Market Concentration and Competition in Vietnamese Banking Sector[*]

Le Hai TRUNG
Banking Faculty, Banking Academy of Vietnam
trunglh@hvnh.edu.vn

Abstract. The wave of financial liberalization raises questions about the competitiveness of Vietnamese commercial banks against those from other countries. The main purpose of this paper is to measure the market concentration using the k banks concentration ratio (CR_k) and the Hirschman-Herfindahl index (HHI) and speculate on the market competition in Vietnamese banking sector under Panzar-Rosse approach. Overall, Vietnamese banking sector is found to be highly concentrated although it is experiencing a decreasing trend. Also, the speculation of market competition indicates a monopolistic behavior of Vietnamese commercial banks.

Аннотация. Волна финансовой либерализации поднимает вопрос о конкурентоспособности вьетнамских коммерческих банков по отношению к банкам других стран. Основная цель данной работы заключается в измерении рыночной концентрации с помощью коэффициента концентрации (CR_k), индекса Герфиндаля-Гиршмана (HHI) с использованием модели Панзара-Росса. В целом вьетнамский банковский сектор является сильно концентрированным, хотя испытывает тенденцию к ослаблению централизации. Кроме того, отмечается монопольное поведение вьетнамских коммерческих банков.

Key words: Market concentration, competition, banking sector, commercial banks, Vietnam.

1. INTRODUCTION

In 1986, Vietnamese government launched an economic renewal campaign named "Doi Moi" to promote economic development and turn the country's economy into a more open and market-oriented one. It is undoubted that Vietnamese banking sector has contributed a large part to the economic expansion recently. The banking sector has been developing substantially in recent years since the banking market was opened to both foreign and private sector banks in 1991. The number of banks in Vietnam reached 104 banks (as of 31/12/2012), including 1 state-owned commercial bank (Agribank), 4 partially state-owned commercial banks (Vietinbank, Vietcombank, BIDV and MHB), 33 joint-stock commercial banks, 5 wholly foreign-owned banks, 4 joint-venture commercial banks and 55 foreign banks' branches and subsidiaries. By the end of 2011, the total domestic credit provided by banking sector constituted 120.8% of GDP, while domestic deposit to banking sector accounted for 106.56% of GDP. High-level of credit growth of around 30% in a long period of time was one of the most important factors in the high growth rate of the Vietnamese economy.

One of the most striking feature of the Vietnamese banking sector is the domination of state-owned banks and partially state-owned banks (from now onwards, they are all called state-owned banks — SOCBs, as the government has controlling right in all of these banks with over 51% of total chartered capital). These state-owned banks' assets account for about 50% of the total banking sector's assets, together with 48% in deposit and 52% in credit market-share, leading to very high market concentration. However, this market concentration has been decreasing considerably due to the increase in market share of domestic joint-stock commercial banks and foreign banks.

In addition, the Vietnamese banking system has been under an unavoidable financial globalization trend as well as dramatic advancement in information and banking technology. According to Linda S. Goldberg (2008), globalization can help the host countries receive the services of globally-oriented banks. It can also have positive effects on real foreign direct investment, technology transfers, and productivity enhancement. Hence, for developing countries such as Vietnam, it is a crucial requirement to participate in globalization process. Globalization in the banking sector could change the market structure and behavior of Vietnamese banking industry. For instance, the increased presence of foreign banks has imposed the

---

[*] Рыночная концентрация и конкуренция в банковском секторе Вьетнама.

needs to enhance the competitiveness and strength of domestic commercial banks, including partially privatizing SOCBs and strengthening bank capital requirement.

As a result, measuring and understanding the current state and trends in market concentration and competition in Vietnamese banking industry could give some implications to government and banking supervisor (State Bank of Vietnam — SBV) to improve the strength and efficiency of banking system. In theory, there are two main approaches to measure the market concentration and competition. From the structural approach, bank concentration and competition is measured by the number of banks and the market share of each bank. The most popular method is the Hirschman-Herfindahl index (*HHI*). In the non-structural approach, different frameworks are developed with the most popular models such as the Iwata model (Iwata, 1974), the Bresnahan and Lau model (Bresnahan and Lau, 1982) and the Panzar-Rosse model (Panzar and Rosse, 1977; 1987).

This paper proceeds as follows: Section 2 will give a brief overview about Vietnamese banking system. Section 3 will provide some theoretical review about the market concentration and competition in banking sector. Section 4 will describe the data and methodology employed in this study. Section 5 will present and analyze the empirical result by both structural and non-structural approaches. Finally, the conclusion will be given in Section 6.

2. OVERVIEW OF VIETNAMESE BANKING SYSTEM

Early reform in Vietnamese banking sector was a part of the broader set of market-oriented reforms that the government began in the mid-1980s, focusing on decentralizing and privatizing financial services. Prior to 1990, the SBV operated as both the central bank and a commercial bank. It then separated its four main departments to form four new SOCBs in 1990, each targeted at different sectors of economy. The central bank's industrial and commercial lending department converted into the Vietnam Industrial and Commercial Bank (Incombank — now is Vietinbank). The agricultural department was converted into the Vietnam Bank for Agricultural and Rural Development (Agribank), while its international trade department and infrastructure department converted into the Bank for Foreign Trade of Vietnam (Vietcombank) and the Bank for Investment and Development of Vietnam (BIDV), respectively.

Since the first reform, Vietnamese banking sector has been playing a vital role in the economic development and growth. In 1992, domestic credit provided by banking sector accounted for only 15.7% of GDP. From this point onward this ratio increased dramatically, peaking at 135.8% of GDP in 2011. Vietnamese stock market is still in early stage of development, as we can see in the Figure 1. The stock market capitalization only accounted for 21.1% of GDP in 2012, which has been recently announced to be increased to about 30% of GDP in 2013.
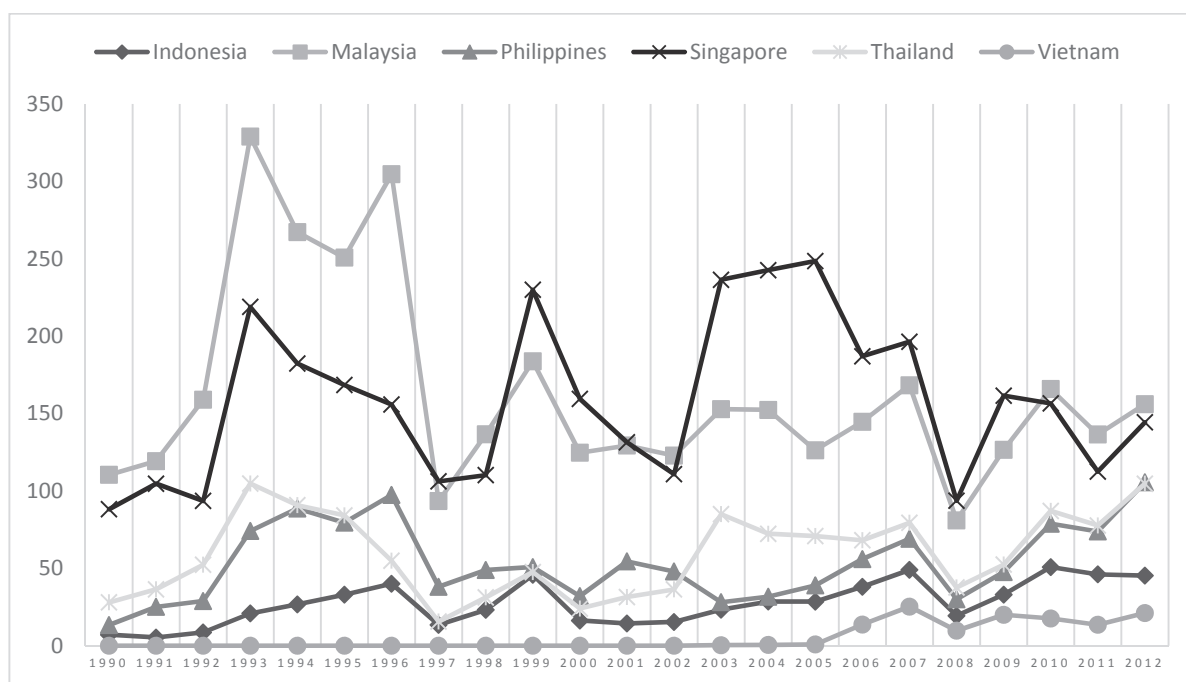

Figure 1. Stock market capitalization of Vietnam and other countries in ASEAN.
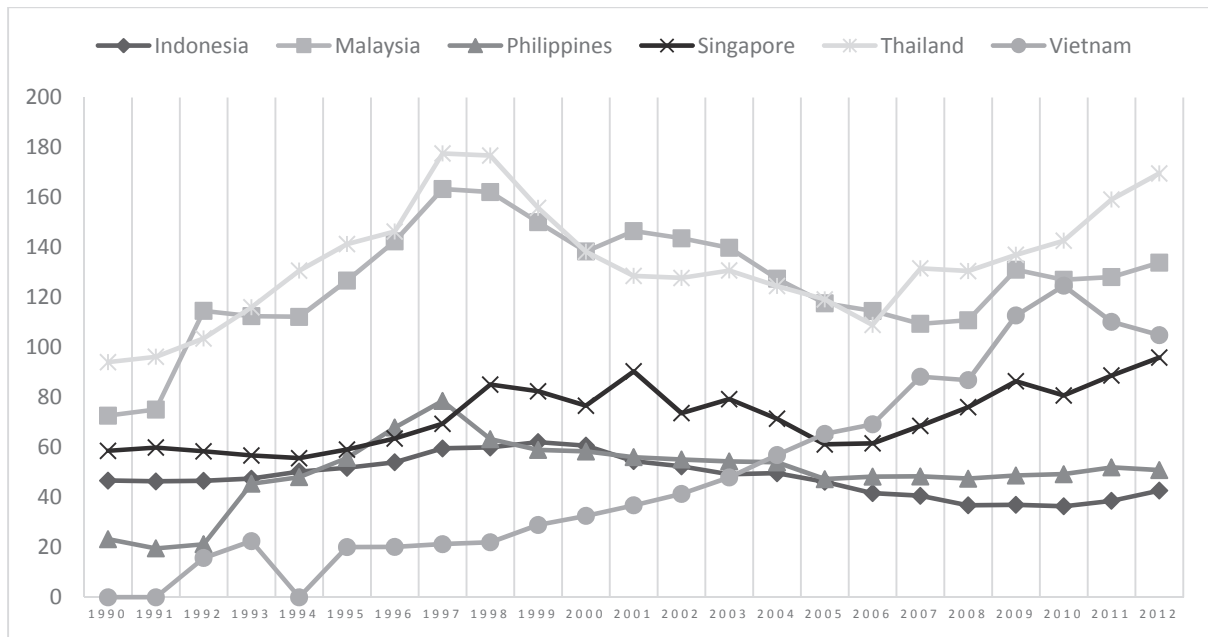Source: World Bank data.

Figure 2. Domestic credit provided by banking sector of Vietnam and other countries.
Source: IMF data.

Table 1. Brief statistic about financial assess of Vietnamese banking sector.

Indicator/Year	2007	2008	2009	2010	2011	2012
Number of banks	85	94	94	101	100	100
Deposit with banks (% of GDP)	97.25	91.7	106.36	121.39	106.56	119.67
Commercial banks branches per 1000 km^2		6.83	6.98	6.98	7.77	6.91
Commercial banks branches per 100000 adults		3.31	3.32	3.25	3.57	3.18
ATMs per 1000 km^2	15.52	24.74	31.38	36.87	43.05	46.02
ATMs per 100000 adults	7.68	11.98	14.91	17.22	19.79	21.16

Source: IMF data.

The size and development of Vietnamese stock market is considerably lower than that of neighboring countries, including Thailand, Singapore, Indonesia and Philippines, with the ratio of over 100% of GDP in 2012. As a result, domestic credit provided by banking system is the main capital source for financing firms and as well as the whole economy. Figure 2 shows a dramatic increasing trend in the ratio of the economy's domestic credit to GDP. Although the credit growth of banking sector has slowed down in recent years due to the severe effects of global crisis, there is no doubt that the banking sector will continue to contribute a large part to the development and growth of Vietnamese economy in the next few years.

Additionally, the Vietnamese banking sector has continued to widen financial access to Vietnamese residents recently. Table 1 provides some brief statistics about the financial assess in Vietnam, collected from IMF data. The financial assess of Vietnamese banking sector has improved significantly in all indicators, high-

lighting the expansion of financial and banking services available to residents.

Vietnamese banking sector seems to have a high concentration with the dominance of SOCBs. 4 main state-owned commercial banks including Agribank, Vietcombank, Vietinbank, BIDV account for 38% of total chartered capital and 49% of total assets of the whole system. They also dominate in both bank credit and deposit markets, as seen in Figure 3.

However, the market concentration in banking sector is decreasing as a part of Vietnam's increasing participation in international trade and investments agreements, such as the US-Vietnam Bilateral Trade Agreement (BTA) in 2001, and the new role as an official member of the WTO in 2007. Since 2006, the State Bank of Vietnam (SBV) has granted licenses to five foreign banks to operate as wholly foreign-owned banks, as well as to six joint venture banks and over 50 subsidiaries of foreign banks. To adhere to WTO regulations, from January 1st, 2011,
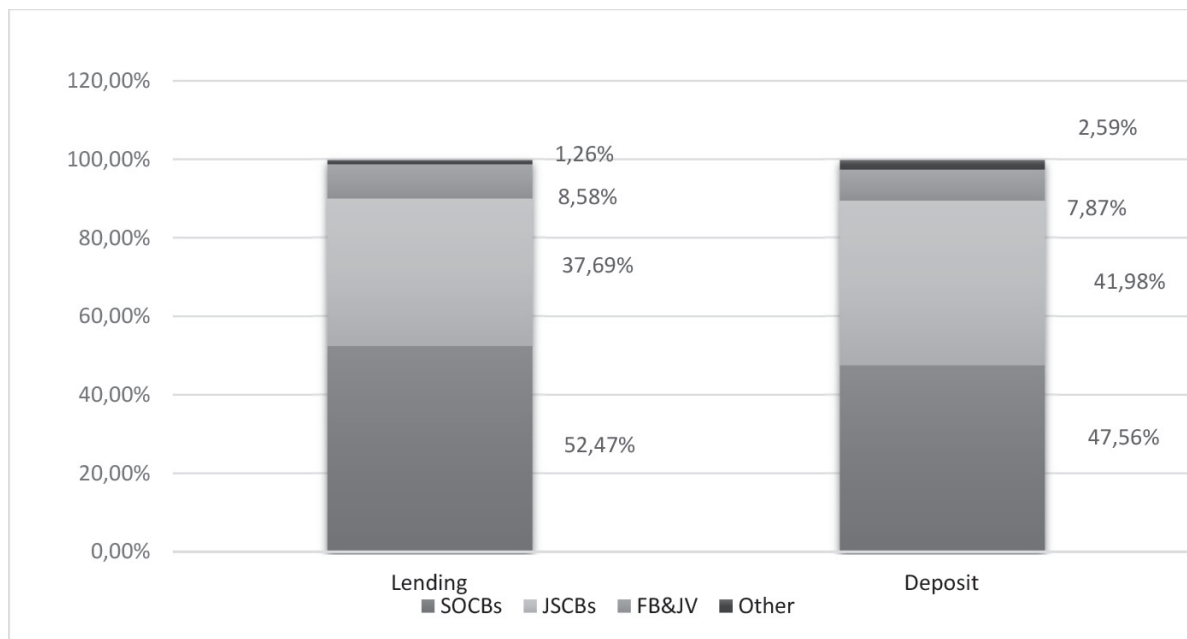
Figure 3. Market share by lending and deposit.
Source: IMF report.

Table 2. Comparison of financial assess of Vietnam and other ASEAN countries.

	Vietnam	Thailand	Singapore	Indonesia	Malaysia
Commercial bank branches per 1000 km^2	6.91	12.55	618.57	9.24	13
ATMs per 1000 km^2	46.02	89.7	3684.29	35.15	34.56
Commercial bank branches per 100000 adults	3.18	11.77	9.76	9.59	19.91
ATMs per 100000 adults	21.16	84.16	58.12	36.47	52.94

Source: IMF data.

foreign banks and branches have received equal treatment as domestic banks. The increasing presence of foreign banks and branches has enhanced the competitive pressure in banking sectors, forcing domestic banks to improve their competitiveness and strength.

Despite significant expansion since 1990s, Vietnamese banking sector is still an infant industry with high potential growth. Only around 20% of the 90m population in Vietnam has bank accounts. As shown in Table 2, financial access to banking services compared to that of other ASEAN countries is much lower. In addition, with a young population and increasing income, the demand for modern banking services is expected to increase substantially in the near future. Hence, together with the unavoidable wave of financial liberalization and deregulation, Vietnamese banking sector will soon receive much higher interests and investments from foreigners and global institutions, which in turn, will change the nature of market concentration and competition of banking sectors.

Since the recent global crisis, Vietnamese banking sector has exposed many weaknesses, slowing down the recovery of the whole economy. This is due to the fact that Vietnamese banking sector is excessive in number, but lacking in the services quality. Despite a low average profitability in comparison with other fields (ROE and ROA at 0.5% and 4%, respectively), bank profit has been deteriorating recently as 24/125 credit institutions experienced losses, 100/125 gained, but 57 of them had negative y-o-y profit growth (as of 30/6/2013). Bank credit growth continues to stay low, with some months being in negative growth, due to the weak domestic demand and high level of NPLs in the banking system. As a result, on March 01, 2012, the banking sector reform strategy was approved with the key objectives is to "restructure fundamentally and comprehensively the system of credit institutions to develop … a modern, safe, sound efficient system compliant with international banking standards and practices". One of key element of the plan to improve the competitiveness of domestic banks is restructuring weak institutions via mergers and acquisitions (M&A) deals, with the number of domestic banks being expected to decrease to about 15 to 17 units in 2017. Apparently, this restructuring progress will have

significant impacts on the market concentration and competition of Vietnamese banking sector as well as the market behaviors of each commercial bank in the near future. Understanding the current state of market concentration and competition in banking sector could give some implications to Vietnamese government and SBVs in policy decisions to successfully implement the banking reform strategy.

3. LITERATURE REVIEW

The competition in financial sector is important since it affects the efficiency of production of financial services, the quality of financial products and the degree of innovation in the sector. The degree of competition in financial sector can affect access of firms and households to financial services which in turn influences overall economic growth. As in other industries, higher competitive nature in banking sector is expected to fuel the efficiency and maximize social welfare to the whole economy. However, banking industries have some special properties as well as high influence to other industries with its important intermediating role in capital allocation in the economy. As a result, there is a conventional debate among academicians about the economic role of market concentration and competition in banking sector regarding the financial stability and social welfare. This debate is getting more and more interest from policy makers as we have experienced a wave of financial liberalization and deregulation, removing barriers to entry as well as protective policies for domestic institutions, which is expected to promote market competition in banking sector.

There are two main arguments in the theory about the economic role of market concentration and competition in banking sector. One argument based on the "*franchise value hypothesis",* indicating that banking system could be more fragile and less stable resulting from higher market competition and lower market concentration. In contrast, the second view based on "*risk shifting paradigm"* argues that financial stability would be enhanced as the banking sector becomes more competitive.

Franchise value hypothesis focuses on the risk incentive of banks and analyses the effects of competition on bank's risk taking behavior. It states that higher competition erodes profits margin causing banks' franchise value drop, thus reducing incentives to prudential behavior and leading to more aggressive risk taking in an attempt to earn higher profits. Banks may choose more risky and lower quality portfolios, taking on more credit risk, lowering capital levels. This behavior, then, increases the probability of higher non-performing loan ratio and more bank bankruptcies resulting in greater fragility and financial instability. (Beck, 2008; Jimenez,

Saurina, 2007). Boyd *et. al.* (2005) indicated that larger banks in a concentrated banking system have higher profit, protecting them against financial shocks. The role of larger banks is also supported by the view of Boot and Thakor (2000), who proposed that larger banks did not need to give credit to risky investors, and could therefore select their clients, increasing both return on investment and the soundness of the credit portfolio.. Allen and Gale (2000) concluded that banking sector with a few larger banks is easier to monitor than one with many smaller banks.

In the supporting view to bank competition, **risk-shifting paradigm,** argues that higher competition could contribute to financial stability as increase in market power and the resulting higher loan rates have the potential to negatively affect the stability of banks due to moral hazard and adverse selection on the part of borrowers, as the borrower may choose higher risk project and increase their own risk of bankruptcy. This is, in turn, higher probability that loans turn non-performing, leading to higher bankruptcy risk for bank and greater financial instability (Boyd and De Nicolo, 2006). Mishkin (1999) also indicated the "*too-big-to-fail"* problem in banking sector as a result of lessening the degree of competition. He stated that larger banks are more likely to receive public support, and this worsens the moral hazard problems as larger banks may take more risky investment under a government safety net. Berger *et al.* (2008) also shared this view, indicated that policy-makers are more concerned about bank failures in more concentrated banking sectors with few large banks. Concerns about contagion and financial crisis resulting from the failure of larger banks make regulators reluctant to let them fail in the event of solvent problem. As a result, in highly concentrated markets, financial institutions may believe they are "too big to fail" and this may lead to riskier investments. He also added that larger banks have more complex organizational structure and may be associated with lowered transparency, which makes them more difficult to monitor. According to the social welfare, creation of a competitive environment encourages financial firms to adopt cost-reducing measures and to use resources more efficiently. In a competitive environment, financial firms are forced to increase the quality of service such as faster clearing of payments, more rapid processing of loan applications, and extended working hours for customers.

Besides theories, large amount of empirical data were used to examine the impact of banking system structure on the stability and efficiency of banking sector. They all give different results and do not offer concrete evidences. The approaches of measuring concentration and competition in banking sector could be

divided into two main lines: structural and non-structural method.

Structural approach based on the traditional industrial organization literature includes Structure-Conduct-Performance paradigm (SCP) and Efficiency Structure Hypothesis: SCP paradigm links between structure and performance of industries. Structure accounts for degree of concentration in the market. Conducts refer to the behavior of firms in price-setting, making research and development. Performance refers to efficiency of firms, defined by the market power, with greater market power implying lower efficiency. The paradigm is based on the hypotheses that structure influences conducts (lower concentration leads to more competitive behavior of firms); conducts influences performance (more competitive behavior leads to less market power, then greater efficiency) and structure therefore influences performance (lower concentration leads to lower market power and then greater efficiency). As a result, competition in the sector could be measured by the degree of concentration. One of the most popular approaches is the use of Herfindahl-Hirschman Index. Efficiency Structure Hypothesis (EH), argued by Demsetz (1973) and Peltzman (1977), states that efficient firms increase in size and, therefore, in market share due to their ability to generate higher profits, leading to higher market concentration. Under EH, there is no direct relationship between market concentration and competition, and the highly concentrated sector is the logical outcome of market forces.

In contrast with structural approach, **non-structural approach** measures the competition directly. Two most popular approaches are the models developed by Panzar and Rosse (1987) and Bresnahan (1989). While Bresnahan (1989) used the condition of General Market Equilibrium with the basic idea that profit-maximizing firms in equilibrium will choose prices and quantities such that marginal costs equal marginal revenue, which coincides with the demand price under perfect competition or with the industrial marginal revenue under perfect collusion, Panzar and Rosse used bank level data and investigated the extent to which a change in factor input prices is reflected in revenues earned by a specific bank. In other words, the competition in a sector is measured by the elasticity of output revenue due to changes in input prices. Under perfect competition, an increase in input prices raises both marginal costs and total revenues by the same amount as the rise in costs. Under a monopoly, an increase in input prices will increase marginal costs, reduce equilibrium output and, consequently, reduce total revenues.

A number of papers have applied both structural and non-structural approaches to investigate the degree of concentration and competition as well as the impact of market concentration and competition in banking sector in developed countries, but just a few of them targeted on developing countries.

For instance, Bikker and Groeneveld (2000) investigated a sample of European countries between 1989 and 1996 and found no evidence of increasing competition during this period. Bikker and Haaf (2002) then extended the analysis to 23 OECD countries over the period 1988 to 1998. For every single country, results described a monopolistic competition environment. They then divided sample banks to large, medium and small-size banks and found that competition appears to be stronger to large banks and weaker to small banks.

Claessens and Laeven (2004) explored a multi-country analysis of banking competition with the largest bank data by computing H-statistic for 50 developed and developing countries for the period 1994–2001. They found a monopolistic competition in the banking sectors of all countries under consideration. They then regressed the estimated H-statistic on a number of country-specific characteristics with the presence of foreign banks, activity restrictions, entry regime, market structure and some general macroeconomic conditions being under review. They did not found a clear relationship between competition and concentration, but did find that fewer entry and activity restrictions resulted in more competition.

Weil (2004) measured the banking competition for a sample of 12 EU countries over a period from 1994–1999 and found that there is a decreasing pattern of monopolistic competition. He then explored the relationship between competition and efficiency measured by efficiency scores being estimated using a stochastic frontier approach, together with a set of macro factors and geographical dummies. He found that relationship between competition and efficiency tends to be negative. This result was supported by the research of Casu and Girardone (2006) on a sample containing 15 EU member countries. The only difference was that Casu and Girardone estimated the efficiency of banks by efficiency scores conducted by a non-parametric Data Envelopment Analysis.

In term of developing countries, Perera *et al.* (2006), by applying Panzar and Rosse test, found a monopolistic competition in banking sector during the period 1995 to 2003. They also compared the competition in traditional market-based products market, and fee- and commission-based products markets. Under their investigation, Bangladesh and Pakistan had more competitive nature in traditional market-based products markets, while Indian and Sri Lankan competition was greater in fee- and commission-based products market.

Gelos and Roldos (2004) were concerned about the market structure in emerging markets banking systems and found that market competition in banking sector did not decrease due to a significant process of bank merger and acquisition wave during 1990s. They also suggested that lowering entry barriers have prevented a decline in competitive pressures.

In their research on the market concentration and competition in Nepalese banking sector, Gajuel and Pradham (2012) found a decreasing trend and low level of market concentration in the period of 2001–2009. They also indicated more competition in interest-based market than fee-based market.

In my knowledge, the market competition and concentration in Vietnamese banking system has not been investigated fully. Vietnamese banking system competition was only a part of data in the research of some academicians for multi-country sample, such as Bikker *et al.* (2012) and Sentiyono and Tarazi (2014). As a result, this study could be the first research that employs both structural and non-structural approaches to investigate the degree on concentration and competition in Vietnamese banking sector. The results of this study could give some policy implications in the hope of strengthening the competitiveness of Vietnamese commercial banks.

4. DATA AND METHODOLOGY

4.1. DATA

The main data employed in this study was collected from bank database of Bankscope by Bureau van Dijk. It includes annual bank level data of all Vietnamese commercial banks during the period from 2004 to 2013 due to the availability of data, except for Vietnamese Bank for Social Polices and Vietnam Development Bank for clear representation of commercial bank behaviors in conducts and performance. The data for foreign banks' branches and subsidiaries are also dropped from the sample as their behavior and performance mainly contributed to their foreign parent bank. Hence, the minimum data available is only 10 banks in 2004 to 34 banks in 2012 maximum, resulting in an unbalanced data with the total bank year observation accounting to 224. The commercial banks sample consists of both state-owned banks, joint-stock banks and wholly foreign-owned banks, hence, it is expected to represent all features of Vietnamese banking sector. The data also concerned about the ownership of commercial banks as well as whether they have foreign involvement in operation, either as an owner or an investor, in order to investigate different competitiveness of different type of commercial banks under consideration.

4.2. METHODOLOGY

4.2.1. Structural approach

Under structural approach, the market concentration and competition in banking sector is measured by the "*k-bank*" concentration ratio, and more intuitive Herfindahl-Hirschman Index (*HHI*-index).

The "*k-bank*" concentration ratio is measured by the sum of market share of k largest banks in the sector. The higher the ratio, the more concentration there is in the banking sector with larger market power to largest banks in the banking sector.

$$CR_k = \sum_i^K MS_i$$

On the other hand, *HHI*-index is calculated by squaring the market share of each banks competing in the banking sector. The *HHI*-index is expressed as follows:

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

The higher the ratio is, the higher the degree of concentration becomes, and therefore the lower the competition in the banking sector is. The US Merger Guidelines pointed out that a *HHI*- index below 0.01 indicates a highly competitive market, a *HHI*-index of between 0.01 and 0.1 belongs to un-concentrated market, a *HHI*-index ranged from 0.1 to 0.18 indicates moderate concentration while *HHI*-index above 0.18 comes from highly concentrated banking sector.

4.2.2. Non-structure approach

This research applies the reduced-form revenue equation specified by Panzar and Rosse (1987), which is one of the most widely used method to differentiate between oligopolistic, monopolistically competitive and perfectly competitive markets. The methodology of Panzar-Rosse is based on the general equilibrium market theory. Assuming long-run market equilibrium, individual firms will decide their productions in quantity and prices by setting marginal revenue equal to marginal costs.

$$R_i^m \left(y_i^*; Z_i^R \right) = C_i^m \left(y_i^*; W_i; Z_i^C \right)$$

Where $R_i(.)$ and $C_i(.)$ are the revenue and cost functions of bank i, y_i is the output of firm, W_i is the K-dimension vector of factor input prices of bank i, $W_i = (w_{1i}; w_{2i}; ...; w_{Ki})$; Z_i^R is a vector of exogenous factors affecting the revenue function, Z_i^C is a vector of exogenous factors that shift the cost function.

Panzar-Rosse approach measures the degree of competition though H-statistic, and evaluates the elasticity of total revenues with respect to changes in the factor input prices.

Table 3. Concentration ratios of Vietnamese banks.

	2007			2009			2012		
	Assets	*Deposit*	*Loan*	*Assets*	*Deposit*	*Loan*	*Assets*	*Deposit*	*Loan*
CR4	66.70%	73.07%	71.70%	53.84%	58.21%	62.84%	49.53%	52.6%	59.91%
CR6	77.95%	81.41%	83.04%	65.36%	68.55%	71.53%	58.26%	61.9%	68.33%
HHI	0.130	0.149	0.166	0.093	0.107	0.124	0.077	0.087	0.106

$$H = \sum_{K=1}^{K} \left(\frac{\partial R_i^*}{\partial w_{ki}} * \frac{w_{ki}}{R_i^*} \right)$$

The empirical application of Panzar and Rosse approach assumes log-linearity in the specification of the revenue and cost equation. The reduced-form of revenue equation is:

$$Ln\left(R_i^*\right) = \alpha + \sum_{k=1}^{K} \beta_k Ln\left(w_{ki}\right) + \sum_{q=1}^{Q} \delta_q Ln\left(z_{qi}\right)$$

Where Z_i is a vector of Q bank-specific variables, w_{ki} is k input factor prices. Then H-statistic is calculated by

$$H = \sum_{k=1}^{K} \beta_k$$

The H-statistic, then, will indicate the overall level of competition in the market under consideration. According to Panzar and Rosse, H-statistic value ranges from minus infinity to unity. Under perfect competition, H-statistic takes unity value that means 1 percent change in cost will lead to 1 percent change in revenues. Under monopoly market structure, H-statistic will take value from minus infinity to zero, meaning 1 percent change in cost will lead to a fail in revenue. H-statistic value ranges from zero to unity will indicate a monopolistic competition in the market, with higher H-value indicate higher competition.

P — R approach assumes market equilibrium, hence, a test for long-run equilibrium is required with ROE or ROA is used as a dependent variable. The same H-statistic value will be recalculated and it is supposed to be significant equal to zero in equilibrium and significant negative in disequilibrium. This is based on the view that in equilibrium, rate of return does not depend on the level of input prices.

5. EMPIRICAL RESULTS

5.1. STRUCTURAL APPROACH

The structural approach in measuring market concentration and competition in Vietnamese banking sector taken by the concentration ratio of four and six largest banks in the industry as well as *HHI*-index, both in term

of total asset, deposit market and loan market, for three years including 2007, 2009 and 2012. Table 3 below summarizes these concentration ratios in Vietnamese banking sector, including CR4, CR6 and *HHI*-index.

As expected, Vietnamese banking sector is dominated by four state-owned commercial banks, which are also four largest banks in the industry both in term of assets, deposit and loan markets. However, there is a clear decreasing trend in total assets, loan and deposit markets. Their assets accounted for 66.7% of the whole banking sector's total assets in 2007 before being dropped considerably to 53.84% in 2009 and slightly below 50% in 2012. It could be due to the fact that their assets had to be increased as all Vietnamese commercial banks had to meet the capital requirement of at least VND 3 trillion by 31/12/2010, required by Decree 141/2006/NDD-CP by the Government on 22/11/2006. Similarly, this trend is also the same in deposit and loan markets, with the ratio CR4 decreasing from 73.07% in 2007 to 52.6% in 2012 and 71.7% to 59.91%, respectively. When we added 2 largest commercial banks to calculate CR6 ratio, the result was absolutely the same. The significant decrease in the market share of four largest banks and six largest banks suggests the change in the market structure in Vietnamese banking sector to a more competitive nature. Interestingly, the concentration in loan market decreased with a faster pace than that of total asset and deposit market.

The main drawback of using "*k largest banks*" ratio is that it does not account for the number of banks in the market although it could give a direct indication to measure the concentration and competition in the industry. Herfindahl-Hirschman Index is usually used to overcome this disadvantage. The changes in value of *HHI* in term of total asset, deposit and loan markets confirm a decreasing trend in market concentration and increasing competitive nature in Vietnamese banking sector. *HHI*-index changed from a moderately competitive nature, with 0.13 in total assets, 0.149 in deposit and 0.166 in loan markets respectively, to an unconcentrated market in 2012, with the value coming to only 0.077; 0.087; 0.106, respectively.

To sum up, all these ratios suggested a decreasing trend in the concentration of Vietnamese banking sector as a result of financial liberalization, deregulation and

loosening entry for foreign banks due to wider assess of the country to global trade. One of the striking features is that loan market seems to have higher competitive nature in comparison with deposit market. It could be due to the fact that domestic credit from banking sector contributes the largest part to economic development and growth, while Vietnamese people still have low access to banking services, particularly in deposit products, as only about 20% of Vietnamese population has bank accounts.

5.2. NON-STRUCTURAL APPROACH

This research employs the revenue reduced-form model to conduct H-statistic by Panzar-Rosse approach that is usually used in previous empirical researches. As suggested in literature, all these variables should be used in natural logarithm form.

$$
\ln(NITA_{it}) = \beta_1 + \beta_2 lnPF_{it} + \beta_3 lnPL_{it} + \\
+ \ \beta_4 lnPK_{it} + \sum_{j=5} \beta_j lnBSF_{it} + \varepsilon_{it} \quad (1)
$$

Where

NITA_{it} is the ratio of net interest revenue to total assets as the dependent variable;

PF_{it} is the ratio of total interest expense to total loanable funds;

PL_{it} is the ratio of total personal expense to total asset;

PK_{it} is the ratio of total operating expense to total asset;

BSF_{it} is the set of bank specific factors that could affect the performance of a commercial bank.

The subscript i represents the bank i and the subscript t denotes the time period t.

The H-statistic at time t is calculated as

$$
H_{t\,=}\ \beta_{1t} + \beta_{2t} + \beta_{3t}
$$

The choice of variables in this research followed the model suggested by Claessens and Laeven (2003). The main reason of choosing NITA_{it} as the dependent variable, representing the output price in revenue reduced-form model, is that the interest-based products is the core function of commercial banks, especially in Vietnam.

In term of inputs used by banks, there is a common agreement between literature amongst three main inputs, namely loanable funds (refers to deposit and loans in wholesale market); labor and physical capital (fix assets), according to Rozas (2007); Claessens and Laeven (2003); Sufian and Habibullah (2013). **PF_{it}** refers to the cost of loanable funds, proxy by the ratio of total interest expense to total loanable funds. **PL_{it}** refers to the cost

of labors, represented by the ratio of personal expense to total assets while the ratio of total operating expense to total assets is used as proxy for the cost of physical capital, *PK_{it}*.

Some bank specifics factors are included in the model to capture the differences between characteristics of each bank in the sample, including **CAP_{it}** (the ratio of total equity to total assets); **LOAN_{it}** (the ratio of net loan to total assets) and **ASS_{it}** (total assets). The ratio of total equity to total assets is used to capture the difference between capital structures of banks. The ratio of net loan to total assets used for measurement of elasticity of banks toward loans financing, while total assets is used as a proxy of bank economic of scope.

However, as Panzar-Rosse approach bases on the assumption that the market is under long-run equilibrium, hence, we also estimate the following equation to test whether Vietnamese banking system is under equilibrium as suggested in the theory.

$$
\ln(ROA_{it}) = \alpha_1 + \alpha_2 lnPF_{it} + \alpha_3 lnPL_{it} + \\
+ \ \alpha_4 lnPK_{it} + \sum_{j=5} \alpha_j lnBSF_{it} + \varepsilon_{it} \quad (2)
$$

In the equilibrium test, ROA_{it} is used as the dependence variable instead of NITA_{it} as suggested by Rozas (2007); Claessens and Laeven (2003), Shaffer (1982) or Bikker and Haaf (2002). We will test the whether E = 0 using a F-test with

$$
E_{t\,=}\ \alpha_{1t} + \alpha_{2t} + \alpha_{3t}
$$

If we reject the hypothesis of E = 0; then the banking sector is not under equilibrium, hence, using H-statistic to measure the concentration and competition of Vietnamese banking sector is no longer suitable. The idea behind this test is that under equilibrium, returns on bank assets should not be related on input prices.

There is a significant difference between mean and median value, especially in ASS_{it} ratio, revealing a high concentration in Vietnamese banking system with the dominance of state-owned commercial banks. One striking feature in the summary statistic table is huge gaps between maximum and minimum value in each variable together with high standard deviation that could result from low competition level in the banking sector.

The earlier empirical researches tended to use a Pooled Ordinary Least Square method to estimate the H-statistic. However, this method could give a biased and inefficient parameter estimates as well as inaccurate standard errors, leading to heterogeneity bias, especially with an unbalanced panel data as used in this research. Hence, there are two popular panel estima-

Table 4. Summary statistic of all variables.

	NITA	PF	PL	PK	LOAN	CAP	ASS	ROA
Mean	3.148371	7.167903	0.722075	0.858705	50.67881	11.7789	112783.5	1.313317
Median	3.1105	7.05	0.674473	0.747599	52.327	9.1025	56880.02	1.338
Maximum	7.259	14.71	1.93752	4.926743	84.477	94.286	1212403	6.403
Minimum	-0.193	1.12	0.043764	0.06558	2.48	1.08	226.1568	-5.993
Std. Dev.	1.061202	2.450226	0.32038	0.459419	18.49874	10.78547	155621.6	0.978742

Table 5. F-test for Fixed − effect.

Redundant Fixed Effects Tests Equation: EQ03 Test period fixed effects			
Effects Test	Statistic	d.f.	Prob.
Period F	3.303912	-9,169	0.001
Period Chi-square	29.983801	9	0.0004

Table 6. Breusch and Pagan Lagrangian multiplier test for random effect.

Breusch and Pagan Lagrangian Multiplier test for random effects
$lnNITAit[Year,t] = Xb + u[Year] + e[Year,t]$

Estimate result

	Var	sd=sqrt(Var)
lnNITAit	0.132301	0.363732
e	0.078721	0.2805733
u	0.007844	0.0885633

Test	Var(u) = 0

chibar2(01) = 6.76
Prob>chibar2 = 0.0047

tor approaches usually used to overcome these limits, namely fixed-effect and random-effect models. In order to produce stable results, the model is firstly tested by F-test and LM-test (Breusch and Pagan Lagrangian Multiplier test) to decide whether Pooled OLS or fixed effect and random effect method could give better results, respectively (Table 5 and Table 6). The results suggest that both fixed-effect and random-effect models would provide more stable results than that of Pooled OLS.

The next step is deciding whether fixed-effects model could be more appropriate than random-effects model or vice versa. Hausman test is used in Table 7 with the null hypothesis in favor of using random-effects and the alternatives supports fixed-effects approach for estimations. The p-value of 0.1018 in result table indicates that we cannot reject the null hypothesis at 10 percent of significance, hence, we should go with random-effects model in this research. Finally, as the panel data used in this paper is a short panel data, hence, a *"within"* random-effect to explore difference in error variance components across time-period is considered.

Table 7. Hausman test for random effect and fixed effect.

Correlated Random Effects - Hausman Test Equation: EQ02 Test period random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	10.592843	6	0.1018

Table 8. Equilibrium test result.

Wald Test:

Equation: Equilibrium test			
Test Statistic	Value	df	Probability
F-statistic	1.390236	(1, 168)	0.24
Chi-square	1.390236	1	0.2384

The equation (2) is estimated firstly in order to test for the market equilibrium assumption required to use Panzar-Rosse method. Table 5 gives a short result, using Wald test with the null hypothesis being market equilibrium ($E = 0$). The value of both F-statistic and Chi-square value failed to reject the null hypothesis, hence, we could use Panzar-Rosse approach to estimate the concentration and competition of Vietnamese banking sector appropriately.

Finally, Table 9 below shows the results of equation (1) estimations using "*within*" random-effects models for the whole samples and four sub-samples concerning state-owned feature and foreign-owned feature.

The H-statistic in overall model and both four sub-samples take values between 0 and 1, indicating a monopolistic competitive nature in Vietnamese banking sector. The null hypothesis of monopoly competitive nature ($H = 0$) and perfect competition in banking sector ($H = 1$) tested by Wald test are rejected with statistical significance, except a highly significant level for the competition between domestic commercial banks. Hence, if everything is kept constant, empirical findings suggest that Vietnamese commercial banks are competing in a monopolistic competitive nature.

It is worth noting that the higher the H-statistic, the higher the degree of competition in the sector. The H-statistic for overall sample is as 0.259172, reconfirming the findings of high concentration and low competition in Vietnamese banking sector in structural approach via *HHI*-index. Additionally, state-owned commercial banks are competing more intensively in comparison with joint-stock commercial banks while whole foreign banks compete harder than domestic banks.

One striking feature of the H-statistic value is that it reveals, to some extent, the degree of competitiveness of a commercial bank as it measures the elasticity of total interest revenue due to changes in input prices. Hence, the higher the H-statistic, the more competitive a bank is as it could turn 1 percent of increase in input prices to a higher degree of total revenue. Therefore, in state-owned feature of banks, state-owned banks have much higher competitiveness in comparison with joint-stock commercial banks. This is an unsurprising result as state-owned banks have much more comparative advantages than joint-stock commercial banks such as economies of scope and scale, higher supports from central banks and governments, wider branches networks, longer operational time with better customer bases. In term of foreign-owned feature, wholly foreign-owned commercial banks seem to have higher competitive behaviors than domestic competitors. This could be due to the fact that Vietnamese domestic banks are still in an early stage of development as most of them have been operating for about 20 years since 1990.

The signs of the coefficients of cost of loanable funds PF_{it}, cost of labor PL_{it} and cost of physical capital PK_{it} give implications about the impacts of input prices to the total revenue of banks. An increase in the cost of loanable funds tends to reduce the total revenues of banks, except for the case of state-owned banks. The costs of loanable funds actually have positive effects on total revenue of state-owned banks as they have more

Table 9. Result output.

Variable	Overall	State-owned feature		Whole foreign-owned feature	
		State-owned banks	Joint-stock banks	Domestic banks	Foreign banks
Constant	0.582957	1.273779	0.825657*	1.36585***	-1.731737***
	(-1.506678)	(1.201556)	(1.792558)	(3.224943)	(-3.969901)
lnPF	-0.173652***	0.282036**	-0.179307**	-0.307278***	0.066052
	(-2.70297)	(2.061729)	(-2.469979)	(-3.845358)	(1.297268)
lnPL	0.325263***	0.189031**	0.324523***	0.388387***	-0.151444
	(5.300601)	(2.159762)	(3.890277)	(5.424917)	(-1.51058)
lnPK	0.107561	-0.069673	0.134813	0.054114	0.387355***
	(1.485205)	(-0.602042)	(1.570821)	(0.682795)	(3.999428)
lnCAP	0.053321***	-0.172534**	0.236272***	0.157837**	0.470507***
	(4.320089)	(-2.161917)	(3.600346)	(2.47875)	(8.484036)
lnASS	0.048753**	0.084972	0.02595	0.013697	0.065797*
	(2.264953)	(1.458519)	(0.955573)	(0.595581)	(2.000372)
lnLOAN	-0.009399	-0.33437	-0.013639	0.000343	0.252289***
	(-0.247538)	(-1.383279)	(-0.326311)	(0.008215)	(3.963006)
Adjusted R-square	0.358254	0.573905	0.365683	0.287346	0.780673
F - statistic	18.1196	9.081361	15.12421	11.81932	13.45794
H - statistic	**0.259172**	**0.401394**	**0.280029**	**0.135223**	**0.301963**
Wald test (H=0)	12.73942	10.95635	10.04946	2.911799	13.53325
(p - value)	0.0000	0.0024	0.0019	0.0899	0.0022
Result	Reject	Reject	Reject	Reject	Reject
Wald test (H=1)	104.0904	24.36696	66.4302	119.0883	72.3195
(p - value)	0.0000	0.0000	0.0000	0.0000	0.0000
Result	Reject	Reject	Reject	Reject	Reject
Test result	Monopolistic	Monopolistic		Monopolistic	
Observations	185	37	148	162	23

Note: All of these regressions used "within" random effect to calculate the value of H under Panzar and Rosse approach These selected confidence level are 90% (*); 95% (**) and 99% (***) respectively. Values in parenthese are t-value and evaluated by White test for heteroscedasticity.

Source: Result output from Eview 6 software.

Table 10. H-statistic of some Asian countries.

Nation	China	Hongkong	Indonesia	Malaysia	Philippines	Singapore	Thailand	Average Asia
H-Statistic	0.324	0.508	0.462	0.441	0.614	0.673	0.349	0.361

Source: Setiyono and Tarazi, 2014.

comparative advantages in raising deposits and wholesale funding due to their economies of scope and scale together with better consumer base than their competitors. The cost of labor has positive signs in all the models, implying that an increase in the cost of labor could lead to higher total revenue with statistically significant level. In contrast, only in foreign-owned banks, cost of physical capital has significantly positive impacts on the total revenue. It could be due to the fact that operating cost could contribute a large part to the performance of foreign-owned banks as they should have to pay higher initial cost in the new market.

Turning to the impacts of bank specific factors, only the capital structure of banks could influence the total revenue of banks with positive signs in almost all models, except for the case of state-owned banks. This shows that better capitalization leads to lower costs of going bankrupt, thus reduces the cost of funding overall. In the case of state-owned banks, the negative sign of coefficient could results from the increase of opportunity costs as they already have better capitalization and lower bankruptcy cost in comparison with joint-stock banks. The positive sign of lnASS$_{it}$ in overall model confirms the existence of economies of scope and scale in Vietnamese banking sector while only foreign-owned banks expect a rise in their ratio of loans to total assets as it could be a signal of higher market penetration in host country.

In the comparison with the H-statistic of other Asia countries collected from the work of Setiyono and Tarazi (2014), provided in Table 10, Vietnamese banking sector seems to have a lower level of competition in the banking sector as well as a lower level of competitiveness of commercial banks. This could be a disadvantage of Vietnamese commercial banks in the international competition of financial and banking services, especially in the unavoidable wave of financial liberalization.

6. CONCLUSION

Vietnamese banking system is under a large reforming and restructuring progress to create a safely proficient system and improve the efficiency of commercial banks. Enhancing competitiveness and strength of domestic commercial banks is a crucial mission of policy makers and supervisors to face with unavoidable globalization in financial and banking services market. Obviously, understanding the current state of the competitive nature in banking sector is the first task.

Empirical findings in both structural and non-structural approaches revealed that Vietnamese banking sector is under monopolistic competitive nature, but still close to the monopoly market with high concentration and low competition. Fortunately, the competition has tended to increase recently, thanks to the higher access of the economy to the international field with lower entry to foreign institutions and lower protective policies toward domestic banks. Additionally, the equilibrium test indicated that the industry is in equilibrium.

State-owned commercial banks and wholly foreign-owned banks have better competitiveness in comparison with their competitors, joint-stock commercial banks and domestic banks. The effect of cost of loanable fund and total asset to total revenues suggest the existence of economies of scope and scale in Vietnamese banking system while an increase in the capitalization of joint-stock banks could improve their competitiveness and total revenue.

To sum up, as indicated by H-statistic and *HHI*-index, Vietnamese banking sector still has much room for improvement in the competitive nature as we still have low competition in comparison with that of other Asian countries. The regulators should continue recent financial liberalization in financial and banking services markets to further improve the competitive market behavior among commercial banks.

REFERENCES

Allen, F., & Gale, D. (2000). Financial Contagion. *Journal of Political Economy, 108* (1), 1–33.

Beck, T. (2008). *Bank competition and financial stability: friends or foes?* Policy Research Working Paper Series 4656, The World Bank.

Berger, A. N., Klapper, L. F., & Turk-Ariss, R. (2009). Bank Competition and Financial Stability. *Journal of Financial Services Research, 35* (2), 99–118.

Bikker, J., & Groeneveld, J. (2000)., Competition and concentration in the EU banking Industry. *Kredit und Kapital, 33*, 62–98.

Bikker, J., & Haaf, K. (2002). Competition, concentration and their relationship: An empirical analysis of the banking industry. *Journal of Banking & Finance, 26* (11), 2191–2214.

Bikker, J., Shaffer, S., & Spierdijk, L. (2012). Assessing Competition with the Panzar-Rosse Model: The Role of Scale, Costs, and Equilibrium. *The Review of Economics and Statistics, 94* (4), 1025–1044.

Boot, A. W., & Thakor, A. V. (2000). Can Relationship Banking Survive Competition? *Journal of Finance, American Finance Association, 55* (2), 679–713.

Boyd, J. H., & Nicolo, G. D. (2005). The theory of Bank Risk Taking and Competition Revisited. *Journal of Finance, 60* (3), 1329–1343.

Bresnahan, T. F. (1989). Empirical studies of industries with market power. In R. Schmalensee, & R. Willig (Eds.), *Handbook of Industrial Organization* (1st ed., Vol. 2, pp. 1011–1057). Elsevier.

Casu, B., & Girardone, C. (2006). Bank Competition, Concentration And Efficiency In The Single European Market. *Manchester School, University of Manchester, 74* (04), 441–468.

Claessens, S., & Laeven, L. (2004). What Drives Bank Competition? Some International Evidence. *Journal of Money, Credit and Banking, 36* (3), 563–583.

Gajurel, & Pradhan. (2012). Concentration and Competition in Nepalese banking. *Journal of Business, Economics and Finance, 1* (1).

Gelos, G., & Roldos, J. (2004). Consolidation and Market Structure in Emerging Market Banking Systems. *Emerging Market Review, 5* (1), 39–59.

Gudmundsson, R., Ngoka-Kisinguh, K., & Odongo, M. T. (2013). *The Role of Capital Requirements on Bank Competition and Stability: The Case of the Kenyan Banking Industry.* Kenya Bankers Association — KBA Centre for Research on Financial Markets and Policy Working Paper Series.

Jiménez, G., Lopez, J. A., & Saurina, J. (2007). *How does competition impact bank risk-taking?* Federal Reserve Bank of San Francisco.

Mishkin, F. S. (1999). Financial consolidation: Dangers and opportunities. *Journal of Banking & Finance, 23* (2–4), 675–691.

Panzar, J. C., & Rosse, J. N. (1987). Testing for "monopoly" equilibrium. *The Journal of Industrial Economics, 35* (4), 443–456.

Pereraa, S., Skullya, M., & Wickramanayake, J. (2006). Competition and structure of South Asian banking: a revenue behaviour approach. *Applied Financial Economics, 16* (11), 789–801.

Rozas, L. G. (2007). *Testing for competition in the Spanish banking industry: The Panzar-Rosse approach revisited.* Banco de Espana Working Paper Series.

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).

Weill, L. (2004). Measuring Cost Efficiency in European Banking: A Comparison of Frontier Techniques. *Journal of Productivity Analysis, 21* (2), 133–152.