

MARKET STRUCTURE AND BANK COMPETITION CONDITIONS IN MALAYSIA

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Abstract

This study investigates the market structure of banking industry in Malaysia from 1996–2009, using the k-bank concentration ratio (CR_k) and the Herfindahl Hirschman Index (HHI). It also evaluates the monopoly of banks over the fourteen years' period using the 'H-statistic', Panzar-Rosse approach. The k-concentration ratio showed Malaysia was moderately concentrated market, moving to a less concentrated one. Meanwhile, the Herfindahl Hirschman Index result showed a constant concentration ratio throughout the period. The Panzar-Rosse H-statistics suggested that banks in Malaysia were operating under monopolistic competition based on total interest income and total revenue as the dependent variables. In the long-run equilibrium, the Panzar-Rosse H-statistics suggested that Malaysian banks were operating under perfect competition. The findings of this study highlight the importance of size, efficient risk management and liquidity in sustaining long run revenue and competition. In order to compete in the next era of globalization, an ongoing investment in technological aspects related to banking products and services should be one of the essential policies for the banks to prosper.

Keywords: Concentration; Market structure; Competition; Panzar-Rosse model; k-bank concentration ratio (CR_k) and Herfindahl–Hirschman Index (HHI)

1.0 Introduction

In the banking world today, financial institutions offer a greater variety of products and services in order to diversify their business. Not only these institutions offer loans such as term deposits but they also offer other banking products related to risk management, investments and retirement plans. As a result, their services overlap and competition between the institutions increased.

The advancement in technology has also changed the banking environment. The internet has promoted more intense competition among financial institutions. Institutions offering online banking services can reduce costs, increase efficiency and intensify the banking competition. The use of internet also has made it possible for non-banking institutions to compete with securities firms by conducting security offerings online and selling directly to investors. Internet has, indirectly, forced banking institutions to offer more competitive services to the consumers.

Regardless of the level or the competitiveness of the environment, a commercial bank's performance needs to be monitored closely. A commercial bank is monitored for various reasons. From an early detection of slow growth in their performance, the bank regulators can identify banks that are experiencing problems so that they could be remedied. In addition, commercial banks also evaluate their

own performance over time to determine the outcomes of previous management decision so that changes can be made where appropriate. In the Asian region, almost all countries are affected during the late 1997 financial crisis. Some banks in Indonesia and Thailand had to be closed, unable to stand the financial turmoil. Thus, assessing the performance of commercial banks is important. Without consistent monitoring, existing problems may go unnoticed and may cripple the institution's growth in the future. The scope of performance measurement varies and can be from the profit, productivity, efficiency, market power as well as the level of the institution's competitiveness.

2.0 Competition and Concentration: Why it matters?

Fritzer (2004) defined concentration of banks as the ratio of a country's three largest bank's assets to the country's total banking sector assets. A highly concentrated banking sector may lead to lack of competition whereas fragmented banking markets may suffer from undercapitalized banks. Fragmented banking markets are thus at a higher risk to suffer from financial market shocks. However, both high concentrated and overly-fragmented banking sectors may have negative effects on efficiency and growth as well as financial stability.

A highly concentrated banking sector is deemed important for any economy as it may enhance the economic growth. Highly concentrated banking sector has stronger resistance to financial crises as large banks in the sector tend to spread their activities geographically (Fritzer, 2004). Banking sector concentration can also be expected to have a positive effect on bank lending. Due to its level of concentration, the sector is able to take advantage of economies of scale especially in the production of banking services by consolidating the output of different banks. This in return, may lead to banks having higher market share with a superior cost structure. Concentration ratios, which are based on the fraction of the banking market served by the largest four or five banks in the country, are often used as a proxy to measure competitiveness.

According to Staikourous (2010), the degree of banking competition and its association with market concentration, seem to contrast each other. If we accept the theoretical proposition, then, a more concentrated market implies a lower degree of competition due to undesirable exercise of market power by banks. Based on other theory, for instance, the contestability theory¹, it highlights that under particular conditions, competition and concentration can coexist. The theory of contestability (Baumol, 1982; Baumol et.al., 1982) assumes that firms can enter or leave rapidly any market without losing their capital and that potential competitors possess the same cost functions as firms that already serve in the market. These characteristics imply that in the contestable market the threat of potential entry constrains firms to price their products competitively. If these conditions are met, then external conditions will dominate internal conditions and guarantee non-collusive behaviour within that market.

On the other hand, a more concentrated system, in as much as it implies the presence of a few relatively large banks, is more likely to display a "too big to fail" problem by which large banks increase their risk exposure anticipating the unwillingness of the regulator to let the bank fail in the event of insolvency problems (Hughes and Mester, 1998).

Another reported reason for bank failures is increased competition. By studying the level of competition in the banking industry, it can shed some light, if any, on the sign of bank poor performances. Deregulation has made the banking industry more competitive. When banks offer more competitive rates on deposits and loans, the result is a reduced net interest margin, and possibly failure, if the margin is not large enough to cover other noninterest expenses and loan losses. A review by The Office of the Controller of the Currency in the United States found that 81 percent out of the 162 failed banks since 1979 were due to not having a loan policy or did not closely follow their loan policy. In addition, 59 percent of these banks did not use an adequate system for identifying problem loans. From this, it can be

deducted that banks can fail not only due to the economic environment but also due to their inadequate management.

A competitive banking market may result in more benefits to the society as a whole, such as lower prices and higher quality of financial products (Boyd and Nicolo, 2005), but on the other hand its influence on the financial stability is not conclusive according to the literature. There are two main rival theories on this matter. Some papers find that competition, in fact, enhances bank risk-taking behavior, since it pressures banks to operate with a minimum capital buffer (Hellman et al., 2000; Allen and Gale, 2004). Others defend the contrary by stating that crises are less likely to happen in competitive banking systems (Beck et al., 2006; Boyd and Nicolo, 2005).

The landscape of Asian banking has shifted rapidly in the last decade and it will continue to do so. Asian countries provide growth opportunities that are unlikely to be matched by maturing banking markets around the world (Bowers et al., 2003). Aside from Singapore, Korea and Japan, most Asian economies are marked by a wide disparity of income. In many of them, the gap is growing, resulting in the formation of a narrow segment of affluent customers who are the main drivers of the new banking opportunities.

3.0 Objectives of the Study

This study seeks to evaluate the degree of competition in the Malaysian banking sector. This study also aims to test the market power in Malaysian banking sectors using the concentration ratio and Herfindahl-Hirschman Index. It will estimate the competitive level for Malaysian banks.

Specific objectives of this study are:

- i. To assess the k-concentration ratio conditions in Malaysia
- ii. To analyze the market power conditions of Malaysian banking industries using the Herfindahl-Hirschman Index.
- iii. To examine the competition conditions and their determinants of the banking industries in Malaysia using the Panzar-Rosse method.

4.0 Theoretical Framework

Neoclassical economics is a general approach in economics focusing on the determination of prices, outputs and income distributions in markets through supply and demand. These are mediated through a hypothesized maximization of income-constrained utility by individuals and of cost-constrained profits of firms employing available information and factors of production. The neoclassical theory of the firm portrays the marginal cost curve and the average cost curve as distinctly U-shaped. Princeton's William Baumol has developed the notion of a contestable market, which means a market in which firm entry and exit are costless and virtually so. Contestability is a measure of the extent to which a market is open to new entry and where the competitive pricing can be observed. The contestable markets approach to competition represents an alternative to the neo-classical theory of the firm.

Contestability became prominent in the early 1980s, largely through the work of the American economist William Baumol (1982). Baumol defined contestable markets as existing markets where "an entrant has access to all production techniques available to the incumbents, is not prohibited from wooing the incumbent's customers, and entry decisions can be reversed without cost."

There are three main conditions for pure market contestability which include perfect information and the ability and/or the rights of all suppliers to make use of the best available production technology in the market, the freedom to market/advertise and enter a market with a competing product and the absence of sunk costs which reduces the risks of coming into a market.

One of the contestable market fundamental features is low barriers to entry¹ and exit. A perfectly contestable market would have no barriers to entry or exit so that there is always the potential for new suppliers to come into a market to provide fresh competition to existing suppliers. If a firm in a market with no entry or exit barriers raise its prices above marginal cost and begin to earn abnormal profits, potential rivals will enter the market to take advantage of these profits. When the incumbent firm(s) responds by returning prices to levels consistent with normal profits, the new firms will exit. In this manner even a single-firm market can show highly competitive behavior. At the extreme, a market with no barriers to entry or exit is perfectly contestable. For a perfectly contestable market, entry into and exit out of the market must be costless. Considerable criticism surrounds this theory because there are often large entry and exit costs associated with entering a market.

Barriers to entry are one of the main features in contestable market. The newly identified barriers in any industry nowadays are mostly found behind the national frontier. They are not the result of measures imposed at the border deliberately to impede imports; instead, they are internal to the domestic economy of a trading nation. They include domestic regulatory policies, which often favor established, incumbent firms by retarding or preventing the entry of new competitors into regulated markets. Such regulations are of concern to any business transaction, in particular of a trade policy, if they impede or block market access by foreign firms via either imports or direct investment. Market access barriers can also be created by industrial policies that grant subsidies and subsidy-like benefits to favored firms.

In addition to government measures, private business practices can also create market entry barriers. These practices include “vertical restraints” such as exclusive dealing relationships between firms, thereby forestalling possible sales by other firms. It is difficult for public policy to deal with these practices because they might be economically justified by the efficiencies they make possible. Nonetheless they may create market access barriers and it is legitimate for policy makers to question whether the anti-competitive effects outweigh any resulting efficiencies.

Private and public measures may come in combinations that reinforce their market-restricting effects. Although the combinations are not specifically border measures, it may be argued that in some cases they have been created with the intent to favor domestically-owned firms over foreign-owned or -controlled ones.

Another major barrier to exit is sunk costs. Indeed, it was suggested by Baumol that markets would be contestable provided there were no sunk costs. Sunk costs are costs that have been committed by a business that cannot be recovered once a firm has entered the industry. It might be easier to think of sunk costs as costs that are unavoidable once they have been committed at a particular moment in time. Sunk costs will be low where the firm can sell or in other ways dispose of its capital equipment without cost. When sunk costs are high, a market is more likely to produce a price and output similar to monopoly.

¹ Barriers to entry, include, special licenses, patents, and copyrights, high fixed costs, marketing barriers (legal and illegal) constructed by incumbent firms

The existence of supernormal profit, no matter how small, would trigger new entry in such a market. On the basis of the assumption that existing firms wish to discourage new entry, the logical conclusion is that they will set prices at such a level that only normal profits are made. They will also produce at lowest possible average cost. If they did not, a new entrant would be able to do so and use the cost saving to undercut the existing firm on price and capture some of the market.

The theory of contestable markets suggests that even if there is only one seller, the seller may be forced to act as if there were many more. In contrast, there are times when great numbers of sellers are able to organize and act as a unified seller. Sellers have the incentive to act in this way because it will increase profits. The key to their success is their ability to restrict sales.

Contestable markets are also characterized by 'hit and run' entry. If a firm in a market with no entry or exit barriers raises its prices above marginal cost and begins to earn abnormal profit, potential rivals will enter the market to take advantage of these profits. In this manner even a single-firm market can show highly competitive behavior.

The reality is that no market is perfectly contestable as there are always some "barriers to contestability". Virtually, every market is contestable to some degree even when it appears that the monopoly position of a dominant seller is unquestionable. This can have important implications for the competitive behavior (conduct) of existing firms; it also affects the performance of a market from an economic efficiency stance such as productivity and technical efficiency. Contestable markets are different from perfect competitive markets. For example, it is feasible in a contestable market for one firm to dominate the industry, have price-setting power and also for firms in a market to produce a differentiated product both of which stick to the assumptions behind the traditional model of perfect competition.

Among other things, pricing in a contestable market is competitive; in other words, prices are maintained at levels that would prevail if a very large number of sellers participate in the market. If prices are held at competitive levels, consumers will receive the benefits of competition even though there may be few sellers in the market. Firms in contestable markets for technologically advanced products and services must also constantly strive to improve the products or services they offer (and to introduce new products at a satisfactory rate) and/or to reduce their operating costs; otherwise, they will be overtaken by new rivals in the marketplace.

Consequently, in contestable markets allocative efficiency is high because prices are competitive and quantities sold commensurate with demand at these prices. In such circumstances, sufficient resources are allocated to produce the relevant goods and services, with the result that there is neither under capacity nor overcapacity. As their innovation rates are high, contestable markets tend to be dynamically efficient as well.

Contestable markets can affect the performance and conduct of businesses. The actual behavior of agents in the market that is more important than a simple picture of market share. Not all markets can, however, be fully contestable. A prerequisite for entry into some markets is high fixed costs, allowing only one supplier of the good or service concerned to operate efficiently.

In the globalization and technological advancement age, there has been an increase in the number of markets and industries that are genuinely contestable. The factors that explain this development include competitive advantages, market liberalization, change in competition policy, single market activity and technological change.

In addition, mergers within industries such as banking, telecommunications and airlines have created a stir among consumers who claim that economic freedom and efficiency are being sacrificed in favor of corporate profits. The theory of contestable markets postulates that firms in imperfectly competitive markets may act as though they operate in a purely competitive market when entry and exit are perfectly (or nearly) costless. Firms generate a normal profit when faced with the threat of additional market entrants. As a result, consumers can continue to enjoy the lower prices that accompany competition; the merger between firms and subsequent strengthening of business concentration may not have detrimental effects on consumers.

The challenge for public policy makers is not to limit competition in the sector but rather to find ways of increasing contestability despite the high degree of natural monopoly. These features of contestable markets imply that a concentrated banking market can be effectively competitive even if it is dominated by a handful of large banks. Therefore, policy makers should be relatively less concerned about the market dominance of some types of financial intermediaries in a country's financial system, if the financial markets are contestable. Based on these arguments, deregulation and liberalization will likely make the banking industry more contestable or open to competition.

5.0 Market power and structure

Market power can generally be defined as the ability of a particular seller, or group of sellers, to influence the prices of a product to their advantage over a sustained period of time. In terms of market structure, the contestable theory says that cost of production is minimized in the long-run equilibrium of a perfectly contestable market. In a simpler form, market power can be defined as the ability to sell products above the marginal cost. In the case of single-product firms with at least two firms in the market the theory of contestable markets predicts that production will take place where returns to scale are constant.

An area that link to competition and banking structure is the effect towards economic growth and development. When market power is high, firms can increase prices and produce less goods and services, provoking inefficient resource allocation as well as reduced capital accumulation and growth.

There are various methods used to measure competition level and market power, in particular, in the area of banking industry. Amongst the most popular methods are the Lerner Index, the Herfindahl Hirschman Index, the Bresnahan-Lau Model and the Panzar- Rosse of H-Statistic Index.

5.1 Measures of Concentration and Competition

5.1.2 Concentration Measurement

Market concentration is a measure of the number of firms in a given market. The degree to which market power can be exercised in a given market is largely a function of market concentration; however, it also depends upon the structure of the market, the nature of the particular product being sold in this market, the ease of market entry for new firms and the price elasticity of demand for the product.

Based on Cetorelli (1999), the use of concentration ratios to evaluate competitive conditions relies on the theoretical predictions of the structure-conduct performance paradigm. According to this paradigm, structure affects the conduct of firms, which ultimately determines their performance. Concentration of market shares will facilitate the adoption of collusive conduct and, ultimately, the setting of prices departing from the perfectly competitive benchmark. In a perfectly competitive market, firms are considered too small to have an individual impact on the price of the goods they produce. From the point of view of social welfare, perfect competition represents an ideal benchmark, since bank customers pay

the lowest possible price for the product they demand. Any situation in which firms command some degree of market power and are therefore able to set higher than competitive prices implies a social cost in terms of welfare loss for consumers.

According to Bikker and Haaf (2002), despite the many different approaches to concentration measurement, general agreement prevails that the constituting elements of concentration measures are the number of banks (fewness) and the distribution of bank sizes (inequality) in a given market.

Concentration indices exhibit the general form of:

$$CI = \sum_{i=1}^n s_i w_i$$

where s_i is the market share of bank i , w_i is the weight attached to the market share and n is the number

of banks in the market in question. Based on Bikker and Haaf (2002), there are ten concentration ratios which are summarized as follows:

The k concentration index is very simple and requires limited data, measured by summing only over the market shares of the k largest banks in the market.

The third approach has received widespread acceptance by the academic community. Panzar and Rosse (1987) test, or the so called “H-Statistic”, is a popular method used in accessing the competition level in the area of banking. This test is based on empirical observation of the impact on firm-level revenues of variations in factor input prices. The Rosse-Panzar H-statistic is the sum of the elasticities of a firm’s total revenue with respect to its factor input prices. Panzar and Rosse showed that, under certain assumptions, the comparative static properties of this type of equations provide a proxy for the overall level of competition prevailing in the market. The Panzar-Rosse approach relies on the premise that banks will employ different pricing strategies in response to changes in input costs depending on the market structure in which they operate. Hence, whether a bank operates in a competitive market or exercises some monopoly power can be inferred from an analysis of that bank’s revenue as it responds to changing input prices.

In order to measure the competitive structure of the industry, Panzar-Rosse established the “H-statistic”; this is estimated as the sum of the elasticities of the reduced form revenues with respect to input prices. More specifically, the H-statistic measures the percentage change in a bank’s equilibrium revenues caused by one percent change in all of the bank’s input prices.

The Panzar-Rosse test has a clear interpretation when applied to the study of markets, given that H represents the percentage variation of the equilibrium revenue derived from a unit percent increase in the price of all factors used by the firm. For a monopoly, a perfectly colluding oligopoly or a homogeneous conjectural variations oligopoly, the value of the H-statistic is less than 0. When the observed firm is in a symmetric perfectly competitive market in long-run equilibrium, then $H = 1$.

6.0 Literature Review

The Panzar-Rosse method has been employed in numerous studies that have examined the competitive structure of the banking industry in various countries. Table 1.2 summarizes the past and recent studies conducted applying the Panzar-Rosse test in the area of banking.

Table 1: Applications of the Panzar-Rosse Methodology in Banking Studies

Authors	Period	Countries	Results
DEVELOPED ECONOMIES			
Shaffer (1982)	1979	New York	1982 -Monopolistic competition
Nathan and Neave (1989)	1982–84	Canada	1983-84 - Perfect competition; 1983–84: Monopolistic competition
Molyneux et al. (1994)	1986–89	France, Germany, Italy, Spain, UK	Monopoly.: Italy; Monopolistic competition: France, Germany, Spain, UK
Vesala (1995)	1985–92	Finland	Monopolistic competition for all but two years
Coccoresse (1998)	1988–96	Italy	Monopolistic competition
Coccoresse (2004)	1997–99	Italy	Monopolistic competition
Rime (1999)	1987–94	Switzerland	Monopolistic competition
Hondroyiannis et al. (1999)	1993–95	Greece	Monopolistic competition
Bikker and Groeneveld (2000)	1989–96	15 EU countries	Monopolistic competition (except Belgium and Greece with Perfect Competition)
Yeyati and Mico (2003)	1993-2002	Argentina, Brazil, Chile, Colombia, Costa Rica, El Salvador, Mexico and Peru)	Monopolistic competition
Belaish (2003)	1997-2000	Brazil	Oligopoly
Yildirim and Philippatos (2007a)	1993-2000	14 Central and Eastern European Countries (CEE)	Monopolistic competition (except 2 Macedonia and Slovakia)
Negrin et al. (2006)	2000-2005	Mexico	Monopolistic competition
Matthews et al. (2007)	1980-1984	British Banks	Monopolistic competition

Continued

Authors	Period	Countries	Results
De Bandt and Davis (2000)	1992–96	France, Germany, Italy	Monopolistic competition : Large banks in all countries; small banks in Italy
Bikker and Haaf (2002)	1988–98	23 OECD countries	Monopolistic competition
Hempell (2002)	1993–98	Germany	Monopolistic competition
Drakos and Konstantinou	1992-2000	Central Eastern European and Former Soviet Union	Monopolistic competition
Mamatzakis et al. (2005)	1998-2002	Seven Southern Eastern European	Monopolistic competition
Mkrtchyan (2005)	1998-2002	Armenia	Monopolistic competition
Koutsomanali-Fillapaki and Staikouras (2005)	1998-2002	EU10vs.EU15	Monopolistic competition
Gutierrez de Rozas (2007)	1985-2005	Spain	Monopolistic competition
Murjan and Ruza (2002)	1993-1997	Middle East	Monopolistic competition (oil-producing countries are less competitive than non-oil producing countries)
Staikouras and Kuotsomanoli (2008)	2008	European Union	Monopolistic competition
Anzoategui et al. (2010)	1994-2008	Middle East and North Africa	Monopolistic competition
Wezel (2010)		Central America	Monopolistic competition
Castellanos and Garza-García (2013)	2002-2012	Mexico	Monopolistic competition

EMERGING ECONOMIES

Authors	Period	Countries	Results
Gelos and Roldos (2002)		8 countries in Latin America & Europe	Monopolistic competition
Claessens and Laeven (2004)	1994-2001	50 countries	Monopolistic competition (Competition is more intense in countries with low barriers).
Gunalp and Celik (2006)	1990-2000	Turkey	Monopolistic competition
Turk Ariss (2009)	1999-2005	Developing Countries	Monopolistic competition
Mensi (2010)	1990-2007	Tunisia	Monopolistic competition
Daley and Matthews (2010)	1998-2009	Jamaica	Monopolistic competition
Aktan and Masood (2010)	1998-2008	Turkey	Monopolistic competition
Tecles and Tabak (2010)		Brazil	Monopolistic competition

Biekpe (2011)	2000-2007	Ghana	Monopolistic competition
Authors	Period	Countries	Results
Simpasa (2011)	2004-2008	Tanzania	Oligopolistic
Fosu (2013)	2002-3009	African	Monopolistic competition
Gorener and Choi (2013)	1992-2009	Turkey	Monopolistic competition

OTHER COUNTRIES

Authors	Period	Countries	Results
	1989-1991Q3;		1989-1991: Monopoly;
Niimi (1998)	1994-1996Q3	Japan	1994-1996: Monopolistic competition
Murjan and Ruza (2002)	1993-1997	Arab Middle East	Monopolistic competition
		Middle East Countries	Perfect competition -Kuwait, Saudi Arabia, UEA
			Bahrain, Qatar - Monopolistic competition
Al-Muharrami et al.(2006)	1993-2002	(Gulf Cooperation Countries)	Monopoly - Oman
Lee and Lee (2005)	1992-2002	Korea	Monopolistic Competition
			Monopolistic competition – Four largest banks;
Yuan (2006)	1996-2000	China	Perfect competition – Small scale banks
Prasad and Ghosh (2007)	1996-2004	India	Monopolistic competition
			Monopolistic competition (Pre-crisis period)
Park (2009)	1992-2004	Korea	Perfect competition (Post crisis)
Maghreyeh and Awartani (2014)	2000-2009	CGC	Perfect competition - market power has a positive influence on bank distress
Naceur, BenKhediri and Casu (2009)	2004-2008	Middle East and North Africa (MENA)	Monopolistic competition
Abdul Majid et al. (2007)	1998-2005	Malaysian Islamic Banks	Monopolistic competition
Demirguc-Kunt et al. (2010)		China	Monopolistic competition
Soedarmono et al.(2012)	2001-2007	12 Asian Countries	Monopolistic competition
Perera, Skully and Wickramanayake (2006)	1995to2003	SouthEastAsia	Monopolisticcompetition

Ou and Tan (2011)	1993-2007	Chinese Banking Industry	Monopolistic competition
Qiang and Qiao (2011)	2000-2007	China	Monopolistic competition
Chen and Yang (2012)	1998-2008	China	Monopolistic competition

Source :Author's compilation.

Using Panzar-Rosse method, Aktan and Masood (2010) examined the competitive structures of the Turkish banking industry from 1998 to 2008 and investigated the factors that explain variances in the degree of competitiveness. The results indicated that the banking industry in Turkey was in a long run equilibrium state. They also found that the banks in Turkey were operating as a whole under conditions of monopolistic competition. The Turkish banks were found to be able to achieve high records of profitability in monopolistically competitive markets.

Daley and Matthews (2010) conducted an empirical assessment of the degree of competition within the Jamaican banking sector during the period of 1998 to 2009. They employed a dynamic version of the Panzar - Rosse Model to estimate market power among the sample of banks that constituted over 90 percent of the banking market. Using the conventional statistical tests, the Daley and Matthews (2010) was unable to reject monopoly/perfect collusion for the merchant banking sector in Jamaica but found competitive conditions in the commercial banking sector. Their result contrasted with earlier findings done on Jamaican banking sector using alternative estimators that found monopolistic competition in the market as a whole.

Anzoategui et al.'s (2010) studied on Russian banks found that government-owned banks appeared to be less competitive than privately-owned banks, and that banks which focused on lending to individuals were less competitive than those that concentrated on financing. The study also found that the top 20 banks appeared to exert more market power relative to smaller banks. On the other hand, there were no significant differences in the competitive behavior of foreign and domestic banks.

Biekpe (2011) empirically examined the degree of bank competition and intermediation efficiency in Ghana. The result obtained suggested a non-competitive market structure in the Ghanaian banking system, which hampers financial intermediation. Biekpe (2011) also found that Ghanaian banks were monopolistically competitive. It was argued that the structure, as well as the other markets characteristics, constituted an indirect barrier to entry thereby shielding the large profits in the Ghanaian banking system. Further, it was argued that policies that encourage and stimulate greater consolidation in the financial sector would go a long way to enhance competition among banks and improve efficiency and profitability.

Simpasa (2011) analysed the competition condition of the Tanzanian banking industry from 2004 to 2008, also by employing the Panzar-Rosse methodology to compute the competitive index. Taking into account risk, efficiency, regulatory and macroeconomic factors, the results showed that banks in Tanzania earned their income under conditions of oligopolistic conduct. Moreover, the competitive index derived from an interest revenue equation was not significantly different from that obtained using an aggregate revenue measure. The result suggested that the degree of contestability from traditional intermediation activities approximates overall bank behaviour. The Tanzanian banking industry greater market contestability can be achieved by adopting measures aimed at stimulating competitiveness in the banking sector, including consolidating gains on the macroeconomic front and allowing more foreign bank entry.

Qiang and Qiao (2011) studied the banking market structure and competition status in China's financial industry based on Panzar-Rosse model from 2000 to 2007 by using the H statistics method. The result showed that China's banking sector is still in monopolistic competition state and the transition from monopoly to moderate competition, and the banking industry needs more competition policy in order to ensure proper competition in China's financial market and promote its development.

Meanwhile, Ou and Tan (2011) examined the competition degree of Chinese Banking Industry from 1993 to 2007 is studied from multi-perspectives based on the basic model of Panzar-Rosse method. They concluded that competition degree of Chinese banking industry fluctuates periodically and deposit prices are the most influencing inputted-factor prices for return on assets. Contrary to common views, the competition between Joint-stock Commercial Banks was less fierce than the competition of the whole banking industry.

Chen and Yang (2012) applied Panzar-Rosse model to assess the competition degree in China's banking industry from 1998 to 2008 on the relationship between financial market development and China's banking competition. The results showed that banks in China were operating basically under monopolistic competition, the competition effect of financial market development has a more significant influence on China's banking competition at the present stage, and both asset scale and liquidity of stock market played a significant role in promoting China's banking industry.

Bikker et al. (2012) summarized empirical analysis of competition in banking, using a sample containing more than 100,000 bank-year observations on more than 17,000 banks in 63 countries during the years 1994 to 2004.

Chiang (2012) measured the competitive landscape of the banking industry in four regions of Europe and four single country's banking sector during the period of 2005-2009 with the focus on the impact of the financial crisis on the market structures; the sample period was during 2005-2007 and 2008-2009, by the financial crisis cut-off point in 2008. The empirical results revealed the monopolistic competition of the banking industry of four European regions countries before and after the financial crisis, but the degree of competition in the operation of the European Union has changed little; on the other hands, the competitiveness of the four European countries was monopolistic competition before the financial crisis and the country's industrial structure has significant differences after the crisis. It was also noted that the effects of the financial crisis have seriously affected the structure of banking and banking revenue by macro-economic situation.

Fosu (2013) investigated banking competition across subregional banking markets in Africa. Panzar-Rosse model was adopted beside the static model to assess the overall extent of banking competition in each subregional banking market in Africa from 2002 to 2009. Consistent with other emerging economies, the results suggested that African banks generally demonstrate monopolistic competitive behaviour. The result suggested that recent structural reforms within Africa may have had significant effects as far as banking sector competition is concerned. African banks exhibited higher competition at interest-generating activities compared to total banking activities.

Castellanos and Garza-García (2013) examines the evolution of the efficiency of the Mexican banking sector from 2002 to 2012 and analyses its relationship with the degree of banking competition. Efficiency tests were estimated by applying the non-parametric methodology, the Data Envelopment Analysis. Meanwhile, the Boone Indicator was used to assess the degree of competition and included among other possible determinants of bank efficiency. The main results indicated increasing trends of efficiency in the banking sector during the period of study. A direct relationship between banking competition and efficiency was observed. Castellanos and Garza-García also found that the Mexican banking system's average efficiency trend is observed among both local and foreign banks, however, the local banks are somewhat more efficient.

By employing the Panzar-Rosse (P-R) H-statistic method, Sufian and Habibullah (2013) examined the impact of consolidation on the Malaysian banking sector's market structure and competition from 1996-2008. The results indicated that Malaysian banks operate under monopolistic competition. This empirical findings indicated that competitive behaviour of banks may be explained by factors other than the number of banks operating in the banking sector and their level of concentration. However, Sufian and Habibullah (2013) highlighted the need to stress out that the results need to be interpreted with caution since the liberalization of the Malaysian banking sector remains an ongoing process. The empirical findings seem to suggest that Malaysian banks have been earning their revenues in a monopolistic competition market condition. Therefore, during the period under study any form of conjectural variation, oligopoly, and/or monopoly is rejected. It was also worth noting that the degree of competition in the Malaysian banking sector has been higher during the pre-merger (1996-2000) period compared to the post-merger period (2001-2008). The empirical findings from their study differed from Majid and Sufian (2006) which suggested that the level of competition was higher during the post-merger compared to the pre-merger period under the total revenue estimation.

Andrade (2013) assessed the degree of competition within the enlarged European Union (EU) commercial banking system during the period ranging from 2004 to 2011 using the non-structural test developed by Panzar and Rosse (1987). The study concluded that banking industry in the region does not seem to have operated either under perfect competition or under perfect monopoly, but rather consistently with long-run monopolistic competition. They also found empirical evidence of efficiency hypothesis posted by Demestz (1973) and Peltzman (1977), as opposed to conventional view that concentration impaired price competitiveness. They concluded with underlining the importance of tradeoff between the costs and benefits of competition to support financial stability objectives.

Fosu (2013) examined the extent of banking competition in African sub-regional markets. A dynamic version of the Panzar-Rosse model was adopted beside the static model to assess the overall extent of banking competition in each sub-regional banking market over the period 2002 to 2009. Consistent with other emerging economies, the results suggested that African banks generally demonstrate monopolistic competitive behaviour. Although the evidence suggested that the static Panzar-Rosse H-statistic was downward biased compared to the dynamic version, the competitive nature identified remains robust to alternative estimators.

Gorener and Choi (2013) investigated the competitive conditions in the Turkish banking system over the period of 1992–2009 using Panzar-Rosse Model. The empirical findings suggested that the Turkish banking market was monopolistically competitive during the pre-crisis period and the post-crisis period, (1992–1998) and (2004–2009), respectively; but the level of competition increased to perfect competition for the period of 1999–2003, the crisis period. The findings also indicated that the Turkish banking market was in long-run equilibrium before 1998, the crisis, fell into disequilibrium during the crisis period, but made adjustments to the new equilibrium. Although the Turkish banking system has become more concentrated due to the restructuring since the crisis, the study shows that the bank competition has not been affected negatively by the bank consolidation. The Turkish banking system may have remained competitive despite its consolidation due to the entry of foreign banks and increased foreign ownership of domestic banks.

Cubillas and Suarez (2013) analyzed how a banking crisis affects bank market power in an international sample of 64 countries over the period before the current global financial crisis (1989–2007). They also studied whether and how this effect varies depending on the degree of severity of the crisis and across countries depending on their bank regulation and institutional quality. From country- and bank-level data, they provided the empirical evidence on the increased in bank market power in the years after banking crisis that is consistent with the processes of restructuring that often occur during episodes of financial distress. The disappearance of failed banks, mergers or absorption of banks with insolvency problems by others implied an increase in the level of bank market concentration that seems to increase the market power of surviving banks. Moreover, the greater the severity of the crisis, the higher the increased experienced by banks in terms of market power in the following years. The results also indicated that the effect is stronger in countries with more competitive banking systems before the crisis. Bank competition was greater in countries with less strict restrictions on non-traditional bank activities and fewer barriers to bank entry so banks operating in the sector will probably enjoy a greater market power. Likewise, in countries with well-developed institutions promoting bank competition, the increase in market power after the crisis will be more pronounced.

Maghreyeh and Awartani (2014) studied 70 banks over the period 2000–2009 in the in the Gulf Cooperation Council countries (GCC) and found that banks that small, less capitalized, banks with low profitability, low liquidity, or risky asset portfolios banks were more susceptible to distress than other banks. Similarly, the influence of efficiency on the chance of distress is negative and significant and thus, banks were more likely to face troubles in the future when they are poorly managed. The evidence from their study also indicated that banks operating in a competitive environment are more fragile. Their finding followed the competition-fragility hypothesis of Hellmann et al. (2000) and it also consistent with the results of Matutes and Vives (1996), Matutes and Vives

(2000) and Repullo (2004). However, it was contrasted to Boyd et al. (2007), De Nicoló and Loukoianova (2007), Schaeck et al. (2009), Uhde and Heimeshoff (2009), Cipollini and Fiordelisi (2009), and Poghosyan and Cihák (2011); who found that market power has a positive influence on bank distress.

Abdelkader and Mansouri (2014) employed the Panzar–Rosse H-statistic to assess the competitive conditions of the Tunisian banking industry over the period 1999 to 2003. The results showed that the banking market is in long-run equilibrium and the Panzar–Rosse H-statistic indicated that the Tunisian banking market is operating under conditions of monopoly. It seems that the liberalization process and the reforms implemented since 1987 to the banking sector in Tunisia could not compensate the existence of market power in the banking sector from 1999 to 2003.

7.0 K- Concentration ratio

CR_k is computed as the sum of top k^{th} -tier firms' market shares and summing only the market shares of the k largest banks in the market, it takes the form:

$$CR_k = \sum_{i=1}^k S_i \quad (1.1)$$

CR_k highlights the market structure through market shares of a few dominating firms. This index is based on the idea that the behavior of a market is dominated by a small number of large banks. The CR_k index is very useful to examine the market influence of a few dominating firms in the market. However, it is not so useful in grasping the general features of market structure.

In this study, the bank concentration index of the highest two (CR_2), three (CR_3) and five (CR_5) bank total assets, total deposits and total loans will be measured.

8.0 Herfindahl Hirschman Index

The Herfindahl – Hirschman Index is a simple but useful tool for the measurement of concentration within an industry. It is calculated as the sum of the squared deposit market shares of all the banks in the market, where market share may be based on either deposits or assets. Market shares are typically derived from deposits, because it is assumed that the level of a bank's deposits in a market is an indication of the level of its other banking services in that same market. The HHI can be computed as follows:

$$HHI = \sum_{i=1}^K MS_i^2 \quad (1.2)$$

where MS_i is the bank's market share of the i^{th} firm and n represents the number of banks in the sector.

The sum of market share is 100% ($\sum MS_i^2 = 100\%$).

By construction, the HH index has an upper value of 10,000 in the case of a monopolist firm with a 100% share of the market -- the index tends to zero in the case of a large number of firms with very small market shares. The lower bound of zero is attained when the market is perfectly competitive. Therefore, the larger the HHI, the more concentrated the market becomes.

In other definition, a market is “unconcentrated” if its HHI is less than 1,000, “moderately concentrated” if its HHI lies between 1,000 and 1,800; and “highly concentrated” if its HHI is greater than 1,800 (Rudkevich et al., 1998). A market with 10 firms with equal shares would have an HH index of 1000 but an uneven distribution of market shares may affect the index substantially.

9.0 Panzar Rosse Model

The Panzar-Rosse static analysis requires the estimation of a reduced form revenue equation, when considering that the total revenue (unlike the price and quantity) is easily observable. For a single firm, the equilibrium total revenue is given by the equilibrium quantity times the equilibrium price. Both depend on costs, demand, and conduct: therefore in the revenue function for all the shifters of cost and demand must be included, with particular attention given to factor prices. For the i th firm, the reduced form revenue equation is the following:

$$R_{it} = f(W_{it}, Z_{it}, Y_{it}, \varepsilon_t) \quad (1.3)$$

where W_{it} is the vector of factor prices, Z_{it} the variables that shift the cost function, Y_{it} the variables shifting the demand function and ε_t is the error term. If $\partial R_{it} / \partial W_{itk}$ is the derivative of the total revenue with respect to the price of the k th input, the Rosse and Panzar H-test can be written as

$$H = \sum_k \left[\frac{\partial R_{it}}{\partial W_{itk}} \frac{W_{itk}}{R_{it}} \right] \quad (1.4)$$

That is, it is the sum of the elasticities of the reduced form revenue with respect to all the factor prices. Hence, the calculation of the H-statistic requires firm-specific data on revenues and factor prices only. Further information on costs is not required, although the insertion of every variable shifting demand or cost is needed.

Based on the results of concentration conditions as depicted by HHI and CR_k results as shown earlier, it is hypothesized that the banks in the five Asian banking sectors operate under conditions of monopolistic competition. Therefore, the H-statistic values are expected to be greater than zero and less than one. For the long run equilibrium level, similar result is also expected; the E-statistics values are expected to range between zeros to one.

Shaffer (1982) showed that the H-statistic is also unity for a natural monopoly operating in a perfectly contestable market and also for a sales-maximizing firm that is subject to breakeven constraints. Panzar-Rosse differentiate the situation of monopolistic competition, in which, although banks behave like monopolists, the market entry or exit of other banks with imperfect rival products makes them always generating precisely zero profits. In this case, the H-statistic will lie between zero and unity, as revenues will increase less than proportionally to changes in input prices. Table 1.3 summarizes the interpretation of the Panzar-Rosse H-statistics result.

Table 3: Interpretation of the Panzar-Rosse H Statistic

H-value	Interpretation
$H < 0$	Monopoly or perfectly collusive oligopoly
$0 < H < 1$	Monopolistic competition
$H = 1$	Perfect competition, natural monopoly in a perfectly contestable market,
	orsales-maximizingfirmsubjecttoabreak-evenconstraint

According to Shafer (1982, 1985), Nathan and Neave (1989), Molyneux et al. (1994) and Hondroyiannis at al. (1999), the following bank revenue equation is estimated in which revenue is explained by factor prices and other bank-specific variables that affect long-run equilibrium bank revenues:

$$\begin{aligned} \ln TINT_{it} = & \alpha_0 + \alpha_1 \ln PL_{it} + \alpha_2 \ln PK_{it} + \alpha_3 \ln PF_{it} + \alpha_4 \ln TA_{it} + \\ & \alpha_5 \ln EQUITYTA_{it} + \alpha_6 \ln LOANLOSSTA_{it} + \alpha_7 \ln LOANTA_{it} + \varepsilon_{it} \end{aligned} \quad (1.5)$$

$$\begin{aligned} \ln TREV_{it} = & \alpha_0 + \alpha_1 \ln PL_{it} + \alpha_2 \ln PK_{it} + \alpha_3 \ln PF_{it} + \alpha_4 \ln TA_{it} + \\ & \alpha_5 \ln EQUITYTA_{it} + \alpha_6 \ln LOANLOSSTA_{it} + \alpha_7 \ln LOANTA_{it} + \varepsilon_{it} \end{aligned} \quad (1.6)$$

For $t = 1, \dots, T$, where T is the number of periods observed and $i = 1, \dots, I$ where I is the total number of banks and \ln is the natural logarithm. Meanwhile, α_0 is an overall constant and ε_{it} represents the

stochastic error term.

The first dependent variable is $\ln TINT$, the ratio of total interest income to the total asset, as in Molyneux et al. (1994). Traditional approaches in the literature have used either gross interest or total income as dependent variable. The decision to consider only the interest part of the total revenue of banks is consistent with the underlying notion inherent in the Panzar Rosse model, that financial intermediation is the core business of most banks. However, Shaffer (1982) and Nathan and Neave (1989) took $\ln TREV$, total revenue, as their dependent variable. $\ln TREV$ is the ratio of total revenue to total assets (where total revenue is calculated as gross interest revenue plus other operating revenues, such as fee income, commission income and bank charges).

In this study, panel data for commercial banks in Malaysia from 1996 to 2009 are used and were extracted from a series of banks Annual Reports taken from BankScope Fitch-International Bank Credit Analysis Limited (IBCA) database. Meanwhile, for country-specific data, datasets from International Financial Statistics from the International Monetary Fund and Thomson DataStream are used. The dataset has also taken into account mergers and acquisitions. When there is a merger, the database also provides information for the largest bank of the merged group while exiting banks are deleted fully from the database. In the case of Asian banking industry where there were a number of merger and acquisition or banks were required to close down following the Asian financial crisis back in 1997, a number of data was not available. In this respect, only prominent banks are covered in the database with smaller ones accorded less attention. The data is different from the other paper as it encompassed both domestic and foreign owned commercial banks.

10. Results

For Malaysia, the concentration conditions increased when the variables for top 2, top 3 and top 5 largest banks were computed. Starting with 0.32 in CR_2 , it increased to 0.52 and 0.67 for CR_3 and CR_5 , respectively. Thailand's concentration condition ranged from 0.34 to 0.69, an increase of 41% and 44% when CR_3 and CR_5 were used, respectively. Concentration conditions in Indonesia showed a slight growth of concentration from 0.33 to 0.46 to 0.61 under CR_1 , CR_3 and CR_5 , respectively. Having a total of 121 banks, the increment showed that banks in Indonesia had low concentration in competition. To some extent, the indices reflected the higher concentration in the Philippines and Singapore. Due to data availability, only small numbers of banks were included in the sample data.

The market concentration ratio in Malaysian banking industry showed an increasing trend in between 1996-2000, after the financial crisis followed by the first phase of financial consolidation. The following changes can be seen from Malaysia banking industry results.

- i. The HHI estimate based on total deposit increased to 1,104.53 (1,006.09 in 1996),
- ii. The CR_2 estimate decreased just by 0.01 (0.38 in 1996),

- iii. CR₃ estimate remained the same at 0.47 and
- iv. CR₅ estimate increased by 0.04 point (0.58 in 1996). Meanwhile,
- v. the HHI estimate based on total loan increased from 957.61 in 1996 to 1,124.79 in 2009,
- vi. CR₂ estimate increased by 0.01 (0.36 in 1996),
- vii. CR₃ estimate improved to 0.47 from earlier 0.43 and
- viii. CR₅ estimate increased by 0.07 point (0.55 in 1996).

This increasing trend was due to the Central Bank monetary activity to restructure the banking system after the Asian financial crisis in 1997. All domestic banking institutions were advised to merge so that six banking groups could be formed (initially ten banking groups). Even though the first phase of consolidation had led to increase in concentration ratios, it was not sufficient to make the banking system to become anti-competitive. The restructuring of the banking system was mainly to remove the unhealthy financial institutions and to retain sound financial institutions in the system. The increased number of other financial institutions could create further stiff competition among the banks (BNM, 1999).

Table 4: Result of Bank Concentration Ratio for Malaysian Banking Industry

	Total Assets				Total Deposits				Total Loans			
	CR2	CR3	CR5	HHI	CR2	CR3	CR5	HHI	CR2	CR3	CR5	HHI
1995	0.38	0.48	0.58	1035.92	0.39	0.49	0.59	1065.21	0.37	0.44	0.56	1000.61
1996	0.38	0.47	0.58	1006.09	0.39	0.48	0.58	1022.20	0.36	0.43	0.55	957.61
1997	0.38	0.45	0.58	1148.26	0.39	0.46	0.59	1108.34	0.37	0.44	0.56	1103.57
1998	0.35	0.44	0.55	1003.72	0.36	0.44	0.55	1001.27	0.36	0.43	0.54	1044.88
1999	0.36	0.46	0.60	1020.97	0.36	0.46	0.60	1016.73	0.36	0.47	0.59	1052.85
2000	0.37	0.47	0.62	1104.53	0.37	0.46	0.62	1105.48	0.37	0.47	0.62	1124.79
2001	0.37	0.46	0.63	1127.56	0.37	0.47	0.63	1158.88	0.37	0.48	0.63	1166.75
2002	0.34	0.44	0.59	1034.72	0.34	0.44	0.59	1029.82	0.34	0.43	0.58	1018.18
2003	0.34	0.43	0.59	1022.05	0.33	0.42	0.58	1007.38	0.34	0.45	0.60	1058.00
2004	0.34	0.44	0.60	1016.43	0.34	0.44	0.60	1009.46	0.34	0.45	0.61	1043.16
2005	0.34	0.44	0.60	995.21	0.33	0.44	0.60	987.53	0.35	0.45	0.62	1039.92
2006	0.36	0.49	0.64	1083.63	0.35	0.48	0.64	1065.62	0.36	0.49	0.66	1122.25
2007	0.36	0.49	0.64	1095.20	0.36	0.49	0.64	1079.21	0.37	0.50	0.67	1135.68
2008	0.38	0.51	0.65	1135.00	0.37	0.50	0.65	1119.14	0.40	0.52	0.68	1212.28
2009	0.38	0.52	0.67	1161.83	0.37	0.52	0.66	1135.68	0.39	0.53	0.70	1215.55

Note: (CR_k) for k = 2, 3 and 5 bank. It means the bank concentration index of the largest two (CR₂), three (CR₃) and five (CR₅) banks. Herfindahl Hirschman index (HHI) of bank concentration is defined as the sum of squared market shares of respective variables.

The second phase of consolidation was between 2001-2004, where the market concentration ratios for CR₂, CR₃, CR₅ and HHI, based on total loans show a decreasing trend of 0.34 (0.37 in 2001), 0.045 (0.48 in 2001), 0.61 (0.63 in 2001) and 1,043.16 (1,166.75 in 2001), respectively. The HHI, CR₂, CR₃, and CR₅ based on total deposit revealed a similar trend to that of market concentration based on total loans. These trends indicated that the first plan of consolidation to merge the domestic commercial banks into six anchor banks was a failure.

In 2005, the HHI results based on total assets, total loans and total deposits were at their lowest point, while result for the concentration ratios, CR₂, CR₃, and CR₅ remained relatively the same as previous year 2004. The sharp increase seen in year 2006 in the market concentration ratios reflected the changes in the market structure and the distribution of market shares derived from the completion of all merger and acquisition exercise during the second phase of consolidation. In these periods, the completion of merger and acquisition had contributed to the expansion of market share of the remaining existing financial institutions. Hence, the plan to initiate further merger and acquisition without opening the market to further competition would increase the market concentration and may lead to anti-competitive actions by financial institutions.

Malaysia's concentration condition based on the Herfindahl Hirschman Index seemed to tally with the economic and the current year financial growth. For instance, concentration conditions dropped after the financial crisis strike which meant the banks were still unstable and were making their own recovery following the financial turbulence. The episode of mega mergers had caused concentration condition to decrease as the banks and their merger partners adjusted to the new management. Concentration conditions seemed to improve after the process.

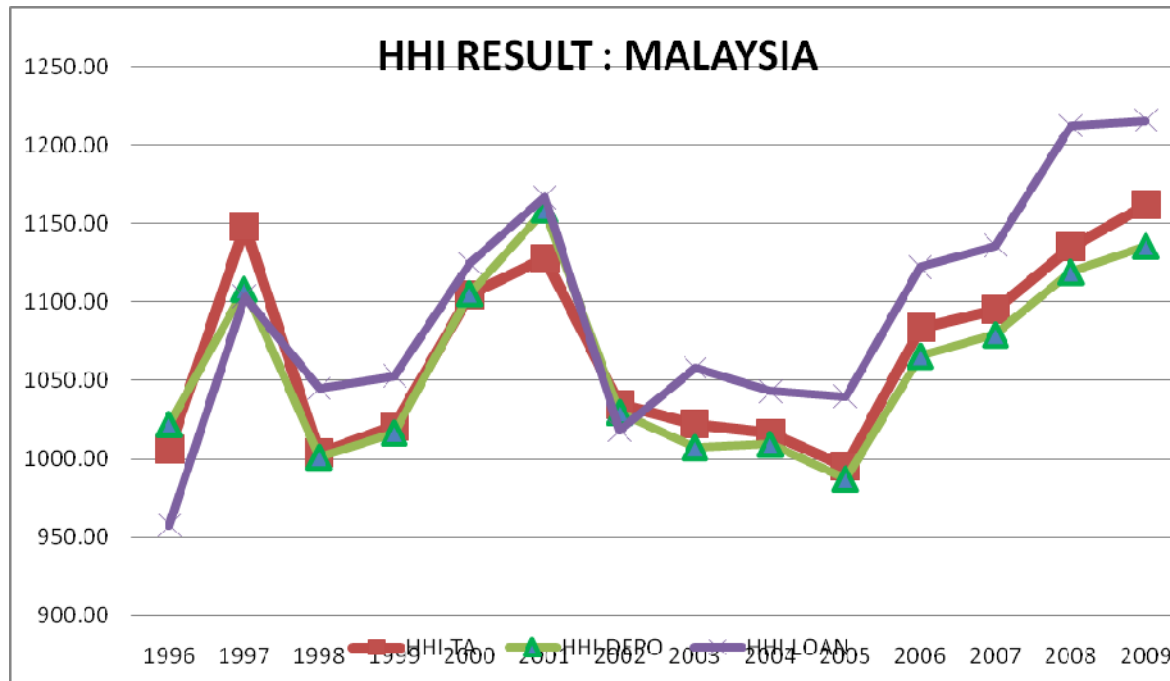


Figure 1: Result of the Herfindahl Hirschman Index for Malaysia

10.1 Results of Panzar- Rosse Test

The empirical results for the competitive position for Malaysia using three different dependent variables, namely the total interest revenue (lnTREV), total interest income (lnTINT) and return on equity (ln1+ROA) are reported in Table 5.18. All tests confirmed the good fit of the models.

In the Panzar-Rosse test, the estimated regression equations for fixed effect model differ in the range of 52.59 to 55% based on the three equations. Two of the variables of banking cost, price of labor (lnPL) and price of capital (lnPK) were statistically significant at the 1% and 5% level for total interest income and total revenue, respectively, with price of labor showing higher elasticity. Specifically, looking at each input level, the coefficients on the bank specific factors were positive for price of labor (lnPL) in all three dependent variables with the elasticity of 0.2512, 0.2484 and 0.0036. 25% of the total interest income was due to positive effect from the price of labor. The same positive sign was found for the unit price of capital (lnPK) with a lower elasticity and 0.0608 and 0.0603 for the short run estimation model. Yet, a negative sign is found for long run equilibrium test with the return on assets as the dependent variable. The effect of the price of fund (lnPF) was found to be negatively correlated in all the three dependent variables and the overall elasticity appeared to be minimal (and statistically insignificant) compared to other two input prices.

The results implied that the increase in labor and capital acquisition costs had led to higher interest income, higher revenue and higher return on asset, respectively, for the Malaysian commercial banks. This may suggest that the growing interest by bank in the fee and commission-based product market segment and large investment in capital including technology and new products development have improved their financial performance.

The results for the Malaysian commercial banks signaled that labor and capital cost were significant in determining the income earned by the banks. Meanwhile, the higher the price of fund, the lower would be the total interest, revenue and return on asset earned. This result indicated that banks in Malaysia were competing competitively. Those banks which offered reasonable lending rate would be able to generate more income.

The H-statistics, an indicator for the degree of competition were positive between the range of 0.0021 to 0.3239 in both pooled and fixed effect equations. The H-statistics for lnTINT as the dependent variable produced similar estimate with lnTREV for both pooled and fixed effect model 0.2288. This rejects the monopoly hypothesis, the conjectural variations short-run oligopoly hypothesis, and the hypothesis of perfect competition. Our findings indicated that banks in Malaysia operated under monopolistic competition between 1996 and 2009. The result is consistent with the study by Claessens and Leaven (2004) on Malaysia and studies on other developing countries (Al-Muharrami et al., 2006; Perera et al., 2006; Abdul Majid et al., 2007) that found H-statistics of between zero and one (i.e. monopolistic competition). Therefore, the H-statistic results suggested that the Malaysian banking sector earned their revenue in market condition of monopolistic competition and any form of conjectural variation oligopoly and monopoly can be clearly rejected during the sample periods. On the other hand, competitive conditions still under the monopolistic competition but with lessen value, in a long term period. The E-Statistics found for long run equilibrium test (ln1+ROA) showed that the figure reduced to 0.0021, very much lower than those found in the other two tests.

The major contribution to the H-statistic mainly came from unit price of labor (lnPL) and followed by unit price of capital (lnPK). This highlights that asset and labor cost are the main factors in the production function of interest income and total revenue for Malaysian banks. This result is similar to those of Abdul Majid et al. (2007), probably due the effect of the increased usage of online banking and phone banking in the recent years in Malaysia. The positive sign of unit price of labor (lnPL) suggested that personnel costs are as important as overhead costs which are relatively high in the banking industry. Meanwhile, the positive sign of unit price of capital (lnPK) may indicate that preferences of bank customer to deal with banks offering the lowest cost of fund. Nevertheless, in both

specifications, the effect of the price of fund on the overall elasticity appeared to be negative and minimal compared to other input prices. This implies that the change of interest rate offered by Malaysian financial institutions adversely affect their income and revenue. The results are consistent with other studies that its impact is negligible on the factor price elasticity (Al-Muharrami et al., 2006; Perera et al., 2006; Abdul Majid et al., 2007).

Moving on to the bank specific variables, the result based on the size of banks as indicated by the ratio of loan to total asset ($\ln\text{LOANTA}$), shows loan size is positively related and highly significance to the total interest income earned and total revenue recorded. Based on the result for $\ln(1+\text{ROA})$, 27% of the loan to total asset increased for a 1% increase in total interest income and total revenue, but in the long run, only 0.9% increment was found.

The coefficient of the total asset variable is positive and statistically significant in the ordinary least square (OLS) model for all three different types of independent variables, whereas for the fixed effect model, it has a negative coefficient. The coefficient of the total asset variable is negative and statistically significant in fixed effect model which suggested that size is not a major factor that contributes to the different income and revenue earned for Malaysian banks. Different sizes between banks may lead to lower total revenue per unit of assets and that larger banks seem to be less efficient compared to smaller banks. Ten anchor banks are now (2013) operating in Malaysia in, which comprised of the local commercial banks. These banks are similar in term of sizes after the merger move (BNM, 2009). This also suggests that as a whole the banking market in Malaysia faces diseconomies of scale with respect to producing interest-based revenue despite the mergers and acquisitions that had taken place.

Meanwhile, the coefficient of the variable depicting risk propensity ($\ln\text{LOANLOSSTA}$) were both positive for total interest income and total revenue, suggesting that banks with a higher level of loan loss provisions indicated a more risky loan portfolio and consequently a higher level of compensating return. This therefore had a positive effect on interest income but statistically insignificant. The elasticity were 0.3245, 0.3436 and -0.5891 which were all insignificant. A positive $\ln\text{LOANLOSSTA}$ indicates that bank operating with higher provisions to assets in their balance sheet generate higher revenue per unit of assets. In the long run, this variable shows a negative and significant value as depicted by the return to asset result.

The coefficient of equity to total asset ($\ln\text{EQUITYTA}$) in the OLS model was positive and statistically significant at 1% level for the period 1996-2009 for all the three specification models. The fixed effect model result showed a positive result but with an insignificant value. The coefficient for this is the highest among the banks' specific variable used. The result is consistent to Berger and Mester (1997) and Isik and Hassan (2003). This means that Malaysian banks are well capitalized bank and efficient in generating their revenue.

Table 4: Summary Results of Panzar-Rosse Test for Malaysia

Dependent / Independent	lnTINT		lnTREV		ln(1+ROA)	
	POOLED	FIXED	POOLED	FIXED	POOLED	FIXED
Variables	OLS	EFFECT	OLS	EFFECT	OLS	EFFECT
lnPL	0.3166 (7.26***)	0.2512 (2.77***)	0.3156 (7.26***)	0.2484 (2.74**)	0.0020 (2.19**)	0.0036 (1.41)
lnPK	0.0727 (3.07***)	0.0608 (2.22**)	0.0722 (3.06***)	0.0603 (2.2**)	0.0006 (1.52)	-0.0005 (-0.84)
lnPF	-0.0664 (-1.12)	-0.0832 (-1.13)	-0.0639 (-1.08)	-0.0800 (-1.09)	-0.0004 (-0.3)	-0.0010 (-0.62)
lnTA	0.0809 (6.48***)	-0.0130 (-0.19)	0.0806 (6.46***)	-0.0129 (-0.19)	0.0012 (4.22***)	0.0008 (0.65)
lnEQUITYTA	3.0117 (5.85***)	1.8798 (1.63)	3.0019 (5.84***)	1.8819 (1.63)	0.0520 (5.19***)	0.0198 (0.82)
lnLOANLOSSTA	0.6210 (0.27)	0.3245 (0.14)	0.6389 (0.28)	0.3436 (0.15)	-0.5927 (-10.59***)	-0.5891 (-10.68***)
lnLOANTA	0.2519 (6.6***)	0.2679 (6.94***)	0.2514 (6.6***)	0.2682 (7***)	0.0008 (1.18)	0.0009 (0.81)
yr1	-0.1759 (-2.51**)	-0.1798 (-2.3**)	-0.1751 (-2.51**)	-0.1787 (-2.28**)	-0.0045 (-2.47**)	-0.0048 (-2.47**)
yr2	-0.1534 (-2.55**)	-0.1568 (-2.73**)	-0.1530 (-2.55**)	-0.1563 (-2.72**)	-0.0028 (-1.61)	-0.0028 (-1.73**)
yr3	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
yr4	-0.3158 (-3.13***)	-0.3237 (-3.39***)	-0.3140 (-3.13***)	-0.3216 (-3.38***)	-0.0016 (-0.75)	-0.0020 (-1.21)
yr5	-0.2560 (-3.38***)	-0.2553 (-2.83***)	-0.2519 (-3.3***)	-0.2505 (-2.76***)	-0.0032 (-1.53)	-0.0040 (-1.67)
yr6	-0.3740 (-4.92***)	-0.3793 (-3.95***)	-0.3722 (-4.91***)	-0.3769 (-3.92***)	-0.0054 (-2.64***)	-0.0063 (-2.63**)
yr7	-0.4688 (-5.23***)	-0.4611 (-3.99***)	-0.4663 (-5.22***)	-0.4580 (-3.96***)	-0.0065 (-2.99***)	-0.0071 (-2.44**)
yr8	-0.4516 (-4.71***)	-0.4677 (-3.86***)	-0.4491 (-4.69***)	-0.4644 (-3.83***)	-0.0076 (-3.03***)	-0.0084 (-2.46**)
yr9	-0.5251 (-5.13***)	-0.5364 (-3.77***)	-0.5224 (-5.11***)	-0.5329 (-3.75***)	-0.0074 (-3.02***)	-0.0081 (-2.34**)
yr10	-0.5167 (-5.48***)	-0.5222 (-4.03***)	-0.5143 (-5.46***)	-0.5191 (-4***)	-0.0070 (-3.13***)	-0.0077 (-2.42**)

Continued - Summary Result of Panzar-Rosse Model for Malaysia

Dependent / Independent	lnTINT		lnTREV		ln(1+ROA)	
	POOLED	FIXED	POOLED	FIXED	POOLED	FIXED
Variables	OLS	EFFECT	OLS	EFFECT	OLS	EFFECT
yr11	-0.4811 (-4.95***)	-0.4554 (-3.55***)	-0.4788 (-4.93***)	-0.4524 (-3.54***)	-0.0065 (-3.1***)	-0.0069 (-2.44**)
yr12	-0.5015 (-5.32***)	-0.4693 (-3.27***)	-0.4993 (-5.3***)	-0.4665 (-3.25***)	-0.0071 (-3.46***)	-0.0077 (-2.46**)
yr13	-0.5212 (-5.64***)	-0.4760 (-3.41***)	-0.5189 (-5.62***)	-0.4733 (-3.39***)	-0.0066 (-3.1***)	-0.0069 (-2.33**)
yr14	-0.6935 (-6.1***)	-0.6382 (-3.69***)	-0.6903 (-6.08***)	-0.6340 (-3.66***)	-0.0088 (-3.51***)	-0.0091 (-2.52**)
constant	-3.5397 (-11.23***)	-2.3218 (-2.35*)	-3.5293 (-11.21***)	-2.3259 (-2.35**)	0.4566 (61.2***)	0.4740 (21.86***)
R-Squared	0.6113	0.5259	0.612	0.5269	0.6203	0.55
F-Statistics	20.67***	114.48***	20.77	112.27	12.33	99.69
H-Statistics	0.3229	0.2288	0.3239	0.2288	0.0022	0.0021
NumberofObservation	333	333	333	333	333	333

The dependent variable, lnTINT is the natural log of total interest income of banks in the countries under the analysis. ; lnTREV is the natural log of total revenue and lnROA is a proxy measure of bank profitability computed as a natural log of profit after tax divided by total assets. Meanwhile, the independent variables, lnPL is a proxy measure of price of labor calculated as the natural log of personnel cost; lnPK is the proxy measure of price of capital, calculated as the natural log of overhead expenses, lnPF as the proxy measure of price of loanable fund, calculated as the natural log for the Ratio of annual interest expenses to total loanable funds; lnTA is a proxy measure of size, calculated as the natural log of total banks assets; lnEQUITYTA is a measure of bank capitalization, calculated as the natural log shareholders equity divided by the total assets; lnLOANLOSSTA is a measure of bank credit risk calculated as a natural log of the ratio of total loan loss provisions divided by total assets; lnLOANTA is used as a proxy measure of loans intensity, calculated as the natural log of total loans divided by total assets. H-statistics is computed based on the total coefficients of the three input variables, the lnPF, lnPK and lnPL. E-statistics is the scores based on the three input variables in the long run equilibrium test. The t-statistics values are in parentheses. A constant is included but not reported. (***) indicates significance at the 1% level, while (**) and (*) indicate significance at the 5% and 10% levels, respectively.

The Breusch and Pagan Lagrange Multiplier test for Malaysia indicates that panel data is more suitable than the pool data. Thus, random effect is used rather than the OLS. Further analysis using the Hausmann Test show that fixed effect model is best for all three specification models. Values in parenthesis are the t-statistics. Symbols ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Year 1 to Year 14 denotes 1996 to 2009. For the time effect test, year 3 (1998) pooled and fixed effect test were omitted due to collinearity.

The variable total loan and advances to total asset (LnLOANTA) used to capture for the liquidity level of Malaysian banks, showed a positive sign and highly significant at 1% level. For a one unit increase in total revenue, total loan and advances to total asset was expected to increase by 27 percent, holding all other variables constant. The high loan ratio was associated to the loan policy practiced by the Malaysian financial institutions. Banking institutions, as part of the lending institutions, offered loans and advances to the consumers and thus, were affected due to these activities. In relation to the HHI result, the higher amounts of loan significantly contributed to the higher amount of total interest income and total revenue for the banks in Malaysia.

Another test conducted was based on the Panzar-Rosse model. This was to see how the Malaysian banks perform in the long run equilibrium. The equilibrium position in the banking industry was assessed by estimating the equation with return on asset (lnROA) as a dependent variable. In the long run equilibrium model, price of labor is positively correlated with return on asset but negative for the price of capital and price of fund. All of these input prices are not significant. The coefficient of the total asset variable is positive but not significant with a minimal elasticity of 0.0008. This suggests that size-induced differences between banks may lead to higher total revenue per unit of assets and that larger banks seem to be more efficient compared to smaller banks in the long run. Having an added advantage of having larger asset, the banks can reap economies of scale in the long term based on efficient and productive used of asset. Similar positive sign are found for lnEQUITYTA and lnLOANTA. On the other hand, looking at the risk indicator, the lnLOANLOSSTA had a negative elasticity of 0.5891 and highly significant at 1% level in the long equilibrium estimation.

11.0 Conclusion

Bank concentration can also influence the cost of intermediation (Demirgüç-Kunt and Huizinga, 1999; Demirgüç-Kunt et al, 2003; Naceur and Kandil, 2009, etc). A higher degree of concentration in the banking industry enables banks to increase their lending rate and hence the cost of intermediation.

The concentration result showed that Asian banks were moving from high concentration to moderate concentration between 1996 to 2009. Malaysia had moderate concentration. Meanwhile, the Herfindahl Hirschman Index result in terms total assets showed Malaysia banking sectors were moderately concentrated. When HHI was measured based on the total assets and total deposits, Malaysia showed a of moderately concentrated conditions. For total assets, the HHI graph for Malaysia showed an HHI of less than 1800.

Taking market shares as weights and stressing the importance of larger banks by assigning them a greater weight than smaller banks, the result for Herfindahl Hirschman Index showed that Malaysian commercial banks are undergoing an increase of competition in a decreased rate -- in the category of moderately concentrated.

The expected sign of market power, is undetermined but the expected relationship between operating expenses and net interest is positive according to the efficient-structure hypothesis (Naceur and Kandil, 2009).

References

- Abd.Kadir , Hazlina, Habibullah,, Muzaffar Shah , Radam, Alias and M Azali (2005), An analysis of technical progress and efficiency in Malaysian finance companies, *The ICAFI Journal of Industrial Economics* 2: 6-19.
- Abd.Kadir, Hazlina, Selamat, Zarehan and Idros, Muzlifah (2010), Productivity of Malaysian banks after mergers and acquisition, *European Journal of Economics, Finance and Administrative Sciences* 24: 111-123.
- Abdelkader, I. B., & Mansouri, F. (2013), Competitive Conditions of the Tunisian Banking Industry: An Application of the Panzar–Rosse Model, *African Development Review* 25(4): 526-536.
- Andrade, S. C. S. (2013), Assessing competition with the Panzar-Rosse model: An empirical analysis of European Union banking industry.
- Abdul Majid, M. Z, & Sufian, F. (2007), Market structure and competition in emerging market: Evidence from Malaysian Islamic industry, *Journal of Economic Cooperation* 28: 99-121.
- Abdul Majid, M. Z, & Sufian, F., M. N, Alifiah (2007), Consolidation, market structure and competition in the Malaysian Banking Industry: Empirical Evidence from Malaysia, Unpublished paper presented in the 15 th Annual Conference PBFEM, Vietnam.
- Adams, C. (2008), Emerging East Asian banking system: ten years after the 1997/98 crisis. ADB Working Paper Series on Regional Economic Integration No. 16.
- Allen, Franklin, and Douglas Gale (2004), Competition and financial stability, *Journal of Money, Credit, and Banking* 36, 453–480.
- Al-Muharrami, Saeed , Matthews, Kent and Khabari, Yusuf (2006), Market structure and competitive conditions in the Arab GCC banking system. Cardiff Economics Working Papers E2006/8. Cardiff University, Cardiff Business School, Economics Section
- Al-Muharrami, S., Matthews, K., & Khabari, Y. (2006), Market structure and competitive conditions in the Arab GCC banking system, *Journal of Banking and Finance* 30: 3487-3501.
- Andrew, Sheng, (1999), Global Financial Crisis: Implications for Financial Regulation, *Ekonomika*, Newsletter of Persatuan Ekonomi Malaysia, July 1999.
- Angelini, P. and Cetorelli, N. (2003), The effects of regulatory reform on competition in the banking industry, *Journal of Money, Credit and Banking* 35: 663-684.
- Anzoategui, D., Melecky, M., and Martinez Peria, M.S. (2010a). Banking sector competition in Russia. World Bank Policy Research Working Paper Series.
- Anzoategui, D., Martinez Peria, M.S., and Rocha, R. (2010b), Bank competition in the Middle East and Northern Africa region, World Bank Policy Research Working Paper 5363.
- Bain, J.S. (1951), Relation of profit rate to industry concentration, *Quarterly Journal of Economics* 65: 293-324.
- Baltagi, Badi H. (2001), *Econometric Analysis of Panel Data*. Wiley, John & Sons
- Bank for International Settlements (1999), *Bank restructuring in practice*, BIS Policy Paper No. 6. (Basel, Switzerland, August).
- Baumol, W. (1982), Constable Markets: an uprising in the theory of industry Structure, *American Economic Review* 72: 1-15.
- Baumol, William J., Panzar, John C., and Willig, Robert D. (1982), *Contestable markets and the theory of industry structure*, New York: Harcourt Brace Jovanovich, Inc.
- Berg, S. A., and M. Kim (1994), Oligopolistic interdependence and the structure of production in banking: An empirical evaluation, *Journal of Money, Credit, and Banking* 26: 309–322
- Beck, Thorsten; Demirguc-Kunt, Asli; Maksimovic, Vojislav (2004), Bank competition and access to finance, *Journal of Money, Credit and Banking* 36: 221-249.
- Beck, T., A. Demirguc-Kunt and R. Levine (2006), Bank concentration, competition, and crises: first results. *Journal of Banking and Finance* 30:1581-1603.
- Belaisch, Agnes (2003), Do Brazilian Banks Compete, IMF Working Paper, 1, 1-22, 2003. Available at SSRN: <http://ssrn.com/abstract=879189>
- Berger, A.N. (1995), The relationship between capital and earnings in banking, *Journal of Money, Credit and Banking* 27: 432-56.
- Berger, Allen N., and Timothy H. Hannan (1989), The price–concentration relationship in banking, *Review of Economics and Statistics* 71: 291–299.

- Berger, Allen N., and Timothy H. Hannan (1997), Using measures of firm efficiency to distinguish among alternative explanations of the structure–performance relationship in banking, *Managerial Finance* 23 : 6–31.
- Berger, Allen N., Hunter, William C., Timme, Stephen G. (1993), The efficiency of financial institutions: A review and preview of research past, present and future, *Journal of Banking & Finance* 17:221-249.
- Berger, Allen N., and Timothy H. Hannan (1998), The efficiency cost of market power in the banking industry: A Test of the ‘quiet life’ and related hypotheses. *Review of Economics and Statistics* 80: 454–465.
- Berger, A.N., A. Demircuc-Kunt, R. Levine and J. Haubrich. (2004), Bank concentration and competition: An evolution in the making, *Journal of Money, Credit and Banking* 36: 433-451.
- Bikker, J.A. and Groeneveld, J.M. (2000), Competition and concentration in the EU banking industry, *Kredit und Kapital* 33 : 62-98.
- Biekpe, N. (2011), The competitiveness of commercial banks in Ghana. *African Development Review* 23(1): 75-87.
- Bikker, J.A. and Haaf, K. (2002), Competition, concentration and their relationship: An empirical analysis of the banking industry, *Journal of Banking and Finance* 26: 2191–2214.
- Bikker, J. A., Shaffer, S., & Spierdijk, L. (2012), Assessing competition with the panzar-rosse model: The role of scale, costs, and equilibrium. *Review of Economics and Statistics* 94(4): 1025-1044.
- Boone, J, Griffith R, and Harrison R (2005), Measuring competition. Working Paper No. 022. August, Advanced Institute of Management Research.
- Boone, J. (2008), A new way to measure competition. *Economic Journal* 118: 1245-1261.
- Boot, Arnoud, A.V. Thakor (2000), Can Relationship Banking Survive Competition, *Journal of Finance* 55: 679-713.
- Boyd, J. and G. De Nicolo (2005), The theory of bank risk taking revisited, *Journal of Finance* 60:1329-1343.
- Boyd, J., G. De Nicolo, and A.M. Jalal (2006), Bank risk taking and competition revisited: New Theory and Evidence, IMF Working paper. WP/06/297.
- Boyd, J. H., De Nicolò, G., & Jalal, A. M. (2009), Bank competition, risk and asset allocations (No. 2009-2143). International Monetary Fund.
- Bresnahan, T.F. (1982), The oligopoly solution concept is identified, *Economic Letters* 10: 87–92.
- Bresnahan, T.F. (1989), Empirical studies of industries with market power. In: Schmalensee, R., Willig, R.D. (Eds.), *Handbook of Industrial Organisation*, Vol. 2. North-Holland, Amsterdam.
- Breusch, T. S., and A. R. Pagan. (1980), The Lagrange Multiplier test and its applications to model specification in econometrics, *Review of Economic Studies* 47:239-253.
- Canoy, M., M. van Dijk, J. Lemmen, R. de Mooij and J. Weigand (2001), *Competition and stability in banking*, The Hague, Netherlands: CPB Netherlands Bureau for Economic Policy Analysis.
- Cameron, A. Colin, and Pravin K. Trivedi. (2009), *Microeconometrics Using Stata*, TX: Stata Press.
- Carlton, D., and Perloff, J. (1989), *Modern Industrial Organization*, Glenview, IL: Scott Foresman/Little, Brown.
- Casu, B., & Girardone, C. (2009), Testing the relationship between competition and efficiency in banking: A panel data analysis, *Economics Letters* 105(1): 134-137.
- Casu, B., & Girardone, C. (2009), Competition issues in European banking, *Journal of Financial Regulation and Compliance* 17(2): 119-133.
- Castellanos, S. G., & Garza-García, J. G. (2013), Competition and Efficiency in the Mexican Banking Sector (No. 1329).
- Calomiris, C. W., & Mason, J. R. (2003), Fundamentals, panics, and bank distress during the depression, *American Economic Review*, 1615-1647.
- Cerasi, V. and Daltung, S. (2000), The optimal size of a bank: Costs and benefits of Diversification, *European Economic Review*, 44: 1701-1726.
- Cetorelli, N. (1999), Competitive analysis in banking: Appraisal of the methodologies, *Federal Reserve Bank of Chicago Economic Perspectives* 23: 2–15.
- Cetorelli, Nicola, and Michele Gambera (2001), Banking, market structure, financial dependence and growth: International evidence from industry data, *Journal of Finance* 56: 617–648.
- Chiang, K. M. (2012), The competition of the European banking industry: Panzar and Rosse model.
- Chen, Y. Y., & Yang, W. L. (2012), Financial Market Development and Competition Degree in China's Banking Industry: An Empirical Study Based on Panzar-Rosse Model, *Journal of Dalian University of Technology (Social Sciences)* 1 : 003.
- Cipollini, A., & Fiordelisi, F. (2009), The impact of bank concentration on financial distress: the case of the European banking system, EMFI WPs, 2-2009. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1578718Cole

- Claessens, S. and L. Laeven (2004), What drives bank competition? Some international evidence, *Journal of Money, Credit, and Banking* 36: 563-583.
- Claessens, Stijn and Luc Laeven (2005), Financial dependence, banking sector competition, and economic growth, *Journal of the European Economic Association* 3: 179-201.
- Coccorese, P. (1998). Assessing the competitive conditions in the Italian banking system: Some Empirical Evidence, *BNL Quarterly Review* 205 : 171-191.
- Coccorese, P. (2004), Banking competition and macroeconomic conditions: A disaggregate analysis, *Journal of International Financial Markets, Institutions and Money* 14: 203-219.
- Cook, M. (2009), *Banking Sector Reform in South East Asia: The Region's Decisive Decade*. Routledge Taylor and Francis Group, New York.
- Daley, Jenifer & Matthews, Kent (2011), Competitive conditions in the Jamaican banking market 1998-2009, *Cardiff Economics Working Papers E2011/28*, Cardiff University, Cardiff Business School, Economics Section.
- Davies, S.W. (1980), Measuring Industrial Concentration: An Alternative Approach, *Review of Economics and Statistics* 62: 306-309.
- De Bandt, O. and Davis, E.P. (2000), Competition, contestability and market structure in European banking sectors on the eve of EMU, *Journal of Banking and Finance* 24: 1045-66.
- Dell'Araccia, Giovanni, Erza Friedman, and Robert Marquez (1999), Adverse selection as a barrier to entry in the banking industry, *Rand Journal of Economics* 30: 515-534.
- De Nicolò, G., & Loukoianova, E. (2007), Bank ownership, market structure and risk, *IMF working papers*, 1-44. <http://www.imf.org/external/pubs/ft/wp/2007/wp07215.pdf>
- DeYoung, R., & Rice, T. (2004), Noninterest income and financial performance at US commercial banks, *Financial Review* 39(1): 101-127.
- Demirguc-Kunt, A. Martinez Peria, M.S. and Merrouche, O. (2010), Competition in the Chinese banking sector, Background paper for Financial Sector Assessment Program, World Bank Mimeo.
- Demsetz, H. (1973), Information and efficiency: Another viewpoint, *Journal of Law and Economics* 10: 1-22.
- Dickson, V.A. (1981), Conjectural Variation Elasticities and Concentration, *Economics Letters* 7 : 281-285.
- DOLE. various years. *Labor Force Statistical Yearbook*. Department of Labor and Employment, Manila.
- Drucker, S., & Puri, M. (2009), On loan sales, loan contracting, and lending relationships, *Review of Financial Studies* 22(7): 2835-2872.
- Duncan, G. J., & Hill, D. H. (1985), An investigation of the extent and consequences of measurement error in labor-economic survey data, *Journal of Labor Economics* 508-532.
- Fernández de Guevara and Maudos, J. (2004), Measuring welfare loss of market power: An application to European banks, *Applied Economics Letters* 11: 833-836.
- Fernandez de Guevara, J., Maudos, J, and Perez, F. (2005), Market power in European Banking sectors, *Journal of Financial Services Research* 27: 109-137.
- Freixas, X. and Rochet, J.C. (1997), *Microeconomics of Banking*, Massachusetts Institute of Technology, MIT Press.
- Fosu, S. (2013), Banking competition in Africa: Subregional comparative studies, *Emerging Markets Review*.
- Gilbert, R.A. (1984), Bank Market Structure and Competition – A Survey, *Journal of Money, Credit and Banking* 19 : 617-645.
- Goddard, J., McKillop, D., & Wilson, J. O. (2008), The diversification and financial performance of US credit unions, *Journal of Banking & Finance* 32(9): 1836-1849.
- Greene, William H. (2008), *Econometric Analysis*, 6th ed. Upper Saddle River, NJ: Prentice Hall.
- Gruben, William C. and Robert P. McComb (2003), Privatization, competition and supercompetition in the Mexican commercial banking system, *Journal of Banking and Finance* 27: 229-249.
- Hall, M., N. Tideman (1967), Measures of Concentration, *American Statistical Association Journal* 1 : 162-168.
- Hannah, L., J.A. Kay (1977), *Concentration in Modern Industry*, MacMillan Press, London.
- Hannan, Timothy H., and Allen N. Berger (1991), The rigidity of prices: Evidence from the banking industry, *American Economic Review* 81: 938-945.
- Hannan, T. H. (February 1991), Foundations of the structure-conduct-performance paradigm in banking, *Journal of Money, Credit, and Banking* 23: 68-84.
- Hannan, Timothy H. (1991), Bank commercial loan markets and the role of market structure: Evidence from surveys of commercial lending, *Journal of Banking and Finance* 15: 133-149.
- Hart, P.E. (1975), Moment Distribution in Economics: An Exposition, *The Journal of the Royal Statistical Society, series A* 138: 423-434.

- Hause, J.C. (1977), The Measurement of Concentrated Industrial Structure and the Size Distribution of Firms, *Annals of Economic and Social Measurement* 6 : 73-107.
- Hauswald, Robert and Robert Marquez. (2002), Information Technology and Financial Services Competition, *Review of Financial Studies*.
- Hausman, J. A. (1978), Specification tests in econometrics, *Econometrica* 46: 1251-1271.
- Hempell, H.S. (2002), Testing for competition among German Banks, Deutsche Bundesbank, Economic Research Centre. Discussion Paper 04/02.
- Hondroyannis, G., Sarantis L. and E. Papapetrou (1999), Assessing competitive conditions in the Greek banking system, *Journal of International Financial Markets, Institutions and Money* 9: 377–391.
- Hsiao, C. (2003), *Analysis of panel data* (Vol. 34), Cambridge University Press.
- Hellmann, T. F., Murdock, K. C., & Stiglitz, J. E. (2000), Liberalization, moral hazard in banking, and prudential regulation: Are capital requirements enough? *American Economic Review* : 147-165.
- Hughes, J.P. and Mester, L. (1998), Bank capitalization and cost: Evidence of scale economies in risk management and signaling, *Review of Economics and Statistics*, 80: 314-325.
- Iwata, G. (1974). Measurement of conjectural variations in oligopoly. *Econometrica*, 42, 947-966.
- Iwata, G. (1974), Measurement of conjectural variations in oligopoly, *Econometrica* 42: 947–966.
- Gelos, R. G., Roldos, J. (2002), Consolidation and market structure in emerging markets banking systems, IMF Working Paper.
- Goldsmith, R.W. (1969), *Financial structure and economic development*. Yale University Press, New Haven.
- Fritzer, Friedrich (2004), Financial market structure and economic growth: A cross-country perspective, *Monetary Policy & the Economy*, Oesterreichische National Bank (Austrian Central Bank) 2: 72-87.
- Genesove, D., and Mullin, W. P. (1998), Testing static oligopoly models: Conduct and cost in the sugar industry, 1890–1914, *The RAND Journal of Economics* 29: 355–377.
- Gilbert, R. A. (1984), Bank market structure and competition: A survey, *Journal of Money, Credit, and Banking* 16: 617–644.
- Khatib, M. Nasir and Mathews, K. (2000), A non-parametric approach to efficiency measurement in the Malaysian banking sector, *The Singapore Review* 44: 89-14.
- Kasprzyk, D., Duncan, G. J., & Kalton, G. En Singh, MP (1989), *Panel Surveys*.
- Keeley, M.C. (1990), Deposit insurance, risk and market power in banking, *American Economic Review*, 80 :1183-1201.
- Lau, Lawrence. (1982), On identifying the degree of competitiveness from industry price and output data, *Economics Letters* 10 : 93–99.
- Levine, R. (1991), Stock markets, growth, and tax policy, *Journal of Finance* 46: 1445-65.
- Lloyd-Williams, D.M., Molyneux, P., Thornton, J. (1991), Market structure and performance in Spanish banking, *Journal of Banking and Finance* 18 : 433–443.
- Louzis, D. P., Vouldis, A. T., & Metaxas, V. L. (2012), Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios, *Journal of Banking & Finance* 36(4): 1012-1027.
- Maghyereh , A.I., Awartani , B. (2014), Bank distress prediction: Empirical evidence from the Gulf Cooperation Council countries, *Research in International Business and Finance* 3 : 126– 147.
- Mamatzakis, E, Christos Staikouras, and Anastasia Koutsomanoli-Fillipaki. (2005), *Competition and Concentration in the Banking Sector of the South Eastern*.
- Matutes, C., & Vives, X. (1996), Competition for deposits, fragility, and insurance, *Journal of Financial Intermediation* 5(2):184-216.
- Matutes, C., & Vives, X. (2000), Imperfect competition, risk taking, and regulation in banking, *European Economic Review* 44(1): 1-34.
- Mensi, S. (2010), Measurement of competitiveness degree in Tunisian deposit banks: An application of the Panzar and Rosse model, *Panoeconomicus* 57(2): 189-207.
- Mathews, K., Murinde V., Zhao, T., (2007), Competitive conditions among the major British banks, *Journal of Banking and Finance* 31: 2025–2042.
- Marfels, C. (1971a), Absolute and Relative Measures of Concentration Reconsidered, *Kyklos* 24 : 753-766.
- Marfels, C. (1971b), A Guide to the Literature on the Measurement of Industrial Concentration in the Post-War Period, *Zeitschrift für Nationalökonomie* 31, 483-505.
- Maudos, J. y Pérez, F. (2003), Competencia versus poder de monopolio en la banca Española, *Moneda y Crédito* 217: 139-166
- Maudos, J., Fernández de Guevara, J. (2004), Factors explaining the interest margin in the banking sectors of the European Union, *Journal of Banking and Finance* 28: 2259-2281.

- Molyneux, P., Lloyd-Williams, D.M. and Thornton, J. (1994), Competitive conditions in European banking, *Journal of Banking and Finance* 8: 445-59.
- Molyneux, P., Thornton, J. and Lloyd-Williams, D.M. (1996), Competition and market contestability in the Japanese commercial banking market, *Journal of Economics and Business* 48: 33-45.
- Molyneux, P. and H. Nguyen-Linh (2008), Competition and risk in the South East Asian banking, Bangor Business School working paper. Bangor, Wales.
- Moshirian, F. (2008), Financial services in an increasingly integrated global financial market, *Journal of Banking and Finance* 32 (11) : 2288–2292.
- Murjan, W., & Ruza, C. (2002), The competitive nature of the Arab Middle Eastern banking markets, *International Advances in Economics* 1: 267–275.
- Nakane, M. (2001), A Test of competition in Brazilian banking, Working Paper Series 12. Brasilia, Brazil: Banco Central do Brazil.
- Nathan, A. and Neave, E.H. (1989), Competition and contestability in Canada's financial system: empirical results, *Canadian Journal of Economics* 22: 576-94.
- Neven, D. and L.H. Roller (1999), Competition in the European banking industry: An aggregate structural model of competition, *International Journal of Industrial Organization* 17: 1059-1074.
- Niimi, K. (1998), Big-bang to waga kuni ginkogyo: Jiyuka to rireshonshippu rending , *Japan Research Review* [in Japanese].
- Ou, C. M., & Tan, Y. J. (2011), Multi-perspective Studies on Competition Degree of Chinese Banking Industry: Empirical Analysis Based on Panzar-Rosse Method, *Systems Engineering* 2: 006.
- Qiang, F. U., & Qiao, L. I. A. N. G. (2011), An Empirical Study on China's Banking Market Structure and Competition Based on the Panzar-Rosse Model, *Journal of Chongqing University (Social Science Edition)* 1: 006.
- Pagano, M. (1993), Financial markets and growth: an overview, *European Economic Review* 37(2): 613-622.
- Pang, Jiaren and Wu, Haibin (2009), Financial markets, financial dependence, and the allocation of capital, *Journal of Banking & Finance* 33: 810-818.
- Panzar, J.C. and Rosse, J.N. (1987), Testing for monopoly equilibrium, *Journal of Industrial Economics* 35: 443-56.
- Panzar, J. and Rosse, J. (1989), Structure, conduct and comparative statistics, *Bell Laboratories Economic Discussion Paper*, No 248.
- Park, Hun Myoung. (2011), Practical guides to panel data modeling: A step-by-step analysis using Stata, Tutorial Working Paper. Graduate School of International Relations, International University of Japan
- Perera, S., Skully, M., & Wickramanayake, J. (2006), Competition and structure of South Asian banking: a revenue behaviour approach, *Applied Financial Economics* 16(11): 789-801.
- Petersen, M.A., Rajan, R.G. (1995), The effect of credit market competition on lending relationships, *Quarterly Journal of Economics* 110: 407–444.
- Phillips, A. (1976), A critique of empirical studies of relations between market structure and profitability, *Journal of Industrial Economics*, 24: 241-249.
- Prescott, H. and McCall, A. (1975), Market power and structure and commercial bank installment lending, *Journal of Money, Credit and Banking* 7: 449-467.
- Rajan, R., Servaes, H., & Zingales, L. (2000), The cost of diversity: The diversification discount and inefficient investment, *The Journal of Finance* 55(1): 35-80.
- Repullo, R., (2004), Capital requirements, market power, and risk-taking in banking, *Journal of Financial Intermediation* 13: 156–182.
- Ribon, S., Yosha, O. (1999), Financial liberalization and competition in banking: An empirical investigation, Working Paper No 23-99, Tel Aviv University.
- Rime, B., (1999), Mesure de degré de concurrence dans le système bancaire Suisse à l'aide du modèle de Panzar et Rosse, *Revue Suisse d'Economie Politique et de Statistique* 135: 21–40.
- Rosenbluth, G. (1955), Measures of Concentration, in *Business Concentration and Price Policy*, National Bureau Committee for Economic Research, Princeton, 57-99.
- Rudkevich, Aleksandr, Max Duckworth and Richard Rosen (1998), Modeling electricity pricing in a deregulated generation industry: The potential for oligopoly pricing in a poolco, *The Energy Journal* 19: 19-48.
- Saint-Paul, Gilles. (1992), Technological choice, financial markets and economic development, *European Economics Review*, 36: 763 -781
- Santoso, W. (2009), Comment on “The determinants of cross-border merger and acquisition activity in the banking sector in Asia: did the Asian financial crisis change them?” NBER chapters. In: *Financial Sector*

- Development in the Pacific Rim, East Asia Seminar on Economics, National Bureau of Economic Research, Inc. 18 : 236–240.
- Schaeck, K., Cihak, M., & Wolfe, S. (2009), Are competitive banking systems more stable? *Journal of Money, Credit and Banking* 41(4): 711-734.
- Simpasa, A. M. (2011), Competitive conditions in the Tanzanian commercial banking industry, *African Development Review* 23(1): 88-98.
- Shaffer, S. (1982), Competition conduct and demand elasticity, *Economic Letters* 10: 167-71.
- Shaffer, S. (1982), A non-structural tests for competition in financial markets. In: *Bank Structure and Competition, Conference Proceedings*. Federal Reserve Bank of Chicago, Chicago, 225–24.
- Shaffer, S. (1989), Competition in the US banking industry, *Economics Letters* 29: 323–323.
- Shaffer, S., (1993), A test of competition in Canadian banking, *Journal of Money, Credit and Banking* 25: 49-61.
- Shaffer, S. (1996a), Structural screens in stochastic markets, *Southern Economic Journal* 63: 140–148.
- Shaffer, S. (1996b), Viability of traditional banking activities: Evidence from shifts in conduct and excess capacity, *International Journal of the Economics of Business* 3: 125–143.
- Shaffer, S. (1999), The competitive impact of disclosure requirements in the credit card industry, *Journal of Regulatory Economics* 15: 183–198.
- Shaffer, S. (2000), Correlation tests for competitive and Cournot conduct, *Review of Industrial Organization* 16: 313–318.
- Shaffer, S. (2001), Banking conduct before the European single banking license: A cross-country comparison, *North American Journal of Economics and Finance* 12: 79–104.
- Shaffer, S. (2004), Patterns of competition in banking, *Journal of Economics and Business*. 56: 287-313.
- Shaffer, S. and DiSalvo, J. (1994), Conduct in a banking duopoly, *Journal of Banking and Finance* 18: 1063–1082.
- Schaeck, K, M. Cihak, and S. Wolfe (2006), Are more competitive banking systems more stable? , Unpublished Working Paper No. 143, International Monetary Fund, Washington, D.C.
- Schaeck, K., and M. Cihak (2007), Banking competition and capital ratios, IMF Working Paper No. 07/216.
- Schumpeter, Joseph. (1911) 1934. *The Theory of Economic Development*. Cambridge, Mass.: Harvard University Press.
- Staikouras, C., E. Mamatzaki, and A. Koutsomanoli-Filippaki, (2008), Cost efficiency of the banking industry in the South Eastern European region, *Journal of International Financial Markets, Institutions and Money* 18: 483-497.
- Stern, G. H., & Feldman, R. J. (2004), *Too big to fail: The hazards of bank bailouts*, Brookings Institution Press.
- Stiroh, K. J., & Rumble, A. (2006), The dark side of diversification: The case of US financial holding companies, *Journal of Banking & Finance* 30(8): 2131-2161.
- Sufian , Fadzman and Majid, Muhd-Zulhibri (2007), Banks' efficiency and stock prices in emerging markets: Evidence from Malaysia, *Journal of Asia-Pacific Business* 7: 35-53
- Sufian, F. (2009), Determinants of bank efficiency during unstable macroeconomic environment: Empirical evidence from Malaysia, *Research in International Business and Finance* 23(1): 54-77.
- Sufian, F., & Habibullah, M. S. (2013), Financial sector consolidation and competition in Malaysia: An application of the Panzar-Rosse method, *Journal of Economic Studies* 40(3) : 390-410.
- Suominen, M. (1994), Measuring competition in banking: A two-product model, *Scandinavian Journal of Economics* 96: 95–110
- Tecles, P. L., & Tabak, B. M. (2010), Determinants of bank efficiency: The case of Brazil, *European Journal of Operational Research* 207(3): 1587-1598.
- Thomas, Tommy (2012), *Corporate Governance And Debt In The Malaysian Financial Crisis Of 1997-98*, Working Papers Series, University of Minnesota
- Trivieri, F. (2007), Does cross ownership affect competition? Evidence from the Italian banking industry, *Journal of International Financial Market, Institutions and Money* 17: 79-101
- Turk Ariss, R. (2009), Competitive behavior in Middle East and North Africa banking systems, *Quarterly Review of Economics and Finance* 49: 693-710.
- Uhde, A., & Heimeshoff, U. (2009), Consolidation in banking and financial stability in Europe: Empirical evidence, *Journal of Banking & Finance* 33(7): 1299-1311.
- Vesala, J. (1995), Testing for competition in banking: Behavioral evidence from Finland, *Bank of Finland Studies E* : 1.
- Vives, X. (2001), Competition in the changing world of banking, *Oxford Review of Economic Policy* 17: 535-547.
- Wachtel, Paul (2001), Globalization of banking: Why does it matter, *International Finance* 4: 335-362.

- Wagner, W. (2007), The liquidity of bank assets and banking stability, *Journal of Banking & Finance* 31(1): 121-139.
- Wagner, W. (2010), Diversification at financial institutions and systemic crises, *Journal of Financial Intermediation* 19(3): 373-386.
- Yildirim, H.S. and Philippatos, G. C. (2002), Efficiency of banks: Recent evidence from the transition economies of Europe, 1993–2003, Unpublished paper, University of Tennessee, April.
- Yildirim, H. S. and Philippatos, G. C. (2002), Competition and contestability in Central and Eastern European banking markets, FMA International Annual Meeting, Dublin: Ireland.
- Yildirim, H. Semih and Philippatos, George, C (2007), Competition and contestability in Central and Eastern European banking markets, *Managerial Finance* 33: 195-209.
- Yuan, Yuan (2006), The state of competition of the Chinese banking industry, *Journal of Asian Economics* 17: 519-534.
- Zhang, J., Jiang, C., Qu, B., & Wang, P. (2013), Market concentration, risk-taking, and bank performance: Evidence from emerging economies, *International Review of Financial Analysis* 30: 149-157.