

**THREE ESSAYS ON THE MARKET STRUCTURE OF  
THE BANKING INDUSTRY IN ASEAN-5**

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**FACULTY OF BUSINESS AND ACCOUNTANCY  
UNIVERSITY OF MALAYA  
KUALA LUMPUR**

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THE BANKING INDUSTRY IN ASEAN-5**

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## ABSTRACT

The study aims to examine the role of bank market structure in relation to bank performance, the transmission of monetary policy and the growth of the manufacturing sectors in five economies – Indonesia, Malaysia, the Philippines, Singapore, and Thailand – from the Association of South East Asian Nations (ASEAN-5). The study is divided into three objectives (essays): (i) the relationship between bank market structure and bank performance with reference to the structure-conduct-performance (SCP) hypothesis; (ii) the role of bank market structure for monetary policy transmission through the banks' lending channel; (iii) the impact of bank market structure on industrial growth in general and the growth of financially dependent industries in particular. Accordingly, each research objective is represented by a separate essay (research article).

The first objective (essay 1) examines the relationship between bank market structure and bank performance by applying a new methodology to the SCP paradigm. The new methodology emphasizes the existence of an indirect relationship between bank market structure and bank performance through bank conduct. The results show that the concentrated banking industries allow banks to earn higher profits partially through anticompetitive conduct by banks. These findings are robust across alternative measures, different time horizons and different concentration levels.

The second objective (essay 2) explores the impact of bank market structure on monetary policy transmission through the bank lending channel by applying two structural and two non-structural measures of the market structure. The study also considers the banks' response to changes in monetary policy stance based on their financial strength (size, liquidity, and capitalization). The results indicate that

concentrated banking industries undermine the transmission of monetary policy through the banks' credit channel. The study also finds that the weakening effect of concentration is stronger for highly capitalized, highly liquid and large-sized banks. These findings are robust in relation to alternative measures of monetary policy indicator and different sample periods.

Finally, the third objective (essay 3) identifies the role of bank market structure with regard to the growth of manufacturing industries in general and those dependent on external financing in particular. Applying two structural and two non-structural measures of market structure, the study finds that the bank concentration slows down the growth of manufacturing industries, especially the financially dependent ones. These findings are robust in relation to a number of sensitivity checks including alternative measures of financial dependence, endogeneity considerations and institutional factors such as property rights, quality of accounting standards and bank ownership.

The overall conclusion from analyses of three objectives (essays) is that concentrated banking industries allow banks to earn higher profits partially through anticompetitive conduct, reduce the effectiveness of monetary policy transmission through the bank lending channel, and slow down the growth of manufacturing industries, especially the financially dependent ones. Therefore, this study suggests that the consolidation policies must be pursued after careful analysis of their impact on bank performance and other economic activities such as monetary policy transmission, economic growth, and financial stability, etc. In doing so, due consideration must be given to all the aspects of the economy that are potentially influenced by the bank market structure.

**Keywords:** Market Structure; Bank Performance; Monetary Policy Transmission; Industrial Growth

## ABSTRAK

Kajian ini bertujuan untuk mengkaji peranan struktur pasaran bank berhubung dengan prestasi bank, penyaluran dasar monetari dan pertumbuhan sektor perkilangan di lima negara - Indonesia, Malaysia, Filipina, Singapura, dan Thailand - dari Persatuan Selatan Bangsa-bangsa Asia Timur (ASEAN-5). Kajian ini dibahagi kepada tiga bahagian (objektif): (i) perhubungan di antara struktur pasaran bank dan prestasi bank berdasarkan hipotesis struktur kelakuan prestasi (SCP); (ii) peranan stuktur pasaran bank untuk transmisi dasar kewangan melalui saluran pinjaman bank; (iii) kesan struktur pasaran bank secara umum terhadap pembangunan industri dan secara khusus terhadap pembangunan industri yang bergantung dari segi kewangan. Dengan itu, setiap objektif diwakili oleh artikel penyelidikan yang berasingan.

Objektif pertama mengkaji perhubungan di antara struktur pasaran bank dan prestasi bank dengan menggunakan kaedah baru ke atas SCP paradigm. Kaedah baru ini menekankan kewujudan hubungan tidak langsung di antara struktur pasaran bank dan prestasi bank melalui kelakuan bank. Keputusan menunjukkan bahawa industri kosentrasi perbankan membolehkan bank mendapat keuntungan yang tinggi sebahagiannya disebabkan oleh kelakuan bank yang tidak berdaya bersaing. Penemuan ini adalah kukuh merentasi sebarang pengukuran alternatif, perbezaan tempoh masa dan perbezaan tahap kosentrasi.

Objektif kedua mengkaji kesan struktur pasaran bank terhadap transmisi dasar kewangan melalui saluran pinjaman bank dengan menggunakan dua struktur dan dua bukan stuktur pengukuran struktur pasaran. Kajian ini juga mengambil kira tindak-balas bank terhadap perubahan dalam dasar kewangan berdasarkan kekuatan kewangan bank (saiz, kecairan dan permodalan). Keputusan menunjukkan kosentrasi perbankan

menjejaskan transmisi dasar kewangan melalui saluran pinjaman bank. Kajian ini juga mendapati kesan kelemahan terhadap konsentrasi perbankan adalah lebih kuat bagi bank yang mempunyai modal dan kecairan yang lebih tinggi dan saiz yang lebih besar. Penemuan ini adalah kukuh berdasarkan pengukuran alternatif terhadap penunjuk dasar kewangan dan tempoh sampel yang berlainan.

Akhir sekali, objektif yang ketiga meneroka peranan struktur pasaran bank untuk pertumbuhan industri pembuatan secara amnya dan juga terhadap yang bergantung kepada pinjaman luar secara khususnya. Dengan menggunakan dua struktur dan dua bukan struktur pengukuran struktur pasaran, kajian ini mendapati bahawa konsentrasi perbankan melambatkan pertumbuhan industri pembuatan terutamanya industri yang bergantung kepada peminjaman kewangan. Penemuan ini adalah kukuh berdasarkan beberapa semakan sensitiviti termasuk kaedah pengukuran alternatif untuk kebergantungan kewangan, pertimbangan *endogeneity* dan faktor-faktor institusi seperti hak harta, kualiti standard perakaunan dan pemilikan bank.

Secara keseluruhan kesimpulan berdasarkan analisis bagi ketiga-tiga objektif ini menunjukkan industri konsentrasi perbankan membolehkan bank mendapat keuntungan yang lebih tinggi melalui kelakuan tidak berdaya-saing, mengurangkan keberkesanan transmisi dasar kewangan melalui saluran pinjaman bank, dan melambatkan pertumbuhan industri pembuatan terutamanya industri yang bergantung dari segi kewangan. Oleh yang demikian, kajian ini mencadangkan penyatuan dasar haruslah dilakukan selepas menganalisa dengan terperinci kesannya terhadap prestasi bank dan aktiviti ekonomi yang lain. Dengan itu, pertimbangan yang sewajarnya perlu diberi keatas semua aspek ekonomi yang mempunyai potensi untuk dipengaruhi oleh struktur pasaran bank.

Kata kunci: Konsentrasi; Pertandingan; Prestasi Bank; Pengantaran Dasar Monetari;  
Pertumbuhan Perindustrian

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## **LIST OF SYMBOLS AND ABBREVIATIONS**

ASEAN	:	Association of South East Asian Nations
AFC	:	Asian Financial Crisis
GFC	:	Global Financial Crisis
SCP	:	Structure Conduct Performance
ES	:	Efficient Structure
RMP	:	Relative Market Power
QL	:	Quite Life
BIF	:	Banking Integration Framework
IO	:	Industrial Organization
NEIO	:	New Empirical Industrial Organization
PRH	:	Panzar-Rosse H Statistic
LI	:	Lerner Index
BI	:	Boone Indicator
CR	:	Concentration Ratio
HHI	:	Hirschman Herfindahl Index
ROAA	:	Average Return on Assets
ROAE	:	Average Return on Equity
NIM	:	Net Interest Margin
PCM	:	Price Cost Margin
ESS	:	Scale Efficiency Version of Efficient Structure
ESX	:	X-Efficiency Version of Efficient Structure

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## **CHAPTER 1: INTRODUCTION**

### **1.1 Overview of Chapter**

This thesis consists of three articles related to a common theme, i.e., the implications of bank market structure for five economies in the Association of South East Asian Nations (ASEAN-5). This chapter provides the foundation for the study by discussing the problems statement, relevant issues, research questions and research objectives. Section 1.2 provides an introduction to the market structure; Section 1.3 discusses its relevance to the banking industry; Section 1.4 is devoted to a discussion of the problem statement; Section 1.5 and 1.6 respectively highlight the historical trends in market structure and profitability/cost in the context of the banking industry in ASEAN-5; Section 1.7 discusses the implications of changes in bank market structure; Section 1.8 highlights the issues in the current literature; research questions and research objectives are respectively elaborated in Sections 1.9 and 1.10; Section 1.11 presents the contribution of the study; and finally, Section 1.12 shows the organization of the thesis.

### **1.2 Market Structure**

In Industrial Organization (IO) literature, the term “market structure” is generally applied to indicate the degree of competition in the goods/services market. The degree of competition can be inferred from market characteristics such as the number of buyers, the number and size of sellers operating in a market including both the local and foreign firms, the market share held by the large firms in the market, the nature and level of costs associated with the market which include the costs to exploit the economies of scale, entry and exit costs, and the sunk costs, the extent to which products are differentiated/homogeneous, the number and bargaining power of the buyers and the extent to which the market is vertically integrated. Based on these characteristics, markets can be categorized into monopoly, oligopoly, monopolistic or perfectly competitive markets.

From an empirical perspective, there are two well-known approaches to approximate the structure of a market, i.e., structural and non-structural approaches. The structural approach originates from traditional IO literature and is based on the structure-conduct-performance (SCP) paradigm (Mason, 1939; Bain, 1951). The SCP paradigm suggests that high seller concentration lowers the cost of collusion and fosters tacit and/or explicit collusion on the part of firms. Under this approach, the level of competition is inferred from the structure of the market (number of firms, size of firms and level of concentration). The higher level of concentration indicates a lower level of competition in the market. Structural measures include the concentration indices such as the n-firm concentration ratio (CR<sub>n</sub>) and the Herfindahl-Hirschman Index (HHI).

The non-structural approach – based on the New Empirical Industrial Organization (NEIO) – emerged as an alternative to the structural approach and assesses the level of competition directly from firms' conduct. The conduct in this sense refers to the relationship between prices/revenues and the costs. The non-structural measures include the Lerner Index, the Panzar-Rosse H-statistic, the Conjectural Variation model and the Boone Indicator. All the indicators (both structural and non-structural) measure the market structure on a continuum between perfect competition and the monopoly. Except for the Panzar-Rosse H-statistic, higher values of the indicators imply more market power and an inclination towards a lower level of competition. Conventionally, the term “concentration” is used to indicate a lower level of “competition.” Therefore, both these terms – i.e., concentration and/or competition – are used interchangeably in the literature to refer to market structure.

### **1.3 Bank Market Structure, Bank Performance, and Economic Activities**

The literature on the relationship between market structure and firm performance can be traced back to the SCP paradigm (Mason, 1939; Bain, 1951) in IO literature. A large

number of studies in IO literature applied the concept of market structure to the manufacturing sectors and found that the market structure (concentration) has a significant impact on the performance of the firms.<sup>1</sup> Considering the importance of the banking industry, the researchers then began to link market structure of banking sectors to bank performance and other related economic activities. In this domain, Edwards (1964) is among the pioneers who introduced the role of market structure in the banking industry. The role of banking market structure came into the limelight especially after the financial crises; in other words, the Asian Financial Crisis of 1997-1998 and the Global Financial Crisis 2008-2009. Therefrom, a multitude of studies applied this concept to different aspects of banking such as banks' performance and/or efficiency, the transmission of monetary policy, industrial growth and financial stability. The way market structure affects bank performance, and other economic activities is described below:

*Market Structure and Bank Performance:* Banks in highly concentrated/less competitive markets possess greater market power as compared to those operating in less concentrated/more competitive markets. The former use their market power to charge higher interest on loans and/or pay lower interests on deposits, and earn higher profits (Park & Weber, 2006; Webster, 2011; Amidu, 2013; Mirzaei, Moore, & Liu, 2013; Nabieu, 2013; Zhang, Jiang, Qu, & Wang, 2013). On the other hand, if concentrated markets are dominated by efficient banks that minimize production cost through technical and/or scale efficiency, these banks can increase their profits (Smirlock, 1985; Berger, 1995; Casu & Girardone, 2009; Delis & Tsionas, 2009; Homma, Tsutsui, & Uchida, 2014).

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<sup>1</sup> See Osborne and Wendel (1978), Heggstad (1979), Bresnahan (1982), and Gilbert (1984) for detailed review of literature.

*Market Structure and Monetary Policy Transmission:* The market structure of banking sector also affects the transmission of monetary policy by influencing bank-lending activities. For instance, the concentrated markets are dominated by large banks that have greater access to alternative sources of funds – ‘that is’ capital markets – as compared to small banks. Accordingly, the lending activities of these banks are less influenced by monetary policy shocks. On the other hand, small banks in a competitive market depend on customers’ deposits for a supply of loanable funds. These banks cannot compensate for the decrease in loanable funds through non-deposit funding in response to contractionary monetary policy; consequently, they have to cut short their loans. Moreover, small banks have to face higher costs of informational asymmetries in order to finance their lending through unsecured funds. Similarly, the large banks in concentrated markets enjoy an information monopoly regarding the creditworthiness of their customers. Therefore, the switching costs for borrowers are high in highly concentrated markets. The borrowers from small banks with extra demands for loans find it difficult to switch their lenders because small banks are more affected by negative shocks of monetary policy and thus these borrowers are not picked by large banks. Through this process, concentration can translate into a depressing effect of monetary policy on economic activity, thus reinforcing the monetary policy transmission through bank lending channels. Furthermore, some banks in less competitive markets may use their liquidity positions and make liquidity costly for other market participants. High liquidity costs can preclude banks from isolating a loan supply from the adverse effects of monetary policy on loanable funds. In such cases, consolidation may increase the cost of liquidity for banks in less consolidated markets and can reinforce the bank lending channels (Peltzman, 1969; Kashyap & Stein, 1995; Favero, Giavazzi, & Flabbi, 1999; Kashyap & Stein, 2000; Kishan & Opiela, 2000;

Adams & Amel, 2005; Gunji, Miura, & Yuan, 2009; Olivero, Li, & Jeon, 2011b, 2011a; Amidu & Wolfe, 2013).

*Market Structure and Industrial Growth:* The level of competition in the banking industry is related to the growth of the manufacturing industries in several ways. For instance, corporate growth is limited in highly concentrated or less competitive banking systems because firms have less access to finance. This limited growth of firms translates into a lower overall economic growth. Similarly, the concentrated banking systems make access to finance difficult and unaffordable for firms, thus limiting their ability to borrow and invest more. Moreover, the concentrated banking systems lead to a low level of firm creation and consequently, to less economic growth. By the same token, the banks operating in concentrated markets tend to use their market power and charge high loan rates which in turn make funding more expensive for firms, which depresses the firms' investing activities (Allen & Gale, 2000). In contrast, concentrated banking systems encourage the growth of manufacturing industries while such industries experience lower growth in a more competitive banking environment. Proponents of this view argue that the banks in more concentrated markets perform the function of information producers and establish a strong relationship with their customers. On the other hand, increased competition can lead to the asymmetry of information between borrowers and lenders, less lending and less investment. Similarly, banking competition hampers the screening role performed by banks in their choice of borrowers; banks in competitive markets take less care in screening firms and also charge higher loan rates; the higher cost of borrowing decreases the availability of funds. Moreover, the creation of new firms is high in economies with less competitive markets, thus they experience higher overall economic growth (Mayer, 1988; Petersen & Rajan, 1995; Guzman, 2000; Cetorelli & Gambera, 2001; Marquez, 2002; Di Patti & Dell'Ariccia, 2004; Claessens & Laeven, 2005; Zarutskie, 2006; Hoxha, 2013).



*Market Structure and Financial Stability:* Bank market structure affects the stability of a financial system. There are two prominent views with respect to the role of market structure in financial system stability. First, the “concentration-stability” view, which suggests that concentrated banking sectors can increase financial stability through at least five channels: (i) the ability of larger banks to increase their profits and build up high ‘capital buffers’ allows them to stand firm against liquidity or macroeconomic shocks; (ii) larger banks discourage excessive risk-taking behavior by increasing their charter value; (iii) it is easier to monitor larger, but fewer banks, resulting in the effective action of supervisory bodies, and consequently reducing the risk of a system-wide contagion; (iv) larger banks tend to be subject to providing credit monitoring services; and (v) due to higher economies of scale and scope, larger banks have the potential to diversify loan-portfolio risks efficiently and geographically through cross border activities (Keeley, 1990; Allen & Gale, 2004). Second, the “concentration-fragility” view, which suggests that concentrated markets weaken the stability of the financial system through three important channels: (i) larger banks are seen as “too big to fail” institutions, which receive guarantees from governments, and consequently the moral hazard problem becomes more severe; (ii) larger banks tend to charge high loan-interest rates due to their market power, which may lead to risky projects being undertaken by borrowers to compensate for such high rates, and the consequence could be increased default risks; and (iii) managerial efficiency such as risk diversification in assets and liabilities may decline, resulting in high operational risk (Boyd & De Nicolo, 2005; Schaeck, Cihak, & Wolfe, 2009; Allen, Carletti, & Marquez, 2011).

The implications of the bank market structure are of relevance for policy-makers because banks play a vital role in the overall well-being of the economy. Financial institutions become even more important when capital markets are not well developed because the entire responsibility for the mobility of funds lies with the financial

institutions. Moreover, financial institutions improve resource allocation and provide funding for the projects with higher rates of return by matching the borrowers and lenders efficiently and by monitoring the borrowers' behavior (Boyd & Prescott, 1986; Allen, 1990; Greenwood & Jovanovic, 1990; King & Levine, 1993, 1994; Kashyap & Stein, 1995, 1997, 2000). Banks also mobilize their resources and generate income from society's savings, so bank performance has substantive repercussions on capital allocation, firm growth, industrial expansion, and economic development (King & Levine, 1993, 1994; Jayaratne & Strahan, 1996; Demirgüç-Kunt & Maksimovic, 1998; Levine & Zervos, 1998; Rajan & Zingales, 1998; Beck, Levine, & Loayza, 2000; Levine, Loayza, & Beck, 2000).

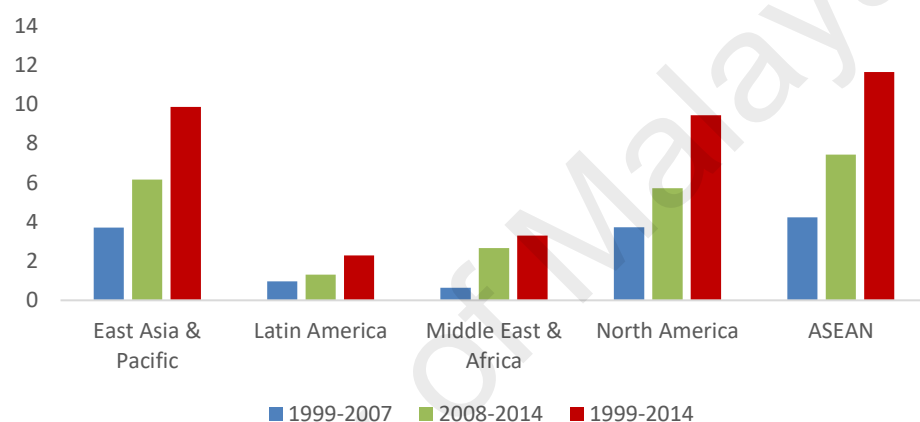
#### **1.4 Problem Statement**

The Asian financial crisis 1997-1998 and the Global financial crisis 2008-2009 re-emphasized the significance of the banking sector across the globe. Following the financial turmoil, several policy measures – bank consolidations, international financial integration, privatization, deregulation, and financial reforms – were undertaken to ensure the stability of the banking sector. Although banking sectors all around the globe witnessed these structural changes, the structural shift was more pronounced in the banking industry of the Association of South East Asian Nations (ASEAN). Figure 1.1 shows the comparison of changes in banking market structure across different regions.<sup>2</sup> In the aftermath of the Asian financial crisis 1997-1998 and the Global financial crisis 2008-2009, the banking industry in ASEAN experienced an unusual surge in consolidations, a large-scale privatization of state-owned banks, deregulation, a significant increase in foreign bank penetration and the restructuring of domestic banking industries (Yokoi-Arai & Kawana, 2007; Olivero et al., 2011b, 2011a).

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<sup>2</sup> The values are averaged for each region based on data available from Global Financial Development Database (GFDD), World Bank. A list of each country along with their concentration ratios is provided in appendix.

Consequently, the ASEAN banking industry moved towards a more concentrated market structure. Additionally, the deregulation of financial sectors allowed other financial institutions such as investment banks, mutual funds, and insurance companies, to compete for the core business of commercial banks. Section 1.5, 1.6 and 1.7 of this thesis are respectively assigned to the discussion on historical trends in market structure, portability/cost conditions and their implications for the ASEAN-5 banking industry.



**Figure 1.1: Average Bank Concentration across Regions**

Source: Global Financial Development Database, World Bank

Apart from the historical changes in banking market structure, the ASEAN banking industry is expected to experience similar trends in the future for two important reasons. First, the governments in these countries are encouraging rather forcing banking organizations into mergers/acquisitions. The purpose of such consolidations is to make the financial institutions stronger and more efficient so that they can stand up against future economic downturns. Second, the ASEAN governments have agreed to liberalize the banking market under the Banking Integration Framework (BIF) by 2020. Under the BIF, the banks will now be able to operate across the member countries. The BIF is expected to increase the level of competition among regional banks; however, it will

also lead to more consolidations in the domestic banking market in an effort to fortify the domestic banks (Ng, 2014; Almekinders, Mourmouras, Zhou, & Fukuda, 2015).

Since the Asian financial crisis 1997-1998 and the Global financial crisis 2008-2009, the topic of bank market structure (concentration/competition) has attracted a huge amount of attention from researchers and policy-makers for its impact on banks' own performance and other economic activities. Several studies have highlighted the role of changes in market structure on the overall performance of banking institutions (Smirlock, 1985; Berger, 1995; Park & Weber, 2006; Casu & Girardone, 2009; Delis & Tsionas, 2009; Webster, 2011; Amidu, 2013; Mirzaei et al., 2013; Nabieu, 2013; Zhang et al., 2013; Homma et al., 2014), financial stability (Allen & Gale, 2004; Boyd & De Nicolo, 2005; Berger, Klapper, & Turk-Ariss, 2009; Fu, Lin, & Molyneux, 2014), monetary policy transmission (Adams & Amel, 2005; Gunji et al., 2009; Olivero et al., 2011b, 2011a; Amidu & Wolfe, 2013), economic growth (Mayer, 1988; Petersen & Rajan, 1995; Guzman, 2000; Cetorelli & Gambera, 2001; Marquez, 2002; Di Patti & Dell'Ariccia, 2004; Claessens & Laeven, 2005; Zarutskie, 2006; Hoxha, 2013) and firms' access to credit (Beck, Demirguc-Kunt, & Maksimovic, 2004; Berger, Demirguc-Kunt, Levine, & Haubrich, 2004; Rice & Strahan, 2010).

Whether the bank concentration is good or bad for the economy is a question of utmost importance for policy-makers. In this regard, the most sensible approach is to look at the influence of bank market structure on the banks' own performance and other aspects of the economy such as the stability of the financial system, the transmission mechanism of monetary policy and the growth of financially dependent sectors. However, the related literature is inconclusive and does not provide adequate policy inputs (a detailed discussion of issues in current literature is given in Section 1.8). For instance, the structure-conduct-performance (SCP) hypothesis suggests that the

concentration of market share eliminates competition from the market and leads to market inefficiency (Park & Weber, 2006; Webster, 2011; Amidu, 2013; Mirzaei et al., 2013; Nabieu, 2013; Zhang et al., 2013). By the same token, the quiet life (QL) hypothesis argues that the banks/firms in concentrated markets are able to earn higher profits due to monopoly power (by charging higher prices); however, they may not operate efficiently (Hicks, 1935; Berger & Hannan, 1998). On the other hand, the efficient structure (ES) hypothesis explains that concentration is the result of changed cost conditions and not the alterations in the height of entry barriers. Firms having superior efficiency in production perform better, become large and obtain a higher market share, and hence the market becomes concentrated (Smirlock, 1985; Berger, 1995; Casu & Girardone, 2009; Delis & Tsionas, 2009; Homma et al., 2014). Nevertheless, the relative market power (RMP) hypothesis proposes that the higher profits are not necessarily a result of cost efficiency but can also result from higher prices. For instance, firms with well differentiated and high-quality products are able to increase their market share and earn abnormal profits (Shepherd, 1982; Mueller, 1983; Ravenscraft, 1983, 1984). Interestingly, all of the related theories with respect to the structure-performance relationship have been tested in different geographical contexts using different measures of market structure and performance but results are mixed, and it can rightly be termed a market structure-performance puzzle

Similarly, the evidence on the role of market structure for monetary policy, industrial growth, and financial stability is divided between two set of arguments. First, the concentrated banking industry can be disadvantageous for monetary policy transmission, industrial growth and the stability of financial systems. For instance, bank concentration may lead to financial instability (Boyd & De Nicolo, 2005; Schaeck et al., 2009; Allen et al., 2011); it weakens the monetary policy transmission through the bank lending channel (Adams & Amel, 2005; Olivero et al., 2011b); and it suppresses the

growth of financially dependent industries (Pagano, 1993; Guzman, 2000; Claessens & Laeven, 2005).

Second, the concentrated banking industry has a favorable effect on monetary policy transmission, industrial growth and the stability of financial systems. For example, the large banks in the concentrated banking markets reduce financial fragility through building up high ‘capital buffers’, increasing their charter value, discouraging bank managers from excessive risk-taking, providing credit monitoring services, and diversifying risk (Keeley, 1990; Allen & Gale, 2004); concentrated banking industries reinforce the impact of monetary policy on bank lending (Gunji et al., 2009; Olivero et al., 2011a; Amidu & Wolfe, 2013); and the concentrated banking markets promote economic growth (Mayer, 1988; Petersen & Rajan, 1995; Cetorelli & Gambera, 2001; Marquez, 2002; Di Patti & Dell’Ariccia, 2004; Zarutskie, 2006).

Accordingly, the inconclusive nature of the current literature makes it very difficult to decide whether or not the move towards a concentrated banking industry in ASEAN is advantageous. Furthermore, the literature in the context of the ASEAN economies is not sufficiently focused on the implications of bank concentration for bank performance and related economic activities such as transmission of monetary policy and growth of manufacturing industries. Although there are some studies on banking market structure in ASEAN (Section 1.8 discusses these studies in greater detail), the issues covered in them lack depth, and their findings are not conclusive.

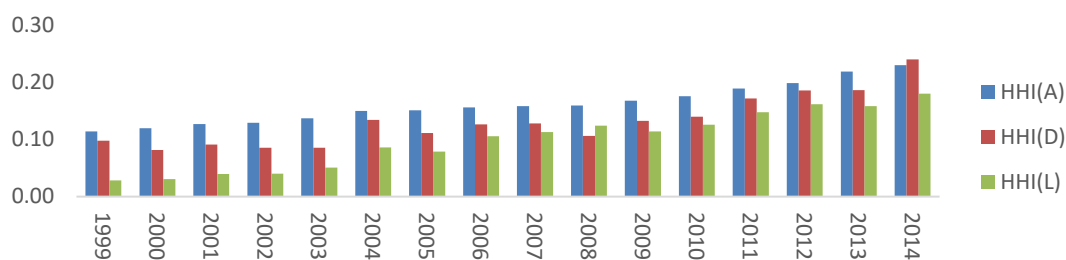
### **1.5 Historical Trends in Market Structure of ASEAN Banking Industry**

Figures 1.2 and 1.3 show the average level of concentration for five ASEAN countries (Indonesia, Malaysia, Philippines, Thailand, and Singapore) from 1999 to 2014. Both five-bank concentration ratio (CR5) and Herfindahl-Hirschman Index (HHI) are calculated based on total assets, total deposits and total loans to produce six

measures of bank concentration (these ratios are calculated based on data collected from BankScope by the author). The average values are calculated for the sample countries in each year and are used to generate the graphical figures. A higher level of concentration indicates a lower level of competition and vice versa. The average total values of assets, loans, and deposits held by the five largest banks were 55.3%, 55.6%, and 33.33% respectively in 1999. Since then, the share of the five largest banks in terms of total assets, deposits, and loans has been on the rise and approached 82.0%, 83.0% and 75.0% in 2014 (Figure 1.2). Similarly, the average of values of HHI were recorded at 11.4%, 9.8%, and 2.9%, in 1999 based on total assets, deposits, and loans respectively. Thereon, the average values of HHI consistently increased over the time and in 2014 were recorded at 22.9% for the asset-based measure, 24.0% for the deposit based measure and 13.8% for the loan based measure (Figure 1.3). Thus, overall evidence from CR5 and HHI indicates a substantial increase in bank concentration over the period 1999-2014.

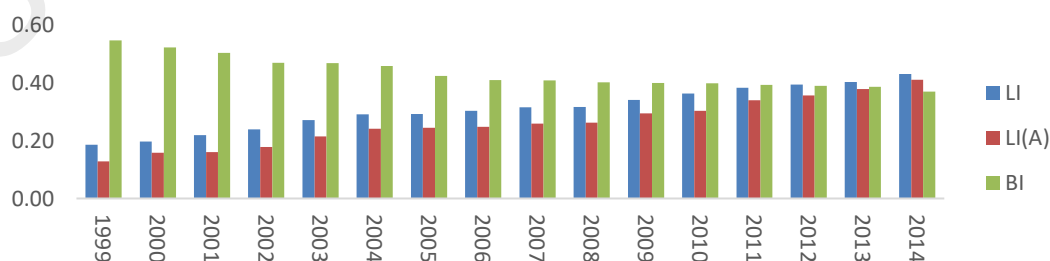


**Figure 1.2: Five-Bank Concentration Ratio (CR5) based on Total Assets, Total Loans, and Total Deposits**



**Figure 1.3: Herfindahl Hirschman Index (HHI) based on Total Loans, Total Assets, and Total Deposits**

Besides concentration indices (CR5 and HHI), this study also uses the Lerner index, the adjusted Lerner index and the Boone indicator to highlight the average level of competition over the period 1999-2014. The higher values of Lerner indicate more market power and less competitive conditions. In the case of the Boone Indicator, the larger values in absolute terms represent a higher level of competition (Schaeck & Cihák, 2014). The average values for the Lerner and adjusted Lerner indices increased from 0.19 and 0.13 in 1999 to 0.43 and 0.41 respectively in 2014 (Figure 1.4). The increases in the value of the Lerner Indices indicate more market power gained by banks over the period and a decrease in competitive conditions of the banking market. The average values for the Boon Indicator (in absolute terms) decreased from 0.55 in 1999 to 0.37 in 2014, thus supporting the deterioration of competitive conditions in the ASEAN banking market.



**Figure 1.4: Lerner, Adjusted Lerner, and Boone Indicator**



Overall evidence from CR5, HHI, the Lerner Indices and the Boon Indicator thus supports the notion of changing competitive conditions in the banking industry. The increase/decrease in the level of concentration/competition alone is sufficient to warrant an investigation into the phenomenon because a higher level of concentration or a lower level of competition are reported to have an adverse effect on bank performance or the performance of related sectors (these effects have been discussed in Section 1.2, 1.3 and 1.7). Nonetheless, historical trends in bank performance (with respect to profitability and efficiency measures) are also considered in the next section, in order to establish a comparison.

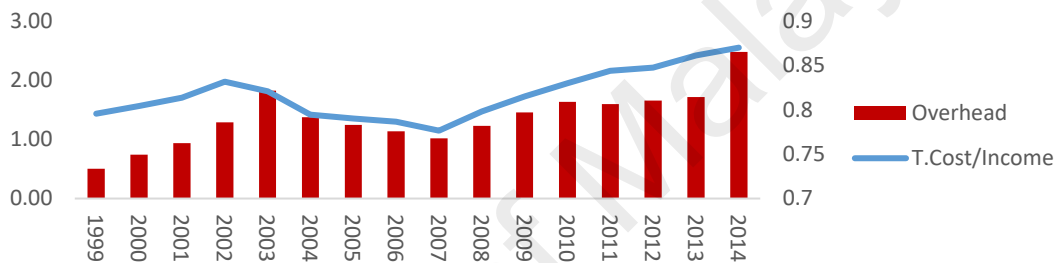
### **1.6 Historical Trends in Profitability and Cost Conditions**

Figures 1.5 and 1.6 show the statistics related to average profitability and raw measures of average efficiency for the ASEAN banking industry. The average values on two profitability measures, namely after-tax return on assets (ROA) and after-tax return on equity (ROE), have been shown in Figure 1.5 over the period 1999-2014. Except for the period corresponding to the global financial crisis, both ROA and ROE indicate an increase in average profitability. For instance, the average values of ROA and ROE increased from 4% and 9% in 1999 to 17% and 14% respectively in 2014 (Figure 1.5). Cost efficiency is another important indicator of banks' performance. For illustration purposes, two raw measures of efficiency have been used in this section. First, overhead cost as a fraction of total assets, which has been used in literature as a raw measure of cost efficiency. Second, the ratio of banks' total cost to total income is another useful indicator of banks' cost efficiency. Figure 1.6 presents the ratios of average overhead to total assets and average total cost to total income for commercial banks in ASEAN-5 over the period of 1999-2014. The average value for overhead to total assets was at 0.05% in 1999; however, it increased to 2.92% in 2014. The average value of total cost to total income was at 79.6% in 1999, which increased to 87.1% in

2014. In general, the average portability of ASEAN commercial banks has increased in the post-financial crisis period, but at the same time, their cost efficiency has decreased.



**Figure 1.5: After-Tax Return on Assets (ROA) and After-Tax Returns on Equity (ROE)**



**Figure 1.6: Average of Overhead to Total Assets and Total Cost to Total Income**

### 1.7 Implications of Changes in Bank Market Structure

The graphical analysis presented in Sections 1.4 and 1.5 highlights four important facts about the ASEAN banking industry from 1999 to 2014. First, the average concentration in terms of assets, loans, and deposits has consistently increased over that time. This is evident from Figure 1.2 where the average proportion of assets, loans, and deposits held by the five largest banks in each country shows an upward trend. This fact is also supported by the increasing trend of the sum of squared market share (HHI) in terms of assets, loans, and deposits, shown in Figure 1.3. Second, the average market power of banks (their ability to charge higher prices) increased over the period. Alternatively, this trend reveals a decrease in the level of competition (Figure 1.4). Third, the average profitability as measured by ROA and ROE has increased in all periods except for the financial crisis period (Figure 1.5). Finally, the average cost

conditions (as measured by overhead cost to total assets and total cost to total income) have deteriorated notably since the global financial crisis 2008-09 (Figure 1.6). An overall increase in overhead cost to total assets indicates that concentration may have led to increased banks' profitability, but their efficiency has deteriorated over the time from 1999 to 2014. The implications of an increase in bank concentration can be counterproductive for banks' own performance and other economic activities. For example, the literature provides ample evidence of the detrimental effects of bank concentration. First, the concentration of market share eliminates competition from the market and leads to market inefficiency (Weiss, 1974; Smirlock, 1985; Berger, 1995). Second, the banks or firms in concentrated markets are able to earn higher profits due to their monopoly power (by charging higher prices); however, they may not operate efficiently (Hicks, 1935; Berger & Hannan, 1998). Third, bank concentration may lead to financial instability (Boyd & De Nicolo, 2005; Schaeck et al., 2009; Allen et al., 2011). Fourth, bank concentration weakens monetary policy transmission through the bank lending channel (Adams & Amel, 2005; Olivero et al., 2011b). Fifth, bank concentration suppresses the growth of financially dependent industries (Pagano, 1993; Guzman, 2000; Claessens & Laeven, 2005).

## **1.8 Issues in Current Literature**

The existing body of literature does not provide sufficient insights into the implications of market structure for bank performance and other economic activities in the context of ASEAN. This apparent inadequacy of the current literature can be attributed to (1) a dearth of in-depth and focused studies in ASEAN economies, (2) mixed and/or inconclusive findings from general literature, (3) an inappropriate methodological approach to analyzing the SCP hypothesis, (4) researchers' disagreement with respect to the most suitable measure of bank competition, and (5)

different explanations for the relationship between market structure and bank performance. The rest of this section discusses these issues in greater detail.

First, the literature on market structure in the context of the ASEAN banking industry does not focus on the issues raised by this study. There are a few excellent studies on different aspects of the banking industry in ASEAN, but their focus is not exactly on the shift towards a more concentrated market structure. The issues covered in these studies include foreign bank penetration and its effect on level of competition (Jeon, Olivero, & Wu, 2011; Mulyaningsih, Daly, & Miranti, 2015), the restructuring process in ASEAN (Laeven, 2005), bank ownership structure and performance (Williams & Nguyen, 2005), bank market structure, foreign banks and transmission of monetary policy (Olivero et al., 2011b, 2011a; Amidu & Wolfe, 2013; Jeon & Wu, 2014), market structure, economic growth and financial stability (Soedarmono, Machrouh, & Tarazi, 2011; Fu et al., 2014), bank regulations and cost of financial crises (Angkinand, 2009), off-balance sheet banking and monetary policy transmission (Perera, Ralston, & Wickramanayake, 2014), structure conduct performance (Khan, 2014), bank consolidations and market structure (Majid, Sufian, & Alifiah, 2007; Abd Kadir, Habibullah, Law, & Mohamed, 2014), off-balance sheet activities, risk and cost efficiencies (Chan, Karim, Burton, & Aktan, 2014), institutional framework and concentration-efficiency relationships (Chan, Koh, Zainir, & Yong, 2015), consolidations and bank efficiency (Sufian & Majid, 2007; Sufian, 2009; Thoraneenitiyan & Avkiran, 2009), and globalization and bank net interest margins (Sufian, 2012).

Some of these studies are directly or indirectly related to the objectives of this study; however, these are limited in scope for several reasons. First, their sample covers either only a single country from ASEAN or regions such as Asia Pacific or Asia – in which

major economies from ASEAN are included as a sub-group. Second, the time period covered in most of these studies does not include recent data, as it only goes up to 2009 in most cases. Third, the few studies that emphasize the ASEAN region and use recent data do not focus on the issues raised by this present study. Some related studies focus on a single country, namely Malaysia, and include Sufian and Majid (2007), Sufian (2009), Sufian (2012) and Abd Kadir et al. (2014). Although these studies do not directly address the issues highlighted by the present study, they do reinforce the problem statement. For instance, Sufian and Majid (2007) find that Malaysian banks operate under a monopolistic competition and that the level of competition has decreased over the time. Similarly, Sufian (2009) discovers that the efficiency of banks has notably decreased in the post-financial crisis period. Moreover, Sufian (2012) also argues that bank net interest margins are negatively influenced by restrictions on capital account; nonetheless, the structure of the banking industry plays a positive role in improving the net interest margins. Furthermore, Abd Kadir et al. (2014) find that Malaysian banks are operating under a monopolistic competition in a moderately concentrated market.

A few other studies that focus on ASEAN and use recent data include Chan et al. (2014) and Chan et al. (2015). These studies also discuss some related issues that reinforce the problem statement of this study. For example, Chan et al. (2014) examine the influence of off-balance sheet (OBS) activities and various types of risks on the cost and profit efficiencies of banks in ASEAN and find that profit efficiency increases with an increase in insolvency risk. However, certain other bank characteristics such as bank size, capitalization, OBS and interest sensitivity decrease the cost efficiency of banks. In the same way, Chan et al. (2015) notice that bank concentration reduces the cost efficiency of banks; however, institutional characteristics play an important part in concentrated markets to ensure that banks operate efficiently.

The studies that are directly related to one of the objectives of this study include Olivero et al. (2011a), Olivero et al. (2011b), Amidu and Wolfe (2013), Jeon and Wu (2014) and Jeon et al. (2011). Nevertheless, these studies use a larger sample in which ASEAN is only a subset. Moreover, the findings of these studies are also not conclusive. For instance, Olivero et al. (2011a) study the impact of bank competition on the transmission of monetary policy in Asian and Latin American economies (including ASEAN) and find that the monetary policy transmission becomes less effective in more competitive banking industries. In contrast, in another study with a similar sample, Olivero et al. (2011b) argue that a higher level of bank concentration weakens the transmission of monetary policy through the bank lending channel. These findings are also supported in Amidu and Wolfe (2013), who find in a sample of 55 countries (including ASEAN), that a higher level of bank competition reduces the effectiveness of monetary policy transmission through the bank lending channel. Moreover, with respect to foreign banks, Jeon and Wu (2014) find that for Asian countries (including ASEAN) foreign bank penetration weakens the effectiveness of monetary policy transmission. Similarly, Jeon et al. (2011) find that foreign bank penetration has increased bank competition in Asian countries (including ASEAN economies) after the Asian and Global financial crises.

With respect to bank market structure and financial stability, Fu et al. (2014) explore the effect of bank concentration/competition on bank stability in the Asia Pacific region (including ASEAN) and find that bank fragility increases with an increase in bank concentration. Similarly, Soedarmono et al. (2011) and Soedarmono, Machrouh, and Tarazi (2013) report that greater market power in the banking industry reduces financial stability in the Asian banking market. On the other hand, Soedarmono and Tarazi (201) find that in commercial banks in the Asia Pacific region a lower level of competition is associated with higher financial instability. In addition, Amidu (2013) suggests that a

higher degree of market power reduces the risk of insolvency in developing and emerging economies (emerging economies also include countries from ASEAN).

Second, the general literature related to the impact of bank market structure on (i) bank performance, (ii) financial stability, (iii) transformation of monetary policy, and (iv) industrial growth does not provide conclusive evidence. For instance, studies on the relationship between bank market structure and banks' performance can be divided into two groups. The first set of studies reports a positive impact of market structure (bank concentration) on bank performance (profitability) and argues that these results support the SCP hypothesis. These studies in the first group include Shepherd (1986), Berger and Hannan (1989), Bourke (1989), Molyneux and Thornton (1992), Lloyd-Williams, Molyneux, and Thornton (1994), Molyneux and Forbes (1995), Berger and Hannan (1997), De Bandt and Davis (2000), Bikker and Haaf (2002), Mendes and Rebelo (2003), Papadopoulos (2004), Tregenna (2009), Al-Muharrami and Matthews (2009), Turk Ariss (2010), and Amidu (2013) among others. The second set of studies fails to establish a positive relationship between market structure (concentration) and bank performance (profitability) and finds evidence in favor of alternative theories in the structure-performance relationship: the efficient structure (ES), quiet life (QL) and relative market power (RMP) hypotheses (which are discussed in detail later in this section).

The studies in the second group include Gale and Branch (1982), Smirlock, Gilligan, and Marshall (1984), Smirlock (1985), Evanoff and Fortier (1988), Martin (1988), Berger (1995), Goldberg and Rai (1996), Pilloff and Rhoades (2002), Brewer and Jackson (2006), Park and Weber (2006), Samad (2008), Casu and Girardone (2009), Coccoresse (2009), Bhatti and Hussain (2010), Hsieh and Lee (2010), Seelanatha (2010), Mirzaei et al. (2013), and Zhang et al. (2013), among others. Some earlier

surveys of the related literature by Osborne and Wendel (1978) and Gilbert (1984) also reveal that the structure-performance literature contains so many inconsistencies as to provide no evidence of a positive association between concentration and performance in banking.

Similarly, evidence on the role of market structure for monetary policy, industrial growth, and financial stability is divided between two set of arguments. First, the concentrated banking industry can be counterproductive for monetary policy transmission, industrial growth and the stability of financial systems. For instance, bank concentration may lead to financial instability (Boyd & De Nicolo, 2005; Schaeck et al., 2009; Allen et al., 2011); it weakens monetary policy transmission through the bank lending channel (Adams & Amel, 2005; Olivero et al., 2011b); and it suppresses the growth of financially dependent industries (Pagano, 1993; Guzman, 2000; Claessens & Laeven, 2005). Second, the concentrated banking industry has a promising role for monetary policy transmission, industrial growth and the stability of financial systems. For example, the large banks in the concentrated banking markets reduce financial fragility through building up high 'capital buffers', increasing their charter value, discouraging bank managers from excessive risk-taking, providing credit monitoring services, and diversifying risk (Keeley, 1990; Allen & Gale, 2004); concentrated banking industries reinforce the impact of monetary policy on bank lending (Gunji et al., 2009; Olivero et al., 2011a; Amidu & Wolfe, 2013); and the concentrated banking markets promote economic growth (Mayer, 1988; Petersen & Rajan, 1995; Cetorelli & Gambera, 2001; Marquez, 2002; Di Patti & Dell'Ariccia, 2004; Zarutskie, 2006).

Third, the manner in which the SCP hypothesis has been tested suffers from certain drawbacks. For example, previous studies regress firm/bank performance on market structure to test the SCP hypothesis [see for example (Weiss, 1974; Smirlock et al.,



1984; Smirlock, 1985; Berger & Hannan, 1989; Berger, 1995)]. This method ignores the role of conduct in the structure-performance relationship and provides misleading conclusions. For instance, the establishment of a concentration-performance relationship does not prove that superior performance is the result of collusion among firms or monopoly rents. According to Demsetz (1973), it cannot be established that higher profitability is the result of efficiency, collusion or product quality (product differentiation) by simply correlating market concentration to industry rate of return. Even if larger firms in concentrated markets earn higher returns, it is difficult to determine whether efficiency or monopoly power is at work. Moreover, Tirole (1988) highlights an identification problem with the classical test of the SCP hypothesis, i.e., a causal relationship in SCP (from structure to conduct and from conduct to performance) cannot be identified by regressing market performance on market structure.

Fourth, the measurement of market structure is a complex task which has resulted in the development of different approaches. From an empirical point of view, there are two approaches to measure the market structure. First, the structural approach from the traditional Industrial Organization (IO) literature. The approach is based on the structure-conduct-performance (SCP) paradigm, according to which the level of competition is inferred from the structure of the market (number of firms, size of firms and level of concentration). Structural measures include the concentration indices such as n-firm concentration ratio (CR (n)) and Herfindahl-Hirschman Index (HHI). The higher values of these indices (higher level of concentration) imply a lower level of competition. This approach is however subject to severe criticism for its inability to measure the market structure. For example, Dell'Ariccia (2000) and Northcott (2004) argue that even highly concentrated markets can be competitive due to information asymmetries. In response to criticism on structural measures, non-structural approaches based on the New Empirical Industrial Organization (NEIO) have been developed. The

purpose of non-structural measures based on NEIO is to assess the level of competition directly from firms' conduct. Non-structural measures include the Lerner Index, Panzar-Rosse H-statistic, Conjectural Variation model and the Boone Indicator. Researchers are far from reaching a consensus with respect to the measurement of market structure. According to Carbó, Humphrey, Maudos, and Molyneux (2009), inferences about the level of competition differ widely using different indicators of banking market competition. Therefore implications of competition depend upon the choice of indicators.

Finally, the relationship between market structure and bank performance has been explained by different theories, and there is no conclusive evidence as to which theory explains the true relationship between market structure and bank performance. For example, the SCP paradigm (Bain, 1951, 1956, 1968) suggests that concentration facilitates tacit/explicit collusion among market participants and reduces the competition. The lower level of competition in return results in a loss of market efficiency through monopoly profits (Weiss, 1974; Smirlock, 1985; Berger, 1995). The Efficient Structure (ES) hypothesis (Demsetz, 1973), however, suggests that concentration is a result of changed cost conditions and not the alterations in the height of entry barriers. Firms having superior efficiency in production perform better, become large and obtain a higher market share. Hence the market becomes concentrated. On the other hand, the Relative Market Power (RMP) hypothesis suggests that higher profits are not necessarily a result of cost efficiency but can also result from higher prices. Firms with well differentiated and high-quality products are able to increase their market share and earn abnormal profits (Shepherd, 1982; Mueller, 1983; Ravenscraft, 1983, 1984). Similarly, the Quiet Life hypothesis (QL) implies that banks/firms in concentrated markets may earn higher profits by charging higher prices, but they may not operate efficiently (Hicks, 1935; Berger & Hannan, 1998). All these theories

explaining the relationship between market structure and performance have been tested in different geographical contexts using different measures of market structure and performance, but results are mixed, and it can rightly be termed as market structure-performance puzzle.

## **1.9 Research Questions**

The contemporary circumstances – in other words, the move towards a concentrated banking industry in ASEAN, the inconclusive general literature and the absence of studies in the specific context on the implications of bank concentration – trigger an important research question regarding the desirability of bank concentration. For instance, is a concentrated banking industry favorable to the ASEAN economies? The answer to this question is, however, not straightforward, because the bank concentration not only affects banks' own performance but also influences other aspects of the economy such as financial stability, transmission of monetary policy and economic growth (these concerns are discussed in section 3). In particular, the relationship between bank concentration and bank performance has been subject to alternative explanations and methodological issues (these issues are discussed in section 1.3). Therefore, any policy recommendations regarding the desirability or undesirability of bank concentration have to be based on an analysis of bank concentration and its relationship with bank performance and other related areas of the economy: the transmission of monetary policy and the economic growth. Accordingly, this study breaks down the main research question into three sub-questions.

The first is whether banks in a concentrated market increase their profits through monopoly pricing/collusion. From section 1.5 and 1.6, it can be observed that an increase in bank concentration is accompanied by an increase in bank profitability and a decrease in cost efficiency. It appears reasonable to have profitable banks, but what if

the profits are being earned out of monopoly pricing? This research question has important implications for anti-trust policies. For instance, if the consolidation activities are motivated by the desire to earn monopoly profits, then they are most likely to hurt the economy by making the intermediation process more costly. On the other hand, bank consolidations are supposed to allow the banks to exploit the scale efficiencies and transfer the efficiency gains to the customers by reducing the cost of credit. These apprehensions are also supported by the structure conduct performance (SCP) hypothesis which suggests that the large banks in concentrated markets collude to charge higher loan rates, pay lower deposit rates and earn high profits (Park & Weber, 2006; Webster, 2011; Mirzaei et al., 2013).

The second sub-question is whether bank concentration weakens or strengthens the transmission of monetary policy through the bank lending channel. The increase in bank concentration is evident from the statistics presented in section 1.5. The role of bank concentration for the transmission of monetary policy is also well documented in literature, but it is not conclusive. Therefore, this research question must be answered before making any policy recommendations regarding the suitability or unsuitability of bank concentration. The monetary policy is one of the fundamental financial policies that aim to control the credit supply for controlling inflation and to stabilize the price level, to stabilize the exchange rate, to achieve equilibrium in the balance of payments and to promote economic development. Therefore, if bank concentration weakens the effect of the monetary policy, the ongoing consolidation in ASEAN is questionable.

The third one is whether the bank concentration fosters or hinders the growth of manufacturing industries, particularly financially dependent ones. The banking industry in ASEAN is moving towards a concentrated market structure (see Section 1.6) and there is substantial evidence that it affects the industrial growth (see Section 1.3).

However, it is not clear whether the effect of bank concentration on industrial growth is positive or negative. Consequently, any policy recommendations with respect to bank concentration must be preceded by an investigation into its effect on industrial growth. Since the performance of the manufacturing sector is a key contributor to the economic development of a country, the desirability of bank concentration is questionable if it slows down industrial growth. All these questions are of prime importance in order to understand the consequences of changing competitive conditions in ASEAN economies and to devise or analyze appropriate policies. Based on these research questions, the objectives of this study follow next.

#### **1.10 Research Objectives**

In line with the research question raised in the previous section, this study aims to evaluate the appropriateness of bank concentration in ASEAN. Nevertheless, bank concentration not only affects the banks' own performance but is also related to industrial growth and the transmission of monetary policy through bank lending activities. It is therefore imperative to investigate the influence of bank concentration on all the related areas such as bank performance, monetary policy transmission, and industrial growth, before making any policy recommendations. For the purpose of analysis, the main objective of this study has been divided into three sub-objectives, which are represented by three essays (research papers). Accordingly, a separate chapter is assigned to each essay (objective) that further includes the relevant sections on introduction, literature review, methodology, results and discussion and conclusion. As a part of an introduction to this study, the following section is dedicated to the discussion of the objectives in greater details.

### **1.10.1 First Objective of the Study (Essay 1)**

The first objective is to see whether the concentrated markets allow the banks to earn monopoly profits as suggested by the SCP hypothesis. This hypothesis indicates that the large banks in concentrated markets collude to charge higher loan rates, pay lower deposit rates and earn high profits (Park & Weber, 2006; Webster, 2011; Mirzaei et al., 2013). The existing literature on the SCP hypothesis is not suitable for policy implications for two important reasons. First, the general evidence on the validity of the SCP hypothesis is mixed. For instance, several studies find a positive relationship between bank concentration and profitability, which they regard as evidence in support of the SCP hypothesis. In contrast, there are numerous studies that simply fail to establish such a relationship. Some of the most relevant studies that support and/or oppose the SCP hypothesis are reported in Section 1.8.

Second, the traditional approach to test the SCP hypothesis is flawed because it ignores the role of bank conduct. For instance, the traditional approach relates bank concentration to bank profitability and concludes that concentration allows banks to earn higher profits through monopoly rents (Homma et al., 2014). Traditionally, a positive relationship between concentration and profitability is assumed to support the SCP hypothesis. Nevertheless, the existence of a positive relationship between bank concentration and profitability is not sufficient to imply that higher profitability is a result of monopoly rents. Accordingly, the policy implications – namely, the monitoring or scrutiny of consolidation activities – based on traditional tests of the SCP hypothesis can be misleading. For example, if bank concentration and profitability are indeed positively related, it cannot be concluded that such a relationship exists because of the monopoly rents. On the other hand, it is quite possible that some other variables such as cost efficiency and/or product quality are driving both market share and profits. Consequently, it becomes immensely relevant for policymakers to study whether the

monopoly pricing is driving the relationship between bank concentration and profitability.

This study applies a different approach to test the SCP hypothesis: unlike other studies, this approach incorporates the role of bank conduct in the structure-performance relationship. The SCP paradigm specifies that the market structure influences the conduct of banks, which in turn affects their performance. Therefore, instead of regressing bank performance directly on the market concentration, this study employs “bank conduct” as the mediating variable between market structure and performance. This approach is expected to be advantageous over those followed by the earlier studies because it considers all three elements in the SCP paradigm – the structure, the conduct and the performance – and relates them as specified by the SCP hypothesis. This approach will enable policy-makers to see whether the banks are profitable through monopoly pricing/collusion.

#### **1.10.2 Second Objective of the Study (Essay 2)**

The second objective is to explore the effect of banking market structure on monetary policy transmission through the banks’ lending. There are several ways in which the structure of the banking industry can affect the bank lending channel. The bank lending channel is an important mechanism for the transmission of monetary policy; therefore, the structure of the banking industry also affects such transmission. For instance, the concentrated markets are dominated by large banks that have greater access to the alternative sources of funds – i.e., capital markets – as compared to small banks. Accordingly, the lending activities of these banks are less influenced by monetary policy shocks. On the other hand, small banks depend on customers’ deposits for a supply of loanable funds. These banks cannot compensate for the decrease in loanable funds through non-deposit funding in response to contractionary monetary

policy; consequently, they have to cut short their loans. Moreover, small banks have to face higher costs of informational asymmetries in order to finance their lending through unsecured funds.

Similarly, the large banks in concentrated markets enjoy an information monopoly regarding the creditworthiness of their customers. Therefore, the switching costs for borrowers are high in highly concentrated markets. The borrowers from small banks with extra demands for loans find it difficult to switch their lenders because small banks are more affected by negative shocks of monetary policy and thus these borrowers are not picked by large banks. Through this process, concentration can translate into a depressing effect of monetary policy on economic activity, thus reinforcing the monetary policy transmission through bank lending channel. Furthermore, some banks in less competitive markets may use their liquidity positions and make liquidity costly for other market participants. High liquidity costs can preclude banks from isolating a loan supply from the adverse effects of monetary policy on loanable funds. In such cases, consolidation may increase the cost of liquidity for banks in less consolidated markets and can reinforce the bank lending channel (Peltzman, 1969; Kashyap & Stein, 1995; Favero et al., 1999; Kashyap & Stein, 2000; Kishan & Opiela, 2000; Olivero et al., 2011b, 2011a).

Despite the fact that the role of the bank market structure for monetary policy transmission is a well-established one, the related literature is inconclusive. For example, Adams and Amel (2005) and Olivero et al. (2011b) argue that higher concentration/low competition in banking industries allows the banks to grow financially stronger and isolate their loans (lending activities) from loanable funds. Such banks are less likely to be affected by monetary policy shocks. Consequently, the monetary policy fails to reduce the credit creation by banks as intended by the monetary



authorities. On the other hand, Gunji et al. (2009), Olivero et al. (2011a), and Amidu and Wolfe (2013) suggest that lower concentration/high competition in banking industries reduces the impact of monetary policy on bank lending. For instance, switching costs for borrowers are high in highly concentrated markets because the large banks enjoy an information monopoly regarding the creditworthiness of their customers. The small banks are more affected by negative shocks of monetary policy while their borrowers find it difficult to switch their lenders. As a result, concentration can translate depressing effect of monetary policy on the lending activity thus reinforcing the monetary policy transmission.

A noticeable point of difference among these studies is the use of different measures of bank competition. With respect to the most suitable measure of competition, the researchers are far from reaching a consensus. For example, concentration is considered to be negatively related to the level of competition under the SCP paradigm. In this regard, Bikker and Haaf (2002) show that a high level of concentration in banking is likely to reduce competition, and thus a few large (cartel) banks can restrict competition, and a multitude of fringe competitors are unable to engender it (competition). However, Dell'Ariccia (2000) and Northcott (2004) argue that competition can prevail even in highly concentrated markets. Thus concentration indices may not be appropriate to infer the level of competition. Addressing the measurement issues, Carbó et al. (2009) argue that the inferences about the level of competition depend upon the choice of indicators. Each indicator captures a unique aspect of competition and has its own advantages and disadvantages. Therefore, using a single measure of market structure can be misleading. Accordingly, it is more logical to use alternative measures of market structure and compare the findings (Leon, 2014). This study applies both structural and non-structural measures of competition to examine its role in monetary policy transmission. In doing so, this study also considers

the banks' response to changes in the monetary policy stance based on their financial strength, i.e., size, liquidity, and capitalization.

### **1.10.3 Third Objective of the Study (Essay 3)**

The third objective of this study is to examine the role of the banking market structure for the growth of manufacturing industries, particularly the financially dependent industries. The bank market structure can affect economic growth by influencing firms' access to finance, establishing a lending relationship, performing a screening role more or less vigorously, and financing new businesses. However, the literature with respect to the role of competition/concentration for economic growth is still in its early stages, and only a handful of studies have so far explored this relationship. The implications of these studies are limited by inconclusive findings, the choice of the sample period and the choice of market structure measures. For instance, their analysis covers a pre-financial crisis period which may not be applicable to post-crisis times because of changing competitive conditions triggered by mergers and acquisitions that occurred in response to the Asian Financial Crisis 1997-1998 and Global Financial Crisis 2008-2009; and their analysis is based on a single measure of market structure, which can be misleading for reasons discussed in the second objective of this study. With respect to the findings of these studies, there are two conflicting views on the role of the bank market structure for economic growth.

First, the competitive banking systems are more conducive to the growth of manufacturing industries while these industries suffer in concentrated banking sectors. For instance, corporate growth is limited in highly concentrated or less competitive banking systems because firms have less access to finance. The limited growth of firms translates into a lower overall economic growth (Pagano, 1993; Guzman, 2000). Similarly, the concentrated banking systems make access to finance difficult and

unaffordable for firms, thus limiting their ability to borrow and invest more (Deidda & Fattouh, 2005). Moreover, the concentrated banking systems lead to a low amount of firm creation and consequently, less economic growth (Berger, Hasan, & Klapper, 2004; Cetorelli & Strahan, 2006). By the same token, the banks operating in concentrated markets tend to use their market power and charge high loan rates which in turn make funding more expensive for firms, which depresses the firms' investing activities (Allen & Gale, 2000).

Second, concentrated banking systems encourage the growth of manufacturing industries while such industries experience lower growth in a more competitive banking environment. Proponents of this view argue that the banks in more concentrated markets perform the function of information producers and establish a strong relationship with their customers. On the other hand, increased competition can lead to the asymmetry of information between borrowers and lenders, less lending and less investment (Petersen & Rajan, 1995). Similarly, banking competition hampers the screening role performed by banks in their choice of borrowers; banks in competitive markets take less care in screening firms and also charge higher loan rates; the higher cost of borrowing decreases the availability of funds (Marquez, 2002). Moreover, the creation of new firms is high in economies with less competitive markets. Thus they experience higher overall economic growth (Di Patti & Dell'Ariccia, 2004; Zarutskie, 2006).

This study addresses the issues in the structure-growth relationship by applying both structural and non-structural measures of market structure. The study also considers the role of financial development (bank and capital market development) and other factors such as growth opportunities, property rights, quality of accounting standards and bank ownership.

### **1.11 Contribution of the Study**

The study contributes to banking literature in general and the bank market structure literature in particular, in several important ways. As discussed in Section 1.4 and demonstrated in Section 1.5, the banking industry in ASEAN has moved to a more concentrated market structure in the aftermath of the Asian and Global Financial crises. The implications of bank concentration are not clear as there are limited studies in the context of ASEAN and the general literature does not provide conclusive evidence. Moreover, the existing literature has mostly focused on a single aspect of bank market structure for policy implications, which can be misleading. This study tries to fill the research gap by examining the role of bank market structure for banks' performance, monetary policy transmission and the industrial growth in ASEAN countries. The findings of the study are important for policy-makers in their decisions regarding the suitability of the banking market structure, i.e., concentration and/or competition.

The study also contributes towards the literature in term of a methodological approach to test the SCP hypothesis. As discussed in Sections 1.8 and 1.9.1, the manner in which the SCP hypothesis has been analyzed by earlier literature is subject to serious methodological issues. For instance, the traditional tests of SCP ignore the role of bank conduct and directly relate the bank concentration to some measure of bank performance. Consequently, the policy implications based on traditional tests of the SCP hypothesis can be misleading. Therefore, the changing competitive conditions in ASEAN banking and related increase/decrease in profitability/cost conditions demand a thorough investigation of the phenomena by applying a more plausible methodology. For example, the study introduces "bank conduct" as the mediating variable between market structure and performance instead of regressing banks' performance directly on market concentration. Following Baron and Kenny (1986), the study specifies four conditions to test the intermediating role of bank conduct between market structure and

bank performance. First, bank concentration significantly influences the conduct of the banks. Second, bank conduct independently affects the performance of the banks. Third, bank concentration affects the banks' performance. Finally, the impact of bank concentration on the banks' performance reduces with the inclusion of conduct in the estimation model. This approach may have advantages over existing ones because unlike the previous studies, it considers all three elements of the theory and relates them as suggested by the SCP paradigm. Despite its obvious mediating role between market structure and market performance, there is hardly any study that considers conduct (collusion) as the plausible explanation for the relationship between concentration and profitability. This study introduces a highly relevant yet neglected piece of the jigsaw puzzle into the SCP paradigm. The resulting approach thus provides a legitimate test of the SCP hypothesis for relevant policy implications.

Another important contribution of the present study towards banking literature is that it addresses both macro and micro aspects of banking market structure. As discussed in Section 1.3, the decision regarding the suitability of a concentrated banking industry for ASEAN economies cannot be solely based on the existence or non-existence of its relationship with bank performance. Bank concentration not only affects the banks' own performance but also influences other aspects of the economy such as financial stability, transmission of monetary policy, and economic growth (this fact is discussed in detail in Section 1.3 and 1.8). The earlier literature, however, ignores other aspects of bank concentration while inferring the policy implications. This study provides better insights into the desirability of bank concentration by considering macro and micro perspectives on the role of bank market structure.

The study also contributes towards banking literature in terms of the methodology applied to explore the impact of bank market structure on monetary policy transmission

and industrial growth. As discussed in Sections 1.10.2 and 1.10.3, the earlier literature has mostly used a single measure of market structure to infer the level of competition, which can be problematic. For instance, Carbó et al. (2009) and Leon (2014) suggest that the inferences about the level of competition differ widely, using different indicators of banking market competition. Thus the implications of competition depend upon the choice of indicators. A single measure of market structure can be misleading because each measure captures a unique aspect of competition and has its own advantages and disadvantages. Therefore it is more plausible to use alternative measures of market structure and compare their findings. This study applies both structural and non-structural measures of market structure to analyze its impact on monetary policy transmission and industrial growth. The use of both structural and non-structural measures is recommended for policy implications regarding the role of market structure.

Although not directly related to the objectives of this study, there are some important findings with respect to the concentration-competition relationship, which is another important contribution of this study. The traditional view based on the SCP hypothesis suggests that a higher level of concentration is negatively related to the level of competition. However, this view is not universally shared and some studies such as Dell'Ariccia (2000) and Northcott (2004), argue that competition can even exist in highly concentrated markets. This study provides both direct and indirect evidence of a negative relationship between concentration and competition. For instance, towards the achievement of the first objective, the study examines the impact of concentration on the conduct of banks. The conduct of banks has been measured through the Panzar-Rosse H statistic and the Lerner Index. Both of these measures have also been used in the literature to assess the level of competition. This study finds that bank concentration is negatively related to the competitive conduct of banks. By inference, this is direct evidence in favor of a negative relationship between bank concentration and level of

competition. Towards the achievement of the second and third objectives, this study uses concentration (structural approach) and competition (non-structural approach) measures to examine the impact of bank market structure on the transmission of monetary policy and industrial growth. Both concentration and competition measures have opposite relationships with dependent variables, implying that these two measures are negatively related to each other. By inference, this is indirect evidence in favor of a negative relationship between bank concentration and level of competition.

The findings of the study are summarized as follows. First, the concentrated banking industries allow banks to earn higher profits partially through anti-competitive conduct by banks. Second, the concentrated banking industries undermine the transmission of monetary policy through the banks' credit channel. Moreover, the weakening effect of concentration is stronger for highly capitalized, highly liquid and large-sized banks. Third, bank concentration slows down the growth of manufacturing industries, especially the financially dependent ones. The overall conclusion from the analyses of the three objectives is that the concentrated banking industries (i) allow banks to earn higher profits partially through anticompetitive conduct; (ii) reduce the effectiveness of monetary policy transmission through the bank lending channel, and; (iii) slow down the growth of manufacturing industries, especially the financially dependent ones. Therefore, the study suggests that the consolidation policies must be pursued after careful analysis of their impact on bank performance and other economic activities. In doing so, due consideration must be given to all the aspects of the economy that are potentially influenced by the bank market structure such as monetary policy transmission, economic growth, and financial stability.

### **1.12 Organization of the Study**

The rest of the study is structured as follows. Chapter 2 provides a critical review of the literature on the role of market structure for banks' performance, monetary policy transmission, and industrial growth. Since this thesis is presented in the form of three related articles (each addressing a specific research objective), Chapters 3, Chapter 4, and Chapter 5 are respectively dedicated to Article 1 (1<sup>st</sup> objective of the study), Article 2 ( 2<sup>nd</sup> objective of the study) and Article 3 (3<sup>rd</sup> objective of the study). Each of these three chapters contains separate sections for the introduction, literature review, methodology, results and discussion, and conclusion. Finally, Chapter 6 concludes the study along with a discussion on policy implications and the limitations of the study.



## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 Overview of Chapter**

The literature on the role of bank market structure for banks' performance, transmission of monetary policy and the industrial growth is abundant, however, despite its voluminous size, literature fails to provide consistent results. Researchers are far from reaching an agreement regarding the desirable form of bank market structure and its role for banks' performance and the overall economy. This chapter discusses the literature related to the impact of bank market structure on banks' performance, the monetary policy transmission, and the industrial growth. The literature review is categorized in 5 sections: section 2.2 provides the theoretical background related to the effect of bank market structure on banks' performance and other economic activities such as monetary policy transmission and the industrial growth; section 2.3 reviews the empirical literature on market structure and performance relationship; section 2.4 discusses the literature on market structure, and transmission of monetary policy; section 2.5 reviews the studies on market structure and industrial growth, and concludes the chapter with discussion on limitations of existing literature.

### **2.2 Theoretical Background**

The relationship between market structure and performance can be traced back to Mason (1939) and Bain (1951, 1956, 1968), who suggest that the market structure has a direct influence on the firms' economic conduct which in turn affects the firms' performance. This relationship is termed as "the structure-conduct-performance (SCP) framework." The central hypothesis of the SCP framework ("SCP hypothesis" or "collusion hypothesis") suggests that the concentration of output reduces the cost of collusion and promotes tacit/explicit collusion by participating firms. Consequently, all firms are able to earn monopoly profits (Bain, 1951, 1956, 1968). The early literature applied the SCP framework to the manufacturing sector and found a positive impact of

market structure (concentration) on firms' performance. Therefrom, it was natural to expect the implications of market structure in the banking industry. Edwards (1964) is among the pioneers who extended the SCP framework to the banking industry. Since then, a multitude of studies has applied this concept to different aspects of banking such as banks' performance, efficiency, transmission of monetary policy, industrial growth, financial stability, access to credit and new firm creation. In the context of banking, large banks in concentrated markets collude, charge higher loan rates, and pay lower deposit rates which are not favorable to customers. Thus, the concentration leads to an overall welfare loss/loss of consumer surplus (Weiss, 1974; Smirlock, 1985; Berger, 1995). Implications of SCP are that the market concentration eliminates the competition from the market and this leads to the market inefficiency, for example, monopolistic pricing and monopoly profits thus SCP proposes a careful analysis of consolidation activities. To the extent that the SCP is correct, merger activities may be motivated by a desire to earn monopoly rent by setting higher prices (high loan rates and low deposit rates) and thus reduce consumer surplus.

However, the SCP paradigm came under criticism for several reasons. For instance, the causality between structure and conduct can run the other way around, i.e., firm's conduct (e.g., predatory behavior or entry deterrence) can shape the market structure within which the firm operates. The relationship between conduct and performance is also weak, and the performance can affect the conduct as well. For example, firms with substantial accumulated profits can incur losses in the short-term to drive out rival firms. It is however interesting that empirical studies testing for SCP hypothesis do not consider the role of conduct as such and directly relate some measure of structure to performance. Similarly, Demsetz (1973) argues that the concentration is the result of changed cost conditions and not the alterations in the height of entry barriers. In other words, firms having superior efficiency in production perform better, become large and

obtain higher market share hence the market becomes concentrated. This narration of structure-performance relationship is known as Efficient Structure (ES) hypothesis. There are two versions of efficient structure hypothesis: X-efficiency version of efficient structure (ESX) and Scale-efficiency version of efficient structure hypothesis (ESS). According to X-efficiency version of efficient structure hypothesis, higher profits are realized by firms with superior X-efficiency. The X-efficiency refers to the combination of superior management and production technology to maximize profit through minimization of cost of production. The X-efficient firms are also able to increase their market share and make the market more concentrated (Demsetz, 1973, 1974; Peltzman, 1977). On the other hand, the scale-efficiency version of ES hypothesis emphasizes that all firms possess equally good management and technology, but some firms can produce at more efficient scales relative to other firms and thus earn higher profits per unit. Thus, scale-efficient firms gain large market shares and lead to market concentration (Lambson, 1987). To the extent that ES hypothesis is correct, merger activities may be motivated by efficiency considerations, which is beneficial for the economy. According to this explanation, concentration results from superior performance and growth of efficient firms, thus anti-concentration policies may bring unnecessary distortions in the economy. Another alternative explanation for the structure-performance relationship comes from Relative Market Power Hypothesis (RMP) also termed as product differentiation hypothesis by Smirlock (1985). According to RMP, higher profits are not necessarily a result of cost efficiency but can also result from higher prices. Firms with well differentiated and high-quality products are able to increase their market share and earn abnormal profits (Shepherd, 1982; Mueller, 1983; Ravenscraft, 1983, 1984). “Quiet life (QL) hypothesis provides yet another dimension to the structure-performance relationship. According to QL hypothesis, firms in concentrated markets can earn higher profits due to monopoly power (by charging

higher prices) however, they may not operate efficiently because of managers' reluctance to put maximum effort, wasteful expenditure to gain and hold the monopoly power, absence of profit-maximizing behavior and/survival of inefficient managers (Hicks, 1935; Berger & Hannan, 1998). Thus firms in concentrated markets can be profit efficient due to monopoly gains but are cost inefficient due to a quiet life.

While the aforementioned studies try to explain the market structure and performance relationship, another stream of studies explores the impact of banks' market structure on macroeconomic aspects such as the financial system stability, the transmission of monetary policy and economic growth. With respect to the market structure and financial system stability, there are two contradicting views known as "the concentration stability" and "the concentration fragility." The concentration stability view suggests that the larger banks in concentrated banking sectors reduce financial fragility through at least five channels: (i) larger banks may increase profits, building up high 'capital buffers', hence allowing them to be less prone to liquidity or macroeconomic shocks, (ii) larger banks may increase their charter value, discouraging bank managers from excessive risk-taking behavior, (iii) it is easier to monitor larger, but fewer banks, resulting in the effective action of supervisory bodies, and consequently reducing the risk of a system-wide contagion, (iv) larger banks tend to be subject to providing credit monitoring services, and (v) due to higher economies of scale and scope, larger banks have the potential to diversify loan-portfolio risks efficiently and geographically through cross-border activities (Keeley, 1990; Allen & Gale, 2004). On the other hand, the concentration-fragility view advocates that the larger banks in a concentrated market weaken the financial system stability through three channels: (i) larger banks are seen as "too big to fail" institutions, which receive guarantees from governments, and consequently the moral hazard problem becomes more severe, (ii) larger banks tend to charge high loan-interest rates due to their market

power, which may lead to risky projects undertaken by borrowers to compensate for such high rates, and the consequence could be increased default risks, and (iii) managerial efficiency such as risk diversification in assets and liabilities may decline, resulting in high operational risk (Boyd & De Nicolo, 2005; Schaeck et al., 2009; Allen et al., 2011).

Similarly, the bank market structure can affect the transmission of monetary policy by influencing the banks' lending activities in several ways. First, the size and the market share of banks in concentrated markets are high. Thus the lending activities of the large banks are less affected by monetary shocks as compared to the small banks. Small banks, on the other hand, depend on customers' deposits for loanable funds, when the monetary policy contracts, these small banks cannot compensate the decrease in loanable funds through non-deposit funding; hence they have to cut short their loans. For instance, small banks have to face higher costs of informational asymmetries in order to finance their lending through unsecured funds (Peltzman, 1969). Second, concentrated markets normally have larger and potentially strong banks as they take over smaller banks. As a result of this consolidation overall banking sector has easy access to sources of loanable funds other than deposits (such as capital markets) thus it is possible for banks to isolate their loan supply from negative shocks of monetary policy to loanable funds (Kashyap & Stein, 1995; Favero et al., 1999; Kashyap & Stein, 2000; Kishan & Opiela, 2000). Third, some banks in less competitive market may use their liquidity positions and make liquidity costly for other market participants. High liquidity costs can preclude banks from isolating loan supply from adverse effects of monetary policy to loanable funds. Fourth, the large banks in concentrated markets enjoy informational monopoly regarding the creditworthiness of their customers. Thus switching costs for borrowers are high in concentrated markets. The borrowers of small banks with extra demand for loans find it difficult to switch their lenders (because small

banks are more affected by negative shocks of monetary policy) thus they are not picked by large banks. Through this process, the bank concentration can translate depressing effect of monetary policy to economic activity thus reinforcing the monetary policy transmission through bank lending channels (Gunji et al., 2009; Olivero et al., 2011a; Amidu & Wolfe, 2013).

Concerning the role of bank market structure for economic growth, the literature suggests that bank market structure can affect the economic growth by influencing the firms' access to finance. However, there are two opposing views with respect to the favorable or unfavorable role of bank concentration for economic growth. The first view highlights the negative impact of the concentrated banking industry on the economic growth. For instance, the firms' growth is limited in highly concentrated or less competitive banking systems because firms have less access to finance. The limited growth of firms (due to a lack of easy access to credit) translates into overall lower economic growth (Pagano, 1993; Guzman, 2000). Similarly, Deidda and Fattouh (2005) find that the higher level of bank concentration negatively affects the industrial and per capita income growth, because the competitive banking systems make access to finance easy and affordable for firms, enabling them to borrow and invest more. Berger, Hasan, et al. (2004) and Cetorelli and Strahan (2006) support this view and demonstrate that concentrated/less competitive banking systems result in the low firm creation and as a result less economic growth. Allen and Gale (2000) argue that banks operating in concentrated markets tend to use their market power and charge high loan rates which make funding more expensive for firms, and expensive funding depresses firms' investing activities. The second view suggests the promising role of bank concentration for the economic growth. For example, the banks in more concentrated markets perform the function of information producer and establish a strong relationship with their customers. Whereas, the increased competition can lead to asymmetry of information

between borrowers and lenders, less lending and less investment (Petersen & Rajan, 1995). Similarly, Marquez (2002) argues that banking competition hampers the screening role performed by banks in their choice of borrowers. Banks in competitive markets take less care in screening firms and also charge higher loan rates, the higher cost of borrowing decreases the availability of funds. According to Di Patti and Dell'Ariccia (2004) and Zarutskie (2006), the creation of new firms is high in economies with less competitive markets thus they experience overall higher economic growth.

### **2.3 Market Structure and Performance**

The literature on the nexus between market structure and performance is abundant. However, the findings are not conclusive. Besides, the methodology applied to study the market structure-performance relationship has been subject to the criticism. Under the traditional approach, different measures of profitability (profit rates, interest rate margins and Tobin's  $q$ ) or prices (interest rate spread) are regressed on measures of market structure (concentration ratio or HHI) and market share (interpreted as a proxy for firm efficiency). Earlier studies (Weiss, 1974; Smirlock et al., 1984; Smirlock, 1985; Berger & Hannan, 1989; Berger, 1995) extend the traditional framework by adding an independent variable, "market share," to the concentration-performance equation. These authors consider market share as a proxy for relative efficiency of firms. Accordingly, if the market share has a positive effect on firms' profit, it supports the ES hypothesis, but if the market concentration is positively related to firms' profit, the SCP hypothesis is supported. Market share as a proxy for the efficiency of the firm is however questionable, and its relationship with firm profitability as evidence for efficient structure hypothesis is also not clear.

An earlier study in this group is Graddy (1980) who uses several measures of market structure (Concentration ratio, market share, Herfindahl Index, Rosenbluth Index) and relates them to bank profitability and prices, however, he does not assume market share as a proxy for efficiency. He finds that choice of structural measure influences the relationship between structure and bank behavior. For example, Herfindahl and Rosenbluth indexes were unrelated to bank service charges, but bank charges were highly correlated with three firm concentration ratio. Similarly, no relationship was found between asset returns and Gini coefficient ( a measure of market structure) while there was a significant relationship between return on assets and other measures of market structure. In terms of dynamic measures (change in concentration and change in market share), market structure significantly affects (positively) bank profitability and prices. A similar methodology is adopted by Gale and Branch (1982) who regress measures of profitability on market share and concentration to examine which of these explains firm profitability. They find evidence that market share, not concentration, is the primary structural determinant of profitability. Market share increases profits through the benefits of scale economies. In contrast, concentration affects profits by facilitating oligopolistic coordination. They conclude therefore that scale economies are far more powerful than oligopoly power in determining profit levels.

With slight variation in the measurement of the dependent variable (performance), Smirlock et al. (1984) regress Tobin's  $q$  (a market measure of firm performance) on market share ( a proxy for firm efficiency) and concentration. Smirlock et al. (1984) find a positive relationship between Tobin's  $q$  and market share which they interpret as supporting efficient structure hypothesis because market share proxies for firm efficiency. They conclude that structure-performance relationship is better explained by efficient structure hypothesis rather than that concentration facilitates collusion to earn monopoly rents.



This approach, however, comes under criticism by Shepherd (1986) for complications with Tobin's  $q$  and assumption that concentration (as a facilitator of collusion) is the exclusive form of monopoly power. Shepherd (1986) asserts that market dominance is the most direct source of market power. The market power occurs regardless of the origins of the dominance. Firms may actually obtain market power from several elements of their market positions. One element is the firm's own market share, which embodies direct control over market transactions. A second element is concentration: oligopoly collusion can give a diluted degree of market control. Reflecting this, concentration has consistently shown a weaker association with profitability than has market share. A third element, entry barriers, can also permit a degree of market power and enhanced profitability. Whatever their origins may be, once these elements exist, they can raise prices and profits. Therefore Shepherd (1986) argues that market share also reflects market power of the firm as its squared sum is Herfindahl Index. If market share has an impact on profit, it is actually supporting SCP hypothesis instead of ES hypothesis. Smirlock, Gilligan, and Marshall (1986) reply to the comment by Shepherd (1986) on their earlier work Smirlock et al. (1984) and justify both the use of Tobin's  $q$  as a measure of performance and use of market share as a proxy for efficiency. They argue that Shepherd (1986) criticisms of their work are not valid, nor do they provide theoretical or empirical evidence that firms with high market share have market power. However, Stevens (1990) clarifies the point of contention between Smirlock et al. (1984) and Shepherd (1986) by comparing their findings. He shows that positive returns to market share depend on a high level of market concentration, suggesting that collusion and efficiency explanations are not clearly separated therefore attributing superior performance to efficiency alone is not substantiated given the interdependence found between the market-share- $q$  relationship and the concentration ratio.

In addition, Smirlock (1985) introduces measures of bank profitability instead of Tobin's  $q$  and regresses banks' profitability on market concentration, market share and an interaction term of market concentration and market share to differentiate between SCP and alternative explanations of structure-profit relationship. Smirlock (1985) argues that concentration-profit relationship is spurious and exists due to the presence of another variable (market share) which proxies for banks' efficiency. Once market share is controlled for, the concentration-profit relationship should disappear. Smirlock (1985) finds a significant positive relationship between market share and profitability whereas concentration and profitability are not related. He concludes that that market concentration is not a signal of collusive behavior rather the superior efficiency of the leading firm. The Same approach is adopted by Lloyd-Williams et al. (1994) who study the structure-performance relationship to test alternative hypotheses (ES and SCP) in Spanish banking industry and find support for SCP hypothesis as a possible explanation for the market behavior of Spanish banks. Following the same approach, Samad (2008) tests efficiency and structure performance hypotheses in Bangladesh banking industry and finds support for efficient structure hypothesis as a better explanation of profit-structure relationship. Bhatti and Hussain (2010) also follow a similar methodology to SCP and ES hypotheses in Pakistani Banking Industry. They find a positive relationship between concentration and banks' profitability whereas a negative relationship between market share and profitability is observed. Bhatti and Hussain (2010) interpret the negative relationship between market share and profitability as evidence against ES hypothesis (following Smirlock (1985), they consider market share as a proxy for efficiency) however this negative relationship is interesting. The positive relationship between concentration and profitability supports SCP hypothesis.

A criticism to alternative explanation in concentration-profit relationship comes from Rhoades (1985) who investigates the proposition that firms with a high market share

enjoy a unique form of market power (inherent product differentiation) by controlling for market concentration, scale economies, and explicit product differentiation as factors influencing rates of return. The results of this study indicate that market share per se is a source of high profits, regardless of the level of concentration and after controlling for firm size. Rhoades (1985) therefore questions the Demsetz (1973) view that high profits of large firms are due to efficiency rather than to some form of market power. He suggests that traditional market models that account only for a single price may be incomplete.

There are other studies which use a similar approach. For example, Evanoff and Fortier (1988) use a methodology similar to that of Smirlock (1985) to study structure-performance nexus by incorporating entry barriers and other neglected aspects of market structure. They find categorical support for the efficient structure hypothesis and limited support for the traditional collusion hypothesis when markets are characterized by significant entry barriers. Their findings suggest that the competing hypotheses may actually be complementary theories, and the negative role of entry barriers may be more important than previously thought. Somewhat similar findings are reported by Martin (1988), who studies the relationship between market power, concentration and efficiency and finds evidence for both SCP and ES hypotheses thus declaring them complementary rather than alternative hypotheses. Martin (1988) explains that once efficiency differences among groups are controlled, price margins of all groups increase with the concentration of sales among large firms, this is an evidence for collusion hypothesis. However, market power can stem from both concentration and efficiency. He further argues that competition from smaller firms limits the ability of larger firms to exercise market power.

The approach these studies used to test SCP and ES hypotheses has some serious problems. For example, it is not clear that impact of market concentration and market share on profit does actually support SCP and ES hypotheses. As Demsetz (1973) puts it “whether concentration is result of efficiency, collusion or product quality (product differentiation), cannot be ascertained by correlating market concentration to industry rate of return because, even if firms in concentrated market show higher returns, it is difficult to determine whether efficiency or monopoly power is at work.” Shepherd (1986) asserts that market share also reflects market power of the firm as its squared sum is Herfindahl Index. If market share has an impact on profit, it is actually supporting SCP hypothesis instead of ES hypothesis. Moreover, there is an identification problem with this approach which is widely known for the classical test of SCP hypothesis, for example, Tirole (1988) claims that by regressing market performance variable on market structure variable; it is not possible to identify a causal relationship.

To address the problems with previous studies, Berger and Hannan (1989) use an alternative approach to test SCP and ES hypotheses by taking price (interest rate paid on deposits) instead of profitability. They assert that under both hypotheses (SCP and ES), the market concentration and profit have a positive relationship but SCP and ES differ in their implications with regard to price and concentration relationship. For example, SCP hypothesis predicts a positive relationship between concentration and prices because firms in a concentrated market have higher monopoly power and they can set higher prices. But ES hypothesis proposes a negative relationship between concentration and prices because efficient firms dominate the concentrated market and they set lower prices. In their study, Berger and Hannan (1989) find a positive relationship between market concentration and prices which according to them supports the SCP hypothesis. Jackson (1992) evaluates the study on the price-concentration

relationship by Berger and Hannan (1989) and argues that use of a linear model may represent a misspecification of the true price-concentration relationship. He finds that a linear model is an inappropriate specification for estimating the price-concentration relationship because the negative price-concentration relationship is not consistent over the full range of observed market concentration values. Thus support for SCP in Berger and Hannan (1989) may not be valid because a nonlinear price-concentration-relationship should not be consistent with SCP hypothesis. However, Berger and Hannan (1992) reply to comment by Jackson (1992) argue that SCP hypothesis has no requirement of linearity whatsoever and an implication of the hypothesis is that once concentration is high enough to generate the monopoly price, further increases in concentration do not affect price. They find that the price-concentration relationship for retail deposit rates is negative, at least on average and for some ranges of concentration, consistent with the SCP hypothesis. Further, the price-concentration relationship varies substantially across time periods.

Use of prices (interest rates) however, can be problematic for example increase in prices may be related to other characteristics of the market structure instead of concentration such as product differentiation and research and development. According to product differentiation view, firms with well differentiated and high quality may charge higher prices and earn high profits (Shepherd, 1982; Mueller, 1983; Ravenscraft, 1983, 1984). Also negative relationship between concentration and prices may not be the necessary condition to supports ES hypothesis because it could be norm for efficient firms to set lower prices to compete in the market but in short run, efficient firms may also set higher prices and enjoy monopoly profits if efficient firms are unique in superior performance and such competitive performance is not obtainable by others (Homma et al., 2014). Another issue with the methodology used by Berger and Hannan (1989) is that they do not control for supply and demand, since the price is a function of

demand and supply these two have to be controlled in order to observe the sensitivity of price to other variables. However, Brewer and Jackson (2006) study price-concentration relationship by considering both demand and supply control variables in their study (as they criticize previous studies for ignoring demand-side factors such as risk .) and find that when bank-specific risk variables are included in the analysis the magnitude of the relationship between deposit rates and market concentration decreases by over 50%. These results suggest that it may be necessary to reconsider the well-established assumption that higher market concentration necessarily leads to anticompetitive deposit pricing behavior by commercial banks. The negative relationship between price and market concentration may say more about the riskiness of banks in concentrated markets rather than it does about collusive behavior. Although their study does not support SCP hypothesis, the use of concentration ratio and market share as independent variables in regression equation is subject to same issues as with previous studies discussed above. With only difference in measurement of profitability (using “value-added” as a measure of performance), Bourke (1989) studies the determinants of banks’ profitability in twelve countries or territories in Europe, North America and Australia and finds a positive relationship between concentration and bank profitability as predicted by SCP hypothesis. Replicating the same methodology, Molyneux and Thornton (1992) examine the determinants of banks’ performance across eighteen European countries and find that concentration is one of the main determinants of banks’ profitability thus supporting SCP hypothesis.

Studies using this approach criticize earlier literature for explicit/implicit assumption that concentration-profitability relationship exists because of market share which proxies for firm efficiency [for instance (Berger, 1995; Molyneux & Forbes, 1995; Goldberg & Rai, 1996)]. This approach uses market concentration, market share and measures of efficiency (X-efficiency and Scale-efficiency) to explain banks’

profitability along with two more regressions using cost efficiency as independent variable and market share and market concentration as dependent variables. A significant coefficient of concentration is enough to validate SCP hypothesis however in order to provide support for ES hypothesis; efficiency has to be positively related to all three variables (profitability, market share, and market concentration).

An earlier study in the group is that of Berger (1995) who criticizes previous studies for not using direct measures of efficiency and assuming that relationship between market concentration and profitability exists because of market share which proxies for firm efficiency. Berger (1995) uses market concentration, market share and measures of efficiency (X-efficiency and Scale-efficiency) to explain banks' profitability. He also uses two more regressions using cost efficiency as independent variable and market share and market concentration as dependent variables. According to Berger (1995), efficiency has to be positively related to all three variables (profitability, market share, and market concentration) in order to provide support for ES hypothesis. Berger (1995) finds support for X-efficiency version of ES hypothesis and concludes about SCP that concentration is usually negatively related to profitability once the other effects are controlled for in the equation and that the profit-concentration relationship is a spurious one, created by correlations with other variables, particularly market share. Homma et al. (2014) termed this approach as "the best so far" in that it is more direct as compared to earlier approaches and uses efficiency measure. Molyneux and Forbes (1995) apply a similar approach to test SCP and ES hypotheses for European banking industry and find evidence in support of SCP hypothesis as an explanation for the behavior of European banking market. Goldberg and Rai (1996) also use identical approach to study structure-performance relationship for European banking industry. They did not find a significant relationship between concentration and performance, however; they find support for X-efficiency version of ES hypothesis. A further improvement in methodology comes

with the introduction of efficiency estimation by Berger and Hannan (1997) who investigate the structure-performance relationship by considering all the relevant relationships among market structure, profits, prices, and explicitly calculating measures of firm efficiency. They find more support for the structure-conduct-performance hypothesis than for the relative-market-power and efficient-structure hypotheses. They also find support for quiet-life hypothesis, which implies that firms with market power adhere less rigorously to efficiency maximization.

Adopting an identical approach, Maudos (1998) regresses bank profitability on market share, concentration and efficiency measure to distinguish alternative explanations of the relationship between market structure and performance within the Spanish banking industry. Maudos (1998) finds both efficiency and market share to be significantly related to banks' profitability. He interprets the results as supporting modified efficient structure hypothesis, and that market share is not a suitable proxy for efficiency. Mendes and Rebelo (2003) test alternative hypotheses in structure-performance relationship in the Portuguese banking industry applying methodology of Berger (1995) and find the support for both collusion and efficiency hypotheses. Papadopoulos (2004) tests market power and efficiency hypotheses related to structure-performance relationship using the methodology of Berger (1995) and finds no support for either of these hypotheses. Papadopoulos (2004) finds negative coefficient for market share and concentration which are rather unexplainable. Using similar approach, Park and Weber (2006) test SCP against ES hypothesis by regressing bank profitability on measures of market structure (HHI, concentration ratio, and market share) and bank efficiency. They find support for efficiency hypothesis and conclude that banking efficiency is a significant determinant of banking profitability and that market structure is not related to bank profits in Korea.



Moreover, Tregenna (2009) uses a similar approach to study the impact of market concentration, market power, bank size and efficiency on the profitability of US banks for period 1994 to 2005 and concludes that market concentration significantly increases banks' profitability, however, efficiency is not a strong determinant of banks' profits during this period. A rather more interesting finding in Tregenna (2009) was that the positive relationship between concentration and profitability holds even after excluding largest banks. Tregenna (2009) concludes from this finding that the relationship between concentration and profitability acts in a generalized structural way and that the higher profits arising from concentration are at the expense of the rest of the economy. Al-Muharrami and Matthews (2009) test four hypotheses (structure conduct performance, efficient structure, relative market hypothesis and quiet life hypothesis) in Arab Gulf Cooperation Council's banking industry. They find positive relationship between market structure (measured by concentration ratio) and banks' profitability thus supporting SCP hypothesis. Seelanatha (2010) applies methodology proposed by Berger (1995) to differentiate between alternative hypotheses in concentration-profitability nexus in Sri Lanka. Seelanatha (2010) uses both profitability and interest margins as measures of bank performance. He finds that traditional structure conduct performance argument does not hold true and the banks' performance does not depend on either market concentration or market power of individual firms but the level of efficiency of the banking units. Hsieh and Lee (2010) also use a similar approach however they take certain factors (such as activity restriction, the efficiency of the judicial system and sound financial system .) into consideration which brings ambiguity regarding the structure-profitability relationship and find following results. First, along with the change in market structure, a higher degree of activity restriction enhances banks' profits. Second, restrictions on the rights of commercial banks to engage in securities, insurance, and other non-banking-related business, along with restrictions on

the entry of foreign banks into these markets, weaken the positive relationship between banking competition and profits. Third, a higher degree of efficiency within the judicial system and the added protection afforded to investors may weaken or else have no impact on the positive relationship. Fourth, the positive relationship may weaken in countries having a sound financial system or high income per capita.

The methodology proposed by Berger (1995) is comparatively better, but still, it has some shortcomings. For example, it is not clear that how the effect of measure of cost efficiency on profitability, concentration and market share supports the ES hypothesis. It is not logically comprehended (Homma et al., 2014). Besides that, results of cost efficiency on profitability, concentration and market share are not consistent in three regressions. Also, Berger (1995) followed tradition framework to test SCP hypothesis (he termed it as “market power hypothesis”). He used market share and market concentration as independent variables while taking profitability as the dependent variable. This approach is similar to the one used by Weiss (1974) and Smirlock (1985) and has same problems as mentioned earlier.

The studies discussed so far (both under traditional and modified-traditional approaches) are based on the structural approach from traditional Industrial Organization (IO) literature. Structural approach infers the level of competition from the structure of the market (level of concentration). On the other hand, non-structural approach from New Empirical Industrial Organization (NEIO) assesses the level of competition directly from firms’ conduct. Studies under this approach do not follow traditional framework rather they introduce new aspects to methodology in terms of measurement or statistical approach. Some studies propose to use conduct in structure-performance relationship. For instance, Calem and Carlino (1991) introduce conduct as the link between structure and performance in local deposit markets. They find that

banks behave strategically in general and that strategic conduct is not limited to concentrated markets. Moreover, market concentration has a statistically significant but small effect on short-term retail deposit rates. Empirical findings, however, indicate that banks behave noncompetitively in retail deposit markets, but reasons are not identified. Sources of noncompetitive conduct in un-concentrated markets could include price leadership, product differentiation, and consumer search costs (imperfect information).

Moreover, Shaffer and DiSalvo (1994) apply two modern empirical tests of conduct (conjectural variation and Panzar-Rosse) to a banking duopoly in southern Pennsylvania and find that the banks' conduct appears imperfectly competitive, but far from collusive. Similarly, De Bandt and Davis (2000) use P-R's H-statistics to assess the impact of Economic and Monetary Union of European Union on banking market structure of participating countries. They assess results separately for large and small banks, and for interest income and total income as a dependent variable. They find that the behavior of large banks in EU was not fully competitive as compared to the US banking industry and regarding small banks, the level of competition appears to be even lower.

Bikker and Haaf (2002) study the impact of banking market structure on banks' conduct. They use PR model to calculate H-score (measures level of competition) and use these scores as a proxy of conduct. H-scores are then related both to the concentration and the absolute number of banks, acting together as a proxy of the market structure. The impact of both market structure measures on competition appears to be significant, most markedly so when the k-bank concentration indices are used. The latter confirms the observation that a few large (cartel) banks can restrict competition and that a multitude of fringe competitors is unable to engender competition. Finally, Coccoresse (2009) examines the conduct of Italian single branch banks that operate in

municipalities as monopolists in an attempt to analyze the pricing behavior in highly concentrated banking markets. He finds that regardless the advantageous condition; these banks can exploit only partially their market power, principally because of the nearby competition, the latest banking consolidation trend and the local presence of big banks. Thus findings reject the hypothesis of pure monopoly pricing. Using another sample of banks, he shows that in duopolistic markets the conduct of single branch banks is virtually competitive.

Some studies focus on issues such as threshold level in structure-performance relationship (Kurtz & Rhoades, 1992), consequences of consolidation in banking (Berger, Demsetz, & Strahan, 1999), and market size structure (Berger, Rosen, & Udell, 2007). Pilloff and Rhoades (2002) study the structure-performance relationship considering several other characteristics of the market such as market size of large banks, deposit per office and resident migration rate. They find that the market concentration (measured by local HHI) is positively and significantly related to profitability. They also argue that several variables including market size, the number of large banking firms, deposits per office, and resident migration rates exhibit similar relationships to profitability, suggesting that there may be some characteristic associated with market size, density, or attractiveness that is important for competition. Casu and Girardone (2009) use Granger-type causality to study the relationship between competition and performance (measured by efficiency). They find positive causation between market power (measured by Lerner Index) and bank efficiency however, causation from efficiency to market power is not significant.

Turk Ariss (2010) uses Lerner index to study the impact of market power on profit efficiency, cost efficiency and financial stability for developing countries and finds that increase in market power enhances profit efficiency of banks despite significant losses

to cost efficiency. These findings typically support SCP and quiet life hypothesis since the loss in cost efficiency rules out the efficient structure explanation of structure-performance relationship and increased profit efficiency lends support to collusion explanation.

Recent studies on this topic include Zhang et al. (2013) who study the relationship between banking market concentration and bank performance for BRIC countries over the period of 2003-2010. They follow the traditional approach and regress firm performance (measured by efficiency) on market concentration (five firm concentration ratio). However, they find a negative relationship between concentration and bank performance. Their findings are in contrast to the prediction of SCP hypothesis. Another study in this domain is Mirzaei et al. (2013) who examine the impact of market structure on banks' performance using SCP and RMP hypotheses for 1929 banks in 40 developed and developing countries over the period 1999-2008. They regress a measure of bank profitability on concentration and market share along with control variables. They do not find support for SCP in either group of countries however RMP is supported for developed countries. Amidu (2013) follows the non-structural approach and employs different specifications of Lerner Index as a measure of market power to test the impact of market structure on profitability of 978 banks in 55 countries and finds that higher market power results in higher profitability. However, the origination of market power is collusive behavior, or product differentiation is not clear.

## **2.4 Market Structure and Monetary Policy Transmission**

The existing literature on the role of banks in monetary policy transmission through bank lending mostly focuses on existence, importance, and potential of the lending channel, and identifying shifts in supply/demand for loans. The literature on existence and importance of bank lending channel can be found in Bernanke and Blinder (1988,

1992), Bernanke and Gertler (1995), Kashyap and Stein (1995), Kishan and Opiela (2000), Ehrmann, Gambacorta, Martínez-Pagés, Sevestre, and Worms (2001), Altunbaş, Fazylov, and Molyneux (2002), Ehrmann, Gambacorta, Martinez-Pagés, Sevestre, and Worms (2003), Ehrmann and Worms (2004), Brissimis and Delis (2009). Several other studies highlight banks' response to monetary policy shocks with respect to other aspects such as the banks' ownership structure, the presence of foreign banks, the banks' risk-taking, the stock market response, the financial crisis, and the financial integration [for example see (Atta-Mensah & Dib, 2008; Scharler, 2008; Altunbas, Gambacorta, & Marques-Ibanez, 2010; Pang, 2013; Jeon & Wu, 2014; Brei & Schclarek, 2015; Dheera-Aumpon, 2016; Allen, Jackowicz, Kowalewski, & Kozłowski, 2017)].

However, the role of banking market structure for transmission of monetary policy has not been explored as the significance of the topic demands. From a theoretical perspective, Aftalion and White (1977) and VanHoose (1983, 1985) are among the pioneers who discuss the impact of credit market competition on the effectiveness of monetary policy transmission. They focus on the appropriate choice of monetary policy targets and instruments and examine the way these choices are affected by banking market structure. VanHoose (1983) finds that in a competitive banking market, monetary policy tool, i.e., federal fund rate becomes ineffective. Baglioni (2007) argues that monetary policy transmission through loan market differs depending on the market structure. For example, monetary policy effects are enhanced under monopolistic competition. However, opposite is true under oligopoly framework.

From an empirical perspective, Adams and Amel (2005) are first to study the influence of local banking market structure on monetary policy transmission using business small loan origination data for US banks from 1996 to 2002. They find that

lending channels become weaker as market concentration increases. This study is however limited in its scope as it applies only to local banking markets in the USA. In a cross-country study, Gunji et al. (2009) examine banks' response to monetary policy shocks in a competitive market. They derive an indicator of monetary policy from interest rate equation and use Panzar-Rosse H statistics to measure bank competition. They find that competitive markets reduce the effect of monetary shocks on banks' lending; their study, however, uses a single measure of market structure which may be misleading.

In two separate studies Olivero et al. (2011a, 2011b) explore impact of banking market structure (measured by Panzar-Rosse H statistics (PRH) and concentration ratio respectively) on monetary policy transmission through bank lending channels using bank-level data on sample of 10 Latin American and 10 Asian economies over the period of 1996 to 2006. They, however, report contradictory results with both measures for the same sample of countries, i.e., both high concentration and high competition reduce the response of banks' lending to monetary policy shocks. Their study is however limited in scope due to the fact that they do not find significant results for Asian countries including countries from ASEAN. One probable reason for their insignificant findings for Asian countries can be the limited sample they use in their study. For example, they use a sample over a period of 1996-2006, whereas they argue that Asian economies witnessed substantial changes in competitive conditions due to factors such as international financial integration, privatization, deregulation, a wave of mergers and acquisitions that resulted in market concentration and financial reforms in response to global financial crisis 2008-2009. Our study, however, uses data from 1999-2014 to cover this period of change in competitive condition.

A recent study by Amidu and Wolfe (2013) explores the impact of banking competition (measured by Lerner index) on monetary policy transmission through bank lending channel using data on 978 banks from 55 countries worldwide. They confirm the presence of a lending channel and find that banking market competition weakens the impact of monetary policy shocks on bank lending. Their study is however subject to limitation for they include only three countries from ASEAN in their sample and their data is limited to pre-global crises period, i.e., 2000-2007. Moreover, they use a single measure of competition (Lerner Index) and do not find significant results for Asia. Use of single competition measure can be problematic because each measure captures a different aspect of competition and has its own advantages and disadvantages. Therefore it is often suggested that a phenomenon be studied using an alternative measure of market structure (Leon, 2014).

Another important aspect of monetary policy transmission is that the banks' characteristics such as size, liquidity, and capitalization also play an important role in banks' response to monetary shocks. According to Olivero et al. (2011a, 2011b) consolidation in the banking industry can impact the effectiveness of bank lending channels as a transmission mechanism of monetary policy in several ways. First, banks' size and market share increase as a result of consolidation, and their lending is not much affected by monetary shocks as compared to small banks. Monetary policy impacts banks of different sizes differently because small banks depend on customers' deposits for loanable funds, when money policy contracts, these small banks cannot compensate the decrease in loanable funds through non-deposit funding; hence they have to cut short their loans. Second, concentrated markets normally have larger and potentially strong banks as they take over smaller banks. As a result of this consolidation, the overall banking sector has easy access to sources of loanable funds other than deposits



thus it is possible for banks to isolate their loan supply from negative shocks of monetary policy to loanable funds.

Third, some banks in the less competitive market may use their liquidity positions and make liquidity costly for other market participants. High liquidity costs can preclude banks from isolating loan supply from adverse effects of monetary policy to loanable funds. In such cases, consolidation may increase the cost of liquidity for banks in less consolidated markets and can reinforce the bank lending channels. Fourth, large banks in concentrated markets enjoy informational monopoly regarding the creditworthiness of their customers. Thus switching costs for borrowers are high in highly concentrated markets. The borrowers of small banks with extra demand for loans find it difficult to switch their lenders (because small banks are more affected by negative shocks of monetary policy) thus they are not picked by large banks. Through this process, concentration can translate depressing effect of monetary policy to economic activity thus reinforcing the monetary policy transmission through bank lending channels. However, the evidence is mixed regarding distributional effects of monetary policy in cross country studies. For example a study by Altunbaş et al. (2002) show that level of capitalization and bank size affect reaction of banks to changes in monetary policy whereas Ehrmann et al. (2003) show that only liquidity plays a role in relationship between bank lending and changes in monetary policy but capital and bank size do affect this relationship.

## **2.5 Market Structure and Industrial Growth**

Earlier evidence on the role of financial institutions in economic growth comes from King and Levine (1993), who argue that good financial systems boost economic growth by enhancing the probability of successful innovations. On the other hand, any disruption in the financial sector hampers the innovation process, leading to a reduction

in overall economic growth. Similarly, Levine and Zervos (1998) show that even after accounting for political and other economic factors, the economic growth is higher for economies with a higher level of bank development and stock market development. An influential study by Rajan and Zingales (1998) is the foundation of research in the domain of bank development, financial dependence of industries and economic growth. The authors estimate the external financial dependence of manufacturing firms by using firm-level data and show that countries with a more developed financial market experience greater industrial growth (Rajan and Zingales (1998). A few other studies which highlight the role of financial sector development for economic growth include Liang and Jian-Zhou (2006), Chen (2006) and Zhang, Wang, and Wang (2012). Thus the importance of financial institutions for economic growth is well recognized in the literature. However, the role of bank market structure (competition/concentration) for economic growth is still in the early stages. The few studies which look into this domain are far from reaching a consensus and provide two seemingly contradictory views: one favoring a higher level of competition/lower level of concentration for economic growth while the other suggests the opposite, as shown below.

According to the first view, firms' growth is limited in highly concentrated or less competitive banking systems because firms have less access to finance. The limited growth of firms (due to a lack of easy access to credit) translates into overall lower economic growth (Pagano, 1993; Guzman, 2000). Deidda and Fattouh (2005) on the other hand find that a higher level of bank concentration negatively affects the industrial and per capita income growth, but that this relationship is significant only for low-income countries. The underlying logic for this view is that competitive banking systems make access to finance easy and affordable for firms, enabling them to borrow and invest more. Berger, Hasan, et al. (2004) and Cetorelli and Strahan (2006) support this view and demonstrate that concentrated/less competitive banking systems result in

the low firm creation and as a result less economic growth. Allen and Gale (2000) argue that banks operating in concentrated markets tend to use their market power and charge high loan rates which make funding more expensive for firms, and expensive funding depresses firms' investing activities. Similarly, Claessens and Laeven (2005) provide evidence that industries that are more dependent on external finance grow more in a more competitive banking environment.

The second view is that banks in more concentrated markets perform the function of information producer and establish a strong relationship with their customers. On the other hand, increased competition can lead to asymmetry of information between borrowers and lenders, less lending and less investment (Petersen & Rajan, 1995). Moreover, Marquez (2002) argues that banking competition hampers the screening role performed by banks in their choice of borrowers. Banks in competitive markets take less care in screening firms and also charge higher loan rates. A higher cost of borrowing decreases the availability of funds. According to Di Patti and Dell'Ariccia (2004) and Zarutskie (2006), economies with less competitive markets experience more creation and emergence of new firms. Evidence supporting this view also comes from Cetorelli and Gambera (2001), who show that the growth of industries that are dependent on external finance is faster in economies with concentrated banking systems.

A few recent contributions highlighting the favorable effects of concentration for economic growth come from Hoxha (2013), Mitchener and Wheelock (2013) and Liu, Mirzaei, and Vadoros (2014). Hoxha (2013) argues that financially dependent industries in concentrated banking markets perform better than those operating in more competitive markets. Mitchener and Wheelock (2013) show that a higher level of concentration in the banking market increases the overall growth of the manufacturing

industry. However, the effect is stronger for industries with a small firm size, a lower incorporation rate, and less dependence on public debt (and, hence, relatively greater reliance on banks). In contrast, Liu et al. (2014) find that both competition and concentration measures are positively related to economic growth, which may indicate that measures of concentration do not necessarily represent a low level of competition.

The overall evidence on the role of bank market structure for banks' performance, transmission of monetary policy and the economic growth is ambiguous and provides little policy inputs as to whether concentration or competition is favorable. In order to explore the market structure-performance relationship and deal with the methodological issues with a traditional test of SCP hypothesis, this study proposes a different approach to test the SCP hypothesis. This approach overcomes the issues highlighted by Demsetz (1973) and Tirole (1988) as discussed in problem statement section. Instead of regressing banks' performance directly on market concentration, this study proposes to include "conduct" as the mediating variable between market structure and performance. From very definition of SCP, it seems more plausible to study the causality from structure to conduct, and then from conduct to performance.

This approach is expected to have an advantage over existing ones because unlike previous studies, it considers all three elements of the theory and relates them as suggested by SCP paradigm. Despite its obvious mediating role between market structure and market performance, there is hardly any study that considers the conduct (collusion) as the plausible explanation for the relationship between concentration and profitability. Although some studies [for instance (Calem & Carlino, 1991; Shaffer & DiSalvo, 1994; Bikker & Haaf, 2002; Coccoresse, 2009)] relate the market structure with the conduct of the firm, they do not examine the mediating role of conduct as done in this study.

For the role of bank market structure in monetary policy transmission and the industrial growth, this study applies structural and non-structural measures of market structure which overcome the issues of using a single measure. Use of structural and non-structural approaches also enables us to compare results and see whether the concentration is negatively related to the level of competition as traditionally considered under structure conduct performance paradigm.

University of Malaya

## **CHAPTER 3: MARKET STRUCTURE AND BANK PERFORMANCE: THE ROLE OF BANK CONDUCT (ESSAY 1)<sup>\*</sup>**

### **3.1 Abstract**

Whether banks in a concentrated market increase their profits through monopoly pricing is a question of prime concern for antitrust policies. The study explores this question by introducing the role of bank conduct into the structure-performance relationship. The study applies Two-step System GMM dynamic panel model to commercial banks in ASEAN countries from 1999 to 2014. The results indicate that the higher profits in concentrated banking industries are partially attributable to the anti-competitive conduct by the banks. These findings are robust across alternative measures of market structure and bank conduct, and different time horizons. The study also discusses the policy implications of the findings.

### **3.2 Introduction**

The Asian financial crisis 1997-1998 and the Global financial crisis 2008-2009 reiterated the significance of the banking sectors across the Association of South East Asian Nations (ASEAN). Following the financial turmoil, several policy measures – i.e., bank consolidations, international financial integration, privatization, deregulation, and financial reforms – were undertaken to ensure the stability of the banking sector (Yokoi-Arai & Kawana, 2007; Olivero et al., 2011b, 2011a). Moreover, the banking industry in ASEAN also witnessed an unusual surge in consolidations, a large-scale privatization of state-owned banks, deregulation, a significant increase in foreign bank penetration and the restructuring of domestic banking industries. Consequently, the ASEAN banking industry moved towards a more concentrated market structure.

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<sup>\*</sup> The article is accepted for publication in “Journal of Policy Modelling” with minor changes. The title in the final version of this article may change depending upon the recommendations of the editor.

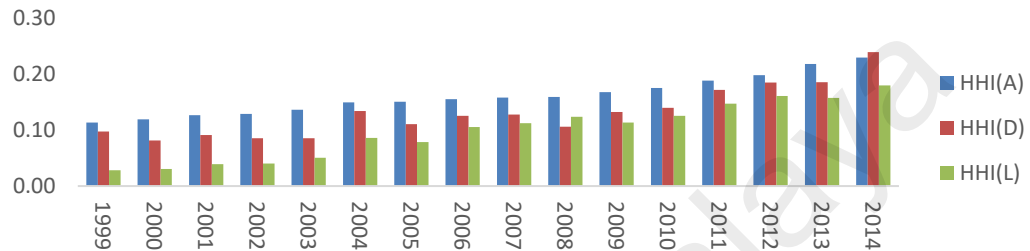
The shift towards bank concentration is evident from the various measures of market structure reported in Figures 3.1 and 3.2. For instance, the five-bank concentration ratio (CR5), based on assets, deposits and loans, increased from 0.55, 0.56 and 0.33 in 1999 to 0.82, 0.83 and 0.75 in 2014 respectively (Figure 3.1). Similarly, the Herfindahl-Hirschman Index (HHI), based on assets, deposits, and loans, increased from 0.11, 0.10 and 0.03 in 1999 to 0.23, 0.24, and 0.18 in 2014 (Figure 3.2).<sup>3</sup> Moreover, the banks' profitability increased during this period, but the cost efficiency declined at the same time. The average values on after-tax return on assets (ROA) and after-tax return on equity (ROE) increased from 4% and 9% in 1999 to 17% and 14% respectively in 2014 (Figure 3.3). Except for the period corresponding to the global financial crisis, there has been an average increase in banks' profitability. The cost efficiency (as represented by the average behavior of overhead to total assets and the total cost to total income) declined over the same period. The average values for overhead to total assets and the total cost to total income were 0.05% and 79.5% in 1999. However, they increased to 2.92% and 87.1% in 2014 (Figure 3.4). Although the cost ratios exhibited a decreasing trend from 2002 to 2007, they have been on the rise since the global financial crisis. Apart from the historical rise in bank concentration, the liberalization of the banking markets under the Banking Integration Framework (BIF) will allow the banks in ASEAN to operate across the member countries. Although BIF is expected to increase the level of competition among regional banks, it will lead to more consolidations as each country would like to fortify the domestic banks.

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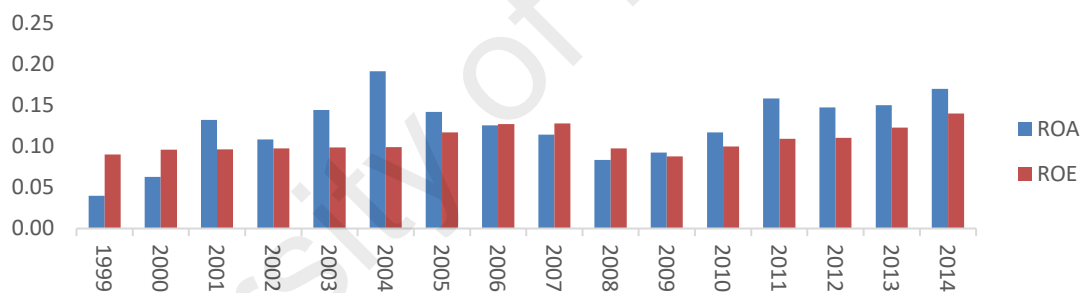
<sup>3</sup> The values of CR5 and HHI represent the yearly averages for five ASEAN countries – i.e. Indonesia, Malaysia, Philippines, Singapore and Thailand.



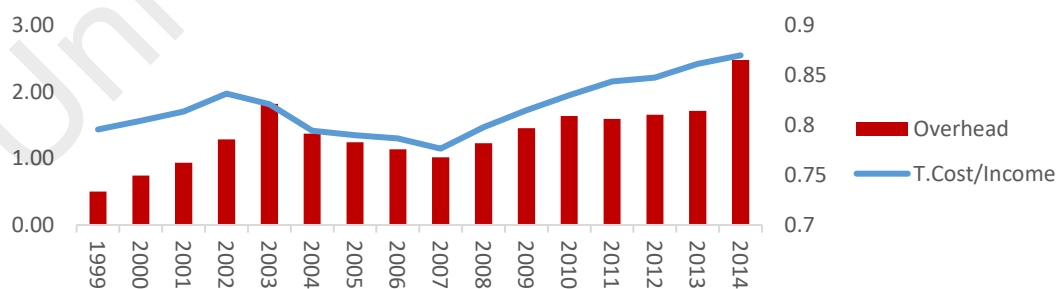
**Figure 3.1. Five-Bank Concentration Ratio (CR5) based on Total Assets, Total Deposits, and Total Loans**



**Figure 3.2: Herfindahl Hirschman Index (HHI) based on Total Loans, Total Assets, and Total Deposits**



**Figure 3.3: After-Tax Return on Assets (ROA) and After-Tax Returns on Equity (ROE)**



**Figure 3.4: Overhead to Total Assets and Total Cost to Income**



Apparently, it seems reasonable to have profitable banks, but what if the profits are being earned out of monopoly pricing? This research question has important implications for anti-trust policies. For instance, if the consolidation activities are motivated by the desire to earn monopoly profits, then they are most likely to hurt the economy by making the intermediation process costlier. On the contrary, bank consolidations are supposed to allow the banks to exploit the scale efficiencies and transfer the efficiency gains to the customers by reducing the cost of credit. These apprehensions are also supported by the structure conduct performance (SCP) hypothesis which suggests that the large banks in concentrated markets collude to charge higher loan rates and pay lower deposit rates (Park & Weber, 2006; Webster, 2011; Mirzaei et al., 2013).<sup>4</sup>

However, the existing literature on the SCP hypothesis is inconclusive and provides little input for the policy decisions regarding antitrust.<sup>5</sup> In addition, the traditional approach to empirically test the SCP hypothesis is flawed (Homma et al., 2014). For instance, the traditional tests of SCP ignore the role of bank conduct and directly relate the bank concentration to some measure of bank performance.<sup>6</sup> The existence of a positive relationship between bank concentration and profitability is not enough to suggest that higher profitability is a result of monopoly rents. Accordingly, the policy implications – i.e., monitoring/scrutiny of consolidation activities – based on traditional tests of the SCP hypothesis can be misleading. For example, it is possible that cost efficiency and/or product quality are driving both market share and banks' profits such that they are positively related. Nevertheless, the traditional approach assumes that the

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<sup>4</sup> See also Smirlock et al. (1984), Smirlock (1985) and Berger (1995).

<sup>5</sup> For example, Gilbert (1984) finds only 27 out of 56 studies supporting the SCP hypothesis in banking. Similarly, Osborne and Wendel (1978) in a detailed critique of the literature argue that the SCP literature contains several inconsistencies and provides no evidence of a positive association between concentration and performance in banking.

<sup>6</sup> See for example, Smirlock et al. (1984), Smirlock (1985), Berger and Hannan (1989) and Berger (1995).

concentration leads to higher profitability through monopoly pricing. Consequently, it becomes immensely relevant for antitrust policy to study whether the monopoly pricing is driving the relationship between bank concentration and profitability.

This study applies a different approach to test the SCP hypothesis. For instance, this study incorporates the role of bank conduct in the structure-performance relationship.<sup>7</sup> The SCP paradigm specifies that the market structure influences the conduct of banks, which in turn affects their performance. Therefore, instead of regressing bank performance directly on the market concentration, the study uses “bank conduct” as the mediating variable between market structure and performance. This approach may have advantages over those followed by the earlier studies because it considers all three elements in the SCP paradigm – i.e. the structure, the conduct and the performance – and relates them as specified by the SCP hypothesis. The proposed methodology has been applied to commercial banks in ASEAN over the period 1999-2014.

The study contributes to the banking literature in general and the SCP literature in particular in several important ways. First, the study introduces a very relevant yet neglected piece of the jigsaw puzzle into the SCP paradigm. The resulting approach thus provides a legitimate test of the SCP hypothesis for relevant policy implications. Second, the study contributes in terms of the geographic and economic context by examining the banking structure in ASEAN where the competitive conditions have changed substantially over time. To the best of our knowledge, the literature on SCP in the context of ASEAN and/or based on a similar approach is non-existent. Results show that the higher concentration is followed by higher profitability and that this relationship is mediated by the bank conduct as expected under the SCP paradigm. These findings suggest that the policymakers need to ensure that the consolidation policy for ASEAN

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<sup>7</sup> This approach addresses the issues highlighted by earlier studies e.g. Demsetz (1973) and Tirole (1988).

is achieving its purpose: in other words, achieving scale efficiency, and not allowing the banks to earn monopoly rents.

The rest of the chapter is organized as follows: Section 3.2 reviews the related literature, with a focus on methodological issues; Section 3.3 discusses the methodology, development of an empirical model and measures of the variables; Section 3.4 reports the estimation of results and related discussion; and, finally, Section 3.5 concludes the study with a discussion on policy implications.

### **3.3 Literature Review**

The literature on market structure and its relationship with bank performance with reference to the SCP hypothesis is abundant. However, this section is more focused on the methodological issues.<sup>8</sup> From a methodological perspective, the literature on the structure-performance relationship can be categorized into three groups. First, the studies that directly regress the profitability measures (i.e., profit rates, interest rate margins and Tobin's Q) or prices (i.e., interest rate spread) on the market structure (i.e., concentration ratio or HHI) and market share. These studies assume that the role of efficiency can be captured by the banks' market share. Therefore, a significant coefficient on concentration and an insignificant coefficient on market share supports the SCP hypothesis. On the other hand, if the structure-performance relationship is explained by bank efficiency then the coefficient on market share is significant while the coefficient on concentration becomes insignificant.<sup>9</sup>

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<sup>8</sup> See Berger, Demircuc-Kunt, Levine, and Haubrich (2004) for a detailed review of studies and the development of the literature.

<sup>9</sup> Studies in this stream of literature include Graddy (1980), Gale and Branch (1982), Smirlock et al. (1984), Smirlock (1985), Rhoades (1985), Smirlock et al. (1986), Shepherd (1986), Evanoff and Fortier (1988), Martin (1988), Berger and Hannan (1989), Bourke (1989), Molyneux and Thornton (1992) and Lloyd-Williams et al. (1994).

The approach used in the studies mentioned above suffers from some serious drawbacks. For example, it is not clear that the impact of market concentration and market share on profitability does support the SCP and efficient structure (ES) hypotheses. According to Demsetz (1973), it cannot be established that higher profitability is the result of efficiency, collusion or product quality (product differentiation) by simply correlating market concentration to industry rate of return. Even if larger firms in concentrated markets earn higher returns, it is difficult to determine whether efficiency or monopoly power is at work. Similarly, Shepherd (1986) asserts that the market share also reflects the market power of the firm, as its squared sum is the Herfindahl Index. If the market share has an impact on profit, it is supporting the SCP hypothesis instead of the ES. Moreover, Tirole (1988) highlights an identification problem with the classical test of SCP hypothesis: the causal relationship in SCP (from structure to conduct and from conduct to performance) cannot be identified by regressing market performance on market structure. On the other hand, Berger and Hannan (1989) introduce an alternative measure of performance and use interest rate paid on deposits instead of profitability. They find a positive relationship between market concentration and prices which according to them supports the SCP hypothesis.<sup>10</sup> Use of prices (interest rates), however, can be problematic: for example, an increase in prices may be related to other characteristics of the market structure instead of concentration, such as product differentiation and research and development. According to the product differentiation view, firms with well differentiated and high-quality products/services may charge higher prices and earn high profits (Shepherd, 1982; Mueller, 1983; Ravenscraft, 1983, 1984). Also, the negative relationship between concentration and prices may not be the condition that is needed to support the ES

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<sup>10</sup> Jackson (1992) argues that the use of a linear model may represent a misspecification of the true price-concentration relationship. However, Berger and Hannan (1992) argue that the SCP hypothesis has no requirement of linearity whatsoever and an implication of the hypothesis is that once concentration is high enough to generate the monopoly price, further increases in concentration have no effect on price.

hypothesis because it could be the norm for efficient firms to set lower prices to compete in the market, but in the short run, efficient firms may also set higher prices and enjoy monopoly profits if such firms are unique in superior performance and such competitive performance is not achievable by others (Homma et al., 2014). Another issue with Berger and Hannan (1989) is that they do not control for supply and demand, whereas since the price is a function of demand and supply, these two factors have to be controlled to observe the sensitivity of price to other variables.<sup>11</sup>

Second, some studies criticize the earlier literature for an explicit assumption that the market share represents the efficiency. These studies use direct measures of efficiency (i.e., X-efficiency and Scale-efficiency) along with market concentration and market share to explain banks' profitability. This approach uses two additional equations in which cost efficiency is separately regressed on market share and market concentration. A significant coefficient on concentration is considered as sufficient evidence to support the SCP hypothesis. However, for the ES hypothesis to be valid, the efficiency should be positively related to all three variables (profitability, market share, and market concentration). The approach was introduced by Berger (1995) who finds support for the X-efficiency version of the ES hypothesis. He concludes that concentration is usually negatively related to profitability once the other effects are controlled for in the equation and that the profit-concentration relationship is a spurious one, created by correlations with other variables, particularly market share.<sup>12</sup> A further improvement in methodology comes with the introduction of efficiency estimation by Berger and Hannan (1997) who study the structure-performance relationship by considering all the

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<sup>11</sup> Nonetheless, Brewer and Jackson (2006) study the price-concentration relationship by considering both demand and supply control variables in their study (as they criticize previous studies for ignoring demand side factors, such as risk). They conclude that if bank specific risk variables are included in the analysis, then the magnitude of the relationship between deposit rates and market concentration decreases to half.

<sup>12</sup> Studies which use similar approaches include Molyneux and Forbes (1995), Goldberg and Rai (1996), Park and Weber (2006) and Tregenna (2009).

relevant relationships among market structure, profits and prices, and by explicitly calculating measures of firm efficiency. They find more support for the structure-conduct-performance hypothesis than for the relative-market-power and efficient-structure hypotheses. Some recent studies which use a similar approach to explore the structure-performance relationship include Zhang et al. (2013), Mirzaei et al. (2013) and Amidu (2013).

The methodology proposed by Berger (1995) to test the SCP and alternative hypotheses is comparatively better than earlier studies, but it has some shortcomings. For instance, it is not clear how the effect of cost efficiency on profitability, concentration and market share supports the ES hypothesis, while the ES hypothesis predicts that efficient firms grow, obtain more market share and as a result market becomes more concentrated (Homma et al., 2014). Besides this, results of cost efficiency on profitability, concentration and market share are not consistent in three regressions. Also, Berger (1995) follows a traditional framework to test the SCP hypothesis. He uses the market share and market concentration as independent variables while taking profitability as a dependent variable. This approach is similar to the one used by Weiss (1974) and Smirlock (1985) and has the same problems as mentioned earlier.

Third, other studies apply non-structural measures of competition<sup>13</sup> and relate them to firm performance. These studies include Calem and Carlino (1991), Shaffer and DiSalvo (1994), De Bandt and Davis (2000), Bikker and Haaf (2002), Coccoresse (2009) and Turk Ariss (2010) among others. Some of the studies in the third group also address the related issues of the market structure such as the consequences of consolidation in

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<sup>13</sup> Non-structural measures of competition from the New Empirical Industrial Organization (NEIO) infer the level of competition directly from banks'/firms' conduct. These measures include the Panzar-Rosse H-statistic, Conjectural Variation Model, Lerner Index, etc.

banking (Berger et al., 1999), market size structure (Berger et al., 2007) and liquidity creation (Kenourgios & Dimitriou, 2015). However, these studies also use the traditional approach of relating bank performance to the market structure measures. Moreover, like the earlier literature, the findings of these studies are also inconsistent.

Except for their use of some alternative measure of market structure and/or profitability, almost all of the studies follow the traditional approach. This study does not deliberate on measurement issues; however, the traditional approach is flawed as it ignores the role of bank conduct in the structure-performance relationship. Although some studies – (Calem & Carlino, 1991; Shaffer & DiSalvo, 1994; Bikker & Haaf, 2002; Coccoresse, 2009) – relate the market structure to the conduct of the banks, they do not examine the mediating role of conduct as this study does. This study first establishes a relationship between structure and conduct, and then between conduct and performance.

### **3.4 Methodology**

The methodology to test SCP hypothesis has been derived directly from the SCP paradigm. For example, Bain (1951) describes the SCP relationship as “the concentration of output reduces the cost of collusion and promotes tacit/explicit collusion by participating firms, and consequently all firms can earn monopoly profits.” Similarly, Martin (2002) suggests that ‘the observable structural characteristics of a market determine the behavior of firms within that market and this (behavior) determines market performance’. The SCP hypothesis has been described in the banking literature as “the large banks in the concentrated markets collude, charge higher loan rates, and pay lower deposit rates and as a result, earn higher profits” (Park & Weber, 2006; Webster, 2011; Mirzaei et al., 2013). In this context, it seems more

plausible to study the causal relationship from market structure to the bank conduct, and then from their conduct to their performance.

### 3.4.1 The Empirical Model

To empirically test the mediating role of bank conduct, the study follows the methodology laid down in Baron and Kenny (1986). According to this approach, if the bank performance is influenced by concentration through the conduct of the banks, then four conditions must be satisfied: (1) the concentration significantly affects the bank conduct, (2) the conduct significantly affects the bank performance, (3) the concentration affects the bank performance in the absence of the conduct and (4) the effect of the concentration on the bank performance is reduced when the conduct variable is also included in the estimation model. These four conditions have been empirically tested with the help of equations 3.1, 3.2 and 3.3.

$$COND_{i,j,t} = \omega_0 + \omega_1 CI_{j,t-1} + \lambda_m \sum_{m=1}^n X_{i,j,t} + \tau_k \sum_{k=1}^n Z_{j,t} + \varepsilon_{i,j,t} \quad (3.1)$$

$$PER_{i,j,t} = \omega_0 + \omega_1 CI_{j,t-1} + \lambda_m \sum_{m=1}^n X_{i,j,t} + \tau_k \sum_{k=1}^n Z_{j,t} + \varepsilon_{i,j,t} \quad (3.2)$$

$$PER_{i,j,t} = \omega_0 + \omega_1 CI_{j,t-1} + \omega_2 COND_{i,j,t} + \lambda_m \sum_{m=1}^n X_{i,j,t} + \tau_k \sum_{k=1}^n Z_{j,t} + \varepsilon_{i,j,t} \quad (3.3)$$

Where  $COND_{i,j,t}$  and  $PER_{i,j,t}$  respectively refer to the conduct and the performance of bank “i” in country “j” at time “t”,  $CI_{j,t-1}$  is the concentration index for country “j” at time “t-1”,  $X_{i,j,t}$  and  $Z_{j,t}$  respectively denote the vector of bank and country level control variables and  $\varepsilon_{i,j,t}$  is the random error term.

Additionally, the study employs the methods introduced by Goodman (1960), Sobel (1982), MacKinnon and Dwyer (1993) and MacKinnon, Warsi, and Dwyer (1995) to verify the indirect effect of market structure on bank performance. These methods



require computation of test score (z-value) to check the significance/insignificance of indirect (mediation) relationship. The test scores are calculated as follows:

$$\text{Sobel Statistics} \Rightarrow z = \alpha * \beta / \text{SQRT}(\beta^2 * SE_{\alpha}^2 + \alpha^2 * SE_{\beta}^2) \quad (3.4)$$

$$\text{Aroian Statistics} \Rightarrow z = \alpha * \beta / \text{SQRT}(\beta^2 * SE_{\alpha}^2 + \alpha^2 * SE_{\beta}^2 + SE_{\alpha}^2 * SE_{\beta}^2) \quad (3.5)$$

$$\text{Goodman Statistics} \Rightarrow z = \alpha * \beta / \text{SQRT}(\beta^2 * SE_{\alpha}^2 + \alpha^2 * SE_{\beta}^2 - SE_{\alpha}^2 * SE_{\beta}^2) \quad (3.6)$$

Where  $\alpha$  is the coefficient of market structure (independent variables) when the bank conduct (mediating variable) is regressed on the market structure,  $SE_{\alpha}$  is the standard error of  $\alpha$ . The  $\beta$  is the coefficient on bank conduct (mediating variable) when the bank performance (dependent variable) is regressed on both market structure (independent variables) and bank conduct (mediating variable), while  $SE_{\beta}$  is the standard error of  $\beta$ . The null hypothesis underlying each test is that the indirect effect of market structure on bank performance is not significantly different from zero.

### 3.4.2 Variables of the Study

#### 3.4.2.1 Bank Performance

The bank performance has been measured through two profitability ratios, i.e., return on average assets (ROAA) and return on average equity (ROAE). Almost all of the studies in the structure-performance domain use ROAE and ROAA as the measure of firm/bank performance. As compared to other measures of performance, the ROAE is considered to be more appropriate because it is most closely related to the shareholders' wealth which owners aim to maximize (Weiss, 1974). On the other hand, ROAA is more popular in banking studies because it provides a more consistent and the strongest relationship with concentration in banking studies (Heggstad, 1979). For reasons such as appropriateness of measures and robustness checks, this study uses both ROAA and ROAE in the analysis.

### **3.4.2.2 Market Structure**

The market structure refers to the level of competition in an industry which has been assessed through the concentration indices based on the structural approach. The level of concentration demonstrates the extent to which the largest firms/banks contribute to the output in industry. The higher level of concentration implies more market power and less competition. Following earlier literature, i.e., Goldberg and Rai (1996) and Mirzaei et al. (2013) among others, the study applies the five bank concentration ratio (CR5), the three bank concentration ratio (CR3) and the Hirschman Herfindahl Index (HHI) based on assets, loans, and deposits. The degree of concentration in a market is expected to exert a negative influence on competition in the market; hence it is likely to raise the bank profits. Therefore, both concentration ratios and the HHI are expected to have a positive relationship with bank profitability.

### **3.4.2.3 Bank Conduct**

To assess the bank conduct, the study follows Bikker and Haaf (2002) who use the Panzar-Rosse H-statistic (PRH) to estimate the competitive or non-competitive conduct of the banks. Alternatively, the price-cost margin (PCM), based on the adjusted Lerner Index, and the net interest margin (NIM) have been used for robustness checks. A detailed discussion of PRH and the Lerner Index is presented in the following section with supporting calculations. NIM has been used following Goldberg and Rai (1996), who suggest that it represents the pricing ability of the banks. According to Berger and Hannan (1989), if the SCP hypothesis reflects anti-competitive pricing, then banks will be able to charge lower deposit rates and/or charge higher loan rates. If banks are able to price their products anti-competitively, then the NIM will be higher because it indicates an ability to charge lower deposit rates and higher loan rates. NIM is measured as the difference between the interest income generated by banks and the amount of interest paid out to their lenders divided by interest-earning assets.

**Panzar-Rosse Model:** The Panzar-Rosse model (Rosse & Panzar, 1977; Panzar & Rosse, 1982; Panzar & Rosse, 1987) captures the transfer of changes in input prices to the revenues. Higher transmission implies more competition and lower values suggest more market power in pricing. The sum of the elasticities of the revenue with respect to all input prices is referred to as the Panzar-Rosse H-statistic (PRH statistic). Panzar and Rosse demonstrate that under profit maximization setting, PRH equals unity (PRH=1) under perfect competition, less than equal to zero (PRH ≤ 0) under monopoly, and between 0 and 1 (0 > PRH > 1) for oligopolistic competition.

Follow Bikker, Shaffer, and Spierdijk (2012); an unscaled revenue equation has been used to estimate the PRH-statistics as below:

$$\ln TI_{i,t} = \alpha_i + \beta_1 \ln W_{1,i,t} + \beta_2 \ln W_{2,i,t} + \beta_3 \ln W_{3,i,t} + \gamma_j \sum_{j=1}^n X_{i,t} + \varepsilon_{i,t} \quad (3.7)$$

Where,  $TI_{i,t}$  represents the total revenue of bank “i” in time “t”;  $W_1, W_2, W_3$  are input prices;  $X_{i,t}$  is the vector of bank level controls, and  $\varepsilon_{i,t}$  is random error. The sum of coefficients on inputs  $W_1, W_2$  and  $W_3$ , i.e.  $\beta_1 + \beta_2 + \beta_3$ , gives the PRH statistic.

According to Bikker et al. (2012), the standalone values of PRH are not sufficient for inferences about the competitive conduct of the banks. Therefore, the study also performs the revenue test using banks’ return on assets (ROA) as dependent variable and input prices along with bank-level control variables as independent variables.

$$\ln ROA_{i,t} = \alpha_i + \beta_1 \ln W_{1,i,t} + \beta_2 \ln W_{2,i,t} + \beta_3 \ln W_{3,i,t} + \gamma_j \sum_{j=1}^n X_{i,t} + \varepsilon_{i,t} \quad (3.8)$$

For the choice of inputs and output, the study adopts an intermediation approach. Accordingly, the output is the natural logarithm of total income which includes interest and non-interest income. The study uses the ratio of personnel expenses to total assets as the cost of labor ( $W_1$ ), the ratio of other non-interest expenses to fixed assets as the cost of physical capital ( $W_2$ ), and the ratio of interest expenses to total funding as the cost of funds ( $W_3$ ). Following the earlier literature, the study includes several variables to control banks-specific characteristics. For instance, the ratio of customer loans to total assets, the ratio of non-earning assets to total assets, the ratio of customer deposits to total funding, and the ratio of total equity to total assets are included in the estimation to control the credit risk, asset composition, funding mix and leverage respectively. The study uses fixed effect model with corrected standard errors clustered at bank level to control the unobservable heterogeneity across banks.

**Lerner Index:** The Lerner Index (Lerner, 1934), shows the ratio of mark up (difference between output price and marginal cost) to output price i.e.  $L = (P-MC)/MC$ , where “ $P$ ” and “ $MC$ ” refer to the price of the output and the marginal cost of producing an additional unit of output respectively. The difference between a firm’s/bank’s price and marginal cost gives the extent of market power a firms/bank may possess. In a perfectly competitive market, the price and marginal cost are equal; however, the divergence between price and cost will be higher in a less competitive environment. The Lerner Index “ranges from 0 in a situation of perfect competition to the inverse of price elasticity of demand in a situation of monopoly or collusion”. Therefore higher values of Lerner indicate more market power and less competitive conditions. The total assets represent the output of a banking firm. Thus the price of total assets is equal to total revenue divided by the total assets. The marginal cost is derived from the translog cost function, as follows:

$$\begin{aligned}
\ln Cost_{i,t} = & \beta_0 + \beta_1 \ln Q_{i,t} + \frac{\beta_2}{2} \ln Q_{i,t}^2 + \sum_{k=1}^3 \gamma_{k,t} \ln W_{k,i,t} + \sum_{k=1}^3 \varphi_k \ln Q_{i,t} \ln W_{k,i,t} \\
& + \frac{1}{2} \sum_{k=1}^3 \sum_{j=1}^3 \delta_{i,j} \ln W_{k,i,t} \ln W_{j,i,t} + \sum_{k=1}^2 \eta_k trend^k \\
& + \sum_{i=1}^3 \omega_i \ln W_{j,i,t} trend + v \ln Q_{i,t} trend + \varepsilon_i
\end{aligned} \tag{3.9}$$

Where  $Cost_{i,t}$  and  $Q_{i,t}$  represent the total cost and output for bank “i” in time “t” respectively, and  $w_1$ ,  $w_2$  and  $w_3$  are the input prices of deposit funds, labor, and capital. Using bank-level panel data, the fixed effect model is applied to Equation 3.9. The introduction of fixed assets ensures that the bank-specific factors are accounted for in the estimation. The marginal cost is the first derivative of the cost function with respect to the level of output. The marginal cost is given by Equation 3.10:

$$MC_{i,t} = \frac{Cost_{i,t}}{Q_{i,t}} \left[ \beta_1 + \beta_2 \ln Q_{i,t} + \sum_{k=1}^3 \theta_k \ln W_{k,i,t} + \delta_3 Trend_{i,t} \right] \tag{3.10}$$

Once the marginal cost is estimated, it is used to calculate the Lerner Index for individual banks through the formula  $L = (P-MC)/MC$ . However, the conventional approach to calculate the Lerner Index has been criticized for its profit and cost efficiency assumptions. Therefore, the Lerner Index under the traditional approach may not reflect the actual market power enjoyed by the banks. The study follows the procedure of Koetter, Kolari, and Spierdijk (2012) to adjust the Lerner Index using Equation 3.11.<sup>14</sup>

$$Lerner(Adjusted) = \frac{\pi_i + tc_i - mc_i * q_i}{\pi_i + tc_i} \tag{3.11}$$

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<sup>14</sup> Issues with the conventional approach to calculate the Lerner Index and the calculation of the efficiency adjusted Lerner Index are discussed in detail in Koetter et al. (2012).

Where,  $\pi_i$ ,  $tc_i$ ,  $mc_i$  and  $q_i$  represent the profit, total cost, marginal cost and output of bank “i”. The value of the adjusted Lerner Index also ranges between 0 and 1 (like the conventional Lerner) with higher values implying more market power.

#### 3.4.2.4 Control Variables

Several bank and country-specific variables have been used in the estimation model to account for the differences in banks’ profitability. Prior studies suggest that the banks with high-quality products can charge higher prices and earn higher profits; such banks have a higher market share.<sup>15</sup> Therefore, the market share is included to capture the effect of product differentiation, and it is expected to have a positive relationship with profitability. The ratio of overheads to total assets is included in the model as a raw proxy for X-efficiency. Conventionally, the overheads are expected to have a negative relationship with the profitability. However, the overheads can positively affect the profitability if high profits earned by firms are attributed to high salaries paid to productive human capital (Molyneux & Thornton, 1992).

The log of total assets is included in the estimation model to account for the differences in profitability attributable to the size of the banks’ operations. The banks’ size can affect the profitability in both directions, i.e., positive or negative.<sup>16</sup> Bank capitalization represents the banks’ ability to stand against adverse economic shocks and absorb losses. Thus it can influence banks’ profitability.<sup>17</sup> The study employs the ratio of equity to total assets as a measure of capital strength. A priori relationship

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<sup>15</sup> Smirlock (1985), Mueller (1983) and Ravenscraft (1983).

<sup>16</sup> For instance, banks with higher assets benefit from economies of scale; moreover, they (large banks) may take advantage of their market powers to earn supernormal profits (Goddard, Molyneux, & Wilson, 2004; Mirzaei et al., 2013). Nevertheless, extremely large sized banks might show a negative relationship with profitability due to agency costs, the overhead cost of bureaucratic processes and other costs related to managing large banks (Mirzaei et al., 2013).

<sup>17</sup> All banks are subject to capital requirements in accordance with the Basel II capital adequacy regulations, where capitalization is seen as the main source to cover loan losses. The banks are required to hold at least 8% of capital against their risk weighted assets.

between capitalization and profitability is not clear.<sup>18</sup> Additionally, the bank level Z-score has been included in the analysis to account for the probability of bank failure. The value of Z-core increases with increase in profitability and capitalization levels, and decreases with unstable earnings reflected by a higher standard deviation of return on assets (Berger et al., 2009). The off-balance-sheet activities have been recognized in the literature as affecting banks' profitability. The findings of an empirical study would be biased if conducted without consideration of off-balance sheet activities (Casu & Girardone, 2005). Therefore, the study uses the ratio of the off-balance sheet activities to total assets in the estimation model.

Banks' ownership structure (foreign versus domestic) can be one of the reasons for differences in performance. For instance, domestic banks in industrialized countries are more profitable than their counterparts in developing countries. However, the opposite is true for foreign banks in emerging economies (Bonin, Hasan, & Wachtel, 2005; Micco, Panizza, & Yanez, 2007). The study employs a dummy variable to control the differences in profitability due to ownership structure.<sup>19</sup>

The demand and supply conditions are also important determinants of banks' profitability. Therefore, the ratio of total loans to total deposits has been used to account for effects of demand for and supply of loans. Development of financial markets can also influence the operations of the banks. For example, efficient capital markets disclose more information about companies. Thus the banks can benefit by reducing adverse selection and moral hazard risks, thereby improving their profitability (Beck &

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<sup>18</sup> Well-capitalized banks increase the banks' creditworthiness, reduce the costs of funding and lower the risk of bankruptcy. Also, a bank can benefit from holding capital in excess of the regulatory minimum. For example, it can possibly increase its portfolio of highly profitable assets, because the accompanying potential risk can be insulated by holding adequate capital. Also, see Pasiouras and Kosmidou (2007) among others.

<sup>19</sup> Following Micco et al. (2007) and Claessens and Van Horen (2012) we define a bank as a foreign bank if at least 50% of the bank's shares are held in foreign hands.

Levine, 2004; Mirzaei et al., 2013). Therefore, the stock market turnover ratio has been included in the estimation as a measure of stock market development.

Almost all of the studies on structure-performance relationship use real GDP growth and inflation rate to control the macroeconomic environment in which the banks operate. Economic growth has a positive effect on banks' profitability, possibly due to an increase in lending rates with less probability of a default rate. However, if the supply of deposits declines due to a rise in consumption in line with GDP growth, the sign on the GDP coefficient may become negative (Athanasoglou, Brissimis, & Delis, 2008). Similarly, in inflationary environments, the banks have wider margins and greater profits. The impact of inflation on profitability depends on whether future inflation is perfectly predicted or not. If bank managers fully anticipate inflation, then they increase lending rates more than deposit rates, maintaining the level of inflation-indexed real profits (Bourke, 1989; Molyneux & Thornton, 1992; Demirgüç-Kunt & Huizinga, 1999).

Moreover, the study also accounts for countries' institutional characteristics and regulatory framework, following Demirguc-Kunt, Laeven, and Levine (2003) and Chan et al. (2015). Institutional characteristics are based on the index of financial freedom and foreign ownership. The Financial Freedom index represents the extent to which a country's financial sector is independent of government intervention and control. The banks enjoying more economic freedom are likely to perform better. The Foreign Ownership index represents the level of foreign-owned businesses in a country. The presence of more foreign-owned businesses is expected to boost the bank performance by mitigating agency problems through more transparent disclosures and better accounting standards. The regulatory framework is represented by the accumulative index of government effectiveness, the rule of law, political stability and regulatory



quality. The Government Effectiveness index signifies the quality of public and civil services, absence of political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The Rule of Law index represents the extent to which agents have confidence in and abide by the rules of society and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. The Political Stability index measures the likelihood of political instability and/or politically-motivated violence, including terrorism. The Index of Regulatory Quality captures the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The source of the individual indices is the World Governance Indicators, provided by Kaufmann, Kraay, and Mastruzzi (2015). The accumulative index ranges from approximately -10 to +10 with higher values indicating effective governance, better enforcement of laws, political stability and a higher quality of regulation formation and implementation, which are expected to have a positive influence on bank performance.

### **3.4.3 Sample and Data**

The study applies the proposed methodology to commercial banks in five countries (Malaysia, Indonesia, Singapore, Philippines, and Thailand) from ASEAN.<sup>20</sup> The bank level data has been collected from financial statements provided by BankScope. The sources of country-level variables include Global Financial Development Database (GFDD), the World Bank, Heritage Foundation and Fraser Institute. Table 3.1 shows the definitions and the sources of the variables. Following Turk Ariss (2010), the original sample has been filtered by excluding banks with less than three consecutive yearly

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<sup>20</sup> The complete coverage of ASEAN countries is limited by availability of bank level data.

observations, and banks for which data on the main variables are not available (such as loans or total assets).

The endogeneity problem seems to be present in the nature of the structure-performance relationship. For example, the SCP paradigm suggests that market structure has a direct influence on a firm's economic conduct which in turn affects its market performance. Therefrom, feedback effects occur such that market performance may impact conduct and structure or conduct may affect the market structure (Martin, 2002). Therefore, the elements of SCP (that is, the concentration, the conduct and the performance) are not determined exogenously. To deal with the possible endogeneity issue, the study applies the Two-step System Generalized Method of Moments (GMM) dynamic panel model with Windmeijer (2005) corrected standard errors and small sample adjustments.<sup>21</sup>

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<sup>21</sup> The system GMM estimator combines the standard set equations in first-difference with a suitable lagged level as instruments, and an additional set of equations in levels with suitably lagged first differences as instruments (Roodman, 2009). Generally, linear difference and system GMM estimators have one-and two-step variants. The two-step variant uses residuals from the one-step estimates and is asymptotically more efficient than the one-step.

**Table 3.1: Variables and Sources**

Variables	Definition	Source
Return on Average Assets	Income before tax divided by Total Assets.	Bank Scope
Return on Average Equity	Income before tax divided by book value of shareholders' equity.	Bank Scope
N-Bank Concentration Ratio	Total assets/deposits/loans held by five/three largest banks of a country to the total assets/deposits/loans of all banks in that country.	Bank Scope
Hirschman Herfindahl Index	Sum of squared market shares of all the banks in each country.	Bank Scope
Market Share	Individual bank's share of assets/deposits/loans to total bank assets/deposits/loans of the market.	Bank Scope
PRH Statistic	PRH is the sum of the elasticities of the revenue with respect to all input prices which ranges between $-\infty$ and 1.	Calculations
Price-Cost Margin (PCM)	PCM is based on adjusted Lerner Index that is the ratio of mark up (the difference between output price and marginal cost) to output price. Its value ranges from 0 to 1 with higher values indicating more market power and less competitive conduct by the banks.	Calculations
Net Interest Margin	The difference between the interest income generated by banks and the amount of interest paid out to their lenders divided by interest-earning assets.	Bank Scope
Bank Overhead	The ratio of overheads to total assets	Bank Scope
Bank Size	Natural log of total assets	Bank Scope
Bank Capitalization	Ratio of equity to total assets	Bank Scope
Off-Balance Sheet Activity	Off-balance sheet items to total assets	Bank Scope
Loan Demand/Supply	Ratio of total loans to total deposits	Bank Scope
Z-Score	Z-score is an inverse proxy for the firm's probability of failure. It combines profitability, leverage, and return volatility in a single measure. It is calculated at bank level as $Z = [ROA + EQ/TA]/SD(ROA)$ . Larger values of Z-score indicate less overall risk.	Bank Scope
Stock Market Development	The total value of shares traded during the period divided by the average market capitalization for the period.	World Bank
Economic Growth	Inflation-adjusted growth rate for GDP	World Bank
Inflation	Inflation based on consumer price index	World Bank
Ownership Structure	A dummy variable equals one if more than 51% share is held by foreign shareholders and 0 otherwise.	Bank Scope
Institutional Characteristics	Institutional Characteristics include the Financial Freedom Index from Heritage Foundation and Foreign Ownership Index Fraser Institute.	Heritage Foundation/ Index Fraser Institute
Regulatory Framework	Regulatory Framework is based on indices of Rule of Law, Regulatory Quality, Government Effectiveness and Political Stability from World Governance Indicators provided by Kaufmann et al. (2015).	World Governance Indicators

Note: The table shows the variables used in this study along with their definition and the sources of the data.

#### 3.4.4 Descriptive Statistics

This section provides a brief description of variables and sources and the correlations. Table 3.2 shows the average values of and the corresponding variations in the main variables of the study. The market structure measures (CR3, CR5, and HHI) represent the level of concentration in the banking industry across five ASEAN countries. The level of concentration varies significantly across the region. For instance, average values of CR3 for Indonesia, Malaysia, the Philippines, Singapore, and Thailand are 0.49, 0.59, 0.51, 0.92 and 0.46 respectively. The banking industry in Singapore is relatively more concentrated in comparison to the rest of the countries in the sample. Thailand, on the other hand, has the least concentrated banking industry in the region. Other concentration measures (i.e., CR5 and HHI) also show similar results. Among the profitability measures, ROAA does not vary much across the sample countries, with an average value of 1.6% (highest) for Indonesia and 0.6% (lowest) for Thailand. However, the standard deviation of ROAA is quite high for Indonesia, the Philippines, and Malaysia. The average values for ROAE are considerably high as compared to ROAA, with 13.8% (highest) for Malaysia and 4.8% (lowest) for Thailand.

Table 3.3 shows the degree of correlation among important variables. There are a few high correlations (around 0.9), but all such correlations are found among alternative proxies of concentration or profitability which do not enter the estimation model simultaneously. A few other correlations are of serious concern because these are to be used together in the estimation.<sup>22</sup> These correlations are high enough to create the problem of multicollinearity. Follows Mirzaei et al. (2013), the study uses lag values of highly correlated variables whenever they enter the estimation together. Alternatively,

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<sup>22</sup> For example, the correlation of log of total assets with market share and equity to total assets, the correlation of CR5, CR3 and HHI with overhead etc.

the results are estimated with and without such variables to compare the findings, both the results are qualitatively similar. The rest of the correlations are not so high as to cause a potential multicollinearity problem. Important for this study are the correlations among market structure, the conduct, and the performance measures. Bank concentration is positively related to bank profitability and anti-competitive conduct, while anti-competitive conduct is positively related to banks' profitability. However, it is premature to assume that these correlations are representative of the true relationships without controlling for other variables.

**Table 3.2: Descriptive Statistics**

	Indonesia				Malaysia				Philippine				Singapore				Thailand			
	Mean	S.D	Min	Max	Mean	S.D	Min	Max	Mean	S.D	Min	Max	Mean	S.D	Min	Max	Mean	S.D	Min	Max
<b>ROAA</b>	0.015	0.010	0.001	0.034	0.012	0.004	0.004	0.018	0.014	0.007	0.003	0.027	0.010	0.004	0.002	0.015	0.006	0.012	-0.021	0.021
<b>ROAE</b>	0.138	0.083	0.017	0.285	0.127	0.068	0.031	0.238	0.112	0.059	0.014	0.205	0.086	0.048	0.014	0.162	0.048	0.140	-0.289	0.183
<b>CR3</b>	0.493	0.061	0.427	0.600	0.596	0.052	0.513	0.665	0.507	0.044	0.445	0.571	0.923	0.024	0.881	0.955	0.463	0.016	0.445	0.491
<b>CR5</b>	0.633	0.049	0.580	0.718	0.779	0.066	0.678	0.868	0.660	0.042	0.587	0.715	0.977	0.011	0.964	0.996	0.662	0.012	0.642	0.678
<b>MS</b>	0.015	0.019	0.001	0.058	0.056	0.057	0.003	0.164	0.038	0.040	0.003	0.117	0.131	0.149	0.001	0.366	0.053	0.052	0.002	0.149
<b>HHI</b>	0.108	0.024	0.085	0.156	0.162	0.031	0.117	0.205	0.127	0.028	0.089	0.167	0.292	0.013	0.269	0.310	0.108	0.003	0.104	0.112
<b>PRH</b>	0.870	0.110	0.710	1.050	0.540	0.530	-0.560	0.920	0.800	0.030	0.120	0.520	0.730	0.430	0.150	0.990	0.910	0.630	0.370	0.970
<b>Price-Cost</b>	0.180	0.110	0.010	0.340	0.280	0.090	0.060	0.420	0.200	0.080	0.050	0.330	0.290	0.160	0.100	0.290	0.200	0.020	0.120	0.410
<b>NIM</b>	0.051	0.016	0.026	0.080	0.028	0.007	0.018	0.041	0.041	0.010	0.029	0.062	0.019	0.008	0.008	0.033	0.029	0.009	0.013	0.043
<b>EQ/TA</b>	0.121	0.054	0.057	0.227	0.112	0.053	0.061	0.220	0.130	0.043	0.079	0.220	0.125	0.041	0.067	0.194	0.129	0.089	0.043	0.324
<b>OH/TA</b>	0.031	0.011	0.015	0.049	0.013	0.005	0.006	0.021	0.034	0.009	0.023	0.052	0.013	0.004	0.008	0.020	0.021	0.007	0.009	0.035
<b>LN(TA)</b>	7.058	1.448	5.006	9.484	8.341	1.374	6.395	10.20	7.871	1.298	5.972	9.831	9.689	2.062	6.523	12.272	8.790	1.385	6.325	10.50
<b>OFBS/TA</b>	0.120	0.091	0.011	0.290	0.380	0.184	0.107	0.693	0.063	0.062	0.005	0.200	0.216	0.167	0.003	0.459	0.323	0.413	0.008	1.328
<b>LOAN/DEP</b>	0.703	0.220	0.315	1.036	0.557	0.255	0.107	0.835	0.529	0.175	0.284	0.859	0.594	0.231	0.198	0.885	0.867	0.155	0.638	1.147
<b>Z-Score</b>	2.434	1.842	0.025	3.700	13.97	1.854	11.825	18.69	18.237	4.780	12.55	30.09	20.76	5.423	6.266	25.87	2.55	1.187	1.12	0.761
<b>Inflation</b>	0.074	0.030	0.043	0.131	0.021	0.008	0.010	0.036	0.046	0.016	0.030	0.083	0.029	0.020	0.006	0.065	0.026	0.014	0.003	0.046
<b>GDP</b>	0.056	0.007	0.045	0.063	0.052	0.019	0.005	0.074	0.053	0.020	0.011	0.076	0.062	0.046	-0.006	0.152	0.042	0.026	0.001	0.077
<b>SMT0</b>	0.486	0.132	0.315	0.713	0.324	0.062	0.227	0.446	0.213	0.031	0.162	0.261	0.761	0.269	0.404	1.220	0.883	0.172	0.642	1.154

Note: The table reports the descriptive statistics of the variables for each country in the sample. Each column in the table shows average value, standard deviation, minimum value, maximum value for return on average assets (ROAA), return on average equity(ROAE), 3-firm concentration ratio (CR3), 5-firm concentration ratio(CR5), market share (MS), Herfindahl Hirschman Index (HHI), PRH statistic, Price-Cost Margin (PCM), equity to total assets (EQ/TA), overhead to total assets (OH/TA), natural log of total assets (LN(TA)), off-balance sheet items to total assets (OFBS/TA), total loans to total deposits (LOAN/DEP), Z-Score, inflation, growth rate of real GDP (GDP), stock market turnover (SMT0).

**Table 3.3: Correlation Matrix**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1) ROAA	1																	
(2) ROAE	0.66**	1																
(3) CR3	0.12**	0.02	1															
(4) CR5	0.16**	0.02	0.96**	1														
(5) MS	0.04	0.25**	0.31**	0.34**	1													
(6) HHI	0.13**	0.01*	0.98**	0.98**	0.33**	1												
(7) PRH	-0.39**	-0.34**	-0.32**	-0.36**	-0.17*	-0.39**	1											
(8) PCM	0.27**	0.22**	0.22**	0.26**	0.15*	0.24**	-0.25**	1										
(9) EQ/TA	0.47**	-0.21**	-0.021	-0.06	-0.35**	-0.03	-0.26**	0.08*	1									
(10) OH/TA	-0.05	-0.05	-0.49**	-0.56**	-0.21**	-0.52**	0.11	0.37**	-0.12**	1								
(11) LNTA	-0.09*	0.30**	0.27**	0.32**	0.82**	0.30**	-0.28**	-0.22**	-0.49**	-0.20**	1							
(12) OFBS	-0.01	0.03	0.16**	0.24**	0.21**	0.19**	-0.19	-0.23**	0.03	-0.28**	0.19**	1						
(13) L/D	0.19**	0.04	-0.20**	-0.19**	-0.07	-0.22**	0.02	0.24**	0.18**	-0.09*	-0.01	0.09*	1					
(14) SMTO	-0.14**	-0.16**	0.02	0.04	0.11**	0.01	-0.03*	0.27**	0.04	-0.11**	0.14**	0.16**	0.36**	1				
(15) INFL	0.13**	0.03	-0.41**	-0.54**	-0.22**	-0.48**	0.13	0.44**	0.05	0.37**	-0.37**	-0.22**	0.09*	-0.02	1			
(16) GDP	0.17**	0.11**	-0.02	-0.08*	-0.10**	-0.04	0.17*	0.07	0.05	0.12**	-0.12**	-0.14**	-0.02	-0.25**	0.16**	1		
(17) NIM	0.26*	0.21*	0.25*	0.28*	0.06	0.24*	-0.08*	0.19*	0.07*	-0.02	0.07*	0.04	0.09*	-0.05	0.13*	0.11	1	
(18) Z-Score	0.19**	0.13**	0.12**	0.07*	0.11*	0.05**	0.17**	0.11*	0.15*	0.22*	0.02*	0.04*	0.06*	0.05*	0.06*	0.07*	0.11*	1

Note: The table reports pairwise correlation among return on average assets (ROAA), return on average equity(ROAE), 3-firm concentration ratio (CR3), 5-firm concentration ratio(CR5), market share (MS), Herfindahl Hirschman Index (HHI), PRH statistic, price-cost margin (PCM), equity to total assets (EQ/TA), overhead to total assets (OH/TA), natural log of total assets (LN(TA)), off-balance sheet items to total assets (OFBS/TA), total loans to total deposits (L/D), stock market turnover (SMTO), inflation, growth rate of real GDP (GDP), net interest margin (NIM), and Z-Score . Subscripts, \*\*, and \* denote the significance of relationship at 1% and 5% levels respectively.

### **3.5 Empirical Results and Discussion**

As discussed in section 3.3, four conditions are specified for the validity of the SCP hypothesis: (1) the concentration significantly affects the bank conduct, (2) the conduct significantly affects the bank performance, (3) the concentration affects the bank performance in the absence of the conduct and (4) the effect of the concentration on bank performance is reduced when the conduct variable is also included in the estimation model. The estimation results of each condition are presented in the sections that follow.

#### **3.5.1 Relationship between Market Structure and Bank Conduct**

The first condition for the validity of the SCP hypothesis requires that the market structure significantly affects the bank conduct. The estimation results of Equation 3.1 are reported in Table 3.4. Bank conduct is represented by the PRH statistic and PCM in panels A and B respectively. The coefficients on market structure measures are highly significant with a negative sign in panel A. Since the higher values of the PRH statistic (values closer to 1) represent more competitive conduct, the negative coefficients on market structure measures imply that higher concentration leads to less competitive conduct by the banks. This is in agreement with Bikker and Haaf (2002), who also find the higher concentration in the banking industry to be related to anti-competitive conduct by the banks. On the other hand, the coefficients on market structure measures are significant with a positive sign in panel B. The higher values of the PCM imply anti-competitive pricing by the banks, and therefore the positive coefficients on market structure measures suggest that the conduct of banks becomes less competitive when bank concentration increases. Among other control variables, the bank size, the bank capitalization, and merger activities are related to the anti-competitive behavior by the banks. Alternatively, the interest margin (NIM) is employed as a proxy for anti-competitive pricing. According to Berger and Hannan (1989), if the SCP hypothesis



reflects anti-competitive pricing, then the banks will be able to charge lower deposit rates and/or charge higher loan rates. The NIM captures the pricing ability of banks for services, deposits, and loans (Goldberg & Rai, 1996). Although not reported in the article to conserve space, the relationship between bank concentration and NIM is significantly positive, which reinforces the earlier findings. The findings for concentration and NIM are in contrast to earlier studies which use net interest margin as a measure of banks' pricing strategy, i.e. Goldberg & Rai (1996) and Seelanatha (2010).

### **3.5.2 Relationship between Market Structure and Performance**

The third condition for the validity of SCP requires the market structure to influence the bank performance independently of the bank conduct. The estimation results of Equation 3.2 are displayed in Table 3.5. The dependent variables are ROAA and ROAE in panels A and B. The coefficients on all measures of market structure are consistently significant with positive signs in both panels A and B. The coefficient ranges between 0.298 and 0.351, which is economically significant. For example, a 1% increase in bank concentration can increase the banks' profitability by 0.298-0.351%. These results are concurrent with some of the earlier studies which use similar measures of concentration and profitability [see for example (Martin, 1988; Molyneux & Thornton, 1992; Lloyd-Williams et al., 1994; Berger, 1995; Al-Muharrami & Matthews, 2009; Tregenna, 2009)]. However, these studies consider the positive concentration-profitability relationship as sufficient evidence in favor of the SCP hypothesis.

With respect to control variables, market share is consistently positive and significant. This is in line with the findings of Mueller (1983) and Ravenscraft (1983), who argue that the market share captures the effects of product differentiation. For instance, banks with higher quality products are able to charge higher prices and earn higher profits, so these banks have a higher market share. Other control variables for

which an a priori relationship was expected (for example equity total assets, overhead to total assets, loan to deposit ratio and stock market turnover) are significant with expected signs. A priori relationship between total assets and bank profitability is not clear. The study consistently finds a positive coefficient on total assets. This finding favors the argument that the banks with higher assets benefit from economies of scale. Moreover, the large banks may take advantage of their market powers to earn supernormal profits (Goddard et al., 2004). Real GDP growth is consistently significant with a positive sign, thus supporting the assertion that GDP growth has a positive effect on banks' profitability, possibly due to an increase in lending rates with less probability of a default rate (Athanasoglou et al., 2008). The coefficients on the ownership structure are also significant with a positive sign, indicating that banks with foreign ownership perform better in terms of profitability. Stock market turnover is consistently positive, which supports the argument that efficient capital markets disclose more information about companies. Thus banks can benefit by reducing adverse selection and moral hazard risks, and thereby improve their profitability (Beck & Levine, 2004; Mirzaei et al., 2013). Inflation is consistently negative in all estimations, which is in contrast to the findings of earlier studies (Bourke, 1989; Molyneux & Thornton, 1992; Demirgüç-Kunt & Huizinga, 1999). However, the impact of inflation on profitability depends on whether future inflation is perfectly predicted or not. If bank managers fully anticipate inflation, they increase lending rates more than the deposit rates, maintaining the level of inflation-indexed real profits. However, inflation may affect the profits negatively if managers cannot fully anticipate it. The coefficients on merged banks are consistently positive, thus demonstrating that the profitability of merged banks is higher than that of the other banks. The coefficients on institutional characteristics and regulatory framework are positive, suggesting that banks in more open and sound business environments are more profitable. Among the time dummies, the coefficients on years

2007, 2008 and 2009 (not reported, for the sake of brevity) are significantly negative, implying that the global financial crisis 2007-2009 had a depressing effect on the banks' profitability.

### 3.5.3 The Mediating Role of Bank Conduct

The second and fourth conditions for the validity of the SCP hypothesis require that the bank conduct significantly affects bank performance and that the effect of the market structure on bank performance reduces in magnitude or becomes zero when the conduct variable is also included in the model. The mediating effect is referred to as "the perfect mediation" if the coefficient on the market structure becomes insignificant while the coefficient on the conduct variable is still significant. However, if the coefficient on the market structure is still significant but reduces in magnitude, then it is a case of partial mediation. The estimation results of Equation 3.3 are shown in Table 3.6 and 3.7. The dependent variables are the ROAA and ROAE in panels A and B respectively. The bank conduct is represented by PRH statistic (table 3.6) and PCM (table 3.7). The coefficients on the market structure are still significantly positive, while the bank conduct is also significant in all specifications. However, the magnitude of the coefficients on the market structure has decreased.<sup>23</sup> Thus, the bank conduct partially mediates the relationship between market structure and the bank performance.

So far, the estimation results have supported all the conditions specified for the validity of the SCP hypothesis. For example, the market structure affects the conduct of the banks; the bank conduct significantly influences the bank performance; the market structure affects the bank performance independently of the bank conduct, and the

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<sup>23</sup> For example, the coefficients on market structure decreased from 0.326, 0.315, 0.298, 0.334, 0.325, and 0.351 in Table 3.5 to 0.115, 0.121, 0.108, 0.162, 0.172, and 0.157 respectively in Table 3.6.

effect of the market structure decreases in magnitude when the bank conduct is incorporated in the estimation model.

To further verify the indirect relationship between market structure and bank performance – i.e. from market structure to bank conduct and then from bank conduct to bank performance – the study follows a procedure introduced by Goodman (1960), Sobel (1982), MacKinnon and Dwyer (1993) and MacKinnon et al. (1995). This procedure involves calculation of test statistics using equation 3.4, 3.5 and 3.6. These results are reported in Table 3.8. The comparison of the coefficients on the market structure variables in the first and second row of the table clearly indicates that inclusion of the bank conduct in the estimation model decreases the impact of the market structure on the bank performance. The last three rows provide further evidence of the reduction of the market structure coefficients. Rejection of the null hypothesis under the Sobel, Aroian and Goodman tests suggests that the mediation effect is present in the structure-performance relationship. However, the effect of the market structure on the bank performance is still significant, and therefore this is a case of partial mediation.

From these results, it can be inferred that the SCP hypothesis seems to be a valid explanation for the positive relationship between market structure and bank performance in ASEAN economies. However, the SCP hypothesis may not be the only explanation for the structure-performance relationship because there is a partial mediation through the bank conduct from market structure to bank performance. Other possible explanations may include bank efficiency and/or product differentiation. For example, it is possible under the ES hypothesis that the efficient banks in concentrated banking markets can earn higher profits out of their cost efficiency (Berger & Hannan, 1989; Goldberg & Rai, 1996). On the other hand, large banks with differentiated

products can charge higher prices and earn higher profits (Mueller, 1983; Ravenscraft, 1983).

**Table 3.4: Market Structure and Bank Conduct**

	Panel A: PRH statistic			Panel B: PCM		
	(1)	(2)	(3)	(4)	(5)	(6)
Market Structure (Concentration)	-0.238*** (0.076)	-0.218*** (0.073)	-0.226*** (0.081)	0.171*** (0.052)	0.148*** (0.049)	0.185*** (0.062)
Bank Capitalization	-0.099** (0.047)	-0.078** (0.038)	-0.089** (0.046)	0.163*** (0.054)	0.143** (0.077)	0.149** (0.079)
Bank Size	-0.168** (0.083)	-0.143** (0.071)	-0.133* (0.065)	0.107** (0.052)	0.111** (0.055)	0.129** (0.063)
Bank Overhead	0.024* (0.013)	0.027 (0.022)	0.035 (0.053)	0.018 (0.092)	0.023* (0.026)	0.025 (0.038)
Off Balance Sheet Activity	0.041 (0.071)	0.031 (0.026)	0.043 (0.025)	0.067 (0.046)	0.021 (0.027)	0.029 (0.024)
Loan Demand/Supply	-0.008 (0.032)	0.014 (0.061)	0.019* (0.010)	-0.015 (0.030)	0.022 (0.038)	0.011 (0.014)
Number of Banks	0.014 (0.021)	0.011 (0.043)	0.008 (0.006)	0.012 (0.021)	0.016 (0.015)	0.007 (0.009)
Economic Growth	-0.29 (0.017)	-0.041* (0.022)	-0.043** (0.019)	0.034** (0.015)	0.045 (0.033)	0.043* (0.022)
Stock Market Development	-0.021** (0.010)	-0.015* (0.008)	-0.063 (0.074)	0.011 (0.013)	0.015* (0.008)	0.074 (0.051)
Ownership Structure	0.031** (0.012)	0.030* (0.014)	0.035* (0.018)	-0.069 (0.063)	-0.072** (0.035)	-0.065* (0.033)
Inflation	0.019* (0.010)	0.017** (0.008)	0.016** (0.007)	-0.023** (0.011)	-0.029* (0.014)	-0.025* (0.013)
Dummy (Merger)	0.017** (0.008)	0.015** (0.007)	0.021* (0.010)	-0.018** (0.008)	-0.015** (0.008)	-0.012* (0.009)
Institutional Characteristics	0.152* (0.079)	0.163* (0.082)	0.124 (0.114)	-0.149* (0.075)	-0.147 (0.134)	-0.167 (0.116)
Regulatory Framework	0.120* (0.061)	0.116* (0.059)	0.132 (0.093)	-0.128* (0.065)	-0.137** (0.067)	-0.124* (0.063)
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes	Yes	Yes
AR(1)	0.029	0.017	0.020	0.012	0.027	0.017
AR(2)	0.134	0.133	0.186	0.081	0.150	0.120
Sargan/Hensen	0.215	0.259	0.172	0.221	0.199	0.216
No. of Instruments	129	129	129	131	131	131
No. of Groups	173	173	173	173	173	173

Note: The table reports the estimation results for the structure-conduct relationship. The dependent variables are PRH statistic (panel: A) and PCM (Panel: B). Market Structure measures include CR5 (column 1 and 4), CR3 (column 2 and 5) and HHI (column 3 and 6) based on Total Assets. Other variables include, Market Share = Bank's share in Assets; Bank Capitalization = Equity to Total Assets; Bank Size = Log of Total Assets; Bank Overhead = Overhead to Total Assets; Off-Balance Sheet activity = Off-Balance Sheet Items to Total Assets; Loan demand/supply = Total Loan to Total Deposits; Number of Banks; Economic Growth = Real GDP Growth; Stock Market Development = Stock Market Turnover; Ownership Structure = Dummy variable for foreign/domestic Ownership; Inflation = change in CPI; Dummy (merger) = Dummy variable for merged banks; Institutional Characteristics = Financial Freedom and Foreign Ownership; and the Regulatory Framework = Rule of Law, Regulatory Quality, Government Effectiveness and Political Stability. Results have been estimated through application of Two-step System GMM with Windmeijer (2005) corrected standard errors and small sample adjustments. Corrected standard errors are reported in the parenthesis. Significant values of AR (1) indicate that null hypothesis of no autocorrelation among error terms in first difference is rejected. AR (2) is insignificant indicating that error terms in level regressions are not correlated. Values of Sargan/Hensen are insignificant indicating that instruments are valid. Results for AR (1), AR (2) and Sargan/Hensen show that GMM is correctly specified and there are no identification issues. Subscripts \*\*\*, \*\*, \* denote the significance of relationships at 1%, 5% and 10% levels respectively.

**Table 3.5: Market Structure and Bank Performance (without Bank Conduct)**

	Panel A: ROAA			Panel B: ROAE		
	(1)	(2)	(3)	(4)	(5)	(6)
Market Structure (Concentration)	0.326*** (0.081)	0.315*** (0.095)	0.298*** (0.102)	0.334** (0.098)	0.325*** (0.108)	0.351** (0.121)
Market Share	0.025** (0.012)	0.019** (0.009)	0.021** (0.009)	0.015* (0.008)	0.013** (0.006)	0.018* (0.008)
Bank Capitalization	0.077** (0.037)	0.065*** (0.021)	0.056*** (0.018)	0.071** (0.034)	0.068** (0.033)	0.074* (0.038)
Bank Size	0.091** (0.044)	0.095** (0.047)	0.103*** (0.050)	0.099* (0.051)	0.092** (0.045)	0.084** (0.041)
Bank Overhead	-0.267** (0.133)	-0.244** (0.121)	-0.263** (0.131)	-0.269** (0.134)	-0.246** (0.122)	-0.238** (0.118)
Off Balance Sheet Activity	0.022* (0.012)	-0.024 (0.016)	-0.031 (0.038)	0.020 (0.016)	0.028 (0.021)	0.019* (0.011)
Loan Demand/Supply	0.024* (0.013)	0.027** (0.013)	0.021* (0.011)	0.029* (0.015)	0.028*** (0.008)	0.023** (0.011)
Z-Score	0.032** (0.014)	0.033* (0.017)	0.013** (0.006)	0.025** (0.013)	0.017* (0.009)	0.014** (0.006)
Number of Banks	-0.013 (0.011)	-0.016 (0.010)	-0.011* (0.006)	-0.014 (0.012)	-0.015* (0.008)	-0.012 (0.013)
Economic Growth	0.033** (0.016)	0.029** (0.014)	0.028** (0.013)	0.031** (0.015)	0.027* (0.014)	0.025** (0.012)
Stock Market Development	0.031** (0.015)	0.026** (0.012)	0.028** (0.013)	0.035** (0.017)	0.037** (0.018)	0.033** (0.016)
Ownership Structure	0.018** (0.008)	0.022* (0.012)	0.021** (0.009)	0.017* (0.009)	0.016** (0.007)	0.020* (0.011)
Inflation	-0.026** (0.012)	-0.024** (0.011)	-0.018** (0.008)	-0.024* (0.013)	-0.021** (0.008)	-0.019** (0.009)
Dummy (Merger)	0.123** (0.061)	0.117** (0.058)	0.111** (0.054)	0.131** (0.064)	0.126** (0.062)	0.134** (0.066)
Institutional Characteristics	0.083** (0.040)	0.062** (0.030)	0.078** (0.038)	0.087** (0.043)	0.081** (0.039)	0.085** (0.041)
Regulatory Framework	0.133** (0.066)	0.127** (0.062)	0.131** (0.064)	0.162** (0.080)	0.144** (0.071)	0.147** (0.072)
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes	Yes	Yes
AR (1)	0.031	0.016	0.021	0.015	0.029	0.013
AR (2)	0.137	0.136	0.189	0.083	0.153	0.123
Sargan/Hensen	0.219	0.264	0.176	0.226	0.203	0.221
No. of Instruments	129	129	129	131	131	131
No. of Groups	173	173	173	173	173	173

Note: The table reports the estimation results for the structure-performance relationship with out the conduct variable. Dependent variables are ROAA (Panel A) and ROAE (Panel B). Market Structure measures include CR5 (column 1 and 4), CR3 (column 2 and 5) and HHI (column 3 and 6) bases on Total Assets. Other variables include, Market Share = Bank's share in Assets; Bank Capitalization = Equity to Total Assets; Bank Size = Log of Total Assets; Bank Overhead = Overhead to Total Assets; Off-Balance Sheet activity= Off-Balance Sheet Items to Total Assets; Loan demand/supply= Total Loan to Total Deposits; Banks' Z-score; Number of Banks; Economic Growth= Real GDP Growth; Stock Market Development= Stock Market Turnover; Ownership Structure= Dummy variable for foreign/domestic Ownership; Inflation=change in CPI; Dummy (merger) = Dummy variable for merged banks; Institutional Characteristics = Financial Freedom and Foreign Ownership; and the Regulatory Framework = Rule of Law, Regulatory Quality, Government Effectiveness and Political Stability. Results have been estimated through application of Two-step System GMM with Windmeijer (2005) corrected standard errors and small sample adjustments. Corrected standard errors are reported in the parenthesis. Significant values of AR (1) indicate that null hypothesis of no autocorrelation among error terms in first difference is rejected. AR (2) is insignificant indicating that error terms in level regressions are not correlated. Values of Sargan/Hensen are insignificant indicating that instruments are valid. Results for AR (1), AR (2) and Sargan/Hensen show that GMM is correctly specified and there are no identification issues. Subscripts \*\*\*, \*\*, \* denote the significance of relationships at 1%, 5% and 10% levels respectively.

**Table 3.6: Structure, Conduct, and Performance**

	Panel A: ROAA			Panel B: ROAE		
	(1)	(2)	(3)	(4)	(5)	(6)
Market Structure (Concentration)	0.115** (0.057)	0.121** (0.060)	0.108** (0.053)	0.162** (0.079)	0.172* (0.087)	0.157** (0.058)
Bank conduct (PRH statistic)	-0.064*** (0.021)	-0.071*** (0.023)	-0.058*** (0.019)	-0.089** (0.044)	-0.078** (0.038)	-0.067** (0.033)
Market Share	0.022** (0.010)	0.015** (0.007)	0.018** (0.008)	0.011* (0.006)	0.014** (0.006)	0.017* (0.009)
Bank Capitalization	0.068** (0.032)	0.055** (0.027)	0.047** (0.023)	0.062** (0.031)	0.059** (0.030)	0.065* (0.033)
Bank Size	0.088** (0.043)	0.092** (0.045)	0.099** (0.049)	0.096* (0.047)	0.089** (0.044)	0.081** (0.040)
Bank Overhead	-0.245** (0.122)	-0.224** (0.111)	-0.241** (0.119)	-0.247** (0.123)	-0.228** (0.113)	-0.219** (0.109)
Off Balance Sheet Activity	0.023** (0.011)	-0.026 (0.018)	-0.029 (0.028)	0.021 (0.017)	0.027 (0.022)	0.018* (0.010)
Loan Demand/Supply	0.021* (0.011)	0.026** (0.012)	0.019* (0.010)	0.026* (0.014)	0.027** (0.013)	0.025** (0.012)
Z-Score	0.011* (0.006)	0.015** (0.007)	0.012** (0.005)	0.014** (0.006)	0.017** (0.008)	0.013** (0.004)
Number of Banks	-0.024 (0.021)	-0.027* (0.014)	-0.022 (0.019)	-0.025* (0.013)	-0.023 (0.020)	-0.021* (0.011)
Economic Growth	0.029** (0.014)	0.026** (0.013)	0.024** (0.012)	0.027** (0.013)	0.023* (0.012)	0.020** (0.009)
Stock Market Development	0.028** (0.013)	0.025** (0.012)	0.033** (0.016)	0.031** (0.015)	0.034** (0.016)	0.032** (0.015)
Ownership Structure	0.016** (0.007)	0.021* (0.011)	0.018** (0.008)	0.013* (0.007)	0.021** (0.010)	0.023* (0.012)
Inflation	-0.024** (0.011)	-0.022** (0.011)	-0.019** (0.009)	-0.021* (0.011)	-0.025** (0.012)	-0.017** (0.008)
Dummy (Merger)	0.118** (0.058)	0.114** (0.056)	0.107** (0.052)	0.127** (0.063)	0.123** (0.061)	0.130** (0.064)
Institutional Characteristics	0.078** (0.038)	0.059** (0.029)	0.073** (0.036)	0.081** (0.040)	0.076** (0.037)	0.079** (0.039)
Regulatory Framework	0.129** (0.064)	0.125** (0.061)	0.127** (0.063)	0.158** (0.078)	0.141** (0.070)	0.145** (0.072)
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes	Yes	Yes
AR (1)	0.034	0.020	0.023	0.014	0.032	0.009
AR (2)	0.146	0.145	0.202	0.088	0.163	0.131
Sargan/Hensen	0.233	0.281	0.187	0.240	0.216	0.235
No. of Instruments	129	129	129	131	131	131
No. of Groups	173	173	173	173	173	173

Note: The table reports the estimation results for the structure-performance relationship in the presence of the conduct variable. Dependent variables are ROAA (Panel A) and ROAE (Panel B). Market Structure measures include CR5 (column 1 and 4), CR3 (column 2 and 5) and HHI (column 3 and 6) based on Total Assets. Bank conduct has been measured by PRH statistic. Other variables include, Market Share = Bank's share in Assets; Bank Capitalization = Equity to Total Assets; Bank Size = Log of Total Assets; Bank Overhead = Overhead to Total Assets; Off-Balance Sheet activity = Off-Balance Sheet Items to Total Assets; Loan demand/supply = Total Loan to Total Deposits; Banks' Z-score; Number of Banks; Economic Growth = Real GDP Growth; Stock Market Development = Stock Market Turnover; Ownership Structure = Dummy variable for foreign/domestic Ownership; Inflation = change in CPI; Dummy (merger) = Dummy variable for merged banks; Institutional Characteristics = Financial Freedom and Foreign Ownership; and the Regulatory Framework = Rule of Law, Regulatory Quality, Government Effectiveness and Political Stability. Results have been estimated through application of Two-step System GMM with Windmeijer (2005) corrected standard errors and small sample adjustments. Corrected standard errors are reported in the parenthesis. Significant values of AR (1) indicate that null hypothesis of no autocorrelation among error terms in first difference is rejected. AR (2) is insignificant indicating that error terms in level regressions are not correlated. Values of Sargan/Hensen are insignificant indicating that instruments are valid. Results for AR (1), AR (2) and Sargan/Hensen show that GMM is correctly specified and there are no identification issues. Subscripts \*\*\*, \*\*, \* denote the significance of relationships at 1%, 5% and 10% levels respectively.

**Table 3.7: Structure, Conduct, and Performance (Robustness Check)**

	Panel A: ROAA			Panel B: ROAE		
	(1)	(2)	(3)	(4)	(5)	(6)
Market Structure (Concentration)	0.118** (0.057)	0.112** (0.055)	0.108** (0.053)	0.131** (0.065)	0.148* (0.076)	0.143** (0.071)
Bank conduct (PCM)	0.055*** (0.017)	0.052*** (0.018)	0.067*** (0.021)	-0.082** (0.040)	-0.075** (0.037)	-0.069** (0.034)
Market Share	0.026** (0.012)	0.018** (0.007)	0.020** (0.009)	0.014* (0.008)	0.016** (0.007)	0.015* (0.008)
Bank Capitalization	0.057** (0.028)	0.051** (0.025)	0.046** (0.022)	0.064** (0.031)	0.053** (0.026)	0.062* (0.031)
Bank Size	0.081** (0.040)	0.085** (0.042)	0.092** (0.045)	0.089* (0.044)	0.083** (0.041)	0.075** (0.037)
Bank Overhead	-0.234** (0.116)	-0.227** (0.113)	-0.238** (0.118)	-0.254** (0.126)	-0.236** (0.117)	-0.228** (0.113)
Off Balance Sheet Activity	0.021* (0.011)	-0.025 (0.016)	-0.028 (0.026)	0.022 (0.018)	0.028 (0.023)	0.019* (0.010)
Loan Demand/Supply	0.014** (0.007)	0.017** (0.008)	0.011* (0.006)	0.018** (0.009)	0.022** (0.011)	0.019** (0.009)
Z-Score	0.023* (0.012)	0.019** (0.009)	0.032** (0.015)	0.031* (0.016)	0.027* (0.014)	0.034** (0.016)
Number of Banks	0.004* (0.002)	0.007 (0.014)	0.002 (0.016)	0.005 (0.021)	0.013* (0.007)	0.001 (0.017)
Economic Growth	0.026** (0.013)	0.024** (0.012)	0.022** (0.011)	0.025** (0.012)	0.021* (0.011)	0.019** (0.009)
Stock Market Development	0.025** (0.012)	0.023** (0.011)	0.031** (0.015)	0.029** (0.014)	0.032** (0.015)	0.030** (0.014)
Ownership Structure	0.017** (0.008)	0.019* (0.011)	0.016** (0.007)	0.015* (0.008)	0.022** (0.011)	0.025** (0.012)
Inflation	-0.016** (0.007)	-0.018** (0.008)	-0.014** (0.006)	-0.013* (0.007)	-0.019** (0.008)	-0.012** (0.005)
Dummy (Merger)	0.119** (0.059)	0.116** (0.057)	0.109** (0.054)	0.124** (0.061)	0.126** (0.062)	0.128** (0.063)
Institutional Characteristics	0.080** (0.039)	0.061** (0.030)	0.076** (0.037)	0.084** (0.041)	0.079** (0.039)	0.082** (0.040)
Regulatory Framework	0.131** (0.065)	0.128** (0.063)	0.129** (0.064)	0.161** (0.079)	0.143** (0.071)	0.147** (0.073)
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes	Yes	Yes
AR (1)	0.033	0.019	0.023	0.014	0.031	0.009
AR (2)	0.143	0.142	0.198	0.086	0.160	0.128
Sargan/Hansen	0.228	0.275	0.183	0.235	0.212	0.230
No. of Instruments	129	129	129	131	131	131
No. of Groups	173	173	173	173	173	173

Note: The table reports the estimation results for the structure-performance relationship in the presence of the conduct variable. Dependent variables are ROAA (Panel A) and ROAE (Panel B). Market Structure includes CR5 (column 1 and 4), CR3 (column 2 and 5) and HHI (column 3 and 6) based on Total Assets. Bank conduct has been measured by PCM. Other variables include, Market Share = Bank's share in Assets; Bank Capitalization = Equity to Total Assets; Bank Size = Log of Total Assets; Bank Overhead = Overhead to Total Assets; Off-Balance Sheet activity= Off-Balance Sheet Items to Total Assets; Loan demand/supply= Total Loan to Total Deposits; Banks' Z-score; Number of Banks; Economic Growth= Real GDP Growth; Stock Market Development= Stock Market Turnover; Ownership Structure= Dummy variable for foreign/domestic Ownership; Inflation=change in CPI; Dummy (merger) = Dummy variable for merged banks; Institutional Characteristics = Financial Freedom and Foreign Ownership; and the Regulatory Framework = Rule of Law, Regulatory Quality, Government Effectiveness and Political Stability. Results have been estimated through application of Two-step System GMM with Windmeijer (2005) corrected standard errors and small sample adjustments. Corrected standard errors are reported in the parenthesis. Significant values of AR (1) indicate that null hypothesis of no autocorrelation among error terms in first difference is rejected. AR (2) is insignificant indicating that error terms in level regressions are not correlated. Values of Sargan/Hansen are insignificant indicating that instruments are valid. Results for AR (1), AR (2) and Sargan/Hansen show that GMM is correctly specified and there are no identification issues. Subscripts \*\*\*, \*\*, \* denote the significance of relationships at 1%, 5% and 10% levels respectively.



**Table 3.8: Mediation Analysis based on Sobel, Aroian and Goodman Tests**

<b>Indirect Relationship between Structure and Performance through Bank Conduct</b>						
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
S-P Coefficients (table 3.5)	0.326*** (0.081)	0.315*** (0.095)	0.298*** (0.102)	0.334** (0.098)	0.325*** (0.108)	0.351** (0.121)
S-P Coefficients (table 3.6)	0.115** (0.057)	0.121** (0.060)	0.108** (0.053)	0.162** (0.079)	0.172* (0.087)	0.157** (0.058)
S-C Coefficients (Table 3.4)	-0.238*** (0.076)	-0.218*** (0.073)	-0.226*** (0.081)	0.171*** (0.052)	0.148*** (0.049)	0.185*** (0.062)
Conduct (Table 3.6 and 3.7)	-0.064*** (0.021)	-0.071*** (0.023)	-0.058*** (0.019)	0.055*** (0.017)	0.052*** (0.018)	0.067*** (0.021)
Sobel Test	2.184** (0.0069)	2.146** (0.0072)	2.077** (0.0071)	2.306** (0.0041)	2.087** (0.0036)	2.179** (0.0056)
Aroian Test	2.129** (0.0071)	2.090** (0.0074)	2.020** (0.0062)	2.253** (0.0041)	2.030** (0.0037)	2.124** (0.0058)
Goodman Test	2.543** (0.0067)	2.206** (0.0070)	2.139** (0.0059)	2.362** (0.0040)	2.150** (0.0035)	2.238** (0.0055)

Note: The Table reports the mediation analysis based on Sobel, Aroian and Goodman tests. First two rows compare the results based on equation 3.2 and 3.3 where the bank performance is regressed on the market structure without consideration of conduct variable and with the conduct variable respectively. The third row represents the estimation results based on equation 3.1 where conduct variable is regressed on measures of market structure. In the fourth row, the coefficients on conduct variables are shown based on equation 3.3 when bank performance is regressed on market structure and the conduct. For the 4<sup>th</sup> row, the conduct variable in columns 1 to 3 is the PRH statistic, while in columns 4 to 6, the conduct variable is the PCM. The coefficients on structure variables (row 3) and the conduct variable (row 4) are used to calculate the z statistics for mediation analysis by Sobel, Aroian and the Goodman tests which are reported in the last three rows. The null hypothesis underlying each test is that there is no indirection relationship. Standard errors are reported in the parenthesis. Subscripts \*\*\*, \*\*, \* denote the significance of relationships at 1%, 5% and 10% levels respectively.

### 3.5.4 Robustness Check

The relationships specified for the validity of the SCP hypothesis are consistently significant across alternative proxies of the market structure, the bank conduct, and the performance. However, additional analyses are performed with six alternative measures of the market structure, i.e., CR5, CR3, and HHI, based on total deposits and total loans<sup>24</sup>. The findings from these analyses are similar to the main results. As additional robustness tests, the analyses are also performed across different sample periods and different bank sizes.

### 3.5.5 The Global Financial Crisis

Although the fluctuations in bank performance and bank conduct have been accounted for by introducing country and time dummies, the study performs the

<sup>24</sup> These results are not reported in the article, to conserve space.

analysis on different sample periods, i.e., pre-financial crisis period (1999-2006), financial crisis period (2007-2009) and post-financial crisis period (2010-2014), as additional robustness checks. The sample has been divided into three groups by (i) insights from earlier studies – i.e. (Moradi-Motlagh & Babacan, 2015; Gulati & Kumar, 2016; Heryán & Tzeremes, 2016) – and (ii) the coefficients on time dummies for the years 2007, 2008 and 2009.<sup>25</sup>

**Table 3.9: SCP Hypothesis and the Global Financial Crisis**

Coefficients/Relationships	Sample 1999-2006		Sample 2007-2009		Sample 2010-2014	
	(1)	(2)	(3)	(4)	(5)	(6)
Structure-Conduct	-0.163** (0.067)	0.125*** (0.041)	-0.112* (0.057)	0.109** (0.053)	-0.289** (0.122)	0.253** (0.106)
S-P (without Conduct)	0.177** (0.086)	0.208** (0.102)	0.126* (0.064)	0.235** (0.115)	-0.329** (0.162)	0.292** (0.141)
S-P(with Conduct)	0.073** (0.056)	0.096* (0.049)	0.057** (0.028)	0.112** (0.053)	-0.136** (0.066)	0.199** (0.096)
Conduct (in S-P Model)	-0.038*** (0.012)	0.046*** (0.015)	-0.032* (0.017)	0.039** (0.015)	-0.042*** (0.011)	0.063*** (0.015)
Sobel Test	2.130** (0.0034)	2.162** (0.0026)	1.359 (0.0026)	1.612 (0.0026)	2.012** (0.0060)	2.075** (0.0076)
Aroian Test	2.075** (0.0035)	2.106** (0.0027)	1.275 (0.0028)	1.544 (0.0027)	1.961* (0.0061)	2.032** (0.0078)
Goodman Test	2.191** (0.0033)	2.222** (0.0025)	1.461 (0.0024)	1.691 (0.0025)	2.064** (0.0058)	2.121** (0.0075)

Note: The table reports the estimation results for the different sample periods, i.e., pre-global financial crisis period (1999-2006), the global financial crisis period (2007-2009) and the post-global financial crisis period. The first row reports the estimation results based on equation 3.1. For the first row, the conduct variables are the PRH statistic (in column 1, 3, and 5) and the PCM (in columns 2, 4, and 6), while the structure variable is CR5. Second and third rows report the estimation results based on equation 3.2 and 3.3 respectively. For the third and fourth row, the performance measure is ROAA, while the structure variables are CR5 (columns 1, 3, and 5) and HHI (columns 2, 4, and 6). The fourth row reports the coefficients on conduct variables from the estimation of equation 3.3. The conduct variables are the PRH statistic (in column 1, 3, and 5) and the PCM (in columns 2, 4, and 6) in the fifth row. The results in each case are estimated through the Two-step System GMM with Windmeijer (2005) corrected standard errors and small sample adjustments. All models have been estimated with control variables, country dummies and time dummies (the coefficients on control and dummy variables are excluded to make the results more presentable). The coefficients on the structure variables (row 1) and the conduct variable (row 5) are used to calculate the z statistics for mediation analysis by Sobel, Aroian and the Goodman tests which are reported in the last three rows. The null hypothesis underlying each test is that there is no indirect relationship. Rejection of null hypothesis thus indicates to the presence of mediation effect. Standard errors are reported in the parenthesis. Subscripts \*\*\*, \*\*, \* denote the significance of relationships at 1%, 5% and 10% levels respectively.

The estimation results for different sample periods and subsequent mediation analysis are reported in Table 3.9.<sup>26</sup> The first row reports the estimation results based on Equation 3.1, the conduct variables are the PRH statistic (column 1, 3, and 5) and the

<sup>25</sup> Although not reported in the Tables for brevity, the coefficients on these years are significantly negative, indicating that the bank performance has been lower during the financial crisis.

<sup>26</sup> The analysis has been performed using all measures of the market structure, the conduct and the performance; however, we only report results from CR5 (assets), to conserve space (results from other measures are qualitatively similar to the overall results).

PCM (columns 2, 4, and 6), while the structure variable is CR5. The coefficients on the market structure are consistently significant for all three samples, implying that the structure-conduct relationship (higher concentration is positively related to anti-competitive conduct) is robust across all sample periods. The second and third rows report the estimation results based on Equations 3.2 and 3.3 respectively, the performance measure is ROAA, while the structure variables are CR5 (columns 1, 3, and 5) and HHI (columns 2, 4, and 6). For each sample period, the coefficients on market structure are significant; however, the magnitude of the coefficients reduces when bank conduct is present in the estimation model. The fourth row reports the coefficients on conduct variables from the estimation of Equation 3.3, and the conduct variables are the PRH statistic (in column 1, 3, and 5) and the PCM (columns 2, 4, and 6). The coefficients on the structure variables (row 1) and the conduct variable (row 4) are used to calculate the z statistics which are reported in the last three rows. In all cases, the null hypotheses under the Sobel, Aroian and Goodman tests are rejected, indicating that the mediation effect is robust for all the sample periods. All models have been estimated with control variables, country dummies, and time dummies.<sup>27</sup>

### **3.5.6 The Bank Size**

The SCP hypothesis suggests that the large banks in a concentrated market are likely to collude and earn monopoly rents (Park & Weber, 2006; Webster, 2011; Mirzaei et al., 2013).<sup>28</sup> The bank size effect has explicitly been captured in the estimation model; however, as an additional robustness check, the analysis is separately performed for large and small size banks. A bank is categorized as a “large” bank if its assets (in a particular year) are on or above the 75<sup>th</sup> percentile of banking assets in a country (in a

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<sup>27</sup> The coefficients on control and dummy variables are excluded to make the results more presentable.

<sup>28</sup> Also see Smirlock et al. (1984), Smirlock (1985) and Berger (1995).

year), whereas a bank whose assets are below the 75<sup>th</sup> percentile is categorized as a “small” bank. Table 3.10 displays the estimation results for the sample of large banks (panel A) and small banks (panel B). The coefficients on market structure are still significant for both the samples when the bank conduct is introduced into the estimation model. Moreover, the null hypothesis of no mediation effect under the Sobel, Aroian and Goodman tests is also rejected for both samples. Accordingly, the implications are that the positive relationship between bank concentration and profitability is partially explained by the anti-competitive conduct of the banks. These findings suggest that the anti-competitive conduct – e.g., monopoly pricing – in the concentrated markets is not specific only to the larger banks. The study also performs a similar analysis based on the banks’ market share (See Table 3.11). These results are qualitatively similar to those for the sample of large and small banks – i.e., anti-competitive conduct in the concentrated markets cannot be attributed only to the banks with a larger market share.

**Table 3.10: SCP Hypothesis and Bank Size**

Coefficients/Relationships	Panel A: Large Banks		Panel B: Small Banks	
	(1)	(2)	(3)	(4)
S-P Relationship without Conduct	0.175** (0.076)	0.193** (0.087)	0.113** (0.049)	0.124** (0.053)
S-P Relationship with Conduct	0.105** (0.045)	0.093** (0.039)	0.087** (0.037)	0.098** (0.044)
Structure-Conduct Relationship	-0.127*** (0.039)	-0.109** (0.046)	-0.068*** (0.019)	-0.079*** (0.023)
Coefficient on Conduct Variable <sup>a</sup>	-0.047*** (0.013)	-0.056*** (0.018)	-0.033*** (0.011)	-0.039*** (0.013)
Sobel Test	2.419** (0.0024)	2.058** (0.0076)	2.299** (0.0097)	2.259** (0.0013)
Aroian Test	2.370** (0.0025)	2.011** (0.0077)	2.248** (0.0099)	2.207** (0.0014)
Goodman Test	2.472** (0.0024)	2.110** (0.0074)	2.353** (0.0095)	2.315** (0.0012)

Note: The table reports the estimation results for the sample of Large Banks (Panel A) and Small Banks (Panel B). A bank is categorized as a “large” bank if its assets (in a particular year) are greater than the average banking assets in a country (in a year). A bank whose assets are equal to or less than the average banking assets is categorized as “small” bank. First and second rows report the estimation results based on equation 3 and four respectively. The performance measures are ROAA (column 1 and 3) and ROAE (column 2 and 4), while the structure variables are CR5 (columns 1 and 3) and HHI (columns 2 and 4) for these two rows. The third row reports the estimation results based on equation 1, the conduct variable is PRH statistic, while the structure variables are CR5 (column 1 and 3) and HHI (column 2 and 4). The fourth row reports the coefficients on conduct variable from the estimation of equation 4 where both market structure and bank conduct has been used as regressors. The results in each case are estimated by Two-step System GMM with Windmeijer (2005) corrected standard errors and small sample adjustments. All models have been estimated with control variables, country dummies and time dummies (the coefficients on control and dummy variables are excluded to make the results more presentable). The coefficients on the structure variables (row 1) and the conduct variable (row 5) are used to calculate the z statistics for mediation analysis by Sobel, Aroian and the Goodman tests which are reported in the last three rows. The null hypothesis underlying each test is that there is no indirect relationship. Rejection of null hypothesis thus indicates

the presence of mediation effect. Corrected standard errors are reported in the parenthesis. Subscripts \*\*\*, \*\*, \* denote the significance of relationships at 1%, 5% and 10% levels respectively. (a): The coefficient on conduct variable when both market structure and bank conduct has been used as regressors.

**Table 3.11: SCP Hypothesis across Different Concentration Levels**

	Panel A: High Market Share		Panel B: Low Market Share	
	(1)	(2)	(3)	(4)
S-P Relationship (without Conduct)	0.225*** (0.108)	0.243*** (0.119)	0.197** (0.093)	0.204** (0.096)
S-P Relationship (with Conduct)	0.126** (0.053)	0.134** (0.061)	0.094** (0.045)	0.101** (0.048)
Structure-Conduct Relationship	-0.216** (0.091)	-0.227** (0.093)	-0.178*** (0.068)	-0.209** (0.074)
Coefficient on Conduct <sup>a</sup>	-0.054*** (0.014)	-0.069*** (0.018)	-0.049** (0.016)	-0.064** (0.022)
Sobel Test	2.021** (0.0057)	2.058** (0.0076)	1.989* (0.0043)	2.071** (0.0064)
Aroian Test	1.973* (0.0059)	2.011** (0.0077)	1.932* (0.0045)	2.014** (0.0066)
Goodman Test	2.072** (0.0056)	2.110** (0.0074)	2.056** (0.0054)	2.134** (0.0062)

Note: The table reports the estimation results for two groups of the sample, i.e., High Market Share (Panel A) and Low Market share (Panel B). The groups are formed by average values on the banks' market share in terms of total assets. The bank located on or above the 75<sup>th</sup> percentile in term of market share in each country are categorized as "high market share" while those located below the 75<sup>th</sup> percentile are categorized as the "low market share." First and second rows report the estimation results based on equation 3 and 4 respectively where, the performance measures are ROAA (column 1 and 3) and ROAE (column 2 and 4), while the structure variables are CR5 (columns 1 and 3) and HHI (columns 2 and 4). The third row reports the estimation results based on equation 1, where, the conduct variable is the PRH, and the structure variables are CR5 (column 1 and 3) and HHI (column 2 and 4). The fourth row reports the coefficients on conduct variables from the estimation of equation 4 where both market structure and bank conduct have been used as regressors. The results in each case are estimated through the Two-step System GMM with Windmeijer (2005) corrected standard errors and small sample adjustments. All models have been estimated with control variables, country dummies and time dummies (the coefficients on control and dummy variables are excluded to make the results more presentable). The coefficients on the structure variables (row 1) and the conduct variable (row 5) are used to calculate the z statistics for mediation analysis on the basis of Sobel, Aroian and the Goodman tests which are reported in the last three rows. The null hypothesis underlying each test is that there is no indirect relationship. Standard errors are reported in the parenthesis. Subscripts \*\*\*, \*\*, \* denote the significance of relationships at 1%, 5% and 10% levels respectively. (a): The coefficient on conduct variable when both market structure and bank conduct has been used as regressors.

On the surface, these findings seem contrary to the premise of the SCP hypothesis, but in some ways, they are related to the existence of the SCP. For instance, Demsetz (1973) argues that if both large and small firms in a concentrated industry earn monopoly rents, then the SCP hypothesis is supported. However, if only larger firms are able to earn monopoly rents, then the SCP hypothesis cannot be supported because smaller firms are receiving no benefits from concentration.<sup>29</sup>

### 3.6 Conclusion

The banking industry in ASEAN has experienced a noticeable shift towards a more concentrated market structure. Moreover, there has also been an increase in banks' profitability and a decrease in cost efficiency. These facts are alarming for antitrust

<sup>29</sup> According to Demsetz (1973), if only larger firms achieve the rents, then the efficient structure hypothesis is supported.

policies if the banks in ASEAN are profitable through monopoly pricing. Such apprehensions are in line with the implications of the SCP hypothesis which suggests that concentration eliminates competition from the market and leads to market inefficiency, i.e., monopoly profits. However, the traditional test of the SCP hypothesis may not be useful for analyzing the situation, owing to the identification issues. This study applies a different approach to test the SCP hypothesis that overcomes the issues with the traditional methodology. Instead of relating market structure directly to the performance, the study introduces the bank conduct as an intermediating variable between market structure and performance. Following Baron and Kenny (1986) for mediation analysis, four conditions are specified for validity of the SCP hypothesis; i) the bank concentration influences the conduct of the banks, ii) the bank conduct significantly affects the performance of the banks, iii) the bank concentration significantly affects the bank performance, and (iv) the impact of the bank concentration on the bank performance reduces with inclusion of the conduct in the estimation model. Additionally, the study employs an alternative procedure laid down in Goodman (1960), Sobel (1982), and MacKinnon et al. (1995) to test the indirect relationship between market structure and bank performance through bank conduct. The study applies two-step System GMM dynamic panel model to commercial banks in ASEAN countries from 1999 to 2014.

The study finds empirical support for all the relationships specified for the validity of the SCP hypothesis. For example, bank concentration leads to anti-competitive conduct by the banks; the anti-competitive conduct leads to higher profitability; the bank concentration is related to higher profitability, and the effect of bank concentration on profitability diminishes when the conduct variable is included in the estimation. These findings are robust across alternative measures of market structure, bank conduct, and different time horizons. Thus, the validity of the SCP hypothesis is supported for the

ASEAN banking industry. Nevertheless, it is important to note that there is a partial mediation from market structure to bank performance through the bank conduct. Accordingly, it is possible that the banks are profitable partially through collusion or monopoly rents. However, the higher profitability cannot be entirely attributed to these factors. Other possible reasons for higher profitability may include bank efficiency and/or product differentiation. An investigation of other possible reasons behind the concentration-profitability relationship can be a good avenue for future research.

The SCP hypothesis implies that the concentration of market share reduces the cost of collusion and promotes tacit/explicit collusion; consequently, all firms can earn monopoly profits. Therefore, the SCP hypothesis proposes a careful analysis of the consolidation activities. The findings of this study suggest that the policymakers need to ensure that the consolidation policy for ASEAN is achieving its purpose, i.e., exploiting the scale efficiency, and not allowing the banks to earn monopoly rents.

## CHAPTER 4: MARKET STRUCTURE AND MONETARY POLICY

### TRANSMISSION (ESSAY 2)\*

#### 4.1 Abstract

The study examines the role of market structure for the transmission of monetary policy through the bank lending channel. The study also considers the extent to which banks' characteristics – i.e., size, capitalization and liquidity – affect the banks' response to monetary policy shocks. The two-step system GMM dynamic panel estimator is applied to bank-level data from five ASEAN countries over the period of 1999-2014. The results suggest that the effect of monetary policy on banks' loans reduces as the level of competition decreases. The weakening/strengthening effect is stronger for highly capitalized, highly liquid and large banks. These findings are robust in relation to alternative measures of monetary policy and different sample periods. The results of this study necessitate policy measures that can counter the adverse effects of changes in banking competition on the effectiveness of monetary policy transmission.

#### 4.2 Introduction

The Asian banking sector has witnessed a significant turnaround in competitive conditions, especially since the Asian financial crisis of 1997-98 and the global financial crisis of 2008-09 (Olivero et al., 2011b). The post-financial crisis era is characterized by deliberate changes in bank market structure such as financial integration, privatization and deregulation, mergers and acquisitions, financial reforms and foreign bank penetration. Furthermore, the investment banks, mutual funds, and insurance companies are now competing with the core business of commercial banks (Yokoi-Arai & Kawana, 2007; Olivero et al., 2011a). The purpose of such deliberate arrangements was to strengthen financial institutions against financial downturns.

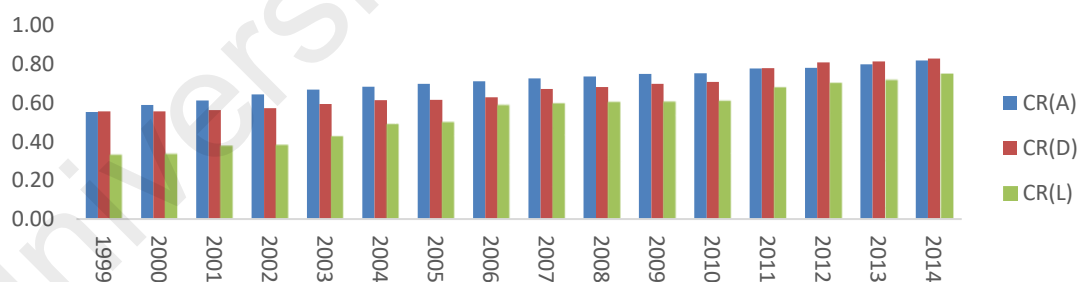
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\* The article is published in "International Review of Economics & Finance" in 2016 with title "Bank Competition and Monetary Policy Transmission through the Bank Lending Channel: Evidence from ASEAN".

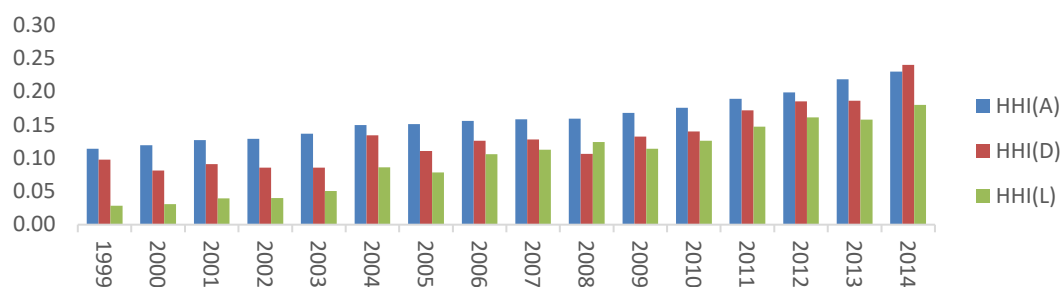


Economies in the Association of South East Asian Nations (ASEAN) are no exceptions, as the banking sector in these countries experienced similar structural changes in the aftermath of the Asian and global financial crises.

Figure 4.1 to 4.3 show the average behavior of different competition measures for the ASEAN banking industry over the period of 1999-2014. The change in competitive conditions is evident from these statistics. For example, five bank concentration ratios based on assets, deposits, and loans increased from 0.55, 0.56 and 0.33 in 1999 to 0.83, 0.84 and 0.74 in 2014 respectively. Similarly, the sum of the squared market share (HHI) in terms of loans, assets, and deposits increased from 0.03, 0.10 and 0.11 in 1999 to 0.19, 0.25 and 0.21 respectively. Both these measures indicate an overall increase in bank concentration (decrease in the level of competition) over this period. Similarly, the increase in the Lerner Index and the Boone Indicator from 0.19 and -0.55 respectively to 0.43 and -0.36 (Figure 4.3) suggests a worsening of competitive conditions (increase in market power).



**Figure 4.1: Five-Bank Concentration Ratio (CR5) based on Total Loans, Total Assets, and Total Deposits**



**Figure 4.2: Herfindahl Hirschman Index (HHI) based on Total Loans, Total Assets, and Total Deposits**



**Figure 4.3: Lerner, Adjusted Lerner and Boone Indicator**

Moreover, the ASEAN banking industry is unique, for two important reasons. First, the governments in these countries are forcing banking organizations into mergers/acquisitions in order to ensure financial stability in the region. Second, the member countries of ASEAN have announced to liberalize the banking market under the Banking Integration Framework (BIF) by 2020. According to a recent report issued by the Asian Development Bank (ADB), the competition in the banking sector may increase as a result of bank integration. At the same time, it may also lead to more consolidations in the domestic banking market in an effort to fortify domestic banks. The move towards a concentrated banking system will ultimately lead to greater monopoly power, which is of special concern to policymakers and academicians because it may affect access to easy credit (due to monopoly pricing), put financial stability at stake (due to excessive risk-taking by banks) and even more importantly, the

concentrated banking system may reduce the effectiveness of monetary policy via the bank lending channel<sup>30</sup>.

Transmission of monetary policy via bank lending is a well-established idea in economics/banking literature. However, the literature related to the role of competition for monetary policy transmission limited in scope and context for two important reasons. First, there is a lack of consensus among researchers concerning competition measures, and second, the role of the banking structure for monetary policy transmission is inconclusive. For example, Adams and Amel (2005) and Olivero et al. (2011b), on the one hand, argue that low competition in banking weakens the lending channel of monetary policy transmission. On the other hand, Gunji et al. (2009), Olivero et al. (2011a), and Amidu and Wolfe (2013) empirically prove that high competition reduces the impact of monetary policy on bank lending.

Much of this controversy can be attributed to the choice of competition measures. For example, under the structure conduct performance paradigm, concentration is negatively related to the level of competition. In this regard, Bikker and Haaf (2002) show that a high level of concentration in banking is likely to reduce competition, and thus a few large (cartel) banks can restrict competition, and a multitude of fringe competitors are unable to engender it. However, Dell'Ariccia (2000) and Northcott (2004) argue that competition can prevail even in highly concentrated markets. Beck, Demirgüç-Kunt, and Levine (2006) also find that both the bank competition and concentration reduce the banking system's fragility and the probability of a banking crisis. Similarly, Olivero et al. (2011b, 2011a), in two separate studies find that concentration and competition both weaken the monetary policy transmission through

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<sup>30</sup>The bank lending channel provides the mechanism by which monetary policy affects the supply of loanable funds. For example, when tightening monetary policy reduces banks' loans and they cannot fully replace the lost funds, they are forced to cut lending.

bank lending. These findings suggest that concentration does not necessarily imply a lower level of competition.

In addition, a frequently used measure of competition, i.e. the Panzar-Rosse (PR) model (Panzar & Rosse, 1987), has been criticized for a number of reasons including its inability to measure the level of competition/market power.<sup>31</sup> The Lerner Index (Lerner, 1934) is yet another measure of market power/level of competition, but it also suffers from weaknesses. The Boone Indicator (Boone, 2008), however, has emerged as a better measure of competition that avoids the major econometric and theoretical drawbacks of the PR model and the Lerner Index. Though some authors favor any competition measure, there is general disagreement among researchers with respect to the best measure. According to Carbó et al. (2009), inferences about the level of competition differ widely, with different indicators of banking market competition being used, and therefore implications of competition depend upon the choice of indicators. Using one measure of market structure can be misleading because each measure captures a unique aspect of competition and has its advantages and disadvantages. Therefore it is more logical to use alternative measures of market structure and compare the findings (Leon, 2014).

This study applies both structural and non-structural measures of competition to examine its role in monetary policy transmission in the context of five ASEAN countries<sup>32</sup>. In doing so, the study also takes into consideration the institutional and regulatory characteristics, such as government effectiveness, the rule of law, political stability, regulatory quality, foreign ownership and financial freedom. The study also observes banks' response to changes in the monetary policy stance based on their

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<sup>31</sup> Please see Leon (2014), page 26-27 for a detailed discussion on the disadvantages of the PR model.

<sup>32</sup> Indonesia, Malaysia, Philippine, Singapore and Thailand.

financial strength, i.e., size, liquidity and capitalization. Moreover, the role of the banking market structure for monetary policy transmission has been analyzed/compared in pre- and post-financial crisis times. This study contributes to the literature in several important ways. First, it compares findings from both structural and non-structural approaches to bank competition. Second, it takes into consideration the regulatory and institutional characteristics that have been ignored in earlier literature. Third, the study also evaluates the extent to which banks' characteristics – such as size, liquidity, and capitalization – affect banks' response to monetary policy shocks. Fourth, it analyses and compares the effect of competition on monetary policy transmission via the lending channel before and after the global financial crisis era. Fifth, it considers the banking industry in the ASEAN region where the literature on the topic is limited, and the few studies that address this topic are also limited in scope. For example, Olivero et al. (2011b, 2011a) include most of the countries from ASEAN in their sample, but their data is limited to a pre-global financial crisis period, 1996-2006. Moreover, they use the five-bank concentration ratio and the Panzar-Rosse model in two separate studies and fail to find evidence on the role of the bank market structure for Asian countries (including countries from the ASEAN region). Similarly, Amidu and Wolfe (2013) include only three countries from ASEAN in their sample and their data is also limited to a pre-global crisis period, 2000-2007. Moreover, they use a single measure of competition (Lerner Index) and do not find significant results for Asia.

This study uses two structural and two non-structural measures to infer the level of bank competition. The structural approach includes the five-bank concentration (CR5) ratio and Herfindahl Hirschman Index (HHI)), while the non-structural approach includes the Boone Indicator (BI) and the Lerner Index (LI). Two-step system GMM dynamic estimator model has been applied to bank-level data from five ASEAN countries from 1999 to 2014. Results show that the choice of competition measures is

indeed important for policy implications regarding the role of competition for monetary policy. With two structural measures, the study finds that the effect of monetary policy on banks' lending reduces as the level of concentration increases (level of competition decreases). Results from the Lerner Index suggest that greater market power/lower competition weakens the effect of monetary policy transmission through the lending channel. However, findings from the Boone Indicator imply that a decrease in the level of competition strengthens the effect of monetary policy on banks' lending. The weakening/strengthening effect of concentration/competition is stronger for highly capitalized, highly liquid and large-sized banks. These findings are robust in relation to alternative measures of monetary policy indicators and different sample periods (i.e., before and after the financial crisis period). Use of alternative competition measures suggests that the implications about the role of competition can be misleading when based on a single measure.

The rest of the chapter is structured as follows. Section 2 discusses the related literature, while Section 3 addresses the methodology and measures of variables. In Section 4 we discuss the results, and finally, section 5 presents the conclusion and implications.

### **4.3 Literature Review**

Most of the existing literature on the role of banks for monetary policy transmission through bank lending focuses on the existence, importance, and potential of the lending channel, and identifying shifts in supply and demand for loans<sup>33</sup>. A few other studies (Atta-Mensah & Dib, 2008; Scharler, 2008; Altunbas et al., 2010; Jeon & Wu, 2014; Brei & Schclarek, 2015; Allen et al., 2017) discuss the banks' response to monetary

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<sup>33</sup> Literature on the existence and importance of the bank lending channel can be found in Bernanke and Blinder (1988, 1992), Bernanke and Gertler (1995), Kashyap and Stein (1995), Kishan and Opiela (2000), Ehrmann et al. (2001), Altunbaş et al. (2002), Ehrmann et al. (2003), Ehrmann and Worms (2004), Brissimis and Delis (2009).

policy shocks with respect to other aspects of banks or the economy, such as banks' ownership structure, foreign banks, banks' risk-taking, stock market response, financial crisis, and financial integration. However, the role of the banking market structure for the transmission of monetary policy has not been explored as the significance of the topic demands. From a theoretical perspective, Aftalion and White (1977) and VanHoose (1983, 1985) are among the pioneers who discuss the impact of credit market competition on the effectiveness of monetary policy transmission. They focus on the appropriate choice of monetary policy targets and instruments and examine the way these choices are affected by the banking market structure. VanHoose (1983) finds that in a competitive banking market, a monetary policy tool (e.g., federal fund rate) becomes ineffective. Baglioni (2007) argues that monetary policy transmission through the loan markets differs depending on the market structure. For example, monetary policy effects are enhanced under monopolistic competition. However, the opposite is true within an oligopoly framework.

From an empirical perspective, Adams and Amel (2005) are the first to study the influence of a local banking market structure on monetary policy transmission using business small loan origination data for US banks from 1996 to 2002. They find that lending channels become weaker as market concentration increases. This study is, however, limited in its scope as it applies only to local banking markets in the USA. In a cross-country study, Gunji et al. (2009) examine banks' response to monetary policy shocks in a competitive market. They derive an indicator of monetary policy from an interest rate equation<sup>34</sup> and use Panzar-Rosse H statistics (PRH) to measure bank competition. They find that competitive markets reduce the effect of monetary shocks

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<sup>34</sup> The monetary policy indicator using this approach has been discussed in the robustness section 4.3.

on banks' lending; their study, however, uses a single measure of market structure, which may be misleading.

In two separate studies, Olivero et al. (2011a, 2011b) explore the impact of the banking market structure (measured by PRH and the concentration ratio respectively) on monetary policy transmission through bank lending channels using bank-level data on a sample of 10 Latin American economies and 10 Asian ones over the period from 1996 to 2006. However, they report contradictory results, with both measures for the same sample of countries. In other words, both high concentration and high competition reduce the response of banks' lending to monetary policy shocks. Their study is, however, limited in scope, as they do not find significant results for Asian countries, including countries from ASEAN. One probable reason for their insignificant findings for Asian countries may be the limited sample they use in their study. For example, they use a sample over the period of 1996-2006, whereas they argue that Asian economies witnessed substantial changes in competitive conditions due to factors such as international financial integration, privatization, deregulation, a wave of mergers and acquisitions that resulted in market concentration and financial reforms in response to the global financial crisis of 2008-2009. Our study, however, uses data from 1999-2014 to cover this period of change in competitive conditions.

A recent study by Amidu and Wolfe (2013) explores the impact of banking competition (measured by the Lerner Index) on monetary policy transmission through the bank lending channel, using data on 978 banks from 55 countries worldwide. They confirm the presence of the lending channel and find that banking market competition weakens the impact of monetary policy shocks on bank lending. Their study is, however, subject to limitation, for they include only three countries from ASEAN in their sample and their data is limited to the pre-global crisis period, i.e., 2000-2007.



Moreover, they use a single measure of competition (Lerner Index) and do not find significant results for Asia. As mentioned, the use of a single competition measure can be problematic, because each measure captures a different aspect of competition and has its advantages and disadvantages. Therefore it is often suggested that a phenomenon should be studied using alternative measures of market structure (Leon, 2014).

Another important aspect of monetary policy transmission is that the banks' characteristics such as size, liquidity, and capitalization also play an important role in their response to monetary shocks. According to Olivero et al. (2011a, 2011b), consolidation in the banking industry can impact the effectiveness of bank lending channels as a transmission mechanism of monetary policy in several ways. First, the banks' size and market share increase as a result of consolidation, and the large banks' lending is not so affected by monetary shocks when compared to small banks. Monetary policy impacts banks of different sizes differently because small banks depend on customers' deposits for loanable funds, so when money policy contracts, these small banks cannot compensate for the decrease in loanable funds through non-deposit funding; hence they have to cut short their loans.<sup>35</sup> Second, concentrated markets normally have larger and potentially strong banks as they take over smaller banks. As a result of this consolidation, the overall banking sector has easy access to sources of loanable funds other than deposits, and thus it is possible for banks to isolate their loan supply from the negative shocks of monetary policy to loanable funds.<sup>36</sup>

Third, some banks in less competitive markets may use their liquidity positions and make liquidity costly for other market participants. High liquidity costs can preclude

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<sup>35</sup> According to Peltzman (1969), small banks have to face higher costs of informational asymmetries in order to finance their lending through unsecured funds.

<sup>36</sup> Such arguments are well supported in Kashyap and Stein (1995, 2000), Favero et al. (1999) and Kishan and Opiela (2000), who find that for small or less capitalized banks, it becomes difficult to obtain funds from capital markets to safeguard their loan portfolios from negative shocks of monetary policy.

banks from isolating a loan supply from the adverse effects of monetary policy on loanable funds. In such cases, consolidation may increase the cost of liquidity for banks in less consolidated markets and can reinforce the bank lending channels. Fourth, large banks in concentrated markets enjoy an information monopoly regarding the creditworthiness of their customers. Thus the switching costs for borrowers are high in highly concentrated markets. The borrowers from small banks with extra demands for loans find it difficult to switch their lenders because small banks are more affected by negative shocks of monetary policy and thus these borrowers are not picked by large banks. Through this process, concentration can translate into a depressing effect of monetary policy on economic activity, thus reinforcing the monetary policy transmission through bank lending channels.

However, the evidence is mixed regarding distributional effects of monetary policy in cross country studies. For example, a study by Altunbaş et al. (2002) shows that the level of capitalization and bank size affect the reaction of banks to changes in monetary policy, whereas Ehrmann et al. (2003) show that only liquidity plays a role in the relationship between bank lending and changes in monetary policy but that capital and bank size do affect this relationship.

To deal with the issues highlighted in the introduction section and literature review, this study applies structural and non-structural measures of competition in order to examine its role in monetary policy transmission through the bank lending channel. The use of structural and non-structural approaches also allows to compare results and see whether the concentration is negatively related to the level of competition as traditionally considered under the structure conduct performance paradigm. The study also examines the banks' response to changes in their monetary policy stance based on their financial strength (size, liquidity, and capitalization). The study also takes into

consideration the institutional and regulatory characteristics, such as government effectiveness, the rule of law, political stability, regulatory quality, foreign ownership and financial freedom. Moreover, the role of the banking market structure for monetary policy transmission is analyzed/compared before and after the financial crisis era.

#### 4.4 Methodology

In order to determine the role of the banking structure for monetary policy transmission, the study follows the approach used by earlier studies [See for example (Gunji et al., 2009; Olivero et al., 2011b, 2011a; Amidu & Wolfe, 2013)]. However, this study uses both structural and non-structural measures of competition. Equation 4.1 has been constructed to relate the banks' lending to market structure, a measure of monetary policy and an interaction term of market structure and monetary policy variables.

$$\begin{aligned}\Delta Loan_{i,j,t} = & \alpha_i + \delta MP_{j,t} + \theta BMS_{j,t} + \phi(BMS * MP)_{j,t} + \gamma_1 Size_{i,j,t} \\ & + \gamma_2 Cap_{i,j,t} + \gamma_3 Liqui_{i,j,t} + \gamma_4 Dep_{i,j,t} + \omega \Delta Loan_{i,j,t-1} \\ & + \beta X_{j,t} + \epsilon_{i,j,t}\end{aligned}\quad (4.1)$$

Where  $i, j$  and  $t$  represent the bank, the country in which bank  $i$  operates and the time respectively.  $\Delta Loan_{i,j,t}$  denotes changes in lending activity for bank  $i$  in country  $j$  at time  $t$ ,  $BMS_{j,t}$  is the measure of the bank market structure for country (market)  $j$  at time  $t$ ,  $MP_{j,t}$  is the measure of monetary policy shock for country (market)  $j$  at time  $t$ . The interaction term of bank market structure and measure of monetary policy ( $BMS * MP$ ) $_{i,j,t}$  captures the marginal effect of market structure on monetary policy transmission through the bank lending channels,  $Size_{i,j,t}$ ,  $Cap_{i,j,t}$ ,  $Liqui_{i,j,t}$  and  $Dep_{i,j,t}$  are bank level characteristics representing size, capital strength, liquidity and deposit growth of bank  $i$  in country  $j$  at time  $t$  respectively,  $X_{j,t}$  represents country level variables such as GDP growth and inflation, and  $\epsilon_{i,j,t}$  is a random error term.

#### 4.4.1 Discussion of Variables

The bank lending channel focuses on monetary policy transmission through banks' lending activity, and therefore this study takes the annual *percentage change in banks' loan volume* as a dependent variable. This measure has been used in almost every study on monetary policy transmission via lending channels. A good indicator of monetary policy is important in conducting this analysis.

Following Olivero et al. (2011a), Olivero et al. (2011b) and Amidu and Wolfe (2013), the change in short-term interest is used as the monetary policy indicator. Short-term interest rate is measured by Treasury Bill (TB) rate and money market rate. Money market rate has been used only for Indonesia for which TB rates are not available. There are some concerns over the use of short-term interest rate as a monetary policy indicator because different countries use different tools for their monetary policy. However, accounting for these differences is not feasible because they change over time and across countries (Olivero et al., 2011a). Thus, to ensure that findings of this study are robust with regard to alternative measures of monetary policy, the study uses an alternative indicator of monetary policy proposed by Gunji et al. (2009).

In order to examine the role played by the market structure in the effectiveness of monetary policy, four different measures of the market structure have been used: the 5-Bank concentration ratio (CR5), Hirschman Herfindahl Index (HHI), Lerner Index and Boone Indicator. Two of these measures (CR5 and HHI) are based on the structural approach from traditional Industrial Organization (IO) literature. With this approach, the level of competition is inferred from the structure of the market (level of concentration). CR5 is measured as the fraction of total assets held by the five largest banks in a country over the total assets of all banks in that country. HHI is defined as the sum of squared market shares based on the assets of all the banks in each country.

The structural approach has been criticized for its inability to measure the true level of competition.<sup>37</sup> The Lerner Index and Boone Indicator are based on the non-structural approach from the New Empirical Industrial Organization (NEIO). NEIO measures aim to assess the level of competition directly from firms' conduct. The Lerner Index directly measures the degree of market power. It is calculated as the ratio of mark up (the difference between output price and marginal cost) to output price, i.e., *Lerner Index* =  $(Price - MC) / Price$ . Where “Price” is the price of the total assets, and “MC” is the marginal cost of producing an additional unit of output. The marginal cost is derived from the translog cost function, as follows:

$$\begin{aligned} \ln Cost_{i,t} = & \beta_0 + \beta_1 \ln Q_{i,t} + \frac{\beta_2}{2} \ln Q_{i,t}^2 + \sum_{k=1}^3 \gamma_{k,t} \ln W_{k,i,t} + \sum_{k=1}^3 \phi_k \ln Q_{i,t} \ln W_{k,i,t} \\ & + \frac{1}{2} \sum_{k=1}^3 \sum_{j=1}^3 \delta_{i,j} \ln W_{k,i,t} \ln W_{j,i,t} + \sum_{k=1}^2 \eta_k trend^k \\ & + \sum_{i=1}^3 \omega_i \ln W_{j,i,t} trend + v \ln Q_{i,t} trend + \varepsilon_i \end{aligned} \quad (4.2)$$

Where  $Cost_{i,t}$  and  $Q_{i,t}$  represent the total cost and output for bank “i” in time “t” respectively, and  $W_1$ ,  $W_2$  and  $W_3$  are the input prices of deposit funds, labor, and capital. The marginal cost is the first derivative of the cost function with respect to the level of output. The marginal cost is given by Equation 4.3 as follow:

$$MC_{i,t} = \frac{Cost_{i,t}}{Q_{i,t}} \left[ \beta_1 + \beta_2 \ln Q_{i,t} + \sum_{k=1}^3 \theta_k \ln W_{k,i,t} + \delta_3 Trend_{i,t} \right] \quad (4.3)$$

Once the marginal cost is estimated, it is used to calculate the Lerner Index for individual banks through the formula  $L = (P - MC) / MC$ . Lerner index ranges from 0 to 1 with higher values indicating more market power and less competitive conditions.

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<sup>37</sup> For a detailed discussion of advantages and disadvantages of structural and non-structural methods, see Leon (2014).

The Boone Indicator (Boone 2008) is based on the notion that in more competitive markets, efficient firms are highly rewarded, and inefficient firms are more harshly punished. The Boone Indicator captures the reallocation of market share from inefficient to efficient firms. Thus the intensity of competition is measured from a profitability equation as follows:

$$\ln \pi_i = \alpha + \beta \ln c_i + \varepsilon_i \quad (4.4)$$

Where  $\pi_i$  is profit and  $c_i$  is the measure of costs. Profits are higher for banks with lower marginal costs ( $\beta < 0$ ). Thus, an increase in competition raises the profits of the more efficient banks relative to less efficient ones. The stronger the effect (i.e. the, larger the  $\beta$  in absolute value), the stronger is the competition (Schaeck & Cihák, 2014). Data on the Lerner Index and Boone Indicator has been compiled from a variety of sources. The main source is the dataset of Clerides, Delis, and Kokas (2015), but as this data covers the period of 1997-2010, the data for the years 1995, 1996 and 2011-2014 is collected from the Economic Research database of the Federal Reserve Bank of St. Louis and the Global Development Indicator Database of the World Bank.

The expected relationship between loan growth and the monetary policy indicator is negative, such that an increase in interest rate suppresses the banks' lending activity. Therefore  $\delta$  in equation 3 is expected to be negative. Banking market structure can either strengthen or weaken the monetary policy transmission via the bank lending mechanism, therefore  $\emptyset$  (coefficient on interaction term) can be positive or negative. Positive (negative) value of  $\emptyset$  would weaken (strengthen) the original relationship between the monetary policy indicator and lending activity.

#### 4.4.2 Control Variables

Almost all the studies focusing on the lending channel of monetary policy transmission argue that bank-level data is helpful in isolating the credit channel from

the interest rate channel of monetary policy transmission. The credit channel view suggests that the response of a bank lending activity to monetary policy changes depends on the banks' characteristics and their financial strength. In order to incorporate this phenomenon into our analysis, the study includes bank size, capitalization, and liquidity. Bank size is one of the measures of the banks' financial strength. It is argued that larger banks can easily isolate loanable funds from monetary policy shock by switching to alternative funding sources (Gunji et al., 2009; Olivero et al., 2011b, 2011a; Amidu & Wolfe, 2013). Size is measured as the natural log of the banks' assets. Liquidity is the other measure of the banks' financial strength and is calculated as the ratio of liquid assets to total assets. Banks with more liquid assets are in a better position to guard their loanable funds against monetary policy shocks. Bank capitalization, calculated as a ratio of equity to total assets, also measures the banks' financial strength. Banks with higher equity capital have access to cheaper sources of finance because they have to pay a lower amount of risk premium. Therefore, they are better able to guard their loan supply against monetary policy shocks. Changes in banks' loans may also be affected by the supply of loanable funds, so to control for this effect, the study follows Gunji et al. (2009) and includes deposit growth in the analysis, calculated as an annual percentage change in banks' deposits. To control for changes in demand for loans and to separate the monetary policy effect on the supply side of the market for loans, the study includes real GDP growth, calculated as an annual percentage change in real GDP. Inflation, along with GDP growth, is also included in order to capture business cycle dynamics.

Following Demirguc-Kunt et al. (2003) and Chan et al. (2015), the study controls for countries' institutional characteristics and regulatory frameworks; in other words, financial freedom, foreign ownership, government effectiveness, rule of law, political stability and regulatory quality, which have the potential to influence banks' activities

including bank lending. *The Financial Freedom* index (obtained from the Heritage Foundation's Index of Economic Freedom) represents the extent to which a country's financial sector is independent of government intervention and control. Higher values of index indicate that banks are enjoying freedom in conducting business, extending loans, and accepting deposits in foreign currencies and that foreign and domestic banks are treated equally. Thus, the banks enjoying more economic freedom are likely to have more lending activities. The *Foreign Ownership/Investment Restrictions* index (obtained from the Fraser Institute's Economic Freedom Dataset) represents the level of foreign-owned businesses in a country with higher values indicating a larger share of foreign ownership. The presence of more foreign-owned businesses is expected to boost the banks' lending activities by mitigating agency problems through more transparent disclosures and better accounting standards. Four indices of governance have been obtained from the World Governance Indicators provided by Kaufmann et al. (2015). First, the *Government Effectiveness* index signifies the quality of public and civil services, absence of political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Second, the *Rule of Law* index represents the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Third, the *Political Stability* index measures the likelihood of political instability and politically-motivated violence, including terrorism. Finally, the index of *Regulatory Quality* captures the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. All the governance indices are presented in units of a standard normal distribution and range from approximately -2.5 to +2.5 with higher values indicating effective governance, better enforcement of laws, political stability and a higher quality of



regulation formation and implementation, which is expected to have a positive influence on banks' lending activities.

#### **4.4.3 Data, Sample and Estimation Method**

The inclusion of bank-level variables may create a problem of endogeneity, which can lead to biased estimates. For example, rapid growth in loans may cause bank assets to increase; similarly, capitalization may change with a change in bank size, and therefore it may not be a good indicator of liquidity constraints. In order to deal with endogeneity concerns the study follows Amidu and Wolfe (2013) and uses the two-step system GMM dynamic panel estimator. The `xtabond2` command (Roodman, 2009) has been used in STATA to implement the estimator with Windmeijer (2005) corrected standard errors small sample and instrument collapse options.

The dynamic panel estimators developed by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) are best for situations where there are panels with small time periods (T) and large cross sections (N); the dependent variable is dynamic (depends on its past values); independent variables are not strictly exogenous (they are correlated with past and possibly current realizations of the error); and there are time-invariant individual fixed effects and heteroscedasticity and autocorrelation within individuals but not across them. The Arellano-Bond estimation starts by transforming all regressors, usually by differencing, and uses the generalized method of moments (GMM), and is called a difference GMM. The system GMM estimator combines the standard set of equations in first-difference with a suitable lagged level as instruments and an additional set of equations in levels with suitably lagged first differences as instruments. Generally, linear difference and system GMM

estimators have one and two-step variants. The two-step variant uses residuals from the one-step estimates and is asymptotically more efficient than the one-step<sup>38</sup>.

The study applies the proposed methodology to commercial banks in five countries (Malaysia, Indonesia, Singapore, Philippines, and Thailand) from the ASEAN region. The Bank Level data is collected from balance sheets and income statements for a period over 1999-2014. The source of data for the bank level variables is Bank-Scope while the country level variables are obtained from the World Bank and IMF databases. According to Bikker (1999) and Punt and Van Rooij (2003), using one type of bank makes the group of observations more homogeneous, thus allowing for better estimates. Following Turk Ariss (2010), the original sample has been filtered by excluding banks with less than three consecutive yearly observations, and banks for which data on the main variables are not available (such as loans, total assets, etc.). Further, the study follows criteria proposed by Arena, Reinhart, and Vazquez (2007) to clean data. This implies deleting outliers from the sample, i.e., observations for which: 1) the growth rate of loans and/or deposits exceeds 300%; 2) the growth rate of assets exceeds 200%, and 3) the volume of loans represents more than 100 times that of deposits.

#### **4.4.4 Descriptive Statistics**

This section provides a brief description of variables, sources, and correlations. Table 4.2 displays the variables used in this study, their definition and their sources. A country-wise descriptive account of variables is presented in Table 4.2. Average values for market structure measures provide a picture of the banking market structure in the sample countries. Singapore has a highly concentrated banking market with an average value of 0.97 and 0.30 for CR5 and HHI respectively. The Boone Indicator (-0.02)

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<sup>38</sup> See Arellano and Bond (1991), Arellano and Bover (1995), Blundell and Bond (1998) and Roodman (2009) for details on dynamic panel estimators.

shows a lower level of competition in Singapore. However, unlike CR5, the Lerner Index (0.16) for Singapore is not the highest in the region, indicating that high concentration may not be related to higher market power. Malaysia stands second in terms of bank concentration, with average values of 0.77 and 0.16 for CR5 and HHI respectively. The value of the Boone Indicator is high (-0.03), indicating a low level of competition, but the Lerner Index (0.32), on the other hand, shows double the value for Malaysia than for Singapore, and this finding again lends support to the idea that concentration may not mean high market power. Indonesia, the Philippines, and Thailand have a similar level of bank concentration with an average value of 0.66 and 0.13 for CR5 and HHI respectively. The average value of the Lerner Index is also similar (around 0.19) for these countries. However, they differ slightly in terms of the Boone Indicator: the Philippines has the lowest average value for the Boone Indicator (-0.07), even among all the sample countries, and this indicates that the Philippines has a more competitive banking industry than all the other countries in the sample. Thailand stands second in terms of Boone value (-0.05), making Thailand second in the competitive banking industry. It is, however, difficult to reach a conclusion about the competitiveness of banking industry based on these measures, because different measures give different inferences about competitive conditions.

Other important variables in the study include loan growth, changes in monetary policy indicators and deposit growth. In term of growth in lending, Indonesia is on top with an average annual loan growth of 23% while Malaysia has the lowest growth in loans (8%). These countries do not differ much in term of deposit growth, which ranges from 13% for Singapore to 18% for the Philippines. The monetary policy indicator has large variations across the sample countries. Malaysia has been the least volatile in term of monetary policy changes, with an average value of 1%, while the Philippines has the highest average value (-17%). Bank capitalization does not differ much across the

region, ranging from 12% for Indonesia and Malaysia to 14% for Thailand. Malaysian banks are more liquid with an average value of 39% while banks in Thailand are least liquid with an average of 13%. The overall economic outlook does not vary much across the countries, with GDP growth ranging from 4% for Thailand to 6% for Singapore and inflation ranging from 2% for Malaysia to 8% for Indonesia.

Table 4.3 reports the correlation among variables. An important concern with respect to correlations among independent variables is that they are not highly correlated, so the problem of multicollinearity does not arise. Except for one value of correlation (0.95), the highest correlation coefficient is 0.34. Therefore it can be safely assumed that there is no issue of multicollinearity among independent variables. The value of 0.95 represents the correlation between alternative measures of concentration (CR5 and HHI) which do not enter the model together. Correlation between loan growth and the monetary policy indicator (variables of interest) is -0.019 and significant at a 5% level. Loan growth is also significantly related to GDP growth and deposit growth. Two non-structural measures of market competitiveness (the Lerner Index and Boone Indicator) are significantly related to banks' lending activity, while the structural measures (CR5 and HHI) do not have a significant correlation with lending activity. However, without controlling for other variables, it is premature to assume that the correlations represent the true relationship. The correlation between structural and non-structural measure is interesting. The two structural measures are highly correlated with each other: the correlation coefficient is equal to 0.95. The non-structural measures are also significantly correlated to each other, but the correlation is not very strong: the correlation coefficient is equal to 0.13. Although not significant, the Boone Indicator is negatively related to both CR5 and HHI, the Lerner Index is also negatively related to CR5, but it is positively related to HHI (again these correlations are not significant). The correlation coefficients between loan growth and indices of financial freedom,

foreign ownership, and governance (government effectiveness, the rule of law, political stability, and regulatory quality) are significant, with positive signs implying that institutional and regulatory characteristics are positively related to banks' lending activities.

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**Table 4.1: Variables and Sources**

Variables	Definition	Source
Loan Growth	Annual percentage change in banks' loans	Bank Scope
CR5	Total assets held by five largest banks of a country to the total assets of all banks in that country.	World Bank
HHI	Sum of squared market shares of all the banks in each country.	Calculation
Lerner Index	The Lerner Index is the ratio of mark up ( the difference between out price and marginal cost) to output price. $Lerner_{i,t} = (Price_{i,t} - MC_{i,t})/Price_{i,t}$ Higher values of Lerner indicate more market power and less competitive conditions.	World Bank
Boone Indicator	The Boone Indicator captures the reallocation of market share from inefficient to efficient firms. The intensity of competition is measured from a profitability equation as follows: $ln\pi_i = \alpha + \beta lnc_i + \varepsilon_i$ The stronger the effect (i.e., the larger the $\beta$ in absolute value), the stronger the competition.	World Bank
Monetary Policy Indicator	Annual percentage change in short-term interest rate (Treasury Bill rate or Money Market rate)	Bank Scope
Size	Natural log of assets	Bank Scope
Capital Strength	Ratio of equity to total assets	Bank Scope
Liquidity	Ratio of liquid assets to total assets	Bank Scope
Deposit Growth	Annual percentage change in banks' deposits	Bank Scope
GDP Growth	Inflation-adjusted growth rate for real GDP	World Bank
Inflation	Inflation based on consumer price index	World Bank
Financial Freedom	Measures the banking system's independence from government control and interference. The index ranges between 0 and 100, higher values indicating a higher level of financial freedom.	Heritage Foundation
Foreign Ownership	Measures the level of foreign-owned businesses in a particular country. The index ranges between 0 and 10, with higher values indicating the presence of a higher share of foreign-owned businesses.	Fraser Institute's
Government Effectiveness	Captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	World Governance Indicators
Rule of Law	Captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	World Governance Indicators
Regulatory Quality	Captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	World Governance Indicators
Political Stability	Measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.	World Governance Indicators

Note: Table shows the variables used in this study along with their definition, the expected relationship with dependent variables and their sources. Column 1 shows the general concept of the variables; Column 2 shows the definition of the variables. Expected relationship with dependent variables is shown in Column 3, while the sources of the data are reported in Column 4

**Table 4.2: Descriptive Statistics**

	Indonesia				Malaysia				Philippine				Singapore				Thailand			
	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD
Loan Growth	-0.13	0.98	0.25	0.28	-0.32	0.59	0.09	0.21	-0.30	0.87	0.17	0.26	-0.16	0.52	0.14	0.17	-0.15	1.03	0.16	0.27
M. Policy Growth	-0.60	0.50	-0.05	0.31	-0.42	0.32	0.01	0.17	-0.87	0.57	-0.18	0.41	-0.68	1.23	0.10	0.62	-0.66	1.13	0.13	0.50
Monetary Policy	0.04	0.26	0.09	0.04	0.02	0.04	0.03	0.00	-0.08	0.08	0.04	0.02	0.00	0.03	0.01	0.01	0.01	0.05	0.02	0.01
Boone Indicator	-0.06	-0.02	-0.03	0.01	-0.05	-0.02	-0.03	0.01	-0.19	0.42	-0.08	0.04	-0.05	-0.01	-0.02	0.01	-0.06	-0.04	-0.05	0.01
Lerner Index	0.04	0.28	0.21	0.05	-0.01	0.56	0.35	0.18	0.02	0.76	0.19	0.13	0.04	0.27	0.17	0.08	-0.50	0.46	0.21	0.23
CR5	0.63	0.83	0.68	0.05	0.49	0.96	0.83	0.11	0.18	0.95	0.71	0.09	1.04	1.07	1.05	0.01	0.69	0.75	0.71	0.01
HHI	0.09	0.18	0.12	0.03	0.06	0.24	0.17	0.04	0.08	0.22	0.14	0.03	0.29	0.48	0.32	0.04	0.11	0.12	0.12	0.00
EQ/TA	-1.39	0.69	0.13	0.13	0.00	0.73	0.13	0.09	-0.06	0.69	0.15	0.09	0.04	0.38	0.14	0.05	-0.02	0.92	0.15	0.14
LQ/TA	0.04	0.98	0.30	0.18	0.09	1.05	0.42	0.25	0.04	9.44	0.32	0.67	0.01	0.83	0.24	0.19	0.00	0.91	0.14	0.10
Ln(TA)	3.39	11.98	7.64	1.77	5.43	13.01	9.05	1.70	0.23	11.38	0.59	1.86	5.44	13.68	10.44	2.32	3.65	12.18	9.45	1.75
Deposit Growth	-0.18	78.84	0.16	0.25	-0.18	0.83	0.14	0.24	-0.16	0.79	0.19	0.24	-0.10	0.70	0.14	0.19	-0.14	0.92	0.15	0.25
Inflation	0.04	0.22	0.09	0.04	0.01	0.05	0.02	0.01	0.03	0.09	0.05	0.02	0.00	0.08	0.03	0.02	-0.01	0.05	0.03	0.02
GDP Growth	0.01	0.06	0.05	0.01	-0.02	0.10	0.05	0.02	0.01	0.09	0.05	0.02	-0.01	0.16	0.06	0.05	-0.02	0.09	0.04	0.03
Financial Freedom	30.0	60.0	37.0	8.75	30.0	60.0	41.25	10.0	30.0	50.0	48.75	5.0	50.0	80.0	65.0	10.3	-0.02	0.85	0.14	0.13
Foreign Ownership	4.83	8.36	6.84	1.12	6.10	7.67	6.98	0.47	5.00	8.44	6.33	1.11	8.33	9.29	8.81	0.28	5.00	7.30	6.41	0.58
Govt. Effectiveness	-0.60	-0.01	-0.31	0.14	0.79	1.25	1.08	0.11	-0.20	0.19	-0.01	0.10	1.85	2.43	2.15	0.15	0.09	0.43	0.28	0.10
Rule of Law	-0.97	-0.35	-0.69	0.15	0.31	0.64	0.50	0.09	-0.60	0.01	-0.45	0.15	1.27	1.89	1.63	0.17	-0.22	0.55	0.03	0.26
Regulatory Quality	-0.78	-0.10	-0.38	0.19	0.31	0.84	0.55	0.12	-0.26	0.34	-0.07	0.15	1.77	2.23	1.92	0.16	0.15	0.49	0.26	0.10
Political Stability	-2.12	-0.37	-1.23	0.58	-0.13	0.55	0.18	0.21	-1.77	-0.30	-1.32	0.43	0.83	1.34	1.15	0.15	-1.43	0.54	-0.75	0.70

Note: Table reports descriptive statistics for each country in the sample. Each column of the table shows average value, standard deviation, minimum value, maximum value for loan growth, monetary policy growth, monetary policy, Boone Indicator, Lerner Index, 5-bank concentration ratio (CR5), Herfindahl-Hirschman Index (HHI), equity to total assets (EQ/TA), liquidity to total assets (LQ/TA), natural log of total assets (Ln(TA)), deposit growth, inflation, GDP growth and indices of financial freedom, foreign ownership, government effectiveness, rule of law, regulatory quality, and political stability. The last row reports a number of observations for each country.

**Table 4.3: Correlation Matrix**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
(1) Loan Growth	1													
(2) M. Policy Growth	-.019*	1												
(3) Boone Indicator	.029*	.001*	1											
(4) Lerner Index	.025*	-.092**	.130**	1										
(5) CR5	-.047	.046**	-.007	-.013	1									
(6) HHI	-.048	.036*	.034	-.035	.950**	1								
(7) EQ/TA	-.002	.018	-.008	.078**	-.051	-.049	1							
(8) LQ/TA	.064*	-.111**	.107**	.066*	.128**	.121**	.082**	1						
(9) Ln(TA)	-.095**	.066*	-.024	.099**	.258**	.218**	-.346**	-.291**	1					
(10) Deposit Growth	.295**	-.040	-.016	.007	-.040	-.040	.048	.110**	-.113**	1				
(11) Inflation	.026	.206**	.024	-.283**	-.263**	-.185**	-.139**	.125**	-.314**	-.023	1			
(12) GDP Growth	.056*	.048	.070**	.108**	-.022	.040	.057**	.028*	-.018	.019**	-.089**	1		
(13) Financial Freedom	.062*	.053*	.077*	.119*	-.024*	-.044*	.063*	.031*	.020**	.021*	.098	.044*	1	
(14) Foreign Ownership	.092*	.079	.116*	.178*	.036*	.066*	.094*	.046**	.030*	.031*	.147*	.066**	.086*	1

Note: Table reports pairwise correlation among loan growth, monetary policy growth, monetary policy, Boone Indicator, Lerner Index, 5-bank concentration ratio (CR5), Herfindahl-Hirschman Index (HHI), equity to total assets (EQ/TA), liquidity to total assets (LQ/TA), natural log of total assets (Ln(TA)), deposit growth, inflation, GDP growth and indices of financial freedom, foreign ownership, government effectiveness, rule of law, regulatory quality, and political stability. “\*\*\*” and “\*\*” indicate the significance of correlations at 1% and 5% respectively.



## 4.5 Empirical Results and Discussion

In this section, the study discusses the results from the estimation of loan growth equation (4.1) using the Two-step System GMM dynamic estimator to encounter possible endogeneity caused by bank characteristics (size, capitalization, etc.). The dependent variable in all specifications is loan growth. The study uses four different measures of market structure in order to capture its role in monetary policy transmission. Table 4.4 reports the results of the estimation. The results from two structural measures (CR5 and HHI) are reported in panel A while panel B reports the results from two non-structural measures (Boone Indicator and Lerner Index). The market structure measures have significant and positive coefficients, indicating that more market power enables banks to increase their loans.<sup>39</sup> The coefficient on the monetary policy indicator is consistently significant and negative, implying the existence of the bank lending channel; in other words, a restricted monetary policy reduces the banks' lending activity. The interaction terms of the monetary policy indicator and the measures of the market structure show significant coefficients. Except for the Boone Indicator, all the coefficients on the interactions terms are positive. The two structural measures (CR5 and HHI) provide complementary evidence that bank concentration undermines the effectiveness of monetary policy through the lending channel. The findings for the structural measure are in agreement with those from Adams and Amel (2005) and Olivero et al. (2011b). The two non-structural measures (Lerner and Boone) provide contradictory results with respect to role competition for monetary policy transmission. For example, results from Lerner imply that market power/lower level of competition undermines the effectiveness of monetary policy. However, findings from the Boone indicator signify that a lower level of competition

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<sup>39</sup> Interpretation of Boone is somewhat tricky and needs a little explanation. Since the larger values of the Boone Indicator (smaller values with negative signs) imply a lower level of competition, the positive coefficient on Boone therefore implies that a low level of competition boosts the loan growth.

strengthens the monetary policy transmission. Different findings from the Boone indicator and other measures (CR5, HHI and Lerner) follow Carbó et al. (2009), who suggest that inferences about the level of competition differ widely using different indicators of competition. Therefore the implications of competition depend upon the choice of indicators. A plausible reason for the different results might be that the Boone indicator is based on the efficient structure (ES) hypothesis (Demsetz, 1973), which suggests that concentrated markets are dominated by efficient firms. From ES perspective, it is possible that efficient banks in less competitive markets reduce their lending in response to a tightening of monetary policy because of efficiency concerns; that is, they reduce the level of lending activity to achieve efficiency. Evidence from Lerner is in contrast to earlier evidence by Gunji et al. (2009), Olivero et al. (2011a) and Amidu and Wolfe (2013); nonetheless, the evidence from Boone is in accordance with these studies.

The coefficients on size, liquidity, and capitalization are significant and negative in all regressions, implying that growth in lending is lower for banks with characteristics such as large size, high capitalization and high liquidity. The coefficient on GDP growth rate is positive and significant, suggesting that loan growth increases in an economy when GDP is growing and the demand for loans is high. These findings are in accordance with previous studies. Deposit growth, which has been included in the analysis to capture the supply side of the lending channel, has a significant and positive coefficient, indicating that banks' lending activity increases when there is an increase in deposits and vice versa. These results are in agreement with Gunji et al. (2009) who also find a positive relationship between deposit growth and lending activity. Lag loan growth is included, following earlier literature, to capture the convergence effect, which is consistently negative, implying that banks experiencing higher growth in the previous year may face slower growth in the subsequent year.

The coefficients on indices of financial freedom, foreign ownership and governance indices (government effectiveness, the rule of law, political stability, and regulatory quality) are significant with positive signs, implying that financial freedom, the presence of foreign investors and stronger regulatory frameworks encourage banks' lending activities. The coefficients on time dummy variables (not shown in the table for brevity) are significant with varying signs. The coefficients for the years 2007, 2008 and 2009 are significant with negative signs, showing that lending activity for banks in ASEAN was lower during the global financial crisis when compared to other years.

In the next step, the study determines the marginal impact of a percentage point change in the monetary policy indicator on the change in the banks' lending at different levels of concentration/competition. Change in banks' lending is calculated by multiplying the coefficient on the interaction terms (between market structure and monetary policy) by the level of competition/concentration and then adding it to the coefficient on the monetary policy indicator:  $\delta + (\emptyset \times \text{Level of Concentration/Competition})$ .

**Table 4.4: Market Structure and Banks' Response to Monetary Policy Shocks**

	Dependent Variable = Annual Percentage Changes in Bank Loans			
	Panel A: Structural Measures		Panel B: Non-Structural Measures	
	CR5	HHI	Boone	Lerner
Market Structure	0.207** (0.094)	0.191** (0.089)	0.058** (0.025)	0.073** (0.031)
%ΔMP	-0.192*** (0.028)	-0.114*** (0.035)	-0.166*** (0.051)	-0.198*** (0.031)
Market Structure*ΔMP	0.146** (0.059)	0.094** (0.041)	-0.126** (0.056)	0.113** (0.049)
Capitalization	-0.083** (0.037)	-0.115** (0.054)	-.093*** (.031)	-0.051* (0.026)
Liquidity	-0.216*** (0.067)	-0.192*** (0.061)	-0.136*** (0.041)	-0.142*** (0.043)
Size	-0.061** (0.027)	-0.057** (0.024)	-0.071** (0.031)	-0.070** (0.029)
Inflation	0.082** (0.037)	0.075** (0.035)	0.063** (0.026)	0.069** (0.031)
GDP Growth	0.256*** (0.079)	0.205*** (0.066)	0.391*** (0.118)	0.412*** (0.121)
Deposit Growth	0.816*** (0.171)	0.823*** (0.222)	0.795*** (0.252)	0.788*** (0.179)
ΔLoan (t-1)	-0.114*** (0.036)	-0.131*** (0.041)	-0.105*** (0.031)	-0.129*** (0.041)
Financial Freedom	0.061** (0.025)	0.027** (0.011)	0.053** (0.022)	0.058*** (0.016)
Foreign Ownership	0.021*** (0.008)	0.025** (0.010)	0.051*** (0.015)	0.043** (0.017)
Rule of Law	0.116*** (0.035)	0.213** (0.088)	0.125** (0.052)	0.185** (0.084)
Regulatory Quality	0.098*** (0.030)	0.180** (0.074)	0.106** (0.044)	0.157** (0.071)
Govt. Effectiveness	0.089*** (0.027)	0.164** (0.068)	0.096** (0.040)	0.142** (0.065)
Political Stability	0.108*** (0.033)	0.198** (0.082)	0.116** (0.048)	0.172** (0.078)
Country Dummy	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes
AR (1) P value	0.001	0.021	0.014	0.007
AR (2) P value	0.172	0.131	0.143	0.167
Sargan/Hansen P value	0.232	0.218	0.233	0.214
Number of Banks	138	138	138	138
Instruments	109	109	109	109

Note: Table reports results of Two-Step System GMM dynamic panel model. The dependent variable in all models is loan growth. Column 2, 3 4 and 5 present results when CR5, HHI, Boone, and Lerner are used as a measure of market structure. ΔMP shows the percentage change in monetary policy indicator. Market Structure\*ΔMP represents the interaction term between alternative market structure measures and monetary policy. Capitalization refers to the capital strength of banks calculated as equity to total assets, liquidity is banks' liquid assets to total assets, size is natural log of total assets, and deposit growth is annual percentage change in banks' deposits. GDP growth is the annual percentage change in real GDP; inflation is the annual percentage change in Consumer Price Index. Financial freedom, foreign ownership, government effectiveness, the rule of law, regulatory quality, and political stability are indices for regulatory framework. Significant values of AR (1) show that null hypothesis of no autocorrelation among error terms in first difference is rejected. AR (2) is significant showing that error terms in level regressions are not correlated. Value of Sargan/Hansen is insignificant, indicating that instruments are valid. Results of AR (1), AR (2) and Sargan/Hansen show that GMM is correctly specified and there are no identification issues. Figures in parentheses are corrected standard errors. "\*\*\*", "\*\*" and "\*" indicate the statistical significance at 1%, 5%, and 10% respectively.

The results of the marginal analysis are reported in Table 4.5 where columns 2, 4, and 6 show the levels of competition/concentration, while Columns 3, 5, 7 and 9 show the percentage change in bank lending in response to a 1% percentage point change in monetary policy stance at different levels of CR5, HHI, Boone Indicator and Lerner Index respectively. The marginal analysis shows that the role of the market structure

under alternative measures differs in its intensity. For example, when bank concentration as measured by CR5 is at its mean, change in banks' lending in response to a monetary shock of 1% reduces to -0.09199 (the original sensitivity is -0.192). As concentration increases to the 75<sup>th</sup> percentile, the sensitivity of loans further reduces to -0.08569. The weakening effect is lower under HHI as compared to CR5, the change in bank lending is -0.10175 at the mean value (original coefficient is -0.114), and the weakening effect gets little stronger when HHI increases to the 75<sup>th</sup> percentile: change in lending is now -0.09967. From this analysis, we imply that a higher level of concentration/lower level of competition weakens the monetary policy transmission through the banks' lending activity. Evidence from Lerner also leads us to the same conclusion. For example, at the mean value of the Lerner Index, the effect of the monetary policy indicator on bank lending is -0.17424 (original sensitivity to monetary policy shock is -0.198) which further decreases to -0.16914 when the Lerner Index rises to the 75<sup>th</sup> percentile. The results under the Boone Indicator imply that a lower level of competition strengthens the monetary policy transmission. The sensitivity of banks' loan growth to monetary policy shock is -0.16106 for the mean value of Boone. However, this sensitivity increases to -0.16300 as the Boone Indicator approaches the 75<sup>th</sup> percentile.

**Table 4.5: Marginal Effects of Monetary Policy Shocks**

Market Structure Value Category	5-Bank Concentration Ratio	Change in Lending (%)	Hirschman Herfindahl Index	Change in Lending (%)	Boone Indicator	Change in Lending (%)	Lerner Index	Change in Lending (%)
Mean Value	0.685019	-0.09199	0.130321	-0.10175	-0.03918	-0.16106	0.210296	-0.17424
25th Percentile	0.606142	-0.1035	0.091196	-0.10543	-0.05259	-0.15937	0.133295	-0.18294
50th Percentile	0.659887	-0.09566	0.110642	-0.1036	-0.03195	-0.16197	0.210984	-0.17416
75th Percentile	0.728131	-0.08569	0.152477	-0.09967	-0.02377	-0.16300	0.255377	-0.16914

Note: Percentage changes in bank lending are calculated as  $(\text{Level of Concentration/Competition} \times \emptyset) + \delta$ , where  $\delta$  is coefficient on monetary policy indicator and  $\emptyset$  is coefficient on interaction term between market structure and monetary policy indicator.

#### **4.5.1 Bank Characteristics and Monetary Policy Transmission**

As discussed in the previous section, banks with individual characteristics such as large size, high capitalization, and high liquidity may respond differently to monetary policy shocks. To examine the role of bank characteristics, the data is divided into two subsamples based on size, liquidity, and capitalization. Categorization is done for each country in each year such that the banks with a value (for size, liquidity, and capitalization) higher than the country median are categorized as large size, high liquidity and high capitalization. The banks with a value at or below median value are categorized as small size, low liquidity, and low capitalization. Then the response of banks' lending to changes in the monetary policy variable is examined in all the samples. The results of this analysis are reported for each characteristic separately in Tables 4.6, 4.7 and 4.8. The coefficients on the monetary policy variable and interaction terms are significant and have expected signs (i.e., the coefficient on the monetary policy indicator is negative, the interaction terms in the case of CR5, HHI and Lerner have positive coefficients while the interaction term in the case of Boone Indicator is negative) for all categories of banks; however, the magnitude of the coefficients differs across these categories.

To isolate and compare the responses of different bank categories to monetary policy shocks at different levels of concentration/concentration, the study examines the marginal impact of monetary policy shocks for each category separately. Table 4.9 reports the results of the marginal analysis with the top two sections comparing high and low capitalization banks, the next two sections high and low liquidity banks, and the final two sections comparing large and small size banks.

The coefficients on monetary policy under the Lerner index is  $-0.118^{40}$  for high capitalization banks and  $-0.292$  for low capitalization ones. When Lerner increases from the 25<sup>th</sup> to 75<sup>th</sup> percentile, the percentage change in high capitalization banks' lending reduces from  $-0.10907$  to  $-0.10089$ , and this represents the weakening effect of 7.5% at the 25<sup>th</sup> percentile and 14.5% at the 75<sup>th</sup> percentile. For low capitalization banks, the percentage change in lending reduces to  $0.27547$ , and  $-0.26033$ , a weakening effect of 5.6% and 10.08% at the 25<sup>th</sup> and 75<sup>th</sup> percentiles respectively. Thus, the weakening effect is noticeably higher for banks with large capitalization. For high and low liquidity banks, the coefficients on monetary policy under the Lerner index are  $-0.141$  and  $-0.208$  respectively. The percentage change in the high liquidity banks' lending reduces to  $0.12474$  and  $-0.10984$  respectively when the Lerner index moves from the 25<sup>th</sup> to 75<sup>th</sup> percentile. The weakening effect in the case of high liquidity banks is thus 11.5% at the 25<sup>th</sup> percentile and 22% at the 75<sup>th</sup> percentile. For low liquidity banks, the percentage change in lending reduces from  $-0.19547$  at the 25<sup>th</sup> percentile to  $-0.18399$  at the 75<sup>th</sup> percentile, and this represents a weakening effect of 6% at the 25<sup>th</sup> percentile and 11.5% at the 75<sup>th</sup> percentile. Similarly, the coefficients on monetary policy for large and small size banks are  $-0.130$  and  $-0.256$  respectively. A change in Lerner from the 25<sup>th</sup> percentile to the 75<sup>th</sup> percentile reduces percentage change in large banks' lending from  $-0.10540$  to  $-0.10012$ , a weakening effect of 18.9% at the 25<sup>th</sup> percentile and 22% at the 75<sup>th</sup> percentile. A similar change in the Lerner index brings a percentage change in small size banks' lending from  $-0.23770$  to  $-0.23378$ , a weakening effect of 7.1% and 8.6% at the 25<sup>th</sup> and 75<sup>th</sup> percentiles respectively.

These findings imply that for each category of banks, a lower level of competition (when measured with CR5, HHI, and Lerner) reduces the effect of monetary policy

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<sup>40</sup> For the sake of brevity, the study reports the analysis from the Lerner index only. However, similar analyses can be performed with other measures of market structure, i.e. CR5, HHI and the Boone Indicator.

shocks on banks' lending. The findings in the case of the Boone Indicator are vice versa. The weakening/strengthening effect is higher for large, highly liquid and highly capitalized banks while this effect is lower for small, low liquid and low capitalized banks. These findings are in line with Adams and Amel (2005), Gunji et al. (2009), Olivero et al. (2011a, 2011b) and Amidu and Wolfe (2013), who show that financially constrained banks cannot switch to alternative sources of funds in response to monetary policy shocks. Consequently, such banks reduce their lending more than those less financially constrained.<sup>41</sup>

#### **4.5.2 Global Financial Crisis and Monetary Policy Transmission**

In the estimation of results, the fluctuations in banks' lending activities in pre and post global financial crisis periods are accounted for by introducing country fixed effects and time fixed effects. However, the study also performs the analysis by splitting the sample into 3 groups: subsample 1999-2006 (pre-financial crisis period), subsample 2007-2009 (financial crisis period) and subsample 2010-2014 (post-financial crisis period). The crisis period is defined based on (i) insights from earlier studies (Ivashina & Scharfstein, 2010; Kwan, 2010; De Haas & Van Horen, 2012) and (ii) coefficients on time dummies for the years 2007, 2008 and 2009. (Though not reported in the Table for brevity, coefficients on these years are significantly negative, indicating that bank lending was lower during the financial crisis).

The average values of key variables during each subsample period are reported in Table 4.10. The average GDP growth during the crisis period is noticeably low, thus indicating the overall adverse effects of the global financial crisis. Loan growth was significantly low during the crisis period as compared to the pre and post financial crisis periods. This is in line with earlier studies on banks' lending during the financial crisis

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<sup>41</sup> It should be noted that Olivero et al. (2011a, 2011b) did not find significant results for Asian countries.



(Ivashina & Scharfstein, 2010; Kwan, 2010; De Haas & Van Horen, 2012). These studies also observed a decline in banks' lending activities at that time. The average values of the monetary policy indicator show a decreasing trend from pre to post-financial crisis periods. This indicates governments' efforts to boost financial activities during and in the post-crisis period. The market structure variables (except for the Boone Indicator) show a decline in concentration/market power during the crisis period and a significant increase in the post-crisis period. The Boone Indicator, however, shows a continuous decline in the level of competition.

Estimation results for the subsamples are reported in Table 4.11. Although the analysis has been performed using all the measures of market structure, the study only report results from CR5 and the Lerner index to conserve space (the results from other measures are qualitatively similar to the overall results). The study uses the same estimation technique (the two-step system GMM) for the sample groups 1999-2006 and 2010-2014, but for the sample period 2007-2009, the Least Square Dummy Variable (LSDV) model is used, due to the problem of small sample size. The coefficients on the monetary policy variable and the interaction terms of the monetary policy and measures of market structure are important ones from this analysis. The monetary policy variable is significant with a negative sign in all sample groups, thereby confirming the existence of the lending channel. This relationship is, however, weak for the financial crisis period. In the pre and post financial crisis periods, the interaction term is significant with a positive sign, but this relationship is weak or insignificant in some cases during the financial crisis. The behavior of other variables in all the sample groups is also similar to the results from the main estimation, except for a few weak and insignificant relationships during the financial crisis period. Thus, even after splitting the sample into pre and post-crisis periods, our findings conform to the main results.

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**Table 4.6: Bank Capitalization and Monetary Policy Shocks**

Dependent variable in all columns is the percentage change in bank loans								
VARIABLES	Panel A: High Capitalization				Panel B: Low Capitalization			
	CR5	HHI	BI	LI	CR5	HHI	BI	LI
Market Structure	0.217** (0.099)	0.201** (0.093)	0.061** (0.026)	0.077*** (0.033)	0.186*** (0.085)	0.172*** (0.080)	0.052*** (0.023)	0.066*** (0.028)
%ΔMP	-0.101*** (0.031)	-0.125*** (0.039)	-0.183*** (0.056)	-0.118*** (0.034)	-0.258*** (0.077)	-0.274*** (0.081)	-0.238*** (0.072)	-0.292*** (0.086)
ΔMP*M. Structure	0.083*** (0.024)	0.108** (0.047)	-0.099** (0.041)	0.067** (0.026)	0.051** (0.023)	0.103** (0.045)	-0.095** (0.040)	0.124** (0.054)
Capitalization	-0.257*** (0.037)	-0.122*** (0.039)	-0.202*** (0.056)	0.088*** (0.028)	-0.125* (0.063)	0.009 (0.071)	0.249*** (0.041)	0.447*** (0.053)
Liquidity	-0.172*** (0.017)	-0.164*** (0.019)	-0.256*** (0.020)	-0.245*** (0.018)	-0.076*** (0.027)	0.004 (0.016)	0.098*** (0.013)	-0.028 (0.024)
Size	-0.019*** (0.005)	-0.013*** (0.004)	-0.020*** (0.004)	-0.011*** (0.005)	-0.011*** (0.002)	-0.004*** (0.001)	-0.006*** (0.002)	-0.006*** (0.001)
Inflation	0.095*** (0.043)	0.087*** (0.040)	0.073*** (0.030)	0.080*** (0.036)	0.097*** (0.044)	0.089*** (0.042)	0.075*** (0.031)	0.082*** (0.037)
GDP Growth	1.473*** (0.194)	2.043*** (0.181)	1.042*** (0.122)	2.140*** (0.195)	1.027*** (0.073)	1.405*** (0.054)	1.183*** (0.103)	1.414*** (0.050)
Deposit Growth	0.219* (0.121)	0.298*** (0.086)	0.824*** (0.109)	0.565*** (0.095)	0.435*** (0.098)	0.237*** (0.058)	0.614*** (0.075)	0.694*** (0.062)
ΔLoan (t-1)	-0.154** (0.064)	-0.230*** (0.022)	-0.123*** (0.025)	-0.328*** (0.077)	-0.099*** (0.032)	-0.193*** (0.054)	-0.134*** (0.033)	-0.228*** (0.074)
Financial Freedom	0.067** (0.028)	0.030** (0.012)	0.058** (0.024)	0.064** (0.018)	0.055** (0.023)	0.024** (0.010)	0.048** (0.020)	0.052** (0.014)
Foreign Ownership	0.023** (0.009)	0.028** (0.011)	0.056*** (0.017)	0.047** (0.019)	0.019** (0.007)	0.023** (0.009)	0.046*** (0.014)	0.039*** (0.015)
Rule of Law	0.128*** (0.039)	0.234** (0.097)	0.138** (0.057)	0.204** (0.092)	0.104*** (0.032)	0.192** (0.079)	0.113** (0.047)	0.167** (0.076)
Regulatory Quality	0.076*** (0.023)	0.138** (0.057)	0.082** (0.034)	0.121** (0.054)	0.061*** (0.019)	0.114** (0.047)	0.067** (0.028)	0.099** (0.045)
Govt. Effectiveness	0.076*** (0.023)	0.138** (0.057)	0.082** (0.034)	0.121** (0.054)	0.061*** (0.019)	0.114** (0.047)	0.067** (0.028)	0.099** (0.045)
Political Stability	0.114*** (0.035)	0.208** (0.086)	0.123** (0.051)	0.182** (0.082)	0.093*** (0.028)	0.171** (0.070)	0.101** (0.042)	0.149** (0.068)
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR (1) P value	0.001	0.007	0.003	0.001	0.003	0.003	0.001	0.040
AR (2) P value	0.361	0.375	0.312	0.340	0.368	0.393	0.440	0.393
Sargan/Hensen	0.146	0.176	0.189	0.195	0.178	0.197	0.190	0.179
Banks	76	76	76	76	62	62	62	62
Instruments	61	61	61	61	53	53	53	53

Note: Table reports results of Two-Step System GMM dynamic panel model for two groups of banks (large and small capitalization). Panel A reports the results for banks with large capitalization; results for banks with small capitalization are reported in panel B. A bank is categorized as large if its ratio of equity to total assets is higher than median value; banks that lie on or below the median are categorized as small banks. The dependent variable in all models is loan growth. Columns 2 to 9 present results when CR5, HHI, Boone, and Lerner are used as measures of market structure. ΔMP shows change in monetary policy indicator. Market Structure\*ΔMP represents the interaction term between alternative market structure measures and monetary policy. Capitalization refers to capital strength of banks calculated as equity to total assets, liquidity is banks' liquid assets to total assets, size is natural log of total assets, and deposit growth is annual percentage change in banks' deposits. GDP growth is the annual percentage change in real GDP; inflation is the annual percentage change in Consumer Price Index. Financial freedom, foreign ownership, government effectiveness, the rule of law, regulatory quality, and political stability are indices for regulatory framework. Significant values of AR (1) show that null hypothesis of no autocorrelation among error terms in first difference is rejected. AR (2) is significant, showing that error terms in level regressions are not correlated. Value of Sargan/Hensen is insignificant, indicating that instruments are valid. Results for AR (1), AR (2) and Sargan/Hensen show that GMM is correctly specified and there are no identification issues. Figures in parentheses are corrected standard errors. "\*\*\*\*" and "\*\*\*" indicate the statistical significance at 1%, 5%, and 10% respectively.

**Table 4.7: Bank Liquidity and Monetary Policy Shocks**

Variables	Dependent variable in all columns is the percentage change in bank loans							
	Panel A: High Liquidity				Panel B: Low Liquidity			
	CR5	HHI	BI	LI	CR5	HHI	BI	LI
Market Structure	0.282** (0.129)	0.261** (0.121)	0.079** (0.034)	0.112*** (0.043)	0.242** (0.111)	0.224** (0.104)	0.068** (0.030)	0.086** (0.036)
%ΔMP	-0.131*** (0.040)	-0.163*** (0.051)	-0.158** (0.073)	-0.141*** (0.044)	-0.198*** (0.039)	-0.216*** (0.049)	-0.233*** (0.072)	-0.208*** (0.043)
ΔMP*M. Structure	0.104** (0.051)	0.131*** (0.046)	-0.125** (0.045)	0.122*** (0.026)	0.103** (0.041)	0.072** (0.031)	-0.097** (0.045)	0.094*** (0.024)
Capitalization	-0.392*** (0.026)	-0.288*** (0.024)	-0.240*** (0.020)	0.008 (0.019)	0.463*** (0.045)	0.417*** (0.036)	0.413*** (0.054)	0.485*** (0.041)
Liquidity	-0.376*** (0.020)	-0.275*** (0.013)	-0.211*** (0.018)	-0.336*** (0.016)	-0.050 (0.086)	0.206*** (0.025)	0.092** (0.045)	-0.026 (0.030)
Size	-0.057*** (0.012)	-0.036*** (0.011)	-0.049*** (0.013)	-0.035*** (0.009)	-0.013*** (0.005)	-0.020*** (0.006)	-0.005* (0.003)	0.010*** (0.003)
Inflation	0.101*** (0.045)	0.092*** (0.043)	0.077*** (0.032)	0.084*** (0.038)	0.103*** (0.047)	0.094*** (0.044)	0.079*** (0.033)	0.087*** (0.039)
GDP Growth	1.019*** (0.074)	1.241*** (0.083)	0.360*** (0.077)	0.509*** (0.059)	1.242 (0.096)	1.259 (0.043)	1.453 (0.068)	1.205*** (0.071)
Deposit Growth	-0.433*** (0.083)	-0.274*** (0.071)	1.044*** (0.123)	0.571*** (0.049)	0.001 (0.053)	-0.047 (0.053)	0.026 (0.060)	0.239*** (0.054)
ΔLoan (t-1)	-0.201** (0.077)	-0.299*** (0.079)	-0.199** (0.087)	-0.426*** (0.035)	-0.129*** (0.042)	-0.251*** (0.018)	-0.174*** (0.017)	-0.296*** (0.108)
Financial Freedom	0.058** (0.024)	0.026*** (0.010)	0.050** (0.021)	0.056** (0.016)	0.048** (0.020)	0.021** (0.009)	0.042** (0.017)	0.045** (0.012)
Foreign Ownership	0.020** (0.008)	0.024** (0.010)	0.049*** (0.015)	0.041** (0.017)	0.017** (0.006)	0.020** (0.008)	0.040*** (0.012)	0.034*** (0.013)
Rule of Law	0.096*** (0.030)	0.179** (0.074)	0.105** (0.044)	0.155** (0.071)	0.119*** (0.036)	0.218** (0.090)	0.128** (0.054)	0.189** (0.086)
Regulatory Quality	0.084*** (0.026)	0.155** (0.064)	0.091** (0.038)	0.135** (0.061)	0.103*** (0.032)	0.190** (0.078)	0.112** (0.047)	0.165** (0.074)
Govt. Effectiveness	0.103*** (0.032)	0.191** (0.079)	0.112** (0.047)	0.166** (0.076)	0.127*** (0.039)	0.234** (0.096)	0.137** (0.057)	0.203** (0.092)
Political Stability	0.116*** (0.036)	0.216** (0.089)	0.127** (0.053)	0.188** (0.085)	0.144*** (0.044)	0.264** (0.109)	0.155** (0.065)	0.229** (0.104)
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR (1) P value	0.006	0.012	0.021	0.009	0.018	0.011	0.013	0.026
AR (2) P value	0.409	0.443	0.449	0.430	0.437	0.433	0.459	0.468
Sargan/Hensen	0.178	0.138	0.186	0.140	0.177	0.163	0.168	0.162
Banks	80	80	80	80	58	58	58	58
Instruments	77	77	77	77	49	49	49	49

Note: Table reports results of Two-Step System GMM dynamic panel model for two group of banks (high and low liquidity). Panel A reports the results for banks with high liquidity; results for banks with low liquidity are reported in panel B. A bank is categorized as having high liquidity if its ratio of liquid assets to total assets is higher than the median value; banks that lie on or below median are categorized as the ones with lower liquidity. The dependent variable in all models is loan growth. Columns 2 to 9 present results when CR5, HHI, Boone, and Lerner are used as a measure of market structure. ΔMP shows change in monetary policy indicator. Capitalization refers to the capital strength of banks calculated as equity to total assets, liquidity is banks' liquid assets to total assets, size is natural log of total assets, and deposit growth is annual percentage change in banks' deposits. GDP growth is the annual percentage change in real GDP; inflation is the annual percentage change in Consumer Price Index. Financial freedom, foreign ownership, government effectiveness, the rule of law, regulatory quality, and political stability are indices for regulatory framework. Figures in parentheses are corrected standard errors. Significant values of AR (1) show that null hypothesis of no autocorrelation among error terms in first difference is rejected. AR (2) is significant, showing that error terms in level regressions are not correlated. Value of Sargan/Hensen is insignificant, indicating that instruments are valid. Results for AR (1), AR (2) and Sargan/Hensen show that GMM is correctly specified and there are no identification issues. Figures in parentheses are corrected standard errors. \*\*\*, \*\*, and \* indicate the statistical significance at 1%, 5%, and 10% respectively.

**Table 4.8: Banks Size and Monetary Policy Shocks**

Variables	Dependent variable in all columns is the percentage change in banks' loans							
	Panel A: Large Size				Panel B: Small Size			
	CR5	HHI	BI	LI	CR5	HHI	BI	LI
Market Structure	0.262** (0.120)	0.243** (0.113)	0.073** (0.032)	0.093** (0.040)	0.225** (0.103)	0.208** (0.097)	0.063** (0.028)	0.080** (0.033)
%ΔMP	-0.122*** (0.037)	-0.152*** (0.047)	-0.221*** (0.068)	-0.130*** (0.041)	-0.208*** (0.036)	-0.239*** (0.046)	-0.217*** (0.066)	-0.256*** (0.040)
ΔMP*M. Structure	0.106** (0.047)	0.142** (0.059)	-0.107** (0.045)	0.117*** (0.024)	0.096** (0.038)	0.067** (0.031)	-0.090*** (0.042)	0.087*** (0.022)
Capitalization	-0.365*** (0.124)	-0.268** (0.122)	-0.223*** (0.059)	0.007 (0.018)	0.431*** (0.142)	0.388*** (0.133)	0.384*** (0.105)	0.451*** (0.138)
Liquidity	-0.350*** (0.019)	-0.256*** (0.012)	-0.196*** (0.017)	-0.312*** (0.015)	-0.047 (0.080)	0.192*** (0.023)	0.086** (0.042)	-0.024 (0.028)
Size	-0.053*** (0.019)	-0.033*** (0.012)	-0.046*** (0.013)	-0.033*** (0.011)	-0.012*** (0.004)	-0.019*** (0.006)	-0.005* (0.003)	0.009*** (0.003)
Inflation	0.104** (0.047)	0.095** (0.045)	0.080** (0.033)	0.088** (0.039)	0.107** (0.048)	0.098** (0.046)	0.082** (0.034)	0.090** (0.041)
GDP Growth	0.948** (0.069)	1.154** (0.077)	0.335** (0.072)	0.473** (0.055)	1.155** (0.089)	1.171** (0.040)	1.351** (0.063)	1.121** (0.066)
Deposit Growth	-0.403*** (0.077)	-0.255*** (0.066)	0.971*** (0.114)	0.531*** (0.046)	0.001 (0.049)	-0.044 (0.049)	0.024 (0.056)	0.222*** (0.050)
ΔLoan (t-1)	-0.187** (0.073)	-0.278*** (0.057)	-0.181** (0.081)	-0.396*** (0.133)	-0.120*** (0.039)	-0.233*** (0.067)	-0.162*** (0.046)	-0.275*** (0.087)
Financial Freedom	0.070** (0.029)	0.031** (0.012)	0.060** (0.025)	0.067*** (0.019)	0.058** (0.024)	0.025** (0.011)	0.050** (0.020)	0.054*** (0.014)
Foreign Ownership	0.024** (0.010)	0.029** (0.012)	0.059*** (0.018)	0.049** (0.020)	0.020*** (0.007)	0.024** (0.010)	0.048*** (0.014)	0.041** (0.016)
Rule of Law	0.097*** (0.030)	0.118** (0.050)	0.105** (0.044)	0.074** (0.031)	0.079*** (0.025)	0.147** (0.061)	0.086** (0.036)	0.127*** (0.058)
Regulatory Quality	0.110*** (0.034)	0.133** (0.057)	0.119** (0.049)	0.084** (0.035)	0.089*** (0.028)	0.166** (0.068)	0.097** (0.040)	0.144*** (0.065)
Govt. Effectiveness	0.118*** (0.036)	0.143** (0.061)	0.128** (0.053)	0.091** (0.037)	0.096*** (0.030)	0.179** (0.074)	0.105** (0.044)	0.155*** (0.070)
Political Stability	0.133*** (0.041)	0.161** (0.069)	0.144** (0.060)	0.102** (0.042)	0.108*** (0.034)	0.201** (0.083)	0.118** (0.049)	0.174*** (0.079)
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR (1) P value	0.011	0.013	0.026	0.026	0.010	0.019	0.022	0.015
AR (2) P value	0.453	0.364	0.280	0.202	0.274	0.251	0.232	0.273
Sargan/Hensen	0.197	0.193	0.179	0.192	0.174	0.108	0.198	0.117
Banks	78	78	78	78	60	60	60	60
Instruments	69	69	69	69	47	47	47	47

Note: Table reports results of Two-Step System GMM dynamic panel model for two groups of banks (Large and Small). Panel A reports the results for large banks, while the results for small banks are reported in panel B. A bank is categorized as large if its total assets are higher than the median value; banks that lie on or below the median are categorized as small banks. The dependent variable in all models is loan growth. Columns 2 to 9 present results when CR5, HHI, Boone, and Lerner are used as a measure of market structure. ΔMP shows change in monetary policy indicator. Market Structure\*ΔMP represents the interaction term between alternative market structure measures and monetary policy. Capitalization refers to the capital strength of banks calculated as equity to total assets, liquidity is banks' liquid assets to total assets, size is natural log of total assets, and deposit growth is annual percentage change in banks' deposits. GDP growth is the annual percentage change in real GDP; inflation is the annual percentage change in Consumer Price Index. Financial freedom, foreign ownership, government effectiveness, the rule of law, regulatory quality, and political stability are indices for regulatory framework. Figures in parentheses are corrected standard errors. Significant values of AR (1) show that null hypothesis of no autocorrelation among error terms in first difference is rejected. AR (2) is significant, showing that error terms in level regressions are not correlated. Value of Sargan/Hensen is insignificant, indicating that instruments are valid. Results for AR (1), AR (2) and Sargan/Hensen show that GMM is correctly specified and there are no identification issues. Figures in parentheses are corrected standard errors. "\*\*\*\*", "\*\*\*\*" and "\*\*\*\*" indicate the statistical significance at 1%, 5%, and 10% respectively.

**Table 4.9: Bank Characteristics and Marginal Effects of Monetary Policy Shocks**

Market Structure Value Category	5-Bank Concentration Ratio	Change in Lending (%)	Hirschman Herfindahl Index	Change In Lending (%)	Boone Indicator	Change in Lending (%)	Lerner Index	Change in Lending (%)
<b><u>High Capitalization</u></b>								
Average	0.685019	-0.04414	0.130321	-0.11093	-0.03918	-0.13912	0.210296	-0.10391
25th Percentile	0.606142	-0.05069	0.091196	-0.11515	-0.05259	-0.13779	0.133295	-0.10907
50th Percentile	0.659887	-0.04623	0.110642	-0.11305	-0.03195	-0.13984	0.210984	-0.10386
75th Percentile	0.728131	-0.04057	0.152477	-0.10853	-0.02377	-0.14065	0.255377	-0.10089
<b><u>Low Capitalization</u></b>								
Average	0.685019	-0.22306	0.130321	-0.26058	-0.03918	-0.23428	0.210296	-0.26592
25th Percentile	0.606142	-0.22709	0.091196	-0.26461	-0.05259	-0.23300	0.133295	-0.27547
50th Percentile	0.659887	-0.22435	0.110642	-0.26260	-0.03195	-0.23496	0.210984	-0.26584
75th Percentile	0.728131	-0.22087	0.152477	-0.25829	-0.02377	-0.23574	0.255377	-0.26033
<b><u>High Liquidity</u></b>								
Average	0.685019	-0.05976	0.130321	-0.14593	-0.03918	-0.15310	0.210296	-0.11534
25th Percentile	0.606142	-0.06796	0.091196	-0.15105	-0.05259	-0.15143	0.133295	-0.12474
50th Percentile	0.659887	-0.06237	0.110642	-0.14851	-0.03195	-0.15401	0.210984	-0.11526
75th Percentile	0.728131	-0.05527	0.152477	-0.14303	-0.02377	-0.15503	0.255377	-0.10984
<b><u>Low Liquidity</u></b>								
Average	0.685019	-0.12744	0.130321	-0.20662	-0.03918	-0.22920	0.210296	-0.18823
25th Percentile	0.606142	-0.13557	0.091196	-0.20943	-0.05259	-0.22790	0.133295	-0.19547
50th Percentile	0.659887	-0.13003	0.110642	-0.20803	-0.03195	-0.22990	0.210984	-0.18817
75th Percentile	0.728131	-0.12300	0.152477	-0.20502	-0.02377	-0.23069	0.255377	-0.18399
<b><u>Large Size</u></b>								
Average	0.685019	-0.04939	0.130321	-0.13349	-0.03918	-0.21681	0.210296	-0.10540
25th Percentile	0.606142	-0.05775	0.091196	-0.13905	-0.05259	-0.21537	0.133295	-0.11440
50th Percentile	0.659887	-0.05205	0.110642	-0.13629	-0.03195	-0.21758	0.210984	-0.10531
75th Percentile	0.728131	-0.04482	0.152477	-0.13035	-0.02377	-0.21846	0.255377	-0.10012
<b><u>Small Size</u></b>								
Average	0.685019	-0.14224	0.130321	-0.23027	-0.03918	-0.21347	0.210296	-0.23770
25th Percentile	0.606142	-0.14981	0.091196	-0.23289	-0.05259	-0.21227	0.133295	-0.24440
50th Percentile	0.659887	-0.14465	0.110642	-0.23159	-0.03195	-0.21412	0.210984	-0.23764
75th Percentile	0.728131	-0.13810	0.152477	-0.22878	-0.02377	-0.21486	0.255377	-0.23378

Note: Percentage changes in bank lending are calculated as  $(\text{Level of Concentration/Competition} \times \emptyset) + \delta$ , where  $\delta$  is coefficient on monetary policy indicator and  $\emptyset$  is coefficient on interaction term between market structure and monetary policy indicator.

**Table 4.10: Average Values of Variables in Subsamples**

Variables	Subsample 1999-2006	Subsample 2007-2009	Subsample 2010-2014
Loan Growth	0.231497	0.174541	0.27178
Monetary Policy Indicator	0.066688	0.048752	0.03438
Boone Indicator	-0.04623	-0.03511	-0.02479
Lerner Index	0.162483	0.142525	0.288376
CR	0.696305	0.679758	0.73716
HHI	0.126377	0.094198	0.148214
GDP Growth	0.050508	0.031299	0.061367

Note: Table shows the average values of bank lending, monetary policy and market structure indicators for three subsamples. Subsample 2007-2009 represents the global crisis period.

**Table 4.11: Global Financial Crisis and Monetary Policy Shocks**

Dependent variable: percentage change in bank loans						
	Subsample 1999-2006		Subsample 2007-2009		Subsample 2010-2014	
	CR5	Lerner	CR5	Lerner	CR5	Lerner
Market Structure	0.087** (0.041)	0.080** (0.037)	0.024* (0.013)	0.031* (0.017)	0.154** (0.063)	0.143** (0.066)
%ΔMP	-0.040** (0.017)	-0.050** (0.019)	-0.073* (0.042)	-0.047* (0.026)	-0.082** (0.034)	-0.119*** (0.032)
ΔMP*M. Structure	0.033** (0.014)	0.043** (0.019)	0.040* (0.022)	0.027 (0.014)	0.042** (0.019)	0.085** (0.037)
Capitalization	-0.103*** (0.015)	-0.049*** (0.016)	-0.031* (0.017)	0.035 (0.025)	-0.104** (0.051)	0.007 (0.059)
Liquidity	-0.069** (0.027)	-0.066** (0.029)	-0.102* (0.058)	-0.098* (0.053)	-0.063*** (0.022)	0.003 (0.013)
Size	-0.018* (0.010)	-0.015** (0.007)	-0.012** (0.005)	-0.014* (0.006)	-0.019** (0.008)	-0.013** (0.005)
Inflation	0.038*** (0.017)	0.035*** (0.016)	0.029** (0.013)	0.032** (0.015)	0.081*** (0.037)	0.074*** (0.035)
GDP Growth	0.589*** (0.078)	0.817*** (0.072)	0.417** (0.017)	0.856* (0.451)	0.852*** (0.061)	1.166** (0.045)
Deposit Growth	0.088** (0.037)	0.119*** (0.034)	0.330** (0.137)	0.226* (0.117)	0.361** (0.081)	0.197** (0.048)
ΔLoan (t-1)	-0.062** (0.026)	-0.092** (0.039)	-0.049** (0.024)	-0.131** (0.059)	-0.082** (0.034)	-0.160** (0.073)
Financial Freedom	0.027** (0.011)	0.012** (0.005)	0.023 (0.017)	0.026* (0.014)	0.046** (0.019)	0.020** (0.008)
Foreign Ownership	0.009** (0.004)	0.011** (0.005)	0.022* (0.012)	0.019** (0.008)	0.016** (0.007)	0.019** (0.009)
Rule of Law	0.020*** (0.006)	0.037** (0.015)	0.022 (0.019)	0.032* (0.017)	0.034** (0.013)	0.063** (0.026)
Regulatory Quality	0.022** (0.009)	0.040** (0.017)	0.024** (0.010)	0.035** (0.016)	0.037** (0.017)	0.069** (0.031)
Govt. Effectiveness	0.025** (0.011)	0.046** (0.019)	0.027** (0.011)	0.040** (0.018)	0.042** (0.020)	0.078** (0.032)
Political Stability	0.024** (0.010)	0.059** (0.024)	0.035** (0.014)	0.052** (0.023)	0.055** (0.027)	0.071** (0.032)
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes	Yes	Yes
AR (1) P value	0.023	0.018	-	-	0.027	0.014
AR (2) P value	0.161	0.175	-	-	0.168	0.193
Sargan/Hensen	0.146	0.176	-	-	0.178	0.179
Banks	101	101	113	113	138	138
Instruments	89	89	-	-	112	112

Note: Table reports estimation results for different sample periods. Two-Step System GMM dynamic panel model is applied for pre and post-crisis period samples while Least Square Dummy Variable (LSDV) technique is applied to data period during the financial crisis. Panel A, B, and C report the results for Subsample 1999-2006, Subsample 2007-2009 and Subsample 2010-2014 respectively. The dependent variable in all models is loan growth. Columns 2 to 7 present results when CR5 and Lerner are used as measures of market structure. ΔMP shows change in monetary policy indicator. CR5\*Market Structure represents the interaction terms to capture the marginal effect of a change in monetary policy indicator. Capitalization refers to the capital strength of banks calculated as equity to total assets, liquidity is banks' liquid assets to total assets, size is natural log of total assets, and deposit growth is annual percentage change in banks' deposits. GDP growth is the annual percentage change in real GDP; inflation is the annual percentage change in Consumer Price Index. Financial freedom, foreign ownership, government effectiveness, the rule of law, regulatory quality, and political stability are indices for regulatory framework. Figures in parentheses are corrected standard errors. Significant values of AR (1) show that null hypothesis of no autocorrelation among error terms in first difference is rejected. AR (2) is significant, showing that error terms in level regressions are not correlated. Value of Sargan/Hensen is insignificant indicating that instruments are valid. Results for AR (1), AR (2) and Sargan/Hensen show that GMM is correctly specified and there are no identification issues. Figures in parentheses are corrected standard errors. "\*\*\*", "\*\*" and "\*" indicate the statistical significance at 1%, 5%, and 10% respectively.

#### 4.5.3 Robustness Test

The monetary policy indicator we used in the main analysis (Treasury Bill rate and Money Market rate) has been criticized for its limitations. For example, the interest rates are measured by other macroeconomic variables. Therefore monetary policy effects are overestimated if short-term interest rates are used. Moreover, different countries use different monetary policy tools (Olivero et al., 2011b, 2011a).

For the robustness of the results under alternative indicators of monetary policy, we follow Gunji et al. (2009) and Olivero et al. (2011a) to develop the vector autoregressive (VAR) model on short-term interest rate (R), bank lending (L), monetary base (M), price level (P), GDP and exchange rate depreciation (X) at country level. For optimal lags to be used in the VAR model, the study uses the likelihood ratio test, Akaike information criterion (AIC), Schwartz's Bayesian information criterion (SBIC), the Hannan Quinn information criterion (HQIC), and the final prediction error (FPE)<sup>42</sup>. Quarterly data on variables for the VAR model has been extracted from International Financial Statistics from 1999 to 2014.<sup>43</sup> To derive the monetary policy indicator the uses the residuals of interest rate equation. Since the study uses annual data for our analysis, the residuals for the four quarters in each year are added to obtain the annualized monetary policy indicator. Since the interest rate changes caused only by exogenous shocks are obtained under this approach, it gives a more appropriate measure of monetary policy shocks. This approach gives a more accurate measure of monetary policy, and is one that has been used to identify the monetary policy variable in

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<sup>42</sup> Model is run at a level using 4 lags as indicated by selection criteria that are the same as in Olivero et al. (2011a)

<sup>43</sup> For Singapore and the Philippines, data over the period 2004-2014 is used.



previous studies [see for example (Sims, 1992; Bernanke & Mihov, 1998; Kim, 1999; Gunji et al., 2009; Olivero et al., 2011a)]<sup>44</sup>.

Results under alternative measures of the monetary policy indicator are reported in Table 4.12. The coefficients on the monetary policy indicator are significant and negative under each market structure measure. The coefficients on interaction terms of the monetary policy indicator and three of the alternative measures of market structure (CR5, HHI, and Lerner index) are significant, with positive signs indicating that a high concentration/low competition reduces the effectiveness of monetary policy transmission through the bank lending channel. The coefficient on the interaction term between monetary policy and the Boone Indicator is negative, implying that a low level of competition can enhance the effectiveness of the monetary policy. These findings are consistent with earlier findings from the main estimation results. The results from the marginal analysis are reported in Table 4.13 and are also consistent with previous findings that an increase (decrease) in concentration (competition) reduces the impact of monetary policy on bank lending activity. The study also conducts the analysis under the alternative measure of monetary policy indicator for subsamples, based on capitalization, liquidity, and size. These results are not reported here, but they are qualitatively similar to previous findings of this study.

The findings of this study are in contrast to those of Olivero et al. (2011a, 2011b) in two ways. First, these authors find that both concentration and competition reduce the effectiveness of monetary policy. However, this study shows that higher competition measured by the Lerner index, in fact, strengthens the monetary policy transmission. Second, they do not find a significant role of market structure in Asian countries,

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<sup>44</sup> According to these authors, the monetary policy measure obtained under this method is better because it captures the changes in interest rates only caused by monetary shocks.

including countries from ASEAN. However, the results for their overall sample are similar to the findings of this study. One probable reason for their insignificant findings for Asian countries can be the limited sample they use in their study. For example (as mentioned in our Introduction), they use a sample over the period 1996-2006, whereas they argue that Asian economies witnessed substantial changes in competitive conditions due to factors such as international financial integration, privatization, deregulation, and a wave of mergers and acquisitions that resulted in market concentration and financial reforms in response to the global financial crisis of 2008-2009. This study, on the other hand, uses data from 1999-2014 to cover the period of change and finds a significant weakening role of concentration in contrast to a strengthening role of competition in monetary policy transmission through the bank lending channel. The findings from the Boone Indicator as a measure of bank competition are however similar to those of Gunji et al. (2009), Olivero et al. (2011a) and Amidu and Wolfe (2013).

**Table 4.12: Alternative Measure of Monetary Policy**

Dependent Variable = Annual Percentage Change in Bank Loans				
	Panel A: Structural Measures		Panel B: Non-Structural Measures	
	CR5	HHI	Boone	Lerner
Market Structure	0.251** (0.102)	0.270*** (0.091)	0.160*** (0.048)	0.216*** (0.075)
%ΔMP (VAR)	-0.246** (0.068)	-0.209*** (0.057)	-0.183*** (0.059)	-0.217** (0.086)
Market Structure*MP (VAR)	0.082*** (0.017)	0.148*** (0.046)	-0.116*** (0.032)	0.117*** (0.032)
Capitalization	-0.105** (0.047)	-0.146** (0.069)	-0.118*** (0.039)	-0.065** (0.027)
Liquidity	-0.274*** (0.085)	-0.244*** (0.077)	-0.173*** (0.052)	-0.180*** (0.055)
Size	-0.077** (0.034)	-0.072** (0.030)	-0.090** (0.039)	-0.089** (0.037)
Inflation	0.104** (0.047)	0.095** (0.044)	0.080** (0.033)	0.088** (0.039)
GDP Growth	0.325*** (0.101)	0.260*** (0.084)	0.497*** (0.150)	0.523*** (0.157)
Deposit Growth	0.734*** (0.154)	0.741*** (0.222)	0.716*** (0.227)	0.709*** (0.161)
ΔLoan (t-1)	-0.215*** (0.059)	-0.232*** (0.061)	-0.137*** (0.047)	-0.185*** (0.045)
Financial Freedom	0.075** (0.031)	0.033** (0.014)	0.065** (0.027)	0.071*** (0.021)
Foreign Ownership	0.026** (0.011)	0.031** (0.012)	0.063*** (0.018)	0.053*** (0.021)
Rule of Law	0.096*** (0.029)	0.176** (0.072)	0.103** (0.043)	0.153** (0.069)
Regulatory Quality	0.089*** (0.027)	0.163** (0.067)	0.096** (0.040)	0.142** (0.064)
Govt. Effectiveness	0.098*** (0.029)	0.180** (0.074)	0.106** (0.044)	0.156** (0.071)
Political Stability	0.143*** (0.043)	0.262** (0.108)	0.154** (0.064)	0.228** (0.103)
Country Dummy	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes
AR (1) P value	0.000	0.000	0.000	0.000
AR (2) P value	0.348	0.315	0.295	0.329
Sargan/Hansen P value	0.212	0.290	0.215	0.246
Instruments	117	117	117	117
Banks	138	138	138	138

Note: Table reports results of Two-Step System GMM dynamic panel model. The dependent variable in all models is loan growth. Columns 2, 3 4 and 5 present results when CR5, HHI, Boone, and Lerner are used as measures of market structure. MP (VAR) shows monetary policy indicator calculated using VAR method. Market Structure\*ΔMP represents the interaction term between alternative market structure measures and monetary policy. Capitalization refers to the capital strength of banks calculated as equity to total assets, liquidity is banks' liquid assets to total assets, size is natural log of total assets, and deposit growth is annual percentage change in banks' deposits. GDP growth is the annual percentage change in real GDP; inflation is the annual percentage change in Consumer Price Index. Financial freedom, foreign ownership, government effectiveness, the rule of law, regulatory quality, and political stability are indices for regulatory framework. Significant values of AR (1) show that null hypothesis of no autocorrelation among error terms in first difference is rejected. AR (2) is significant, showing that error terms in level regressions are not correlated. Value of Sargan/Hansen is insignificant, indicating that instruments are valid. Results for AR (1), AR (2) and Sargan/Hansen show that GMM is correctly specified and there are no identification issues. Figures in parentheses are corrected standard errors. "\*\*\*\*", "\*\*\*" and "\*\*" indicate the statistical significance at 1%, 5%, and 10% respectively

**Table 4.13: Marginal Effects of Change in Monetary Policy Stance**

Market Structure Value Category	5-Bank Concentration Ratio	Change in Lending (%)	Hirschman Herfindahl Index	Change in Lending (%)	Boone Indicator	Change in Lending (%)	Lerner Index	Change in Lending (%)
<b>Average</b>	0.685019	0.31031361	0.130321	0.25243178	-0.03918	0.191198	0.210296	0.0152254
<b>25th Percentile</b>	0.606142	0.27458233	0.091196	0.17664665	-0.05259	0.256639	0.133295	0.0096506
<b>50th Percentile</b>	0.659887	0.29892881	0.110642	0.21431355	-0.03195	0.155916	0.210984	0.0152752
<b>75th Percentile</b>	0.728131	0.32984334	0.152477	0.29534795	-0.02377	0.115998	0.255377	0.0184893

**Note:** Percentage changes in bank lending are calculated as  $(\text{Level of Concentration/Competition} \times \emptyset) + \delta$ , where  $\delta$  is coefficient on monetary policy indicator and  $\emptyset$  is coefficient on interaction term between market structure and monetary policy indicator.

## 4.6 Conclusion

Monetary policy transmission through bank lending channels is well-established in the economics and finance literature, yet literature on market structure-monetary policy transmission is limited in scope and context, for two main reasons. First, there is a lack of consensus among researchers with respect to competition measures, and second, the evidence on the weakening/strengthening role of the banking structure in monetary policy transmission is inconclusive.

This study applies two structural and two non-structural measures of competition in order to examine its role in monetary policy transmission in the context of five ASEAN countries. The study also observes the banks' response to changes in their monetary policy stance based on their financial strength (size, liquidity, and capitalization). The results from the two structural measures indicate that bank concentration undermines the effectiveness of monetary policy transmission through the bank lending channel. However, the two non-structural measures provide contradicting the evidence. The results from the Lerner index suggest that greater market power/lower competition weakens the transmission of the monetary policy. The results from the Boone Indicator, however, show that a lower level of competition strengthens the monetary policy transmission. These findings thus follow Carbó et al. (2009), who suggest that inferences about the level of competition differ widely when using different indicators of competition and therefore the implications of competition depend upon the choice of

indicators. Assuming that all measures refer to the true level of bank competition, the overall conclusion is that the lower level of competition in banking industry undermines the transmission of monetary policy through the banks' credit channel. The use of alternative competition measures supports the argument that the implications regarding the role of competition can be misleading when based on a single measure. The study also finds that the weakening/strengthening effect of concentration/competition is stronger for highly capitalized, highly liquid and large size banks and that these findings are robust in relation to alternative measures of monetary policy indicator and different sample periods (pre and post financial crisis periods).

The findings of this study propose a careful surveillance of developments that affect the competitive conditions in the banking industry (international financial integration, privatization and deregulation, and banking consolidations). These developments have a direct and significant influence on competitive conditions in the banking industry which in turn plays an important role in monetary policy transmission through the bank lending mechanism. Therefore, this study calls for policy measures that can tackle the adverse effects of changes in banking competition for the effectiveness of monetary policy transmission.

## **CHAPTER 5: MARKET STRUCTURE AND GROWTH OF FINANCIALLY DEPENDENT INDUSTRIES (ESSAY 3)<sup>\*</sup>**

### **5.1 Abstract**

The study examines the role of market structure for growth in financially dependent industries from five economies in ASEAN from 1999 to 2014. The approach of this study departs from existing literature in that it applies four alternative measures of market structure based on structural and non-structural approaches and compare their outcomes. Results indicate that higher bank concentration may slow down the growth of financially dependent industries. Bank competition, on the other hand, allows financially dependent industries to grow faster. These findings are consistent across a number of sensitivity checks such as alternative measures of financial dependence, institutional factors (including property rights, quality of accounting standards and bank ownership), and endogeneity consideration. In sum, the study suggests that financially dependent industries grow more in more competitive/less concentrated banking systems. Therefore, regulatory authorities need to be careful while pursuing a consolidation policy for the banking sector in ASEAN economies.

### **5.2 Introduction**

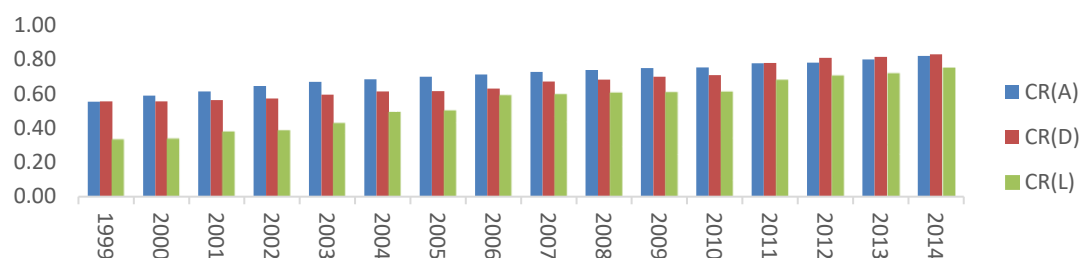
The banking industry in Association of South East Asian Nations (ASEAN) is moving towards a more concentrated market structure, particularly after the Asian Financial Crisis of 1997-1998 and the Global Financial Crisis of 2008-2009. This fact is obvious from Figure 5.1, 5.2 and 5.3. For example, five bank concentration ratios (CR5) based on assets, deposits and loans increased from 0.55, 0.56 and 0.33 in 1999 to 0.83, 0.84 and 0.74 in 2014 respectively (Figure 5.1). Similarly, the sum of the squared

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<sup>\*</sup> The article is published in "PLOS ONE" in 2016 with title "Market Structure, Financial Dependence and Industrial Growth: Evidence from Banking Industry in Emerging Asian Economies". The sample size in the published version includes five countries – India, China, Japan, Hong Kong and Korea – from Asia, in addition to five ASEAN economies. These countries were included on the recommendations of two anonymous referees from PLOS One Journal. The "results and discussion section" of this thesis reports the analysis on five ASEAN countries. The results for sample of ASEAN countries and total sample – i.e. 10 Asian countries, as in published article – are qualitatively similar. The estimation results for complete sample are reported in appendix B of this thesis.

market share (HHI) in terms of loans, assets, and deposits increased from 0.03, 0.10 and 0.11 in 1999 to 0.19, 0.25 and 0.21 respectively (Figure 5.2). Both these measures indicate an overall increase in bank concentration (decrease in the level of competition) over this period. Moreover, the increase in the Lerner Index and the Boone Indicator from 0.19 and -0.55 respectively to 0.43 and -0.36 (Figure 5.3) suggests a worsening of competitive conditions (increase in market power). The move towards concentrated banking industry in ASEAN can be attributed to several policy measures – which were aimed to strengthen financial institutions against financial downturns – such as financial integration, privatization and deregulation, mergers and acquisitions, financial reforms and foreign bank penetration. (Yokoi-Arai & Kawana, 2007; Olivero et al., 2011b, 2011a).

The bank market structure has important implications for bank performance and other economic activities for many reasons. First, it can influence banks' efficiency, the product quality and the extent of invention/innovation (Claessens & Laeven, 2005; Xiaogang, Skully, & Brown, 2005; Xiaoqing Maggie & Heffernan, 2007; Ariff & Luc, 2008; Fungáčová, Pessarossi, & Weill, 2013; Hsiao, Shen, & Bian, 2015). Second, the linkage between bank concentration/competition and economic stability is also relevant to financial institutions (Allen & Gale, 2004; Boyd & De Nicolo, 2005; Berger et al., 2009; Fu et al., 2014). Third, bank concentration/competition can also affect firms' access to credit and the monetary policy transmission (Beck et al., 2004; Berger, Demirgüç-Kunt, et al., 2004; Rice & Strahan, 2010).



**Figure 5.1: Five-Bank Concentration Ratio (CR5) based on Total Loans, Total Assets, and Total Deposits**



**Figure 5.2: Herfindahl Hirschman Index (HHI) based on Total Loans, Total Assets, and Total Deposits**



**Figure 5.3: Lerner, Adjusted Lerner and Boone Indicator**

However, literature with respect to the role of bank market structure for economic growth is still in its early stages, and only a handful of studies have so far explored this relationship.<sup>45</sup> Even these studies are limited in scope, for three important reasons. First,

<sup>45</sup> The significance of financial institutions for economic growth is well established in economics and finance literature. Several channels through which financial institutions may contribute to economic well-being have been documented. For example, financial institutions play a key role in providing information and allocating resources by evaluating firms' prospects and devoting resources to promising ventures (King & Levine, 1993); they take on a risk-sharing role by financing mega-projects with high returns



they are far from reaching a consensus regarding favorable/unfavorable effects of bank concentration on economic growth. Second, their analysis covers a pre-financial crisis period which may not be applicable to post-crisis times because of changing competitive conditions triggered by mergers and acquisitions that occurred in response to the Asian Financial Crisis 1997-1998 and Global Financial Crisis 2008-2009. Third, their analysis is based on a single measure of market structure, which could be misleading. These limitations are discussed one by one below.

The first limitation relates to inconclusive nature of existing empirical evidence on the market structure-economic growth relationship. For instance, the literature provides two contradictory findings. First, more concentrated/less competitive banking systems negatively affect the economic growth of financially dependent industries, while such industries grow more in less concentrated/more competitive banking systems (Pagano, 1993; Guzman, 2000; Claessens & Laeven, 2005). Second, the concentrated banking markets actually promote economic growth while a higher level of competition suppresses economic growth (Mayer, 1988; Petersen & Rajan, 1995; Cetorelli & Gambera, 2001; Marquez, 2002; Di Patti & Dell'Ariccia, 2004; Zarutskie, 2006). Therefore, the empirical evidence on the role of bank market structure in economic growth is inconclusive.

The second limitation is related to the sample and the period covered by existing studies. Almost all of the studies on the market structure-economic growth relationship are conducted before the Global Financial Crisis, and none of them has taken into consideration the economies in Asia where the competitive conditions of banking

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accompanied by high risk (De La Fuente & Marin, 1996); and they perform a monitoring function over borrowers (Blackburn & Hung, 1998).

markets have substantially changed after financial crises. These changes can be attributed to bank consolidations, privatization, financial integration, deregulation, and financial reforms in response to the global financial crisis of 2008-2009 (Yokoi-Arai & Kawana, 2007; Olivero et al., 2011a, 2011b). These developments raise serious concerns regarding the desirability of bank concentration or competition for industrial growth owing to an ambiguous competition-growth relationship.

Regarding the third limitation, there is an important debate with respect to the measures of market structure. Under the structure-conduct-performance paradigm (SCP), concentration is negatively related to the level of competition. The empirical evidence on such relationship is provided by Bikker and Haaf (2002) who demonstrate that a high level of concentration in banking is likely to reduce the competition. However, Dell'Ariccia (2000) and Northcott (2004) indicate that even highly concentrated markets can be competitive due to information asymmetries. Similarly, Beck et al. (2006) show that a higher level of concentration and competition both enhance the banking system stability and reduce the probability of a crisis, their findings thus provide indirect evidence of a positive relationship between competition and concentration.

Moreover, a frequently used measure of competition, the Panzar-Rosse (PR) model (Panzar & Rosse, 1987), has been criticized for a number of reasons, including its inability to measure the level of competition/market power.<sup>46</sup> The Lerner Index (Lerner, 1934) is yet another measure of market power/level of competition; however, it also suffers from weaknesses. In contrast, the Boon Indicator (Boone, 2008) has emerged as a better measure of competition, as it avoids the major econometric and theoretical drawbacks of the PR model and Lerner Index. Although some authors argue in favor of

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<sup>46</sup> See Leon (2014), pp. 26-27, for a detailed discussion on the disadvantages of the PR model.

any competition measure, there is general disagreement among researchers with respect to the best measure. According to Carbó et al. (2009), inferences about the level of competition differ widely using different indicators of banking market competition, and hence the implications of competition depend upon the choice of indicators. Consequently, employing only one measure of market structure can be misleading because each measure captures a unique aspect of competition and has its advantages and disadvantages. Therefore, it is more effective to use several measures of market structure.

In order to address the above issues, this study applies structural and non-structural measures of market structure and relates them to the growth of externally financially dependent industries in five ASEAN countries. The study also considers the role of financial development (bank and capital market development) and other factors that might explain the banking structure-growth relationship. These factors include growth opportunities and institutional factors such as property rights, quality of accounting standards and bank ownership.

This study contributes towards finance literature in general and bank literature in particular in several aspects. First, it compares the findings from both structural and non-structural measures in order to have a better understanding of the competition-growth relationship. Second, it uses recent data that covers both the Asian Financial Crisis 1997-1998 and the Global Financial Crisis 2008-2009. Third, it considers the banking industry in ASEAN economies where the literature on the topic is almost non-existent. Finally, four alternative measures of banking market structures, i.e. , the five-bank concentration ratio (CR5), the Herfindahl Hirschman Index (HHI), the Boon Indicator (BI) and the Lerner Index (LI) – are used in this study, and the results are

compared. The results show that less concentrated and more competitive banking systems boost the growth of externally financially dependent industries.

The rest of the chapter is organized as follows. A review of the relevant literature is presented in Section 2, while Section 3 addresses model development and measurement of variables. In Section 4, the estimation results are reported and discussed, and finally, the conclusion and policy implications are reported in Section 5.

### **5.3 Literature Review**

Earlier evidence on the role of financial institutions for economic growth comes from King and Levine (1993), who argue that good financial systems boost economic growth by enhancing the probability of successful innovations. On the other hand, any disruption in the financial sector hampers the innovation process, leading to a reduction in overall economic growth. Similarly, Levine and Zervos (1998) show that even after accounting for political and other economic factors, the economic growth is higher for economies with a higher level of bank development and stock market development. An influential study by Rajan and Zingales (1998) is the foundation of research in the domain of bank development, financial dependence of industries and economic growth. The authors estimate the external financial dependence of manufacturing firms by using firm-level data and show that countries with a more developed financial market experience greater industrial growth. A few other studies which highlight the role of financial sector development for economic growth include Liang and Jian-Zhou (2006), Chen (2006) and Zhang, Wang, and Wang (2012).

Thus, the importance of financial institutions for economic growth is well recognized in the literature. However, the role of bank market structure (competition/concentration) for economic growth is still in the early stages. The few studies which look into this domain are far from reaching a consensus and provide two seemingly contradictory

views: one favoring a higher level of competition/lower level of concentration for economic growth while the other suggests the opposite, as shown below.

According to the first view, firms' growth is limited in highly concentrated or less competitive banking systems because firms have less access to finance. The limited growth of firms (due to a lack of easy access to credit) translates into overall lower economic growth (Pagano, 1993; Guzman, 2000). On the other hand, Deidda and Fattouh (2005) find that a higher level of bank concentration negatively affects the industrial and per capita income growth, but that this relationship is significant only for low-income countries. The underlying logic for this view is that competitive banking systems make access to finance easy and affordable for firms, enabling them to borrow and invest more. Berger, Hasan, et al. (2004) and Cetorelli and Strahan (2006) support this view and demonstrate that concentrated/less competitive banking systems result in the low firm creation and as a result less economic growth. Allen and Gale (2000) argue that banks operating in concentrated markets tend to use their market power and charge high loan rates which make funding more expensive for firms, and expensive funding depresses firms' investing activities. Similarly, Claessens and Laeven (2005) provide evidence that industries that are more dependent on external finance grow more in a more competitive banking environment.

The second view is that banks in more concentrated markets perform the function of information producer and establish a strong relationship with their customers. On the other hand, increased competition can lead to asymmetry of information between borrowers and lenders, less lending and less investment (Petersen & Rajan, 1995). Moreover, Marquez (2002) argues that banking competition hampers the screening role performed by banks in their choice of borrowers. Banks in competitive markets take less care in screening firms and also charge higher loan rates. A higher cost of

borrowing decreases the availability of funds. According to Di Patti and Dell'Ariccia (2004) and Zarutskie (2006), economies with less competitive markets experience more creation and emergence of new firms. Evidence supporting this view also comes from Cetorelli and Gambera (2001), who show that the growth of industries that are dependent on external finance is faster in economies with concentrated banking systems.

A few recent contributions highlighting the favorable effects of concentration for economic growth come from Hoxha (2013), Mitchener and Wheelock (2013) and Liu et al. (2014). Hoxha (2013) argues that financially dependent industries in concentrated banking markets perform better than those operating in more competitive markets. Mitchener and Wheelock (2013) show that a higher level of concentration in the banking market increases the overall growth of the manufacturing industry. However, the effect is stronger for industries with a small firm size, a lower incorporation rate, and less dependence on public debt (and, hence, relatively greater reliance on banks). In contrast, Liu et al. (2014) find that both competition and concentration measures are positively related to economic growth, which may indicate that measures of concentration do not necessarily represent a low level of competition.

To summarize, the overall evidence on the role of banking structure (competition/concentration) for economic growth is ambiguous and provides little policy inputs as to whether concentration or competition is favorable for economic growth. Furthermore, only a few studies on competition-growth – Claessens and Laeven (2005) and Hoxha (2013) – use the Panzar-Rosse model (a non-structural approach) along with structural approaches (CR5 and HHI). However, research has shown that the PR model is subject to several theoretical and econometric drawbacks, including its inability to measure the level of competition/market power. The Boon Indicator, on the

other hand, is a better measure and avoids the major econometric and theoretical drawbacks of the PR model. This study addresses some of the issues of earlier studies by using several measures for both concentration and competition: CR5, HHI, the Lerner Index and the Boone Indicator.

## 5.4 Methodology

The study follows the two-step methodology applied by Cetorelli and Gambera (2001), Claessens and Laeven (2005) and Hoxha (2013) to analyze the role of the banking market structure for industrial growth in ASEAN economies. In the first step (basic model), the industrial growth is regressed on market structure (concentration/competition) along with bank development, stock market development, and other control variables. In the second step (extended model), the measures of financial development and financial dependence, as in Cetorelli and Gambera (2001), are introduced.

### 5.4.1 Basic Model

The basic model examines the effect of concentration/competition on industrial growth in general; that is, without considering industry characteristics, e.g., financial dependence.

$$VA_{jct} = \alpha + \beta_1 MS_{ct} + \beta_2 MC_{ct} + \beta_3 DC_{ct} + \gamma_c \sum_{c=1}^C Country.Control_{ct} + \gamma_j \sum_{j=1}^n Dummy(Industry)_j + \gamma_t \sum_{t=1}^T Dummy(Time) + \varepsilon_{jct} \quad (5.1)$$

Where,  $VA$ ,  $MS$ ,  $MC$ , and  $DC$  represent industry value added, market structure, market capitalization and domestic credit to private sector respectively. Subscripts  $j$ ,  $c$  and  $t$  respectively indicate industries, countries and time.  $VA$  is the annual growth of industry value added. Industry, country and time fixed effects are included to capture unobservable heterogeneity across industries, countries and time respectively.

Following Cetorelli and Gambera (2001), included here are the measure of stock market development (market capitalization), a measure of bank development (domestic credit to the private sector), and country level controls such as per capita GDP, and an Index of quality of accounting standards to address the misspecification issues. The Market Structure variable represents the measures of bank concentration and bank competition, to be discussed in detail in the next section. As mentioned in the introduction, the expected signs on the coefficient of market structure are ambiguous.

#### 5.4.2 Extended Model

While the basic model identifies the overall impact of competition/concentration on industrial growth, the extended model is constructed to decompose this effect at country and industry levels. There are two interaction terms included in the extended model. First, between the market structure measures (concentration and competition) and industries' financial dependence; and second, between the financial dependence of industry and financial development.

$$\begin{aligned}
 VA_{jct} = & \alpha + \beta_1 MS_{ct} + \beta_2 E.D_j + \beta_3 F.D_{ct} + \beta_4 MS_{ct} * ED_j + \beta_5 ED_j * FD_{ct} \\
 & + \gamma_j \sum_{j=1}^n Dummy(Industry)_j + \gamma_c \sum_{c=1}^c Country.Control_{ct} \\
 & + \gamma_t \sum_{t=1}^T Dummy(Time) + \varepsilon_{jct}
 \end{aligned} \tag{5.2}$$

Where  $ED$  and  $FD$  represent external financial dependence and financial development respectively. The interaction term of market structure and financial dependence tests whether financially dependent industries grow more/less in economies with high/low bank concentration/competition. The sign on  $\beta_4$  is not clear a priori owing to ambiguous evidence from the relevant literature. Interaction between external dependence and financial development is included, following earlier studies, to determine whether the growth of financially dependent industries is higher for economies with a well-developed financial sector. The sign on  $\beta_5$  is expected to be



positive because this relationship has been extensively discussed in Rajan and Zingales (1998), and almost all subsequent studies in this domain endorse its positive relationship with industrial growth.

### **5.4.3 Data and Variables**

#### **5.4.3.1 Industrial Growth**

Data on variables of this study come from various sources, the definitions of variables and sources of data are shown in Table 5.1. Data on the dependent variables in this study (annual growth in value added of manufacturing industries in each country) is extracted from the industrial database of United Nations Industrial Development Organization (UNIDO).

#### **5.4.3.2 Market Structure**

For market structure, four different measures have been used: the 5-Bank concentration ratio (CR5), Herfindahl- Hirschman Index (HHI), Lerner Index and Boon Indicator. Two of these measures (CR5 and HHI) are based on the structural approach from traditional Industrial Organization (IO) literature. Under this approach, the level of competition is inferred from the structure of the market (level of concentration). CR5 is measured as the fraction of total assets held by the five largest banks in a country over the total assets of all banks in that country. HHI is defined as the sum of squared market shares based on the assets of all the banks in each country. Both these measures have been used in literature to study the role of bank concentration for industrial growth.<sup>47</sup> Data on CR5 has been obtained from the Global Financial Development Database (GFDD) of the World Bank while HHI has been calculated on the basis of the banks' total assets, collected from Bankscope.

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<sup>47</sup> See Cetorelli and Gambera (2001); Claessens and Laeven (2005); Hoxha (2013); and Mitchener and Wheelock (2013)

The structural approach has been criticized for its inability to measure the true level of competition. Therefore, this study also uses two non-structural measures (i.e., the Lerner Index and Boone Indicator), from the New Empirical Industrial Organization (NEIO). The aim of the NEIO measures is to assess the level of competition directly from firms' conduct.

**Lerner Index:** The Lerner Index directly measures the degree of market power. It is calculated as the ratio of mark-up to price of output, i.e.,  $Lerner = (Price - MC)/Price$ . Where “Price” is the price of the total assets, and “MC” is the marginal cost of producing an additional unit of output. The marginal cost is derived from the translog cost function, as follows:

$$\begin{aligned} \ln Cost_{i,t} = & \beta_0 + \beta_1 \ln Q_{i,t} + \frac{\beta_2}{2} \ln Q_{i,t}^2 + \sum_{k=1}^3 \gamma_{k,t} \ln W_{k,i,t} + \sum_{k=1}^3 \phi_k \ln Q_{i,t} \ln W_{k,i,t} \\ & + \frac{1}{2} \sum_{k=1}^3 \sum_{j=1}^3 \delta_{i,j} \ln W_{k,i,t} \ln W_{j,i,t} + \sum_{k=1}^2 \eta_k trend^k \\ & + \sum_{i=1}^3 \omega_i \ln W_{j,i,t} trend + v \ln Q_{i,t} trend + \varepsilon_i \end{aligned} \quad (5.3)$$

Where  $Cost_{i,t}$  and  $Q_{i,t}$  represent the total cost and output for bank “i” in time “t” respectively, and  $W_1$ ,  $W_2$  and  $W_3$  are the input prices of deposit funds, labor, and capital. The marginal cost is the first derivative of the cost function with respect to the level of output. The marginal cost is given by Equation 5.4 as follow:

$$MC_{i,t} = \frac{Cost_{i,t}}{Q_{i,t}} \left[ \beta_1 + \beta_2 \ln Q_{i,t} + \sum_{k=1}^3 \theta_k \ln W_{k,i,t} + \delta_3 Trend_{i,t} \right] \quad (5.4)$$

Once the marginal cost is estimated, it is used to calculate the Lerner Index for individual banks through the formula  $L = (P - MC)/MC$ . According to Lerner (1934), the value of the Lerner Index ranges between 0 – indicating the state of no market power (perfect competition) – and 1 – indicating a situation of high market power (monopoly).

Therefore, the higher values of Lerner indicate more market power and less competitive conditions.

**Boone Indicator:** The idea behind the Boone Indicator (Boone, 2008) is that efficient firms are highly rewarded, and inefficient firms are more harshly punished in perfectly competitive markets. The Boone Indicator captures the market share transmission from inefficient to efficient firms. Thus, the intensity of competition is measured from a profitability equation as follows:

$$\ln \pi_i = \alpha + \beta \ln c_i + \varepsilon_i \quad (5.5)$$

Where  $\pi_i$  and  $c_i$  represent bank profit and costs respectively. For banks with lower marginal costs, the profits are higher, therefore  $\beta < 0$ . Thus, increases in competition raise the profits of more efficient banks relative to less efficient ones. Larger values of  $\beta$  in absolute terms indicate higher levels of competition (Schaeck & Cihák, 2014). The data on the Lerner Index and Boone Indicator have been compiled from a variety of sources. The main source is the dataset of Clerides et al. (2015). However, their data covers the period 1997-2010, and so we have collected data for the years 2011-2014 from Economic Research database of Federal Reserve Bank of St. Louis and Global Financial Development Database (GFDD) of the World Bank.

#### 5.4.3.3 External Financial Dependence

The financial dependence of an industry refers to the need for firms to raise finances from external sources; in other words, banks and/or capital markets. Rajan and Zingales (1998) determine the external dependence of the US manufacturing industry by using firm-level data. They define external financial dependence as the ratio of capital expenditure not financed with cash flows from operations to total capital expenditure. Almost all subsequent studies, i.e. , Cetorelli and Gambera (2001); Claessens and Laeven (2005); Fisman and Love (2007); and Hoxha (2013) – use their data to infer the

financial dependence of manufacturing sectors in other countries.<sup>48</sup> Due to mismatches in the sample periods, this study is unable to directly use their data. However, the study uses the ranking order of external financial dependence from Table 1 in Rajan and Zingales (1998) and Table 2 in Fisman and Love (2007). Using this information, a dummy variable is generated which equals 1 if the financial dependence of a sector is above the median value and 0 otherwise. It thus bisects the data into two groups: that is, sectors located above the mean value are highly dependent on external finance, and those located below the median are less financially dependent. For the purpose of robustness check, industries are also ranked in 4 and 10 groups in order of their financial dependence. However, the results from alternative rankings and dummy variables are qualitatively similar.

#### **5.4.3.4 Financial Development**

The study follows Claessens and Laeven (2005) and uses total capitalization as the measure of financial development. Total capitalization is the sum of stock market capitalization as a percentage of GDP which proxies for capital market development and domestic credit to the private sector as a percentage of GDP which represents bank development. Both stock market capitalization and private credit have also been used separately as a robustness check. Data on market capitalization and domestic credit to the private sector has been obtained from the Global Financial Development Database (GFDD) of the World Bank.

A few other variables, such as investment opportunities, property rights, accounting standards and bank ownership have been used for a robustness check. These variables and their sources are explained when they are used in estimation.

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<sup>48</sup> See footnote 4 in Hoxha (2013) and footnote 6 in Claessens and Laeven (2005)

#### 5.4.4 Descriptive Statistics

This section provides country-wise descriptive account of variables of the study. Country wise averages, standard deviations, and minimum and maximum values on important variables are reported in Table 5.2. CR5 and HHI both represent the level of bank concentration in each country. Singapore is at the top in bank concentration, with an average value of CR at 0.97, followed by Malaysia with an average value of CR at 0.77. The Indonesian market is the least concentrated, with a CR of 0.63, while Philippines and Thailand have the second least concentrated markets with an average CR of 0.66 (both). The ranking of countries with respect to market concentration is not same as with HHI, however. Singapore has the highest average for HHI (0.29), followed by Malaysia with an average value of HHI at 0.16. Indonesia, Philippines, and Thailand occupy the last three positions, with HHI at 0.10, 0.11 and 0.12 respectively.

Two competition measures (the Lerner Index and Boone Indicator) represent the level of competition in banking markets. Nonetheless, the ranking of countries with respect to the Lerner Index and Boone Indicator is not always the same. For example, Singapore has the least competitive banking market in terms of the Lerner Index (0.26) and the Boone Indicator (-0.03). The Philippines is the most competitive in terms of the Boone Indicator, with an average value of -0.23; however, it is 4<sup>th</sup> on the level of competition when measured through the Lerner Index.

In terms of industry growth, Indonesia is at the top, followed by Thailand, Philippines, Malaysia, and Singapore, with average values of industrial growth at 0.24, 0.14, 0.13, 0.09 and 0.06 respectively. Financial development is estimated using two indices: market capitalization, which measures capital market development, and domestic credit to the private sector, which measures bank development. In terms of bank development, Malaysia is at the top, followed by Thailand, Singapore, Philippines

and Indonesia with average values on bank development at 1.21, 0.99, 0.36 and 0.33 respectively.

Correlations among important variables are reported in Table 5.3. There are two important considerations with respect to correlations among independent variables. First, correlations among independent variables are not so high that they create the problem of multicollinearity. Second, that dependent variable has a significant relationship with explanatory variables, especially the variables of interest. Signs and magnitude with respect to the second consideration are not important at this stage because simple correlation may not depict the true relationship without controlling for other relevant explanatory variables. A few high correlations in Table 5.3 (i.e., 0.806, 0.652, and 0.632) do raise concern about the issue of multicollinearity. However, some variables such as CR and HHI are used alternatively in the model and do not appear together. Moreover, the study follows Mirzaei et al. (2013) to handle this issue by taking the lag values for highly correlated variables when they are used together. The study also applies the estimation technique with and without such variables to observe the differences. However, the results are qualitatively similar. Column 1 of Table 5.3 shows the correlation between dependent and explanatory variables. Most of these correlations are significant, with expected signs, and represent a rough picture of relationships among variables of interest. Nevertheless, it is too early to draw conclusions on the basis of simple correlations.

**Table 5.1: Variables and Sources**

Variable	Description
Industry Value Added	Industry Value Added represents the contribution of industry to the overall gross domestic product (GDP). Data on value added for each manufacturing sector in each sample country has been obtained from the United Nations Database on Industrial Statistics.
Growth in Value Added	Annual growth rate in industry value added from 1999 to 2014.
Share in Industry Value Added	The fraction of industry value added in overall value added of manufacturing sector over the period.
Financial Dependence	External financial dependence has been extracted from Table 1 in Rajan and Zingales (1998) and Table 2 in Fisman and Love (2007). (1) A dummy variable which equals 1 if the financial dependence of a sector is above the median value and 0 otherwise. It thus bisects the data into two groups, i.e., sectors located above mean value are highly dependent on external finance, and those located below the median are less financially dependent. (2) Ranking of industries in groups of 4, and 10 in order of their financial dependence. The higher the rank, the higher the financial dependence.
Private Credit	Credit provided to the private sector by the financial sector divided by GDP. Source: World Development Indicators of the World Bank.
Market Capitalization	Stock Market Capitalization divided by GDP. Source: World Development Indicators of the World Bank.
Total Capitalization	Sum of private credit and market capitalization.
Concentration	1-Total assets held by five largest banks of a country to the total assets of all banks in that country (5-bank concentration ratio). 2-Sum of squared market shares of all the banks in each country (HHI). Source: Global Financial Database World Bank (for CR5), calculated based on banks' total assets, obtained from BankScope.
Competition	1- The Lerner Index is the ratio of mark up ( the difference between out price and marginal cost) to output price. $Lerner_{i,t} = (Price_{i,t} - MC_{i,t})/Price_{i,t}$ The higher values of Lerner indicate more market power and less competitive conditions. 2- The Boone Indicator captures the reallocation of market share from inefficient to efficient firms. The intensity of competition is measured from a profitability equation as follows: $ln\pi_i = \alpha + \beta lnc_i + \varepsilon_i$ The stronger the effect (i.e., the larger the $\beta$ in absolute value) the stronger the competition.
Accounting Standards	Accounting Standards is an index representing the quality of firms' disclosure for a country. This index ranges from 0 to 90 with higher values indicating more disclosure. Source: Centre for International Financial Analysis and Research (CIFAR).
Property Rights Index	The Property Rights Index measures the enforcement of property rights. The index ranges from 0 to 100. Higher values of the index represent greater enforcement of property rights and hence greater protection. Source: Heritage Foundation.
GDP per capita	Log of per capita GDP over the period of 1999-2014. Source: World Development Indicators of the World Bank.

Note: Table shows the names, definitions and sources of the variables used in this study. Names are given in the first column, while in the second column provides a brief description of the variables and the sources from which data on these variables is collected.

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**Table 5.2: Descriptive Statistics**

Description	Indonesia				Malaysia				Philippines				Singapore				Thailand			
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
VA Growth	0.24	1.03	-0.91	1.18	0.09	0.25	-0.76	3.75	0.13	0.28	-0.63	4.18	0.06	0.20	-0.59	1.64	0.14	0.34	-0.65	4.21
Industry Share	0.05	0.05	0.00	0.25	0.18	0.57	0.00	5.25	0.05	0.08	0.00	0.46	0.06	0.12	0.00	0.89	0.05	0.05	0.00	0.28
Log(VA)	8.12	1.24	2.40	11.23	8.25	1.31	4.89	11.04	7.04	1.22	2.83	10.04	7.42	1.75	3.69	11.24	8.40	1.08	5.51	11.14
Market Cap/GDP	0.28	0.09	0.14	0.45	1.50	0.42	1.07	2.62	0.51	0.16	0.28	0.85	1.67	0.38	1.02	2.43	0.55	0.19	0.24	0.82
Domestic Credit	0.32	0.14	0.20	0.61	1.23	0.19	0.97	1.59	0.36	0.08	0.29	0.57	0.99	0.08	0.86	1.18	1.21	0.22	0.95	1.66
CR5	0.63	0.05	0.58	0.718	0.77	0.06	0.67	0.86	0.66	0.04	0.58	0.71	0.97	0.01	0.96	0.99	0.66	0.01	0.64	0.67
Boone Indicator	-0.04	0.02	-0.06	-0.02	-0.04	0.01	-0.05	-0.02	-0.23	0.17	-0.51	-0.05	-0.03	0.03	-0.13	0.00	-0.05	0.01	-0.06	-0.04
Lerner Index	0.15	0.06	0.04	0.24	0.29	0.15	-0.01	0.52	0.14	0.12	-0.15	0.27	0.26	0.13	0.04	0.48	0.09	0.22	-0.46	0.32
Property rights	37.23	9.62	30.00	50.00	57.35	9.43	50.00	70.00	46.47	17.16	30.00	70.00	90.00	0.00	90.00	90.00	63.53	15.63	45.00	90.00
HHI	0.10	0.02	0.08	0.15	0.16	0.03	0.11	0.20	0.12	0.028	0.08	0.16	0.29	0.01	0.26	0.31	0.11	0.01	0.10	0.11

Note: Table reports country wise averages, standard deviation, and minimum and maximum values on important variables.

**Table 5.3: Correlation Matrix**

Names of Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Growth in Value Added	1													
(2) Industry Share of VA	.024**	1												
(3) Financial Dependence	.038*	.077**	1											
(4) Market Capitalization/GDP	-.079**	.164**	.007	1										
(5) Domestic Credit to Private Sector	-.104**	.070**	.000	.383**	1									
(6) CR5	-.033**	-.074**	.006	.246**	.051**	1								
(7) Boon Indicator	.015**	.011**	.005	.161**	.306**	-.263**	1							
(8) Foreign Bank Share	.031**	.090**	-.012	.067**	-.118**	.112**	.124**	1						
(9) Log of Per Capita GDP	-.122**	.015**	.007	.497**	.652**	.302**	.272**	.040*	1					
(10) Lerner Index	.029**	.032**	.005	.235**	.175**	.106**	.150**	.074**	.141**	1				
(11) Growth in Industry VA	.049**	.021**	.003	.146**	-.113**	.072**	.069**	.130**	-.138**	.263**	1			
(12) Property Rights	-.153**	.044*	.003	.411**	.516**	.394**	-.108**	-.092**	.671**	-.041*	-.157**	1		
(13) HHI	-.043**	-.027**	.016	.463**	.113**	.634**	.059**	-.133**	.343**	.246**	.081**	.369**	1	
(14) GDP Growth	.046**	.004**	.004	.207**	-.177**	.023	.029	.013	-.208**	.320**	.806**	-.204**	.060**	1

Note: Table reports pairwise correlation among the variables of the study. Indicators “\*\*” and “\*” show the statistical significance of correlations at 1% and 5% levels respectively. Description and sources of data are presented in Table 5.1.

## 5.5 Empirical Results and Discussion

### 5.5.1 Basic Model

In the first step, the study explores the role of bank concentration/competition for industrial growth in general, regardless of specific industry characteristics (i.e., external financial dependence). Tables 5.4 and 5.5 report the results of estimation based on Equation 5.1. The dependent variable in all the specifications is the annual growth of real value added of the manufacturing industries. Two indicators (CR5 and HHI) are used as the measure of bank concentration while the Lerner Index and Boone Indicator measure bank competition. Following Cetorelli and Gambera (2001), the study also includes a log of per capita GDP, domestic credit to the private sector, market capitalization, and depth of credit information.

**Table 5.4: Concentration and Industrial Growth**

Dependent Variable in all specifications is annual growth in real Value Added				
	CR5		HHI	
	(1)	(2)	(3)	(4)
Market Structure (Concentration)	-0.643*** (0.271)	-0.637*** (0.191)	-0.397** (0.129)	-0.332** (0.156)
Domestic Credit to Private Sector	-	0.447*** (0.102)	-	0.324*** (0.098)
Market Capitalization to GDP	-	0.197*** (0.043)	-	0.139*** (0.046)
Accounting Standards	-	0.008** (0.004)	-	0.018** (0.008)
Log of Per Capita GDP	-	-2.910*** (0.122)	-	-2.892*** (0.131)
Industry Share of Value Added	-	-0.381** (0.181)	-	-0.448* (0.266)
R-squared	0.426	0.679	0.437	0.713
Time Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes

Note: The table displays the impact of market structure (concentration) along with other variables on growth in industry value added. The dependent variable in all the specifications is the annual growth rate of real value added of the manufacturing industries. The main regressors are the 5-bank concentration ratio (CR5) and the Herfindahl-Hirschman Index (HHI), which represent the bank market structure (Bank Concentration). Columns 1 and 3 report the result of estimation when CR5 and HHI respectively are used as the main regressors without including other controls in the model. Columns 3 and 5 show the estimation results when models are run considering other relevant variables. Domestic credit to the private sector as a fraction of GDP proxies for the banking sector development. Market capitalization as a fraction of GDP measures the capital market development. All regressions include country, industry and time dummies in order to tackle unobserved heterogeneity. Robust standard errors are in parentheses, \*\*\*, \*\*, and \* show the significance at 1%, 5%, and 10% respectively.

Columns 1 and 3 in Table 5.4 display the estimation results when CR5 and HHI are used respectively as the main regressors without controlling for other factors. In Columns 2 and 4, the estimation results are reported when other factors have also been

accounted for. The coefficients on both of the concentration measures are consistently significant, with negative signs. These results imply that a rise in bank concentration, in general, has detrimental effects on industrial growth. The economic significance of coefficients is also important here. One percentage point increase in the level of concentration may lead to a decrease of around 0.46 percent in industrial growth. These findings concur with those of Cetorelli and Gambera (2001) who also find that bank concentration, in general, slows down industrial growth. Although Claessens and Laeven (2005) and Hoxha (2013) do not report coefficients on measures of concentration, similar results can be inferred from their studies. Hoxha (2013) and Liu et al. (2014) provide contradictory findings with respect to the impact of concentration on economic growth. Table 5.5 reports the estimation results when two competition measures (Lerner Index and Boone Indicator) have been used as the main regressors.

Columns 1 and 3 in Table 5.5 display the estimation results when competition measures have been used as the main regressors excluding the other factors. Columns 2 and 4 show the estimation results when other factors have also been included in the model. In all the estimations, the coefficients on both Lerner and Boone are significant with negative signs. Interpretation of negative signs for Lerner and Boone is a bit tricky. Since the larger values of the Lerner Index indicate more market power and less competition, the negative coefficient for the Lerner Index reinforces our findings in Table 5.4 that a low level of competition in the banking industry depresses industrial growth. Similarly, the smaller values of the Boone Indicator (higher values with negative signs) indicate a higher level of competition, and therefore the negative coefficient on Boone implies that a low level of competition undermines industrial growth. The findings for the relationship between competition and industrial growth are in agreement with Claessens and Laeven (2005) and Liu et al. (2014). However, Hoxha (2013) finds a low level of competition to be favorable for industrial growth.

**Table 5.5: Competition and Industrial Growth**

Dependent Variable in all specifications is annual growth in real Value Added				
	Lerner Index		Boone Indicator	
	(1)	(2)	(3)	(4)
Market Structure (Competition)	-0.439** (0.216)	-0.355** (0.171)	-0.393** (0.187)	-0.309** (0.138)
Domestic Credit to Private Sector	-	0.323*** (0.097)	-	0.334*** (0.098)
Market Capitalization to GDP	-	0.137*** (0.043)	-	0.131*** (0.042)
Accounting Standards	-	0.0174** (0.008)	-	0.0197** (0.009)
Log of Per Capita GDP	-	-2.889*** (0.124)	-	-2.876*** (0.125)
Industry Share of Value Added	-	-0.448* (0.264)	-	-0.447* (0.264)
R-squared	0.411	0.638	0.387	0.693
Time Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes

Note: The table displays the impact of market structure (competition) along with other variables on industry value added. The dependent variable in all specifications is the annual growth rate of real value added of manufacturing industries. The main regressors are the Lerner Index and Boone Indicator, which represent bank competition. Columns 1 and 3 report the results of estimation when Lerner and Boone are used as the main regressors without including other controls in the model. Columns 3 and 5 show the estimation results when models are run considering other relevant variables. Domestic credit to the private sector as a fraction of GDP proxies for banking sector development. Market capitalization as a fraction of GDP measures the capital market development. All regressions include country, industry and time dummies in order to tackle unobserved heterogeneity. Robust standard errors in parentheses, \*\*\*, \*\*, and \* show the significance at 1%, 5%, and 10% respectively.

The behavior of coefficients in relation to other variables is in agreement with the literature: for example, domestic credit to the private sector which proxies for bank development has a positive and significant coefficient, indicating that industries with better-developed banking systems exhibit higher growth. Per capita GDP, which shows the convergence effect of the economy to its long-run equilibrium, has a negative and significant coefficient as expected. Market capitalization, which represents the development of capital markets, has positive coefficient showing that industries grow more in economies where capital markets are more developed. The coefficient on the accounting standards index is positive, showing that more disclosure enables industries to grow more, as they can obtain finances from a variety of investors. These findings conform to earlier studies such as Cetorelli and Gambera (2001), Claessens and Laeven (2005) and Hoxha (2013). These findings suggest that higher bank concentration is likely to slow down the industrial growth in general, whereas the bank competition encourages the growth of manufacturing industries.

### 5.5.2 Extended Model

Table 5.6 reports the results of an estimation based on Equation 5.2, where two interaction terms (the interaction between external dependence and concentration/competition, and the interaction between external dependence and financial development) are included on the right-hand side. Both financial dependence and financial development have significant and positive coefficients, suggesting that industries which are dependent on external finance and those operating in well-developed financial systems grow more. The coefficients on all market structure measures maintain their significance with expected signs. The interaction terms between concentration (both CR5 and HHI) and financial dependence is negative and significant, implying that bank concentration shrinks the growth of externally financially dependent industries. These findings are in contrast to earlier evidence provided by Cetorelli and Gambera (2001) and Hoxha (2013), who show a positive relationship between bank concentration and the growth of externally financially dependent industries. On the other hand, Claessens and Laeven (2005) provide weak evidence of a negative impact of bank concentration on the growth of externally financially dependent industries.

The coefficient on the interaction term between competition measures (Lerner Index and Boone Indicator) and financial dependence is significant with a negative sign. These results suggest that bank competition encourages the growth of externally financial dependent industries. The results for the competition are in agreement with the findings of Claessens and Laeven (2005), who find that bank competition has a positive impact on the growth of externally financially dependent industries. Hoxha (2013), however, shows that bank competition is negatively related to the growth of industries that depend on external finance; this is in contrast to both Claessens and Laeven (2005) and findings of this study. The interaction term between external dependence and

financial development enters the model with a positive and significant coefficient, indicating that externally financially dependent industries grow more in financially developed economies. The findings for financial development and financial dependence are in agreement with the earlier literature (Rajan & Zingales, 1998; Cetorelli & Gambera, 2001; Claessens & Laeven, 2005; Chen, 2006; Liang & Jian-Zhou, 2006; Love & Zicchino, 2006; Hoxha, 2013). Other variables such as per capita GDP have expected and consistent signs in all specifications.

**Table 5.6: Role of Financial Dependence and Financial Development**

Dependent Variable in all specifications is annual growth in real Value Added				
	Concentration		Competition	
	(1)	(2)	(3)	(4)
Market Structure	-0.373*** (0.183)	-0.297** (0.138)	-0.265** (0.129)	-0.254** (0.123)
Market Structure*Financial Dependence	-0.071*** (0.024)	-0.056** (0.027)	-0.057** (0.025)	-0.057** (0.028)
Financial Dependence	0.082** (0.039)	0.089** (0.041)	0.078** (0.036)	0.084** (0.041)
Financial Development	0.661*** (0.232)	0.642*** (0.289)	0.684*** (0.243)	0.649*** (0.228)
Financial Dependence*Financial Development	0.070** (0.031)	0.088** (0.039)	0.061** (0.026)	0.052** (0.023)
Log of Per Capita GDP	-1.754*** (0.228)	-1.754*** (0.223)	-1.762*** (0.223)	-1.764*** (0.227)
Industry Share of Value Added	-0.259** (0.123)	-0.301** (0.127)	0.312** (0.147)	0.312** (0.147)
R-squared	0.674	0.666	0.668	0.671
Time Dummy	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes

Note: The table reports the results of estimation when interaction terms between sectoral financial dependence and market structure (concentration and competition) and country level financial development are included in the model. The dependent variable in all specifications is the annual growth rate of real value added of manufacturing industries. Columns 1 and 2 report the results of estimation from the 5-bank concentration ratio (CR5) and the Herfindahl-Hirschman Index (HHI) respectively. CR5 and HHI both represent the bank concentration. Columns 3 and 4 show the estimation results from the Lerner Index and Boone Indicator respectively, both of which measure the banking competition. Domestic credit to the private sector as a fraction of GDP proxies for banking sector development. Market capitalization as a fraction of GDP measures the capital market development. All regressions include country, industry and time dummies in order to tackle unobserved heterogeneity. Robust standard errors in parentheses, \*\*\*, \*\*, and \* show the significance at 1%, 5%, and 10% respectively.

### 5.5.3 Robustness Check

In this section, a number of robustness checks have been conducted to ensure that the results reported in Table 5.6 reflect the true relationship between market structure and the growth of externally financially dependent industries. The study specifically accounts for growth opportunities, property rights, accounting standards, foreign bank ownership and endogeneity.

### 5.5.3.1 Growth opportunities

It is argued that the relationship between industrial growth and financial development can possibly be driven by other elements that are also responsible for industrial growth across the economies. For instance, Fisman and Love (2007) maintain that growth rate differentials across the economies are better explained by the presence of growth opportunities rather than financial development. A similar argument may also apply to competition/concentration. In other words, it is not the availability/unavailability of finance to externally dependent industries in a competitive/ concentrated banking system that leads to sectoral growth, but rather the existence/non-existence of growth prospects which somehow are related to concentration/competition. Following Claessens and Laeven (2005) and Fisman and Love (2007), This study uses industry sales as a proxy for growth opportunities<sup>49</sup>. The interaction terms of growth opportunities with concentration, competition, financial dependence and financial development are included in the original model (Equation 5.2). The estimation results for growth opportunities are reported in Table 5.7. Alternatively, the price-earnings ratio (a market-based measure) to capture the effect of growth opportunities has also been used. Results for price-earnings ratio are reported in table 5.8. The coefficients on the interaction terms of financial development and growth opportunities are positive and significant; however, the interaction term of financial development and financial dependence is not significant in some cases. These findings are similar to those of Claessens and Laeven (2005) and Fisman and Love (2007). What is important for this study is the finding that the interaction terms of financial dependence and market structure measures (concentration and competition) have expected signs and significant coefficients, implying that even after accounting for growth opportunities, bank

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<sup>49</sup> Data on industry sales come from industrial database of United Nations Industrial Development Organization (UNIDO).



concentration seems to suppress the growth of externally financially dependent industries while more competitive banking systems likely allow these industries to grow more.

**Table 5.7: Accounting for Growth Opportunities (by Industrial Sales)**

Dependent Variable in all specifications is annual growth in real Value Added				
	Concentration		Competition	
	(1)	(2)	(3)	(4)
Market Structure*Financial Dependence	-0.0461** (0.019)	-0.129*** (0.043)	-0.145** (0.072)	-0.156*** (0.051)
Market Structure*Growth Opportunities	-1.512 (0.987)	-1.221 (0.883)	-0.712 (0.415)	-0.148 (0.105)
Financial Development*Growth Opportunities	0.641** (0.268)	0.593** (0.257)	0.476** (0.193)	0.528** (0.219)
Financial Dependence*Financial Development	0.684** (0.311)	0.579** (0.263)	0.697 (0.426)	0.575 (0.428)
Industry Share of Value Added	0.575 (0.433)	0.574 (0.425)	-0.175** (0.083)	-0.144** (0.065)
R-squared	0.137	0.126	0.142	0.131
Time Dummy	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes

Note: The table shows the robustness of results by incorporating the growth opportunities into estimation results reported in Table 5.6. The dependent variable in all specifications is the annual growth rate of real value added of the manufacturing industries. Columns 1 and 2 report the result of estimation from the 5-bank concentration ratio (CR5) and the Herfindahl-Hirschman Index (HHI) respectively, both of which represent the bank concentration. Columns 3 and 4 show the estimation results from the Lerner Index and Boone Indicator respectively, both of which measure banking competition. Domestic credit to the private sector as a fraction of GDP proxies for banking sector development. Market capitalization as a fraction of GDP measures capital market development. All regressions include country, industry and time dummies in order to tackle unobserved heterogeneity. Robust standard errors in parentheses, \*\*\*, \*\*, and \* show the significance at 1%, 5%, and 10% respectively.

**Table 5.8: Accounting for Growth Opportunities (by Price-Earnings Ratio)**

Dependent Variable in all specifications is annual growth in real Value Added				
	Concentration		Competition	
	(1)	(2)	(3)	(4)
Market Structure*Financial Dependence	-0.076** (0.031)	-0.102*** (0.029)	-0.089** (0.038)	-0.081*** (0.034)
Market Structure*Growth Opportunities (P/E)	-0.044* (0.023)	-0.075** (0.36)	-0.121 (0.118)	-0.137** (0.065)
Financial Development*Growth Opportunities (P/E)	0.363** (0.157)	0.328** (0.155)	0.342** (0.168)	0.353** (0.163)
Financial Dependence*Financial Development	0.342 (0.242)	0.329* (0.166)	0.386* (0.196)	0.338 (0.371)
Industry Share of Value Added	-0.128** (0.061)	-0.137** (0.065)	-0.124** (0.059)	-0.131** (0.063)
R-squared	0.268	0.288	0.314	0.317
Time Dummy	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes

Note: The table shows the robustness of results by incorporating the growth opportunities (price earnings ratio) into estimation results reported in Table 5.6. The dependent variable in all specifications is the annual growth rate of real value added of the manufacturing industries. Columns 1 and 2 report the result of estimation from the 5-bank concentration ratio (CR5) and the Herfindahl-Hirschman Index (HHI) respectively, both of which represent the bank concentration. Columns 3 and 4 show the estimation results from the Lerner Index and Boone Indicator respectively, both of which measure banking competition. Domestic credit to the private sector as a fraction of GDP proxies for banking sector development. Market capitalization as a fraction of GDP measures capital market development. All regressions include country, industry and time dummies in order to tackle unobserved heterogeneity. Robust standard errors in parentheses, \*\*\*, \*\*, and \* show the significance at 1%, 5%, and 10% respectively.

### 5.5.3.2 Property Rights

The economic literature suggests that institutional factors such as enforcement of property rights play an important role in the industrial growth and financial development.<sup>50</sup> In order to ensure that findings of this study are not influenced by such institutional characteristics, the study follows Claessens and Laeven (2005) and include the interaction between property rights and financial dependence. The results of this analysis are shown in Table 5.9. The interaction term of property rights and financial dependence enters with a positive and significant coefficient, indicating that financially dependent industries grow more in economies with a greater enforcement of property rights. Importantly, the coefficients on the interaction term between market structure (competition and concentration) and financial dependence are still significant and with consistent signs. Thus even after controlling for property rights, the main findings of the study are unchanged: in other words, a higher level of competition and a lower level of concentration in banking industry foster the growth of financially dependent industries.

**Table 5.9: Accounting for Property Rights**

Dependent Variable in all specifications is annual growth in real Value Added				
	Concentration		Competition	
	(1)	(2)	(3)	(4)
Market Structure*Financial Dependence	-0.164** (0.073)	-0.226*** (0.102)	-0.569*** (0.162)	-0.321** (0.139)
Financial Dependence*Financial Development	0.648*** (0.102)	0.598*** (0.094)	0.649*** (0.096)	0.632*** (0.096)
Property Rights*Financial Dependence	0.035*** (0.003)	0.034*** (0.002)	0.033*** (0.009)	0.032*** (0.002)
Industry Share of Value Added	0.176** (0.081)	0.111** (0.051)	0.157** (0.071)	0.162** (0.076)
R-squared	0.230	0.241	0.236	0.230
Time Dummy	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes

Note: The table displays the robustness of results by incorporating the property rights into the estimation results reported in Table 5.6. The dependent variable in all specifications is the annual growth rate of real value added of the manufacturing industries. Columns 1 and 2 report the result of the estimation from the 5-bank concentration ratio (CR5) and the Herfindahl-Hirschman Index (HHI) respectively, both of which represent the bank concentration. Columns 3 and 4 show the estimation results from the Lerner Index and Boone Indicator respectively, both of which measure banking competition. Domestic credit to the private sector as a fraction of GDP proxies for banking sector development. Market capitalization as a fraction of GDP measures capital market development. All regressions include country, industry and time dummies in order to tackle unobserved heterogeneity. Robust standard errors in parentheses, \*\*\*, \*\*, and \* show the significance at 1%, 5%, and 10% respectively.

<sup>50</sup>See for example, Beck, Demirgüç-Kunt, and Levine (2003); and Zhang, Wang, and Qu (2012)

### 5.5.3.3 Accounting Standards

Economic growth across countries may vary because industries have varying access to external finance, depending upon the quality of disclosure. According to Claessens and Laeven (2005), “quality of accounting standards” refers to all forms of external financing and not just to banking and stock markets. Moreover, quality of accounting standards reflects the potential to obtain finance. Rajan and Zingales (1998) claim that higher standards of the financial disclosure enable firms to raise finance from a vast group of investors. In order to test this possibility, the study includes the interaction term of accounting standards with financial dependence in the estimation model. The results of this analysis are reported in Table 5.10. The coefficient on the interaction term between accounting standards and financial dependence is significant and positive. The findings for accounting standards are in agreement with earlier studies such as Rajan and Zingales (1998), Cetorelli and Gambera (2001) and Claessens and Laeven (2005). Important for this study is the coefficient on the interaction of financial dependence and financial development which is significant with expected sign. The main findings of this study are reinforced: namely, the interaction term of financial dependence and concentration/competition remained unchanged. Thus, the results of this study are not driven by the availability of better quality information.

**Table 5.10: Controlling for Accounting Standards**

Dependent Variable in all specifications is annual growth in real Value Added				
	Concentration		Competition	
	(1)	(2)	(3)	(4)
Market Structure*Financial Dependence	-0.151** (0.068)	-0.440*** (0.146)	-0.432*** (0.163)	-0.354*** (0.122)
Financial Dependence*Financial Development	0.372*** (0.093)	0.401*** (0.091)	0.444*** (0.092)	0.425*** (0.093)
Accounting Standards*Financial Dependence	0.225*** (0.025)	0.221*** (0.025)	0.228*** (0.024)	0.212*** (0.025)
Industry Share of Value Added	-0.169** (0.079)	-0.163** (0.077)	-0.211** (0.095)	-0.213** (0.096)
R-squared	0.240	0.250	0.240	0.245
Time Dummy	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes

Note: The table displays the robustness of results by incorporating quality of accounting standards into the estimation results reported in Table 5.6. The dependent variable in all specifications is the annual growth rate of real value added of manufacturing industries. Columns 1 and 2 report the result of estimation from the 5-bank concentration ratio (CR5) and Herfindahl-Hirschman Index (HHI) respectively, both of which represent bank concentration. Columns 3 and 4 show the estimation results from the Lerner Index and Boone Indicator respectively, both of which measure banking competition. Domestic credit to the private sector as a fraction of GDP proxies for banking sector development. Market capitalization as a fraction of GDP measures the capital market development. All regressions include country, industry and time dummies in order to tackle unobserved heterogeneity. Robust standard errors in parentheses, \*\*\*, \*\*, and \* show the significance at 1%, 5%, and 10% respectively.

#### 5.5.3.4 Bank Ownership

Industrial growth may be different across countries not only because of banking concentration/competition but also because of the ownership structure of the banking sectors. For example, firms' access to credit in economies dominated by state-owned banks can be lower because it is possible that such banks do not have enough incentives to build strong lending relationships with successful ventures (Cetorelli & Gambera, 2001). In contrast, the existence of foreign banks can increase competition and improve efficiency, which ultimately increases the credit supply (Agénor, 2003; Lensink & Hermes, 2004; Baharumshah & Thanoon, 2006; Qiang, Zeng, & Zhang, 2013). Similarly, a reduced cost of borrowing as a result of foreign acquisitions can lead to firms having greater access to credit (De Blas & Russ, 2013). Nevertheless, the pressure from foreign banks can cause domestic banks to reduce the credit supply, thus firms' access to credit decreases (Giannetti & Ongena, 2009; Gormley, 2010; Chan, Dang, & Yan, 2012).

This study uses data on the share of foreign and state-owned banks to examine their role in the relationship between concentration/competition and industrial growth.<sup>51</sup> Table 5.11 shows the results of estimation where the interaction terms of foreign-owned banks and state-owned banks with financial dependence have been used. The coefficient on the interaction term between financial dependence and state-owned banks is negative and significant, thus supporting the argument that a higher share of state-owned banks depresses industrial growth. The coefficient on the interaction term between foreign banks and financial dependence is positive and significant, implying that a higher share foreign banks increase the access to credit and therefore fosters the growth of financially dependent industries. The findings for state-owned banks are in agreement with Hoxha (2013); however, for foreign banks, these results contrast with his findings.

Importantly, the main findings of this study (the concentration/competition and growth of financially dependent industries) remain the same, as the coefficients on the interaction between the measures of market structure (concentration/competition) and financial dependence remain significant with consistent signs even after controlling for banks' ownership.

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<sup>51</sup> Data on foreign and state owned banks' share comes from different sources, such as the central banks of sample countries, Helgi Library and the World Bank.

**Table 5.11: Accounting for Foreign Ownership**

Dependent Variable in all specifications is annual growth in real Value Added				
	Concentration		Competition	
	(1)	(2)	(3)	(4)
Market Structure*Financial Dependence	-0.143** (0.065)	-0.111** (0.047)	-0.195** (0.092)	-0.305*** (0.103)
Financial Dependence*Financial Development	0.548*** (0.115)	0.538*** (0.112)	0.550*** (0.111)	0.516*** (0.110)
State Owned Banks' Share*Financial Development	-0.026** (0.012)	-0.063** (0.031)	-0.067** (0.033)	-0.051** (0.025)
Foreign Banks' Share*Financial Dependence	0.322*** (0.107)	0.812*** (0.271)	0.337*** (0.121)	0.860*** (0.277)
Industry Share of Value Added	-0.038** (0.017)	-0.065** (0.029)	-0.045** (0.021)	-0.039** (0.018)
R-squared	0.157	0.159	0.157	0.180
Time Dummy	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes

Note: The table displays the robustness of results by incorporating the government and foreign banks' share into the estimation results reported in Table 5.6. The dependent variable in all specifications is the annual growth rate of real value added of manufacturing industries. Columns 1 and 2 report the result of estimation from the 5-bank concentration ratio (CR5) and Herfindahl-Hirschman Index (HHI) respectively, both of which represent bank concentration. Columns 3 and 4 show the estimation results from the Lerner Index and Boone Indicator respectively, both of which measure banking competition. Domestic credit to the private sector as a fraction of GDP proxies for banking sector development. Market capitalization as a fraction of GDP measures capital market development. All regressions include country, industry and time dummies in order to tackle unobserved heterogeneity. Robust standard errors in parentheses, \*\*\*, \*\*, and \* show the significance at 1%, 5%, and 10% respectively.

### 5.5.3.5 Dealing with Endogeneity

According to Cetorelli and Gambera (2001), it is possible that the relationship between market structure and industrial growth suffers from an endogeneity bias because the bank market structure may adjust to the industrial structure. Claessens and Laeven (2005) also discuss the possibility of an endogeneity problem in their study. Following (Mirzaei et al., 2013) and Claessens and Laeven (2005), this study deals with endogeneity problem by estimating the results with instrumental variable (IV) approach and the Two-step System GMM dynamic panel model with Windmeijer (2005) corrected standard errors and small sample adjustments. The results from GMM and the IV approach are reported in Table 5.12 and 5.13 respectively. The coefficients on interaction terms between the measure of market structure (concentration/competition) and financial dependence remain unchanged. Also, the coefficients on all the other variables are significant and with expected signs. These results reaffirm the findings that externally financially dependent firms grow more/less in competitive/concentrated banking systems.

**Table 5.12: Generalized Method of Moments (GMM) Approach**

Dependent Variable in all specifications is annual growth of industry Value Added				
	Concentration		Competition	
	(1)	(2)	(3)	(4)
Market Structure	-0.356*** (0.118)	-0.262** (0.124)	-0.287** (0.139)	-0.248** (0.122)
Market Structure*Financial Dependence	-0.047*** (0.005)	-0.166*** (0.011)	-0.027*** (0.009)	-0.085** (0.038)
Financial Dependence	0.076** (0.036)	0.068** (0.033)	0.082** (0.039)	0.079** (0.037)
Financial Development	0.674*** (0.229)	0.638*** (0.231)	0.762*** (0.298)	0.741*** (0.282)
Financial Dependence*Financial Development	0.026** (0.012)	0.068** (0.031)	0.064** (0.029)	0.089*** (0.039)
Log of Per Capita GDP	-0.107** (0.051)	-0.109** (0.054)	-0.141** (0.067)	-0.142** (0.065)
Industry Share of Value Added	-0.018* (0.010)	-0.016** (0.006)	-0.011* (0.006)	-0.010** (0.005)
AR(1) P value	0.013	0.011	0.017	0.015
AR(2) P value	0.347	0.322	0.413	0.360
Sargan/Hansen P value	0.312	0.283	0.358	0.238
Number of Instruments	102	102	102	102
Number of ID	115	115	115	115

Note: The table shows the results from the Two-step system GMM when applied to the model in Equation 5.2. The dependent variable in all specifications is the annual growth rate of real value added of manufacturing industries. Columns 1 and 2 report the result of estimation from the 5-bank concentration ratio (CR5) and the Herfindahl-Hirschman Index (HHI) respectively, both of which represent bank concentration. Columns 3 and 4 show the estimation results from the Lerner Index and Boone Indicator respectively, both of which measure banking competition. Domestic credit to the private sector as a fraction of GDP proxies for banking sector development. Market capitalization as a fraction of GDP capital market development. All regressions include country, industry and time dummies in order to tackle unobserved heterogeneity. Robust standard errors in parentheses, \*\*\*, \*\*, and \* show the significance at 1%, 5%, and 10% respectively.

**Table 5.13: The Instrumental Variable (IV) Approach**

Dependent Variable in all specifications is annual growth in real Value Added				
	Concentration		Competition	
	(1)	(2)	(3)	(4)
Market Structure	-0.272** (0.131)	-0.198** (0.088)	-0.228** (0.108)	-0.187** (0.082)
Market Structure*Financial Dependence	-0.072*** (0.021)	-0.059** (0.024)	-0.068** (0.029)	-0.072** (0.035)
Financial Dependence	0.113** (0.051)	0.121** (0.057)	0.101** (0.045)	0.106** (0.049)
Financial Development	0.563*** (0.201)	0.538*** (0.1991)	0.575*** (0.211)	0.567*** (0.212)
Financial Dependence*Financial Development	0.174** (0.081)	0.166** (0.076)	0.156** (0.067)	0.163** (0.078)
Log of Per Capita GDP	-0.472** (0.212)	-0.581** (0.258)	-0.611** (0.297)	-0.538** (0.263)
Industry Share of Value Added	-0.076** (0.034)	-0.085** (0.041)	-0.068** (0.031)	-0.082** (0.043)
R-squared	0.613	0.672	0.638	0.627
Time Dummy	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes

Note: The table reports the results from the instrumental variable (IV) approach. The dependent variable in all specifications is the annual growth rate of real value added of manufacturing industries. Columns 1 and 2 report the results of estimation of the 5-bank concentration ratio (CR5) and the Herfindahl-Hirschman Index (HHI) respectively. CR5 and HHI both represent the bank concentration. Columns 3 and 4 show the estimation results from the Lerner Index and Boone Indicator respectively, both of which measure the banking competition. Domestic credit to the private sector as a fraction of GDP proxies for banking sector development. Market capitalization as a fraction of GDP measures the capital market development. All regressions include country, industry and time dummies in order to tackle unobserved heterogeneity. Robust standard errors in parentheses, \*\*\*, \*\*, and \* show the significance at 1%, 5%, and 10% respectively.

### 5.5.3.6 Market Structure-Industrial Growth and the Financial Crisis

Although the fluctuations in industrial growth in pre and post financial crisis periods have been accounted for by introducing country, industry and time fixed effects, as an additional robustness check, the analysis has also been performed on different sample periods, i.e., subsample 1999-2006, subsample 2007-2009 and subsample 2010-2014. The sample has been divided into three groups on the basis of (i) insights from earlier studies (Ivashina & Scharfstein, 2010; Kwan, 2010; De Haas & Van Horen, 2012), and (ii) coefficients on time dummies for the year 1999, 2007, and 2009. Although not reported in the table for brevity, the coefficients on these years are significantly negative indicating that industrial growth has been lower during the financial crisis. Table 5.14 shows the estimation results for subsamples 1999-2006, 2007-2009, and 2010-2014. The analysis has been performed using all measures of market structure. However, the results from CR5 and Lerner Index are reported here to conserve the space (results from other measures are qualitatively similar to the overall results).

Important for this analysis are the coefficients on market structure variables, the interaction between market structure and financial dependence and the interaction between financial development and financial dependence. The coefficients on both CR5 and Lerner Index across all the sample periods are significant with a negative sign. Similarly, the coefficients on the interaction terms between market structure and financial dependence, and the financial dependence and financial development are significant with the expected sign. Moreover, the behavior of other variables across all the sample periods is also similar to results from the main estimation. Overall, findings of this study – externally financially dependent firms grow more/less in competitive/concentrated banking systems – are robust across different sample periods.



**Table 5.14: Market Structure-Industrial Growth Relationship and the Financial Crisis**

Dependent variable: Growth in Industry Value Added						
	Subsample 1999-06		Subsample 2010-14		Subsample 2007-09	
	(1)	(2)	(3)	(4)	(5)	(6)
Market Structure	-0.265** (0.131)	-0.217** (0.107)	-0.204*** (0.081)	-0.302*** (0.089)	-0.236* (0.119)	-0.272** (0.133)
Market Structure*Financial Dependence	-0.038** (0.017)	-0.047** (0.022)	-0.079** (0.037)	-0.117*** (0.035)	-0.069** (0.033)	-0.043* (0.022)
Financial Dependence	0.047** (0.023)	0.044** (0.021)	0.056*** (0.018)	0.081*** (0.026)	0.053* (0.027)	0.066** (0.032)
Financial Development	0.291*** (0.093)	0.299*** (0.098)	0.289** (0.139)	0.282** (0.135)	0.279* (0.141)	0.295** (0.143)
Financial Dependence*Financial Development	0.058** (0.026)	0.057** (0.028)	0.059*** (0.017)	0.072** (0.031)	0.092* (0.047)	0.096* (0.049)
Log of Per Capita GDP	-0.481** (0.232)	-0.517** (0.255)	-0.495** (0.246)	-0.493** (0.243)	-0.526** (0.259)	-0.548** (0.268)
Industry Share of Value Added	-0.076*** (0.017)	-0.064*** (0.020)	-0.058*** (0.018)	-0.052*** (0.014)	-0.047** (0.023)	-0.071** (0.033)
R-squared	0.498	0.532	0.571	0.551	0.517	0.546
Time Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes

Note: Table reports estimation results of the extended model for different sample periods. Panel A, B and C report the results for Subsample 1999-2006, Subsample 2007-2009 and Subsample 2010-2014 respectively. The dependent variable in all specifications is the annual growth of real value added of manufacturing industries. Column 1, 3 and 5 show the estimation results when CR5 is used as a measure of market structure. While, the columns 2, 4 and 6 report the estimation results when Lerner Index is used as a measure of market structure. Domestic credit to the private sector as a fraction of GDP proxies for banking sector development. Market capitalization as a fraction of GDP measures the capital market development. All regressions include country, industry and time dummies in order to tackle unobserved heterogeneity. Robust standard errors in parentheses, \*\*\*, \*\*, and \* show the significance at 1%, 5%, and 10% respectively.

## 5.6 Conclusion

This study examines the role of bank market structure (concentration/competition) for the growth of manufacturing industries that are dependent on external financing. The study takes into account two structural and two non-structural measures of market structure and applies them to industry-level data on the manufacturing industries from ASEAN economies from 1999 to 2014.

The results show that bank concentration (as measured by CR5 and HHI) may slow down the growth of externally financially dependent industries. This finding lends support to the idea that firms in a concentrated banking industry have low access to credit, which leads to less economic growth (Pagano, 1993; Guzman, 2000), and that higher concentration in banking sectors leads to less new firm creation and less economic growth (Berger, Hasan, et al., 2004; Cetorelli & Strahan, 2006). On the other hand, bank competition (as measured by the Lerner Index and Boone Indicator) may allow financially dependent industries to grow faster. This finding supports the notion

that a higher degree of competition in the banking industry reduces the holdup problems, reduces the cost of intermediation and encourages financially dependent firms to access bank credit (Claessens & Laeven, 2005).

These findings are robust when subjected to a number of sensitivity checks including alternative measures of financial dependence, and other channels that might explain the relationship between market structure and the growth of financially dependent industries. Other factors explaining this relationship include institutional characteristics, such property rights, quality of accounting standards and ownership of banks. In conclusion, the study suggests that industries in need of external finance grow more in a less concentrated and more in a competitive banking environment.

The study provides important implications for anti-trust policies. For example, in the aftermath of the Asian financial crisis 1997-1998 and the global financial crisis 2008-2009, there has been an unprecedented increase in bank consolidations. Based on concentration-stability hypothesis, the idea was to strengthen the financial institutions in the events of financial downturns. The concentration-stability hypothesis suggests that larger banks in concentrated banking industries can reduce the financial system risk. However, the literature reveals that concentrated banking industries may prove to be counterproductive for financial stability, bank efficiency, monetary policy transmission and the economic growth. This study provides the evidence of such counterproductive effects of bank concentration on the economic growth of financially dependent industries. Therefore, consolidation policies must be pursued carefully.

## CHAPTER 6: CONCLUSION AND IMPLICATIONS

### 6.1 Conclusion

The banking industry in ASEAN has witnessed a substantial increase in concentration in the aftermath of the Asian financial crisis 1997-98 and the global financial crisis 2008-09. The implications of bank concentration for banks' performance, monetary policy, and industrial growth are unclear. A number of studies have noted the unfavorable effects of bank concentration on banks' performance and other economic activities. For instance, the concentration of market share eliminates competition from the market and leads to market inefficiency (Weiss, 1974; Smirlock, 1985; Berger, 1995); the banks/firms in concentrated markets are able to earn higher profits by charging higher prices, however, they may not operate efficiently (Hicks, 1935; Berger & Hannan, 1998); bank concentration may lead to financial instability (Boyd & De Nicolo, 2005; Schaeck et al., 2009; Allen et al., 2011); it weakens monetary policy transmission through the bank lending channel (Adams & Amel, 2005; Olivero et al., 2011b; Khan, Ahmad, & Gee, 2016a); and it suppresses the growth of financially dependent industries (Pagano, 1993; Guzman, 2000; Claessens & Laeven, 2005; Khan, Ahmad, & Gee, 2016b).

On the other hand, there are studies that show the promising role of bank concentration in relation to banks' performance, financial stability, monetary policy and industrial growth. For example, the firms/banks having superior efficiency in production perform better, become large and obtain a higher market share, and hence the market becomes concentrated (Demsetz, 1973, 1974; Peltzman, 1977; Lambson, 1987); firms/banks with well differentiated and high-quality products in the concentrated markets are able to increase their market share and earn abnormal profits (Shepherd, 1982; Mueller, 1983; Ravenscraft, 1983, 1984); concentrated banking sectors reduce financial fragility through building up high 'capital buffers', increasing their charter

value, discouraging bank managers from excessive risk-taking, providing credit monitoring services, and diversifying risk (Keeley, 1990; Allen & Gale, 2004); concentrated banking industries reinforce the impact of monetary policy on bank lending Gunji et al. (2009); Olivero et al. (2011a); Amidu and Wolfe (2013); and concentrated banking markets promote economic growth (Mayer, 1988; Petersen & Rajan, 1995; Cetorelli & Gambera, 2001; Marquez, 2002; Di Patti & Dell'Ariccia, 2004; Zarutskie, 2006).

In the context of increased bank concentration and inconclusive literature, this study is aimed at examining the role of bank market structure for banks' performance and other economic activities such as monetary policy transmission and industrial growth in ASEAN economies over the period of 1999-2014. For the purpose of analysis, the main objective has been broken down into three sub-objectives (essays). First, to identify the relationship between banking market structure and banks' performance in relation to the SCP hypothesis. Second, to explore the impact of banking market structure on monetary policy transmission through the banks' lending channel. Third, to examine the role of banking market structure for industrial growth in general and the growth of financially dependent industries in particular.

**Objective One:** Towards the achievement of the first objective (essay 1), this study applies the SCP paradigm to examine the relationship between bank market structure and banks' performance. However, unlike the earlier studies, a different approach has been applied to the SCP hypothesis. The earlier studies directly relate market concentration to firm/bank performance in order to test the SCP hypothesis. This approach, however, does not prove that the superior performance on the part of banks in the concentrated market is the result of the monopoly rents or collusion among firms/banks. Under the new approach, this study introduces "bank conduct" as the

intermediating variable between the market structure and the banks' performance. The study follows the procedure introduced by Baron and Kenny (1986) to examine the mediating effect of bank conduct. Accordingly, four conditions have been specified for the existence of a mediation effect: i) bank concentration influences the conduct of the banks, ii) the banks' conduct independently affects the performance of the banks, iii) bank concentration affects the banks' performance, and (iv) the impact of the bank concentration on the banks' performance reduces with the inclusion of conduct in the estimation model.

Additionally, the study employs an alternative procedure laid down in Goodman (1960), Sobel (1982), and MacKinnon et al. (1995) to test the indirect relationship between market structure and bank performance through bank conduct. This approach may have advantages over those followed by the earlier studies because it considers all three elements in the SCP paradigm (the structure, the conduct, and the performance) and relates them in order as specified by the SCP hypothesis. The results support all the four relationships specified for the validity of the SCP hypothesis. For example, higher bank concentration leads to anti-competitive conduct by the banks, the anti-competitive conduct leads to higher profitability, higher bank concentration is related to higher profitability, and the effect of bank concentration on profitability diminishes when the conduct variable is included in the estimation. These findings are robust across alternative measures, different time horizons, and the different concentration levels, and therefore, the SCP hypothesis is valid for the ASEAN banking industry. However, the SCP may not be the only explanation for the structure-performance relationship because there is a partial mediation through the banks' conduct from the market structure to the banks' performance. It is possible that the large banks in the concentrated market are able to earn higher profits due to collusion/monopoly rents, but the higher profitability cannot be entirely attributed to the collusion or monopoly rents. Other possible reasons

for higher profitability may include the bank efficiency and/or the product differentiation. For example, it is possible under the efficient structure (ES) hypothesis that the efficient banks in concentrated banking markets are able to earn higher profits out of the cost efficiency (Berger & Hannan, 1989; Goldberg & Rai, 1996). Similarly, under the relative market power (RMP) hypothesis, the large banks with differentiated products may be able to charge higher prices and earn higher profits (Mueller, 1983; Ravenscraft, 1983).

**Objective Two:** The second objective of this study (essay 2) examines the impact of bank market structure on monetary policy transmission through the bank-lending channel. The monetary policy transmission through bank lending channel is well-established in the economics and finance literature, yet the literature on market structure-monetary policy transmission is limited in scope and context, for two main reasons. First, there is a lack of consensus among researchers with respect to competition measures, and second, the evidence on the weakening or strengthening the role of the banking structure in monetary policy transmission is inconsistent. This study applies two structural and two non-structural measures of market structure in order to examine its role in monetary policy transmission through the bank lending channel. The study also considers the banks' response to changes in monetary policy stance based on their financial strength (size, liquidity, and capitalization). The results from the two structural measures indicate that bank concentration undermines the effectiveness of monetary policy transmission through the bank lending channel. However, the two non-structural measures provide contradictory evidence. The results from the Lerner index suggest that greater market power or lower competition weakens the transmission of the monetary policy. The results from the Boone Indicator, however, show that a lower level of competition strengthens the monetary policy transmission. These findings thus follow Carbó et al. (2009), who suggest that inferences about the level of competition

differ widely when using different indicators of competition and therefore the implications of competition depend upon the choice of indicators. Assuming that all measures refer to the true level of bank competition, the overall conclusion is that a lower level of competition in the banking industry undermines the transmission of monetary policy through the banks' credit channel. The use of alternative competition measures reinforces the argument that the implications regarding the role of competition can be misleading when based on a single measure. The study also finds that the weakening or strengthening the effect of concentration/competition is stronger for highly capitalized, highly liquid and large-sized banks and that these findings are robust in relation to alternative measures of monetary policy indicator and different sample periods (pre-and post-financial crisis periods).

**Objective Three:** The third objective of the study (essay 3) explores the role of bank market structure in relation to the growth of manufacturing industries in general and those dependent on external financing in particular. Although the role of the bank market structure for economic growth is well recognized in the literature, the findings are inconsistent. This study uses two structural and two non-structural measures of market structure to examine the impact of bank market structure on the growth of manufacturing industries in general and that of financially dependent industries in particular. The results show that bank concentration (measured by CR5 and HHI) slows down the growth of manufacturing industries and that the slowing down effect is higher for externally financially dependent industries. This finding lends support to the idea that firms in a concentrated banking industry have low access to credit, which leads to less economic growth (Pagano, 1993; Guzman, 2000), and that higher concentration in banking sectors leads to less new firm creation and less economic growth (Berger, Hasan, et al., 2004; Cetorelli & Strahan, 2006). On the other hand, competition (measured by the Lerner Index and Boone Indicator) boosts the growth of externally

financially dependent industries. This finding supports the notion that a higher degree of competition in the banking industry reduces the holdup problems, reduces the cost of intermediation and encourages financially dependent firms to access bank credit (Claessens & Laeven, 2005). These findings are robust in relation to a number of sensitivity checks including alternative measures of financial dependence, endogeneity considerations, and institutional characteristics such as property rights, quality of accounting standards and ownership of banks.

Overall, the conclusion from the analysis of the three objectives (essays) is that the bank concentration allows the banks to earn higher profits partially through monopoly power, weakens the monetary policy transmission through the bank lending channel, and slows down the growth of manufacturing industries, particularly those that are financially dependent.

## **6.2 Policy Implications**

Based on its findings, the study provides important implications for anti-trust policies. For example, in the aftermath of the Asian financial crisis 1997-98 and the global financial crisis 2008-09, there has been an unprecedented increase in bank consolidations. In some countries, governments have even encouraged banking organizations to merge. Such moves were targeted to strengthen the financial institutions in the event of a financial downturn. However, this study shows that a concentrated banking industry may prove to be counterproductive for bank performance, monetary policy transmission, and industrial growth. For instance, the SCP hypothesis implies that the concentration reduces the cost of collusion and promotes either tacit or explicit collusion; consequently, all firms are able to earn monopoly profits. In other words, concentration eliminates competition (through collusion) from the market and leads to market inefficiency: in other words, to



monopolistic pricing and profits. Therefore, the SCP hypothesis proposes a careful analysis of consolidation activities. However, if alternative hypotheses (ES and RMP) are true, then the anti-concentration policies might bring inefficiency into the economy. This study provides partial evidence in favor of the SCP hypothesis, but it is possible that other theories such as ES or RMP hypotheses may also be coexisting in ASEAN. Similarly, the findings of this study provide evidence of the unfavorable effects of a concentrated banking industry on the transmission of monetary policy through the bank lending channel, and the growth of financially dependent industries.

Keeping the findings of this study in view, it is imperative to analyze the consequences of a consolidation policy. Several questions may be asked in order to analyze such policies. For example, is the banking industry becoming more concentrated as a result of the consolidation activities? Does a higher level of concentration imply more market power for the leading market players? Does a concentrated banking industry allow these leading players to exercise market power and earn abnormal profits? How does the concentrated banking industry affect other economic activities such as financial stability, industrial growth, and monetary policy transmission? The consolidation policies must be pursued after considering all such important questions. Finally, the regulatory authorities need to ensure that the consolidation policy for ASEAN – while promoting the financial stability – is not allowing the banks to earn monopoly rents, and/or reducing the effectiveness of monetary policy transmission and/or slowing down industrial growth.

### **6.3 Limitations and Future Recommendations**

This study is focused on three very important areas concerning the role of the banking market structure: namely, bank performance with reference to the SCP

hypothesis, the monetary policy through the banks' lending channel, and the growth of financially dependent industries.

However, there are other important aspects of banking market structure that are not addressed in this study. For instance, the market structure and performance relationship has also been explained by alternative hypotheses such as the efficient structure (ES) hypothesis, the quiet life (QL) hypothesis and the relative market power (RMP) hypothesis. Since this study finds partial support in favor of the SCP hypothesis, it is possible that higher profits associated with bank concentration are partially explained by ES or RMP hypotheses. Similarly, this study does not address the role of the banking market structure for other areas of the economy such as the growth of small and medium-sized enterprises (SMEs), financial stability, firms' access to credit, and new firm creation. Future research in these domains, considering the alternative explanations of the market structure and performance relationship, and the role of market structure for other aspects of economies, could offer a valuable contribution towards policy analysis and empirical literature in the context of the ASEAN banking industry.

Furthermore, complete coverage of ASEAN is limited by the availability of data in the post-Asian financial crisis period. Therefore, the sample of this study only covers five ASEAN countries, i.e., Indonesia, Malaysia, the Philippines, Singapore, and Thailand. The analysis of this study can be extended to a sample all ASEAN countries. Moreover, to achieve its objectives, this study estimates the results using panel data for five countries in ASEAN as a whole. The study uses several country-specific variables, bank fixed effects and time fixed effects to account for unobserved heterogeneity across banks. Nevertheless, a country-specific analysis can be a better way to ensure that the estimation results are not affected by macro and microeconomic dynamics of these countries. In this regard, performing a separate analysis for each country will be a

valuable contribution to the empirical literature on implications of market structure in the context of ASEAN economies.

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## LIST OF PUBLICATIONS AND PAPERS PRESENTED

Khan, H. H., Ahmad, R. B., & Gee, C. S. (2018). Market Structure and Bank Performance: The Role of Bank Conduct. *Journal of Policy Modeling (Forthcoming)*

Khan, H. H., Ahmad, R. B., & Gee, C. S. (2016). Bank Competition and Monetary Policy Transmission through the Bank Lending Channel: Evidence from ASEAN. *International Review of Economics & Finance*, 44, 19-39.

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