relevant variables. The measurements of cost and output variables are notably difficult because of the joint production of financial products and also because prices are set based on a bundle of financial services. Thus, researchers resort to one of three approaches, based on production approach, intermediation approach and revenue approach as widely accepted in the literature.

Under the first two approaches, traditional microeconomic theory of firm is applied to banking. But the specification of banking activities between these two approaches is different to pin down. The third approach is more advanced as some specific activities of banking are incorporated into the classical theory and then applied in a modified manner. Benston (1965) defines the financial institution as producer of services for account holders under a production approach. In other words, institutions perform transactions on customer deposits system and also bank processes their documents such as loans, etc. Therefore, the best measure for output could be the number of accounts or its related transactions whereas the number of employees and physical capital can be used for inputs. On the other hand, financial terms can be used as intermediary between savers and borrowers which is assumed by the intermediation approach. Under this approach, the measurement of output is based on the total loans and securities whereas the deposits along with the labor and physical capital will be used as measures for inputs.

Table 3: List of Malaysia's banks included in the research

No.	Name of Banks	Category	Total Assets (RM billion)
1	Affin Bank Holdings	Local	59.50
2	Alliance	Local	48.05
3	AMMB Bank	Local	130.20
4	CIMB	Local	414.16
5	Citibank	Foreign	37.60

Table 3 (Cont.)

6	Hong Leong Bank	Local	194.87
7	HSBC	Foreign	82.99
8	Maybank	Local	655.40
9	OCBC	Foreign	89.11
10	Public Bank	Local	345.72
11	RHB Bank	Local	219.35
Total Assets			2,276.96

The revenue approach is recently proposed by Drake *et al.* (2006) for DEA-Malmquist analysis. This approach is also known as income-based approach. Banks are viewed as having the same final objective, which is to generate revenue from use of costly inputs in doing business. A banks' output is defined as total revenue (interest and non-interest income) whereas total expense is defined as inputs (interest and non-interest expense).

Under the intermediation approach, we assume deposits (X1), labor (X2) and capital (X3) as inputs for producing loans (Y1) and investments (Y2). Under the revenue approach, non-interest expenses (X4) and interest expenses (X5) are used as inputs producing outputs, loans (Y1), deposits (Y3) and non-interest income (Y4).

Table 4 provides a summary of statistics. It is similar to the output and input variables used in the P-R model. Once the necessary data are collected, the STATA software was used to estimate the P-R market model to our data set.

Table 4: Summary statistics of Variables used in the Panzar-Rosse banking industry computation (2006-2014)

Summary Statistics of variables used in P-R model (RM mil)					
Variable	Mean	Median	Maximum	Minimum	Std Dev
Total Rev	4,410	2,725	18,390	771	4,110
Total Interest Rev	5,090	3,166	17,970	1,016	4,296
Total Loans	83,098	47,611	403,513	13,434	79,774
Total Deposits	93,418	55,480	439,569	12,642	91,071
Total Assets	135,632	82,997	640,300	23,580	124,441
Loan Provisions	760	648	2,719	-56	636
Shareholders Equity	10,766	6,016	54,741	1,929	10,622
Salaries	1,202	600	12,173	189	1,616
Other Non-Int Income	1,626	1,016	8,703	-319	1,711
Fixed Assets	674	313	3,478	55	704
Net profit	1,535	899	6,716	-282	1,458
Interest Exp	2,306	1,492	8,148	392	1,972
Non-interest Exp	2,059	1,219	9,111	404	2,225

## METHODOLOGY

The Panzar-Rosse approach is used to assess the competitiveness of banking industry. The indicator developed by Panzar & Rosse (1987) enables us to compare and contrast competition between different market structures. The H-statistics of this model enables the identification of the industry as being oligopolistic, monopolistically competitive or perfectly competitive markets. How much a change in input prices can be reflected in the equilibrium revenues earned by banks is identified. In some restrictive circumstances, it is defined as a measure of the overall competition prevailing in a particular sector. To put it differently, the premise of this methodology is that when there is a change in the prices of inputs, banks will employ their preferred pricing strategies in response to the changes as being dependent on the competitive behavior of other market participants in a given industry.

The test is derived from a general banking market model, which determines equilibrium output and the equilibrium number of banks as maximizing profits at both the bank level and the industry level. Two critical implications exist for this equilibrium model. First, at the bank level, profit is maximized where marginal revenue is equal to marginal cost:

$$R_i^l(y_i, \kappa, v_i) - C_i^l(y_i, f_i, q_i) = 0 \quad (1)$$

$$H = \sum \frac{\partial R_i^*}{\partial f_{xi}} \frac{f_{xi}}{R_i^*} \quad (2)$$

$R_i^l$  is the marginal revenue function,  $C_i^l$  is marginal cost function,  $y_i^l$  is the output of bank  $i$ ,  $k$  is the number of banks,  $v_i$  and  $q_i$  consists of exogenous variables that shift the bank's revenue and cost functions, respectively and  $f_i$  is a vector of bank  $i$ 's factor input prices.

Table 5: Interpreting the P-R H statistic

Parameter region	Competitive environment test
$H \leq 0$	Monopoly or conjectural variations short-term oligopoly. Each bank operates independently as under monopoly profit maximizing conditions. H is a decreasing function of the perceived demand elasticity.
$0 < H < 1$	Monopolistic competition Free entry (Chamberlinian) equilibrium excess capacity. H is an increasing function of the perceived demand elasticity.
$H = 1$	Perfect competition, or natural monopoly in a perfect contestable market, or sales maximizing firm subject to break even constraint. Free entry equilibrium with full (efficient) capacity utilization.
Parameter region	Market equilibrium test
$H = 0$	Equilibrium
$H \leq 0$	Disequilibrium

Source: Molyneux *et al.* (1994)

By evaluating the elasticities of the reduced-form revenues against the changes in factor prices in unit using this indicator, the banking competitive behavior can be identified. As proposed by Panzar and Rosse (1987), the range of the estimated value of the H-statistic is from minus infinity to unity. If the H-statistic has a negative value, the market structure of the firm is monopoly or a perhaps also cartel-like oligopoly. In both cases, when the input price increases, marginal costs will also increase, equilibrium output reduces and so subsequently it will lead to a fall in total revenue. On the other hand, if the H-statistic equals unity, it indicates perfect competition where without distorting the optimal output of any individual bank, an increase in input price will lead to a rise in both marginal and average costs. If any of the bank exits the market, the demand will increase evenly in the industry and the prices and total revenue will eventually increase by the same amount as the rise in costs. Finally, the market structure is named as monopolistic competition when the H-statistic is between zero and unity, in which case contestable market equilibrium is developed by potential entry of new entrants, the demand for banking products is inelastic and thus the income increases less than proportionally to the input prices.

Another characteristic of this research methodology is that, without requiring the estimation of output demand or cost function, the input price shocks to the cost function is allowed to have interaction with the revenue function. Moreover, the non-necessity to define the location of the market indicates that it is able to avoid misspecification of market boundaries which may cause potential bias.

We adopt the methods used by Bikker & Haaf (2002a,b), Claessens & Laeven (2004) and Schaeck *et al.* (2009) to approximate the H-statistic empirically. It is shown as the following equations:

$$\ln T_{rev_{it}} = \alpha_0 + \alpha_1 \ln PL_{it} + \alpha_2 \ln PK_{it} + \alpha_3 \ln PF_{it} + \sum_{j=1}^n \zeta_j \ln BSF_{it} + \varepsilon_{it} \quad (3)$$

$$\ln T_{int_{it}} = \alpha_0 + \alpha_1 \ln PL_{it} + \alpha_2 \ln PK_{it} + \alpha_3 \ln PF_{it} + \sum_{j=1}^n \zeta_j \ln BSF_{it} + \varepsilon_{it} \quad (4)$$

where:

the superscript *i* denotes bank *i*, and the upper-script *t* denotes quarter *t*;

$\ln T_{rev}$  – total revenue to total assets (this our proxy for output price in equation 1);

$\ln T_{int}$  – interest revenue to total assets (this our proxy for output price in equation 2);

$\ln\_PL$  – price of personal expenditure, i.e. the ratio of personnel expenses to total assets (proxy for the price of labor);

$\ln\_PK$  – price of capital expenditure, i.e. the ratio of other operating and administrative expenses to fixed assets (proxy for price of fixed capital);

$\ln\_PF$  – price of funds, i.e. the ratio of interest expense to total deposits (proxy for price of funds);

$\ln\_BSF$  – control variables, including: total equity to total assets (EQASST); to control for differences in the capital structure; (loans to assets ratio (LOANASST); loan provision to total asset ratio (RSKASST); total assets (ASST); and

$\varepsilon_{it}$  – random error

$$\text{Here, H-statistics} = \alpha_1 + \alpha_2 + \alpha_3 \quad (5)$$

We begin with a pooled model where all the cross section data are pooled together and the coefficients estimated using OLS. Because of the presence of specific effects for each bank, we then proceed to a model that takes into consideration the panel nature of data, i.e. to account for random-effects (RE) by using generalised least squares regression (GLS) for which an alternative choice is a fixed effects (FE) regression. In all three models, the same set of explanatory variables are used, selected in accordance with the theory as well as the norm established in empirical studies. The choice between fixed effect and random effect models may be justified by theory. In general, fixed effect model should be used if the differences between individuals may be captured through different constant values in the model because it is not always possible to assume that individual random effect is uncorrelated with the explanatory variables, which is the assumed in the random effect model. It is also reflected in other empirical studies, where the authors adapt the Panzar-Rosse approach fixed effect. This is verified by statistical test such as Breusch-Pagan and Hausman tests.

An alternative way to examine competition is to compute direct measure of market power, since greater market power implies less competition: this is the Lerner index, defined as the difference between output prices and marginal costs (relative to prices). The Lerner index is computed using the formula  $(P-MC)/P$ , where  $P$  is the price of banking outputs and  $MC$  is the marginal cost. Following the approach in Fernandez de Guevara, Maudos & Perez (2005; 2007) and Berger, Klapper & Turk-Ariss (2008), we proxy bank output by using Total assets,  $P$  is calculated as total bank revenues over assets, and  $MC$  is calculated by taking the derivative from a translog cost function shown in equation (6):

$$\begin{aligned} \ln(C_{it}) = & a_{oi} + b_0 \ln(Q_{it}) + \frac{1}{2} b_1 \ln(Q_{it})^2 + \sum_{i=1}^{11} a_i \ln(W_{ikt}) \\ & + \frac{1}{2} \sum_{i=1}^3 \sum_{k=1}^3 a_{jk} \ln(W_{kit}) \ln(W_{ikt}) + \sum_{i=1}^3 a_{ki} \ln(Q_{it}) \ln(W_{ikt}) \\ & + \mu_1 \text{Trend} + \frac{1}{2} \mu_2 \text{Trend}^2 + \mu_3 \text{Trend} \ln(Q_{it}) + \sum_{i=1}^3 \pi_{ki} \text{Trend} \ln(W_{ikt}) + \mu_{it} \end{aligned} \quad (6)$$

where  $i$  denotes banks,  $k$  denotes variables and  $t$  denotes years.  $C$  is total operating plus financial costs,  $Q$  is total assets,  $W1$  is the ratio of ratio of personnel expenses to total assets (proxy for input price of labor),  $W2$  is the ratio of interest expenses to total deposits and money market funding (proxy for input price of deposits) and  $W3$  is the ratio of other operating and administrative expenses to total assets (proxy for input price of equipment/fixed capital). We also include a time trend to capture the influence of technical change leading to shifts in the cost function over time. As in most papers, the estimation is done under the restrictions of symmetry and degree one homogeneity in the price of inputs. However, our results do not change if we drop these constraints.

The estimated coefficients of the cost function are then used to compute the marginal cost. As the marginal cost is the derivative of total cost in relation to output, it can be estimated as the derivative of the logarithm of total cost to logarithm of output as the ratio of marginal cost to total cost multiplied by output. As a consequence, marginal cost is equal to the product of

the derivative of the logarithm of total cost to output (that is, the derivative of equation to total assets TA) multiplied by the ratio of total cost to output). The advantage of the Lerner Index, against the H-statistic is that it is not a long-run equilibrium measure of competition. Because of this, the Lerner index can be calculated at each point in time. Hence, we apply two very powerful measures to judge the competition of the banking industry in this study

## FINDINGS

This study uses equations (3) and (4) to study the effects of post-merger (2006-2014) competition in the Malaysian banking sector. Table 6 is a summary of results of the panel regression on the competitive conditions. Columns 2–4 contain the figures derived from the TREV estimation. Overall, looking at the goodness of fit statistics, the model is appropriately specified although the fit for LTREV only account for 40-64 per cent of the data, while the fit for LTINT is higher 30-85 per cent. The H-statistics for LTREV has the theory-predicted sign in all models ranging from 0.05 to a high 0.14 as shown in Table 6. In earlier studies (Claessens & Laeven, 2004, Al-Muharrami *et al.*, 2006), Perera *et al.*, 2006, Aktan & Masood, 2010 and Mensi, 2010)) the H-statistics range between 0 and 1, implying a monopolistic market structure. In Table 6, we presented the results for the 3 models, Pooled OLS, Panel FE and Panel RE. Our tests (using Breusch and Pagan Lagrange Multiplier tests) showed that the Panel data is more suitable than the pooled data because of the presence of heterogeneity among banks in our sample. Between the Panel FE and Panel RE, the Hausman test indicated that the null hypothesis of no correlation between explanatory variables is rejected. This leads us to use the results of the FE model as it is more appropriate and the rest of our findings will be discussed using FE results.

Our study of Malaysia's banking sector indicates a market structure that is closer to cartel or near monopoly (given the value of 0.05 using FE model. In the equation for LTINT, the goodness of fit is higher for the FE model which explains 85 per cent of the variation in the dependent variable. This would have us state that the banks enjoy a near monopoly or near cartel like power in generating interest revenue segment of banking during the post-merger period. According to Suffian, (2007), the value was much higher, meaning more competition.

For the FE models, our analysis of TREV equation indicates the coefficient of price of labour (PL) is positive, suggesting an increase in labor cost contributes to higher revenue. This is possible because of fee based income which requires higher level of skilled labor. In the equation for LTINT, the coefficient for PL is negative, which means higher labor cost leads to lower interest income (LTINT). The PL coefficient contributes the highest to the H-statistic in the LTREV model while PF has the highest contribution to the H-statistic in the LTINT equation. Among the prices of factor inputs, only P(K) and P(F) are statistically significant for the LTINT equation. The elasticity of the price of labor (PL) becomes a more economically meaningful and statistically significant as banking moves towards a more fee-based income captured in total revenue equation.

Turning to the impact of other bank-specific control variables, the coefficient on ASST is negative and statistically significant. This is unlike results of the earlier studies by Berger *et al.* (1997), Boyd & Runkle (1993) and Athanasoglou *et al.* (2008). Their findings were based

on when banking industry was just developing, so marginal cost can be lowered as banking firms operate to their capacity. However, this can only be achieved up to a certain point before diseconomies of scale set in. Beyond this point, as in Malaysia's experience for 2006-14 suggests, the impact of size can be negative as confirmed also in Suffian (2011).

Table 6: Panel Regression Results of competitive condition for Total Revenue and Total Interest Revenue

Variable	Pooled OLS	Panel FE	Panel RE	Pooled OLS	Panel FE	Panel RE
	LnTREV			LnTINT		
constant	-2.7890*** (-3.71)	0.8418 -1.63	-1.3378*** (-3.08)	-2.0270*** (-2.98)	1.5049*** -3.48	0.5029 -1.19
LnPK	0.033 -0.98	-0.004 (-0.18)	-0.016 (-0.64)	0.007 0.15	0.0365* -1.98	0.017 -0.84
LnPL	0.2296* -1.99	0.0578* -1.89	0.1170*** -3.17	0.106 -1.43	-0.0022 (-0.09)	0.0059 -0.21
LnPF	-0.1254*** (-5.01)	-0.003 (-0.11)	-0.012 (-0.35)	0.151 -1.88	0.2755*** -10.87	0.2711*** -10.05
LnAsst	0.028 -0.78	-0.2882*** (-5.96)	-0.0647* (-1.86)	-0.002 (-0.05)	-0.3252*** (-8.03)	-0.2237*** (-5.85)
LnEqasst	0.162 -1.07	0.2432*** -4.11	0.2430*** -3.37	-0.049 (-0.48)	0.0841* -1.69	0.073 -1.28
LnRskasst	0.0391* -1.89	-0.005 (-0.29)	0.0464 -2.7	0.051 -1.86	-0.024 (-1.63)	0.0043 -0.28
LnLoanasst	-0.5390*** (-2.81)	0.1498 -1.25	-0.1196 (-0.90)	0.048 -0.19	0.0091 -0.09	-0.012 (-0.11)
Adjusted R <sup>2</sup>	0.6432	0.621	0.4877	0.3029	0.8526	0.8418
F-stat	67.72	18.03	72.86	14.52	63.63	330.7
Hausman test	36.41	(p-val = 0.00)	29.71	(p-val=0.0001)		
H-statistics	0.137	0.051	0.089	0.264	0.31	0.294
No of Obs.	95	95	95	95	95	95

The impact of capitalization on total earnings is also positive as shown by the coefficient on EQASST (statistically significant at the 0.01 level). It is not only statistically significant but also economically significant as the value of 0.26 is the highest among the variables in the LTREV equation. This confirms theory prediction about well capitalized banks having lower cost of bankruptcy, so will have lower cost of funding. The impact of credit risk on LTREV is negative and statistically insignificant. Berger & DeYoung (1997) suggests that a bank in the short-run may rationally choose to have lower costs by skimping on the resources as the banks seek to maximize profits in the long run. After the consolidation phase, banks in Malaysia did not skimp on their resources, paying careful attention to their loan performance and providing more loan provisions for their loans.

The positive coefficients for LOANASST and LTREV indicate positive relationship between bank total revenue and the level of loan to liquid assets. During the post-merger period,

our test period, empirical findings seem to suggest that the more liquid banks disbursing more loans tend to exhibit higher total revenue. This could be due to the ability of the banks who have more liquid assets will be able to give out loans when the opportunity arises. Loans are the type of assets which need funding (Ben Naceur & Omran, 2011). However, as indicated in the results, the coefficient is not statistically significant.

The results using total interest revenue (TINT) in our study are also presented in Table 6. Similar to the TREV estimation, we used the sample period 2006-14, the post-merger period. The adjusted R<sup>2</sup> of 85 per cent as goodness of fit measure of the models is excellent for the FE model. The F-statistics for all models are also statistically significant at the 0.01 level. As in the LTREV models, the H-statistics are also positive at higher level than in the TREV equations. Compared to a pre-merger (Suffian 2011) study, the H-statistic of 31 per cent in our FE model test is higher than those gotten by (Suffian 2011).

Unlike the results from the LTREV models, the results from the LTINT models seem to suggest that the coefficients of price of labor (PL) variable is negative. That suggests an increase in the factor costs to lead to lower total interest revenue from loans. The higher cost of labor will affect interest revenue from loans, since loan disbursement is labor intensive. The coefficient of price of funds (PF) and that of price of funds (PF) are both positive on LTINT. Those are as per expectation in view of the mark-up pricing model of most banking institutions, which are to pass on the cost of funding to customers. The coefficient on (PF) is statistically significant during the post-merger period of our study. The price of capital (PK) is significant at the 10% level under FE model. The major contribution to the size of H-statistic comes from price of funds (PF) followed by the price of capital (PK). Finally, as before, the impact of bank size is negative on bank interest income under the TINT models. We find that the level of capitalization (EQASST) exerts a positive impact on bank interest income during the post-merger period, although the coefficient is not statistically significant.

For the above discussion to be valid, the banking sector should in the long-run be in equilibrium. The reason for this is simply the fact, if it is in equilibrium, the dependent variable should not be correlated with the factor input prices.

$$\ln(1 + ROA_{it}) = \alpha_0 + \alpha_1 \ln PL_{it} + \alpha_2 \ln PK_{it} + \alpha_3 \ln PF_{it} + \sum_{j=1}^n \zeta_j \ln BSF_{it} + \varepsilon_{it} \quad (7)$$

Table 7: Panel Regression Results of equilibrium conditio

Variable	Pooled OLS	Panel FE LROA	Panel RE
constant	-0.0233 (-1.27)	0.0484 (1.90)	-0.0057 (-0.48)
LnPK	0.0000 (0.3)	-0.0001 (-0.01)	0.0001 (0.12)
LnPL	-0.0010 (-0.57)	-0.0017 (1.12)	0.0010 (0.48)

Table 7. (Cont.)

LnPF	-0.0020*	-0.0021	-0.0037***
	(-1.89)	(-1.43)	(-3.56)
LnAsst	0.0013*	-0.0038	-0.0038
	(1.93)	(-1.58)	(0.55)
LnEqasst	-0.0018	0.0025	-0.0009
	(-1.03)	(0.84)	(-0.36)
LnRskasst	0.0023	-0.0027***	-0.0011**
	(0.57)	(-3.05)	(2.24)
LnLoanasst	-0.0032	0.0012	-0.0054
	(-1.55)	(0.19)	(-1.38)
Adj R <sup>2</sup>	0.1635	0.2305	0.1219
F-stat	3.350	3.2500	16.220
Hausman test	21.26	(p-val = 0.0034)	
H-stat	-0.003	-0.0005	-0.0030
No of Obs.	95	95	95

The equilibrium position in the banking sector is assessed by estimating equation (7) by using ROA as the dependent variable, where ROA is the return on total bank assets. We define equilibrium E-statistics as being equal to  $\alpha_1 + \alpha_2 + \alpha_3$ . We test whether E=0, using F-test. If the test rejects the null, the market is assumed not to be in equilibrium. The idea behind this test is that, in equilibrium, risk-adjusted rates of return should be equal across banks and returns on bank assets should not be related to input prices.

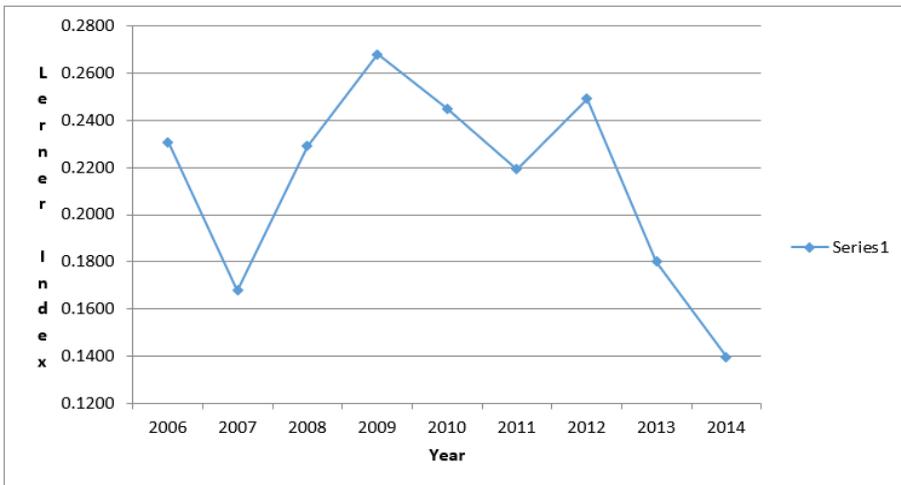
This approach for testing whether the observations are in long-run equilibrium is established in the literature (see e.g. Shaffer, 1982; Molyneux *et al.*, 1996; Claessens and Laeven, 2004; Schaeck *et al.*, 2009). Table 7 presents the results of our regression and test. The Wald  $\chi^2$  test value shows we reject the null hypothesis that H = 0, as to whether the market is in equilibrium. Therefore rejection of the null points to the conclusion that the Malaysian banking sector is in equilibrium in the long-run in the period tested.

## Lerner Index

Table 8: Summary statistics of Variables used in the Lerner index banking industry computation (2006-2014)

	P	w1	w2	w3
Mean	0.0642	0.0084	4.0380	0.0319
Median	0.0638	0.0075	3.3894	0.0250
Maximum	0.0729	0.0543	17.7513	0.1504
Minimum	0.0577	0.0041	0.6346	0.0030
Std. Dev.	0.0059	0.0052	2.7383	0.0264

The Lerner Index indicates rising market power, so less competitiveness among banks in the system: Figure 3 statistics computed by the World Bank using data from Bankscope,<sup>1</sup> the Lerner Index has risen steadily from -0.12 to 0.435 (a 41 per cent rise) between 2006 and 2010. Using the World Bank methodology, the author has extended the calculation to 2014, and this shows a similar trend whereby the Lerner Index declined from a high of 0.25 in 2010 to a low of 0.22 in 2011 and again rose to a high of 0.25 before declining to 0.14 in 2014. The decline in competition up till 2010 is as per expectation amidst bank mergers and consolidations, which is also consistent with our findings using the H-statistic. The rebound of the Lerner index to 0.25 indicates a slow move towards competitive banking in recent few years after a period of consolidation right up to year 2010.



Source: Author's calculation.

Figure 1: Lerner Index for Banking Institutions in Malaysia, 2006-14

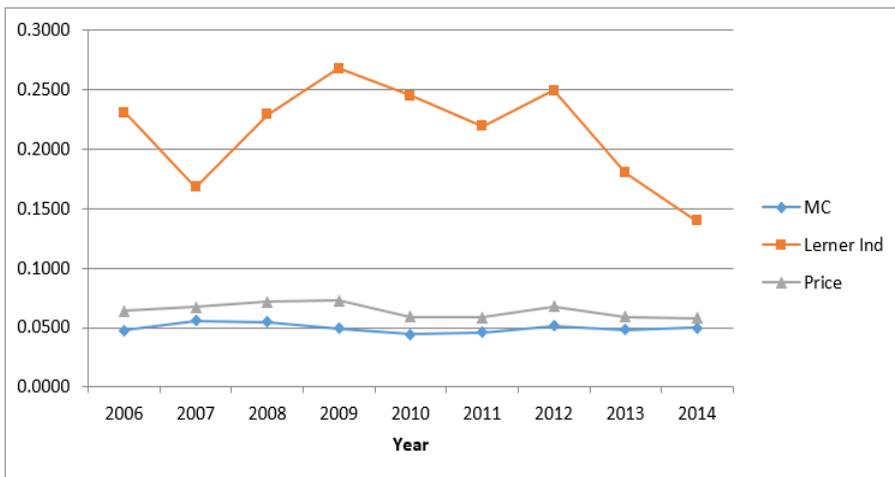


Figure 2: Trend in Output price, Marginal Costs and the Lerner Index, 2006-14

<sup>1</sup> World Bank computation as shown in Bankscope based on (Anginer, D, Demirguc-Kunt A, & Zhu Min 2012)

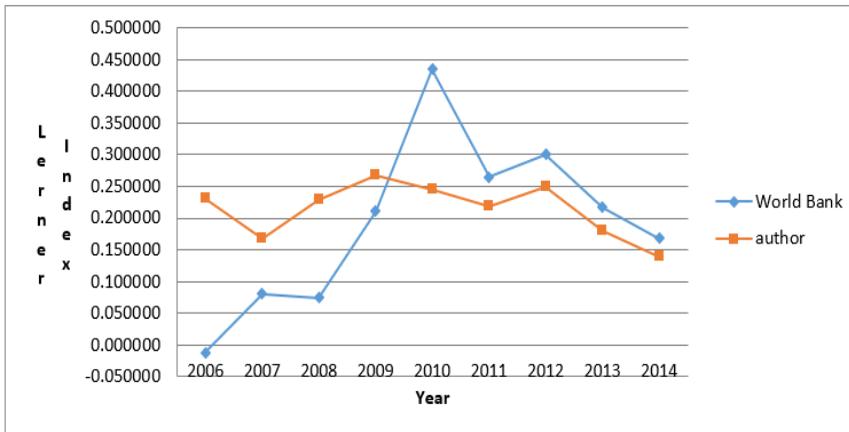


Figure 3: A Comparison with World Bank computation

Relative to measures reported for other countries, the current number for Malaysia seems to indicate greater evidence of market power, and hence a lower degree of competition after the restructuring completed in 2003. Only in post 2010 period a slow recovery towards competition is underway.

## CONCLUSION

This article is a timely exercise to assess the impact of the 2002/3 merger-consolidation of a middle-income country's very weak banking sector with periodic failures to improve its long run resilience. The study aims to assess competitive conditions in the recent years to 2014, using the widespread non-structural test developed by Panzar & Rosse (1987) as well as the Lerner Index. Both measures are hailed as excellent measures for estimating competition in an industry.

The main finding is that during the post banking consolidation period of nine years, the Malaysian banking sector have earned their profits under conditions of increasingly monopoly or cartel-like environment. From a theoretical perspective, this conclusion is most plausible for characterizing the performance structure of the banks after a period of consolidation in 2002/3 to stop the general weakness of the banks prior to that period. Compared with similar measures estimated from data in pre-merger period, the banking sector has regressed more towards monopolistic condition.

From a social welfare perspective, there are still conflicting views on the desirable degree of competition the banks in a middle-income small economy may be able to sustain. Increased competition in the banking markets will benefit investments and economic performance, while too much competition may also lead to lower market power and lower profitability of banks, weakening their ability to withstand adverse developments of the kind that troubled this country's banking sector during 1957 and 2001. Remarkably, the trade-off between the costs and benefits of competition appears to have led to less competition yet more stability as

aimed by the regulators and supervisors. The findings reported in this study using corroborating measures for the first time, appear to suggest increasing concentration from consolidation may lead to the undesirable cartel-like industry structure where the exercise of market power in the name of stability may not be welfare promoting.

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