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School of Management

# Banking Market Structure and Bank Intermediation Strategies in Emerging Markets: Three Essays

by

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## ABSTRACT

FACULTY OF BUSINESS AND LAW
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# BANKING MARKET STRUCTURE AND BANK INTERMEDIATION STRATEGIES IN EMERGING MARKETS: THREE ESSAYS

By Mohammed Amidu

This thesis focuses on bank market structure and the effect of changes to this structure on intermediation strategies using a dataset that covers many regions of the world. Employing different estimation techniques and methodologies, and using a novel approach to each line of research, this thesis provides the following robust results: first, increase banking competition weakens the effectiveness of monetary policy. This is because an increase in the degree of market power increases the response of bank lending to the monetary policy stance. Second, competition increases stability as banks diversify across and within their business activities. Third, the high net-interest margin and relatively low insolvency risk among banks in developing countries could be attributed to a high degree of market power and the use of internal capital financing.

The thesis makes the following contributions to the literature: first, in order to gain new insights and provide new dimensions to the existing literature, each of the three core chapters employs an estimation strategy that is new in the literature and which offers more scope for investigation. For instance, the positive influence of revenue diversification on the competition-stability nexus is new in the literature. Second, this thesis is first in considering how various measures of market power and a variety of bank funding strategies impact on banks performance. Furthermore, considering the banking structure-risk-lending channel hypothesis in assessing banks' response to monetary shocks is also new in the monetary policy transmission literature.

In conclusion, this thesis gives rise to important public policy recommendations. First, the strong link between market imperfections and the effectiveness of monetary policy indicators requires regulation that can resolve and offset the adverse effects of further increases in the degree of bank market power on the effectiveness of monetary transmission. Second, given the results of the role of diversification on the competition-stability relationship, there is no evidence to support regulatory initiative that restricts banks diversification activities. The third and final recommendation is on the concept of market power: bank market power in itself is not detrimental to banking activities, but the level and the application of it could negatively affect bank insolvency risk. Therefore, supervisory, regulatory and competition authorities should coordinate to put in place a comprehensive framework that allows banks to have a considerable amount of market power that is robust and consistent with any competition policy.

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## DECLARATION OF AUTHORSHIP

I, **Mohammed Amidu** declare that this thesis entitled

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and the work presented in the thesis are both my own, and have been generated by me as the result of my own original research. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University;
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or other institution, this has been clearly stated;
- Where I have consulted the published work of others, this is always clearly attributed;
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
- I have acknowledge all main sources of help;
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
- None of this work has been published before submission.

Signed:……

Date:……. ……

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'To God be the Glory'

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# *Chapter I*

# INTRODUCTION

## 1.1 AIM

The aim of this thesis is to offer new insight into bank market structure, intermediation strategies and stability. To this end, this study provides distinctive analyses of the relationship between market structure, lending and stability of banks in emerging and developing countries. In addition, a unique evaluation of overall bank performance, focusing on funding strategies and the degree of competition among banks concludes this work.

## 1.2 OVERVIEW

Banking sector under-performance including financial crises over the past three decades has resulted in sizeable output losses in both developed and developing economies. In developing economies, the output losses have been rather more detrimental to subsequent economic growth. This is because banks and other related financial intermediaries have failed to perform their important developmental function, by providing firms, entrepreneur, and households with essential finance. Also, the losses have hindered and reduced investments which are necessarily needed for economic growth, financial development and poverty alleviation. The impact, severity and the systemic nature of the 2007 financial crisis has revived interest in overall banks performance and intermediation strategies in both industrialised and non-industrialised economies. Moreover, the crisis has shown the need for a co-ordinated policy response across countries in order to prevent the occurrence and the spread of financial stress in the future.

Motivated by this upsurge in public policy interest in bank lending, the need to ensure solvency of individual institutions so as to prevent/or stop the systemic financial crisis and the need to assess the various channels of instability, this empirically driven study aims to discover the linkages between bank market structure, individual bank intermediation strategy as well as performance. Thus this work makes the following specific and direct contributions to the literature:

First, employing a variety of econometric methodologies and techniques and a large data sample, this work improves and deepens the understanding of the relationship

between market structure, bank lending and monetary policy transmission of banks in developing countries. It not only analyse the effect of standard bank-specific characteristic (i.e. variables capturing bank size, liquidity and capitalization are considered the standard indicators in the bank lending channel literature) on bank lending, but explores the extent to which banks' market structure and insolvency risk affect monetary policy transmission through the lending channel. The argument in support of the banking structure-risk-lending channel hypothesis is that monetary policy does not only affect bank reserves but also impacts on marginal cost through interest rates paid on bank liabilities. More so, banking market structure determines how banks' marginal cost shocks could be passed to prices and lending. In addition, analysing the implication of the degree of bank market power and the changes in the banks' financial condition for loan supply and monetary policy transmission is important in that: the changes in developing countries' bank market structure, liberalization of financial sector, and the emergence of financial innovation could increase the perception and the risk pricing of bank behaviour (Borio and Zhu 2008); and that traditional variables may not provide an accurate assessment of banks' capacity, ability and willingness to grant additional loans (Altunbas et al., 2010).

Second, this thesis for the first time in the banking literature investigates the role of revenue diversification on the relationship between competition and stability of banks in developing economies. This thesis extends previous research, and in doing so, provides a new direction to the literature by focusing on the influence of diversification in the competition-stability relationship. The fact that competition may exert pressure on banks to diversify their business activities and the fact that these activities may affect bank insolvency risk, has not been previously considered worth further investigation. The result that competition benefits from diversification provides valuable insight for regulatory authorities, banking supervisors, market participants and indeed the general public about the role of revenue diversification in the competition and stability relationship.

Third, using a panel dataset, this thesis further investigates how different measurements of market structure affects bank funding strategies and performance. It

provides additional insight by examining the complex interlocking of three key variables that are very important for bank regulators: the degree of market power, funding sources and banks' performance. This analysis is particularly novel as the current credit turmoil has highlighted the importance and resilience of bank funding structure to banking crises.

## 1.3 STRUCTURE OF THIS THESIS

This thesis is structure along two distinctive public policy debates related to banking, whereby one problem is further decomposed into two different analyses. As a result of this, one chapter is devoted to each of the three different lines of research. However, what is common to these three distinct lines of research is their focus on the effect of bank market structure. Banking market structure connotes to the different attributes of a market, including the number and distribution of banks (Bauer and Cromwell (1989), and Besanko et al. (2007)), specific characteristics of the banks within the market (Bikker and Haaf 2002) and the characteristics of the market itself (De Nicolo et al., 2004). Throughout this thesis market structure or bank market structure connotes the competitiveness or non-competitive environment in which the sample banks operate.

Chapter II is the starting point of the thesis and it contains an analysis of the relationship between bank market structure, insolvency risk and lending channel using panel dataset of 978 banks across 55 developing/emerging economies. Following a detailed review of the literature on bank market structure, the association between market structure and bank lending, and the current literature on risk and monetary policy, this chapter empirically test whether change in monetary policy stance increases sensitivity of lending of banks with: 1) high degree of market power; and 2) low level of insolvency risk. This chapter presents robust evidence in support of a stronger relationship between market imperfection, bank's risk conditions and the effectiveness of the monetary policy instruments.

Chapter III builds upon the initial findings of chapter II and extends the analysis of market structure to bank performance and insolvency risk. In light of this, Chapter III contains an empirical investigation of the effect of revenue diversification on the

competition and stability relationship, as previous studies have not considered the role of diversification in the competition stability nexus. The results are consistent with previous studies that suggest that greater competition among banks increases banking stability by showing robust evidence for this positive link when revenue diversification of banks' activities are controlled.

Chapter IV employs a different approach to analysing bank performance and stability, by focusing on bank funding structure and variety of degree of market power. Employing the systems generalised methods of moments estimator (system GMM), the study analyses how funding strategies of banks with market power affect their net-interest margin, return on their assets as well as their insolvency risk. The results suggest that the performance of banks with market power is significantly more sensitive to internally generated funds than they are to deposit and wholesale funding.

Furthermore, the high degree of market power does not only increase the net-interest margin and profitability level of banks in emerging and developing countries, it also reduces their insolvency risk. Relating bank funding strategy to insolvency risk, the results suggest that banks that depend heavily on internal and deposit funding are safer than those that finance their assets with wholesale funds. The results thus provide support to the existing findings that banking strategy that relies predominantly on attracting non-deposit funding is more risky and less resilient to the crisis.

Chapter V draws an overall summary to this thesis and identifies and provides policy implications emanating from the findings of the three core chapters. It also acknowledges inherent limitations of the current research and brings to light areas for future research.

# *Chapter II*

# BANK COMPETITION, FINANCIAL STABILITY AND THE LENDING CHANNEL OF BANKS IN EMERGING MARKETS

# Bank competition, financial stability and the lending channel of banks in emerging markets

**Abstract**

This chapter analyses the extent to which the level of bank competition and insolvency risk affect monetary policy transmission through the lending channel. Using a large panel dataset of 978 banks of 55 countries, and employing the Lerner index model as a measure of market structure, the results show that an increase banking sector competition weakens the effectiveness of monetary policy on bank lending. The results also show that banks with low insolvency risk have the financial strength to provide new loans. These findings are robust to a broad array of sensitivity checks including control of alternative measurements of the Lerner index, different samples and different methodological specifications. By extension, these results have important policy implications for regulators in assessing the effectiveness of monetary policy transmission mechanisms.

## 2.1 Introduction

The objective of any economic policy according to Friedman (2008) is to advance the economic well-being of a nation's citizens and to strengthen the institutions through which they interact to achieve this welfare. Some of these institutions are financial intermediaries which firms as well as households rely on to finance their projects. This chapter examines the role of bank market structure and its risk conditions in monetary policy transmission. Banking market structure connotes to the different attributes of a market, including the number and distribution of banks (Bauer and Cromwell (1989), and Besanko et al. (2007)), specific characteristics of the banks within the market (Bikker and Haaf 2002) and the characteristics of the market itself (De Nicolo et al., 2004). For the purpose of analysing the extent to which bank market structure and insolvency risk affect monetary policy, this chapter employs Lerner index as a proxy for market power. The Lerner index represents the price mark-up over marginal cost and it is the only measure of competition calculated at the bank level (Berger et al. 2009).

The standard view of a transmission mechanism focuses on the effect of monetary policy on interest rates and through interest rates on lending and credit. According to this standard view as explained through the interest rate channel, a change in the monetary policy stance affects long-term interest rates and the exchange rate, and this alters relative prices in the economy, the price of future consumption and investment relative to the price of present consumption, and the prices of foreign goods in terms of domestic goods (Bean et al. 2002).[1] In contrast, the bank lending channel of monetary policy transmission focuses not only on the impact of monetary policy on demand for loans, but more important on the supply of loans. However, to support the existence of a lending channel, there is a need for evidence that monetary policy tightening causes a shift in the supply of loans and that there are certain categories of borrowers who depend on bank loans for their finances.

[1] The interest rate channel cannot fully explain the intensity, timing and composition of responses of real variables to variations in monetary policy (Pruteanu-Podpiera, 2007). Bernanke and Gertler (1995) provide an exposition of what the interest rate channel theory fails to explain.

Studies on the bank lending channel, either country specific or cross-country, have centred on the identifying its existence, on gauging its potency and its overall importance, on identification of shifts in loan demand from shifts in loan supply, and on the types and distributional effects (Bernanke and Blinder (1988), Kashyap and Steins (1995, 2000), Kishan and Opeila (2000), Altunbas et al. (2002), Ehrmann et al. (2003), and Brissimis and Delis (2009)). Little attention has been given to the effect of banking structure and bank risk conditions on the response of bank lending to monetary policy. The argument in support of the banking structure-risk-lending channel hypothesis is that monetary policy not only affects bank reserves either through the traditional open market operations or reserve requirements, but also impacts on marginal cost through interest rates paid on bank liabilities. More so, banking market structure is important as the degree of market power determines how banks' marginal cost shocks could be passed to prices and lending. Vanhoose (1985) shows that monetary policy designed to target an interest rate automatically impacts on the monetary aggregate as a result of changes in bank market structure. In addition, (Borio and Zhu 2008) contend that changes in the banking system coupled with changes in the prudential regulation could have increased the effect of banks' perception, pricing and risk management behaviour (especially in the developing countries). Thus, proper understanding of the industrial organisation of local financial markets is necessary for a detailed analysis of monetary transmission mechanisms (Toolsema, 2002).

From an empirical point of view, studies which examine the relationships between the level of competition and the effect of monetary policy on bank lending are those of (Adams and Amel (2005), Gunji et al. (2009) and Olivero et al. (2011)). Adams and Amel (2005) use US data to investigate the impact of local bank concentration on monetary policy transmission and find that the impact of monetary policy on loan originations is weaker in more concentrated markets. Gunji et al. (2009) and Olivero et al. (2010) test the impact of *H-statistic* (competition measurement) on the transmission of monetary policy and their result show that increased competition in the banking industry leads to a smaller policy effect on bank lending. However, the concentration ratio does not necessarily measure the level of competition (Claesens

and Laeven 2004) and it cannot be used to explain differences in market structure. Secondly, *H-statistic* is seen as an aggregate phenomenon emanating from the collective interaction of set of a market participants. In contrast, *Lerner index* is an individual phenomenon which results from the behavioural pricing strategy of a particular bank (Gutierrez de Rozas 2007).[2] Thirdly, the use of aggregate data that rely on the short-term responses of bank lending may not be very informative in view of the fact that banks may be prevented from quickly adjusting the stock of their loans following a monetary policy shock, due to loan commitments (Brissimis and Delis, 2009).

In addition to investigating the changes in the sensitivity of bank lending to changes in monetary policy as a result of differences in the market structure that a bank operates, this chapter also examines the effect of risk on the banks' reaction to monetary policy.

It is well established in the new empirical industrial organisation literature that, there is a well-established relationship between market structure and interest rates charged on loans and deposits. Using for example the structural-conduct-performance hypothesis, studies reveal that in a market where banks are concentrated, lending reduces as a result of high lending rates. Also, deposit rates decline where a bank has excessive market power in a deposits market (Hannan and Prager (1998), Berlin and Mester (1999), Black and Strahan (2002) and Kahn et al. (2005)).[3] Also, due to innovation in the financial system, variables such as bank size, liquidity and equity may not be enough to assess banks' ability to provide additional loans (Altunbas et al., 2010).

[2] The *Lerner index* is a measure of market power or price mark-up over marginal cost. It provides a separate value for each bank in the industry. Conversely, the *H-statistic* is an indicator of competition and it is based on the price elasticities of inputs cost in a reduced-form revenue equation. It provides a single value for the whole industry (Gutierrez de Rozas 2007). Thus using *H*-statistics to investigate the effect of bank market structure on the lending channel to changes in monetary policy may not be appropriate.

[3] Corvoisier and Gropp (2002) summarise the impact of concentration on the pricing behaviour of banks using the 'structure performance hypothesis' (i.e. ability of a bank with market power to extract higher rent) and 'efficient structure hypothesis' (i.e. lower operating cost).

The aim of this chapter is to blend the above research with that of a study on monetary policy transmission. To the best of my knowledge this thesis is first in monetary policy transmission literature to consider banking structure-risk-lending channel hypothesis in assessing banks' response to monetary policy shocks. Apart from an extension in the scope of current literature, this chapter also makes the following four important contributions with respect to the established literature and in particular regarding developing and emerging economies: First, a Lerner index is constructed as a proxy for bank market power and test its sensitivity with core deposits on bank loan growth.[4] This is to investigate whether banks with a high degree of market power are constrained by the availability of loanable funds which is a necessary condition for the existence of a bank lending channel (Jayaratne and Morgan 2000). Secondly, the Lerner index is interacted with the monetary policy stance to examine the response of market structure to monetary policy changes. Specifically, bank loan growth is regressed on the Lerner index, the stance of monetary policy and the interactions between these variables. The third contribution emanates from the use of 978 individual banks' balance sheet data across 55 developing countries for the period 2000-2007. Favero et al. (1999) indicate that microeconomic data makes it possible for one to identify the presence of a credit channel. The fourth innovation of this chapter lies on investigating the effect of insolvency risk on the banks' response to monetary policy and macroeconomic shocks.

Analysing the implication of the degree of bank market power and the changes in the banks' financial condition for loan supply and monetary policy transmission is important for two reasons: the changes in developing countries' bank market structure, ever increasing liberalization of the financial sector, and the emergence of financial innovation in these markets could have changed the perception and the risk pricing behaviour of banks (Borio and Zhu 2008) and that traditional bank-specific variables may not provide an accurate assessment of banks' capacity, ability and willingness to grant additional loans (Altunbas et al., 2010).

[4]An alternative version (i.e. funding-adjusted Lerner index) is also constructed as a robustness check of the earlier version (i.e. conventional Lerner index).

The results show that a decline in the level of competition increases the response of bank lending to monetary policy stance, providing evidence in support of a stronger relationship between market imperfection and the effectiveness of the monetary policy instrument. Also, bank risk, as measured by Z-score, suggests that highly solvent banks operating in emerging markets are not more sensitive to monetary policy shocks in extending credits in the short-run. The overall implication of this finding is that bank market structure and risk conditions need to be considered in addition to the traditional bank-specific indicators (bank size, liquidity and capitalisation) in assessing banks ability to finance economic activities.

The remainder of this chapter is organised as follows; section (2.2) reviews the extant literature on the lending channel, market structure and risk-taking behaviour of banks, section (2.3) discusses the research methodology as well as the measurement of key variables used in the study, section (2.4) contains the data while section (2.5) discusses the empirical results and robustness tests and finally, section (2.6) concludes.

## 2.2 Literature review

This section provides a review of related literature on the relationship between bank lending channel, market structure and insolvency risk. It begins with a theoretical overview of the principles underlying a bank lending channel and then follows with a discussion of the empirical literature including methods and results on the micro-bank-specific and macro-country-level variables that affect loan delivery. The section concludes with a review of the extant literature on bank risk and monetary policy.

### 2.2.1 Bank lending Channel

The theoretical principles underlying the bank lending channel posit the effect of monetary policy on the real economy through direct impact on the supply of bank loans. The mechanism is that, tightening of monetary policy shrinks banks' reserves and reduces banks' access to loanable funds and credit (Lensink and Sterken, 2002). The lending channel according to (Bernanke and Blinder (1988), and Kashyap and Stein (1995)) operates on certain premises: bank loans and publicly issued bonds are

imperfect substitutes for firms and that capital structure matters for such firms since they cannot offset a decline in the supply of loans by financing their investment with external borrowings. The other condition is that bonds and loans are not perfect substitutes for banks and that, the central bank must be able to alter the quantity of reserves available to banks in order to influence the supply of loans. This condition is key in that, banks must not be able to completely insulate their lending activities from the shocks to reserves, either by switching from deposits to non-reservable sources of finance such as certificate of deposits (CD), commercial paper or equity (Bernanke and Blinder 1988). The implication of a bank lending channel of monetary policy transmission is that, it has distributional effects on varying levels of bank characteristics with small, illiquid and less capitalised banks most affected. However, some studies have cast doubt on the existence and implications of the bank lending channel. Romer and Romer (1990) argue that, large multinational firms and private banks may neutralise the effects of a monetary contraction by replacing a decrease in bank loans and reserves with other forms of funds by issuing equity and CDs respectively. Disyatat (2010) contends that the importance placed on policy-induced changes in deposits is misplaced and that the lending channel works through the effect of monetary policy on banks' balance sheet strength and risk perception.

Given the lack of consensus on theories underlying the relevance of the lending channel, perhaps empirical studies provide evidence on the existence, relevance, distribution and implication of a bank lending channel. Empirical studies in the U.S. show that a bank lending channel exists and that the transmission is through bank size (Kashyap and Stein 1995); bank size and liquidity (Kashyap and Stein 2000) and bank size and the level of capital (Kishan and Opiela 2000). However, recent studies suggest that the bank lending channel within the US is declining in strength (Loutskina and Strahan, (2009), Cetorelli and Goldberg (2008), and Ashcraft (2006)). (Loutskina and Strahan, (2009) results suggest that the increased securitization of the mortgage secondary market has reduced the effect of lender financial condition on credit supply. Employing quarterly data between 1989 and 2005 (Cetorelli and Goldberg 2008) find that bank lending channel within United States has declined in strength as banking becomes more globalized. Ashcraft (2006) reveals that banks

loans do not play a significant and independent role in the transmission mechanism of monetary policy in U.S. On cross-country studies (mainly in continental Europe), there are mixed results on distributional effects of monetary policy. Altunbas et al. (2002) find that capitalization level and the size of the bank affect a bank's reaction to monetary policy change in the Euro area. Ehrmann et al. (2003) show that apart from banks' liquidity, neither capital nor size play a role in distinguishing bank lending in the Euro area countries. Brissimis and Delis (2009) who use bank panel data for six OECD countries find no significant evidence supporting the distributional effect of the bank lending channel.

### 2.2.2 Bank market structure and lending channel

Though these studies as reviewed in section 2.2.1 examine the effects of monetary policy changes on bank lending, no attempts have been made to control for differences in banking markets and bank risk condition that have been shown to affect bank lending. Again, the literature drawing on industrial organisation has shown that banks in more concentrated markets tend to adjust prices less completely in response to changes in input costs than banks in more competitive markets. Cerqueiro (2008) finds that in a market where banks are concentrated, the lending rate increases by more than 70 basis points and that concentrated markets seem to attract low-quality loan applicants. Black and Strahan (2002) show that fewer enterprises are created in more concentrated banking markets. Kahn et al. (2005) who examine the relationship between bank consolidations and dynamics of insurer loan interest rates point out that interest rates quoted by banks for personal and automobile loans are higher in concentrated markets. On deposits rates, Hannan and Prager (1998) show that they decline by a greater percentage as a result of substantial increase in local market concentration. Berger and Hannan (1989) suggest that banks in most concentrated environments pay a range of 25-100 basis points less on their deposits compared to those operating in less concentrated markets.

Though monetary policy affects marginal cost through interest rates paid on bank liabilities, there exists a thin literature directly analysing the relationship between the bank lending channel and the level of competition. Adams and Amel (2005) use US

data to investigate the impact of local bank concentration on monetary policy transmission and find that the impact of monetary policy on loan originations is weaker in more concentrated markets. Gunji et al. (2009) test the impact of *H*-statistic on the transmission of monetary policy and the results show that competition in the banking industry leads to a smaller policy effect on bank lending. This chapter contends that monetary policy shifts bank marginal costs by influencing the interest rates that banks pay at the margin for loanable funds and that the effect of monetary policy depends on the competitive environments in which banks operate. In the standard model of the firm, the adjustment of prices and output according to Vives (1999) is a function of the curvature of demand and cost functions and of market competition. Goldberg and Knetter (1997) argue that in the case of perfect competition where equilibrium price is set to marginal costs, changes in marginal costs will be transmitted to reflect in the price. However, as the degree of competition decreases, two theoretical possibilities may occur according to Freixas and Rochet, (1997): in the first case, as the degree of competition decreases, output becomes less sensitive to changes in marginal costs and price changes in response to a marginal cost shock become restrained. As a result, the sensitivity of bank lending to the monetary policy stance decreases as the market becomes less competitive. In the second case, under certain demand and cost curvature conditions, price becomes more sensitive to changes in marginal costs as the degree of competition decreases. Alencar and Nakane (2004) who disagree with the positions of earlier studies investigate monetary policy on both perfect and monopolistic competition and their simulation results show that increased bank competition causes the economy to be more sensitive to interest rates. Also, Vanhoose (1985) shows that if the central bank targets monetary aggregates and uses the security rate as a policy instrument, then a change in competition causes no significant effect on the deviation of money from the target.

As policy implications on these theoretical models are not conclusive, it is imperative to assess empirically the degree of bank market power in developing economies so that authorities get a better understanding of the potential effectiveness of monetary policy. To this end, the chapter first analyses these questions: What is the degree of competition in developing countries? Does this make monetary policy less effective?

Using new empirical industrial organisation methodology, the Lerner index is constructed to analyse the response of a monetary policy shock to bank lending.

### 2.2.3 Bank risk condition and monetary policy

The shift of part of the banking sector activities from the traditional 'originate-to-hold' to an 'originate-to-distribute' model of banking has impacted on the way banks grant credit and react to monetary policy shocks (Altunbas et al. (2009), Loutskina and Strahan, (2009), and Hirtle, (2008)). Literature on the transmission mechanism under bank risk condition has focused on banks' incentive problem emanating from bank mangers. Borio and Zhu (2008) contend that financial innovations in addition to the changes to Basel II are likely to enhance the impact of the perception, pricing and management of risk on the behaviour of banks. Rajan (2005) on his part, suggests that more market-based pricing and the stronger interaction between banks and financial markets increase the incentive structure driving banks, especially to a stronger link between monetary policy and financial stability effects. Thus bank risk condition as perceived by so called 'market investors' affect banks' ability, capacity and willingness to supply loans. This is because, the riskiness of the credit portfolio reduces a bank's profits, capital and lending. Altunbas et al. (2010) find that banks with a lower expected default frequency (EDF) cannot only offer a higher amount of credit, but also are able to shield their lending from monetary policy changes. Furthermore, there is evidence to suggest that euro area investors in banks debt are quite sensitive to bank risk and more sensitive after the introduction of the common currency (Sironi 2003).

Clearly banks' risk conditions matter for the supply of loans especially following monetary policy shocks. Thus this chapter considers banks' insolvency risk together with the competitive structure and other bank-specific variables in analysing the functioning of the bank lending channel of monetary policy transmission in the context of developing and emerging economies.

## 2.3 Construction of key variables

### 2.3.1 Degree of market power

This chapter employs the Lerner index to measure the degree of competition among banks. One advantage of the Lerner index is that it can be estimated using bank-specific variables. The index captures more information about the actual price-setting behaviour of banks in relation to their cost structure than the size of banks measured in terms of deposits, relative size of balance sheets or income generated (Hawtrey and Liang 2008). It also provides information on whether or not banks can pass on additional costs to borrowers as a result of monetary policy shocks. The construction of the Lerner index follows that of (Berger et al. 2009) as:

$$Lerner\,index_{it} = (P_{TA,it} - MC_{TA,it}) / P_{TA,it} \tag{2.1}$$

The Lerner index in equation (2.1) suggests the extent to which the monopolist's market power allows it to fix a price above marginal cost. The primary assumption is that the flow of goods and services produced by banks is proportional to total assets (Fernandez de Guevara et al. 2005). With this assumption, the price is constructed to include both interest and non-interest income, where $P_{TA,it}$ is the price of the total assets. $MC_{TA,it}$ is the marginal cost of producing an additional unit of output. The $MC_{TA,it}$ is derived from the following translog cost function as:

$$\begin{aligned}\ln Cost_{it} = {} & \beta_0 + \beta_1 \ln TA_{it} + \frac{\beta_2}{2} \ln TA_{it}^2 + \sum_{k=1}^{3} \gamma_{kt} \ln W_{k,it} + \sum_{k=1}^{3} \phi_k \ln TA_{it} \ln W_{k,it} + \\ & \sum_{k=1}^{3}\sum_{j=1}^{3} \delta_{ij} \ln W_{k,it} \ln W_{j,it} + \sum_{i=1}^{3} (\delta_i / 2) \ln W_{t,ij}^2 + \sum_{k=1}^{2} \eta_k trend^k \\ & \sum_{i=1}^{3} \varsigma_i \ln W_{t,ij}\, trend + \nu \ln TA_{tj}\, trend + \varepsilon_j \end{aligned} \tag{2.2}$$

Where *Cost* is the bank's total costs including financial and operating cost; $TA_i$ represents a proxy for bank output measured as total assets, and $W_1$, $W_2$ and

$W_3$ indicate the input price of deposit funds, labour and capital and these are respectively calculated as the ratio of interest expenses to total deposits and money market funding, labour cost to total assets[5], and other operating and administrative expenses to total assets. The cost function is estimated separately using a panel data for each country in the sample. This allows for the parameters of the cost function to vary from one country to another, reflecting different technologies. Fixed effects are also introduced to capture the influence of variables specific to each bank. Once the cost function is estimated, marginal cost is evaluated by taking the first derivative with respect to the output for each bank in the sample. Hence, the marginal cost is calculated for each banking firm as:[6]

$$MC_{it} = \frac{Cost_{it}}{TA_{it}}\left[\beta_1 + \beta_2 \ln TA_{it} + \sum_{k=1}^{3} \phi_k \ln W_{k,it} + \delta_3 Trend_{it}\right] \tag{2.3}$$

The index is interpreted as follows: a Lerner index with higher value implies higher pricing power and less competitive market conditions[7].

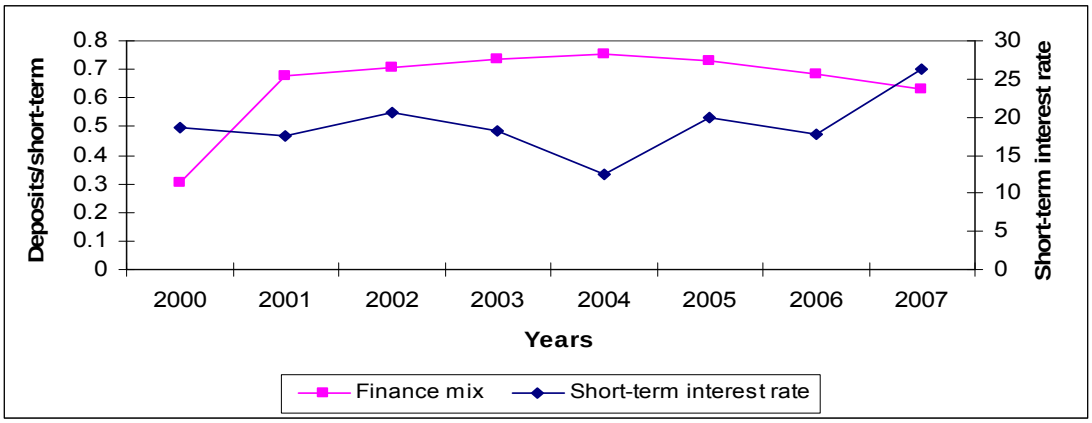
### 2.3.2 Choices in the measures of monetary policy

A prerequisite for this analysis is a good indicator of the stance of monetary policy. However, the literature is still not conclusive on the best indicator of monetary policy stance. In the banking literature, the conventional variable used as a stance of monetary policy is the rate of growth of one or more monetary aggregates, for example M1, M2 or the monetary base. The rate of growth of monetary aggregates has been criticised as financial innovation and deregulation render it ineffective (Bernanke and Mihov 1998). Cross-country studies on monetary policy choices are also limited. This is because, various countries use different monetary policy instruments. However, following Shambaugh (2004), this chapter utilises the respective countries short-term interest rates as the monetary policy indicator. Short-

[5] Due to the absence of data on total number of employees, the unit cost of labour is expressed in terms of total assets.
[6] See Fernandez de Guevara et al. (2005) for the detailed estimation process.
[7] In theory, the marginal cost concept is the derivative of the coefficient of output, and that the $MC_{it}$ computed in equation (2.3) is adjusted to attain variability across bank, $i$ and in period, $t$.

term interest rates appear to be a good indicator as the correlation test shows a negative relationship with core deposits. Figure 2.1 also supports a strong negative correlation between short-term interest rates and the share of deposits in total short-term bank financing. An increase in short-term interest rates leads to a corresponding decrease in the share of deposits in short-term finance. This result is consistent with the argument that banks rely more on uninsured debt (Ashcraft 2006). The choice of short-term interest rates as a monetary policy stance is therefore a good measure to be used in the panel data regression analysis of the relationship between market structure, financial stability and bank lending channel since the bank lending channel operates through changes in the mix of deposits in bank liabilities.

**Figure 2.1**
**Banks' short-term finance mix and short-term interest rate**




**Source: WDI, Bankscope and author's own calculation**
**Data is aggregated averaging across years, 2000-2007**

### 2.3.3 Measurement of bank condition risk

This chapter uses Z-score to investigate the effect of bank risk conditions on banks' response to monetary policy. Z-score measures the number of standard deviations that a bank's profit must fall to drive it into insolvency. It is a measure of risk that is monotonically associated with a bank's probability of failure and has been widely used in the empirical banking and finance literature (Boyd et al. 2009). According to Roy (1952), Z-score does not require bank profit to be normally distributed in order to be a valid probability measure, it requires the existence of what (Roy 1952) called the first four moments of the return distribution. It is calculated as:

$$Z - score = \frac{ROA + E/TA}{\sigma ROA} \tag{2.4}$$

Where, $ROA$ is the return on assets of a bank, $E/TA$ represents a bank equity to total assets ratio and $\sigma ROA$ is an estimate of the standard deviation of return on assets. According to De Nicolo et al. (2004), the bank stability indicator increases with higher profitability and capitalization levels, and decreases with unstable earnings reflected by a higher standard deviation of return on assets. Thus from an economic point of view, the *Z-score* initially measures the probability of a bank becoming insolvent when the value of assets becomes lower than the value of debt. This means that a higher (lower) *Z-score* implies a lower (higher) probability of insolvency risk.

### 2.3.4 Other controlled variables

Previous empirical studies on the bank lending channel of monetary policy transmission have identified the size of the bank (Kashyap and Stein, 1995), the capitalization (Kishan and Opiela (2000), and van den Heuvel (2002)), and liquidity level of banks (Stein 1998) as bank-specific variables that affect bank lending. In addition to these bank-specific characteristics, (Jayaratne and Morgan (2000), Gambacorta (2005), and Ashcraft (2006)) also identified securities, internal capital and binding leverage as variables that impact on loan growth.

The ***size*** of a bank, the ***capitalization*** level and ***liquidity*** position have been found to have an impact on loan growth. Well capitalised and liquid banks are in a better position to shield their loans from monetary policy changes. This they do according to (Brissimis and Delis 2009) by resorting to the high amount of equity funds available and equally by using their buffer of liquid assets. In the case of the size of a bank, the larger banks are able to raise external funds from the capital market at lower cost for loan supply. The natural logarithm of total assets is used as a proxy for bank size; the ratio of total equity capital to total assets is used as a measure of capitalization, while liquidity is measured as total liquid assets as a percentage of total assets. ***Internal capital*** is the internally generated funds and its definition is in line with (Houston et al., 1997) as the sum of net profit before extraordinary items and loan loss provisions

relative to bank loans at the end of the period. Bank ***securities*** holding is measured as the total investment of banks in securities divided by total assets and the ***binding leverage*** is approximated by an equity ratio of less than 4 percent.

***Inflation*** and nominal ***GDP*** growth are included as explanatory variables to control for demand effects, to allow the estimation to capture business cyclical movements and to segregate the monetary policy component of short-term interest changes (Gambacorta 2005). Consumer price index is used as a measure of inflation while a change in growth rate of gross domestic product is used as a measure of GDP growth.

## 2.4 Data and descriptive statistics

### 2.4.1 Data sources

Both micro and macro data are used. Bank level data was taken from the Bankscope database. Series are yearly-covering a sample of 978 banks across 55 developing countries during 2000–2007. As the study focuses on intermediation of banks in emerging economies[8], unconsolidated balance sheet data are opted for whenever possible even though in some cases the study has to depend on consolidated statements because of data unavailability. The sample includes all commercial banks, cooperative banks, development banks, savings banks, real estate and mortgage banks for which annual data is available for some period or the years during the period 2000-2007. To ensure that banks that are important players in the deposit and/or loan markets are not omitted in the study, medium and long term credit banks and specialised government institutions are included as they remain important in these countries. This is after necessary adjustments are made for differences in accounting and reporting standards across countries. Observations with out-liers such as zero and /or negative capitalisation are dropped. Also, observations for capitalization above the 98$^{th}$ percentile were dropped. In addition, loan growth rate observations above 99$^{th}$

[8] The selection of these countries is based on 2008 GNI per Capita. The groups are: low income (LIC) $975 or less; lower middle income (LMC), $976- 3, 855; upper middle income (UMC), $3,856-11,906; and high income, (HIC), above $11, 906. This study selects banks in countries whose GDP per income level is between LIC and UMC as our emerging economies. In addition, grouping of countries into different regions such as Africa; Asia, Central and Eastern European countries (CEEC) and Latin America follows that of World Bank Development indicators classifications (source: World Bank data 2010).

percentile of the distribution were equally dropped. This is to correct for mergers, acquisitions and start ups during the study period. Macro data is obtained from the International Financial Statistics database of the International Monetary Fund and World Bank Development Indicator. The series includes GDP growth, average policy interest rate, the Treasury bill rate, interbank rate and money market rate.

### 2.4.2 Descriptive statistics and pair-wise correlation coefficients

Table 2.1 shows the descriptive statistics for seven bank activity variables, one variable for degree of competition and two stability variables for 978 banks across 55 countries. The data is averaged across years and reported showing the trend of the key variables from 2000 to 2007. The banks are grouped into four regions in accordance with World Bank Development indicators: Africa, Asia, Central and Eastern European Countries (CEEC), and Latin America. Loans to assets ratio measuring bank loan portfolio size has been increasing during the period. It increased by 147% (between 2000 and 2004a ratio of 19.19% to 49.18%) and then fell marginally in 2007 to 42.78%. On a regional trend, it is the banks in CEEC that saw their loan portfolio increase by an average of 301% from a ratio of 12.83 in 2000 to a ratio of 51.39 in 2004. In the same period, investment in bank securities also increased by a similar margin. That is, a ratio of 15.03 in 2000 increased by 146% to a ratio of 36.92 in 2004. However, it is the Latin American banks that led the growth in securities holdings, followed by Asian banks. Sub Saharan African banks growth in securities investments of 93%, is the lowest in the sample. The funding source pattern also shows a similar trend. Deposits as a percentage of bank liabilities increased by 148% (a ratio of 30.34 to 75.34) from 2000 to 2004, and then fell to 63.28 in 2007. Again, it is the CEEC banks that had a significant growth in liabilities during the period. These figures suggest that banking activities (measured by loan to assets ratio, securities to assets ratio and deposits to liabilities ratio) in emerging markets followed a similar trend, increasing between 2000 and 2004, then falling marginally thereafter to 2007.

On the bank-specific variables, the size of the bank proxied by the US dollar amount of total assets has been relatively stable during the period under study. Asian banks are the biggest in terms of size. The average bank size of an Asian bank in 2007 is

US$41,622 million and the smallest banks are found in Africa with average size of US$647million in 2007. In this chapter, equity to assets ratio is used as a measure of capitalization level of the selected banks. The capitalization level of the banks has been increased more than a 100 fold. An equity ratio of 6.45 in 2000 increases to a ratio of 13.94 in 2004. Liquidity has improved while internal generated funds measured as the sum of net profit before extraordinary items and loan loss provisions relative to bank loans at the end of the period has also increased. The rise of internal funding (especially among Asian banks) shows the importance that banks in emerging economies attach to these sources of funding. The competitive structure proxied by the Lerner index has been increasing steadily. A six and three quarter percent price mark up over marginal cost in 2000, increased to a 23.55% mark up in 2005, then fell slightly to 19.26% in 2007. Overall, figures from the Lerner index vary across countries by over 18% on average, with African banks pricing their products at around 20% on average over marginal cost. It should be noted that the competitive environments of emerging markets has improved since 2005. Two variables have been used to measure risk of the selected banks. Z-score measures insolvency risk while non-performing loan ratio is used as a measure of credit risk. Insolvency risk has been improving with the Asian banks scoring the highest with an average figure (2000-2007) of 20.79 across the 8 year period. The non-performing loans figures are also indifferent. There has been a considerable fall in the non-performing loan ratio. These two variables suggest an improvement of the financial stability of the selected samples over the period, 2000-2007.

Pair-wise correlation coefficients are used in this chapter as a first step to test the relationship between the key variables. The results are presented in table 2.2. The correlation coefficient between *Lerner index* and loans is negative and statistically significant indicating that banks in emerging markets increase *loan to asset* ratio in a more competitive environment. The reverse holds with securities as the Lerner index is positively correlated with investment in securities. On the correlation between Z-score and loan to assets ratio, one notes that stable banks increase their loan portfolio as the correlation coefficient is positive. Next is the pair-wise correlation coefficient between bank lending and the selected bank-specific characteristics. Whereas bank

size has a positive relationship with bank lending, equity ratio and liquidity have a negative and statistically significant relationship. These results show that improving capitalization and liquidity levels do not necessarily translate to increased bank lending in emerging markets. The sign and the magnitude of the relationship between capitalization and liquidity on one hand and Z-score on other hand suggest that banks in emerging markets use their capitalization and liquidity position to enhance their stability. Thus, banks in the selected sample hold more capital and liquid assets as a buffer for stability instead of supplying credit. Furthermore, the pair-wise correlation between bank loan supply on one hand and interaction of monetary policy indicators with Lerner index, Z-score, size, equity and liquidity on the other hand is positive and statistically significant. The results of these tests suggest that large, stable, liquid and well-resource banks with market power are better able to buffer their lending against monetary policy shocks.

Regarding macroeconomic variables, the correlation coefficient between monetary policy stance and bank lending is negative and statistically significant indicating that bank decrease lending during tightening of monetary policy. This result is also consistent with monetary policy theory on lending channel that banks reduce loan supply during monetary tightening (Bernanke and Blinder 1988). Next is the correlation between GDP growth and bank lending which is negative. Similar result is found on the relationship between bank lending and inflation. These findings suggest that bank lending decreases during economic booms and high inflation.

## 2.5 Regression results

This chapter subsection presents regression results in four parts. The first part analyses the relationship with loan growth and the growth of core deposits. The results from the first part are then used in the second to test the response of bank lending to the monetary policy stance. The third part tests the impact of bank risk condition on loan growth. Finally several variations are made to the benchmark estimator in order to confirm robustness and this is presented in the fourth subsection.

### 2.5.1 Sensitivity of loan growth to core deposits growth and market power

Before examining how bank market structure responds to changes in monetary policy stance, the sensitivity of loan growth to core deposits growth is analysed in a context similar to that of investment-cashflow sensitivity analysis. This approach has been used by Jayaratne and Morgan (2000) and Ashcraft (2006) to test whether bank lending is constrained by the availability of core deposits, a necessary condition for the existence of a bank lending channel of monetary policy transmission. While these studies focus on measuring financial constraints of a standalone bank and bank affiliation with a multi bank holding company respectively, this analysis focuses on cross-country banks with the degree of market power. For the estimation of loan growth to core deposit growth, the following empirical model is employed:

$$\Delta \ln(loans)_{it,c} = \beta_0 + \beta_1 \Delta \ln(deposits)_{it,c} + \beta_2 Lerner_{it,c} + \alpha X_{it,c} + \psi X_{it,c} * \Delta \ln(deposits)_{it,c} + \gamma Lerner_{it,c} * \Delta \ln(deposits)_{it,c} + \lambda M_{tc} + \varepsilon_{it} \quad (2.5)$$

The above is a regression of annual loan growth for bank $i$ for period $t$ in country $c$, $\Delta \ln(loans)_{it,c}$, on core deposit growth of a bank $i$ for period $t$ in country $c$, $\Delta \ln(deposits)_{it,c}$; the degree of market power, proxied by the Lerner index, $Lerner_{it,c}$ the vector of bank-specific characteristic for period $t$ in country $c$, $X_{it,c}$, the interaction of these bank characteristics with deposit growth, $X_{it,c} * \Delta \ln(deposits)_{it,c}$; the interaction of Lerner index with deposit growth, $Lerner_{it,c} * \Delta \ln(deposits)_{it,c}$; the vector of macroeconomic variables, $M_{tc}$ are included to capture for differences in the level of economic development and cyclical movements; and $\varepsilon_{it}$ is the error term. The bank specific characteristics are the natural logarithm of total assets, the ratio of securities to assets, internally generated funds and the standard binding leverage requirements. Following Demirguc-Kunt and Huizinga (2010) equation (2.5) is estimated using country and time fixed effects and clustering at the bank level. Fixed effects are used to control for other bank-specific characteristics that remain relatively stable over the sample period. The regression results are presented in table 2.3.

The key result in table 2.3 is that the Lerner index interacts with deposits in a negative and significant way implying that developing countries banks with market power are less sensitive to core deposits. Similar results are found for larger banks and banks with standard capital. The economic significance of these results are that, the effects for banks with market power are 26.20 times that of the effect for log assets (bank size) and 1.57 times the effect for binding leverage in minimising the sensitivity of loan growth to growth of core deposits. The results also show no significance or sensitivity of banks investments in securities and internal capital to that of lending growth to deposit growth. A special mention is made on the relationship between banks investment in securities and loan growth. The coefficient on security holdings is negative and statistically across all specifications indication a trade-off between bank lending and securities. A fall in banks investment in securities increases loan growth. On the whole, the result suggests that banks with market power reduce their sensitivity of lending to deposits on average by 40%.

Further investigation is conducted on whether regional differences in bank loan growth are affected by financing mix. The results are reported in table 2.4 and broken down into columns on the basis of the continental location of the banks. Africa refers to the selected banks in Sub-Saharan Africa, Asia for banks in Asia-Pacific, Europe for selected banks in Central and Eastern European countries and America for banks located in Latin America. The results are similar in magnitude and significant to those reported in table 2.3. The coefficient of the interaction of core deposit growth with the Lerner index (of 44.5, 51.2, 77.0 and 47.0 for Africa, Asia-Pacific, CEEC and Latin America respectively) indicates that lending by CEEC banks with market power are the least sensitive to core deposit growth. Possible explanations could be the relative development of the capital markets as well as the availability of wholesale funds in that region. The deposit growth interaction with the log of total assets produces mixed results. While the size of a bank does not explain financing constraints in African banks, the result is positive and statistically significant in Asian and Latin American banks, and negative and significant among CEEC banks. These results demonstrate that not all large banks in developing countries have market power. It is only banks in CEEC that have the power to reduce the sensitivity of lending to deposit growth by

8.7%. More so, measures of securities, internal capital and binding leverage have the expected sign with the exception of binding leverage that has a positive coefficient for Asian banks and securities having a negative sign for African banks. This finding suggests that African banks with investment in securities are less sensitive to core deposits.

### 2.5.2 Response of bank-lending to monetary policy stance

With both the results of table 2.3 and the regional analysis in table 2.4, showing loan supply for developing countries' banks with market power being less sensitive to the availability of core deposit funds, the response of lending to bank market structure and changes in macro variables are examined. The following model is used to estimate this relationship:

$$\Delta \ln(loans)_{it,c} = \beta_0 + \beta_1 \Delta \ln(loans)_{it,c-1} + \beta_2 Lerner_{it,c} + \alpha_1 \Delta M_{tc} + \alpha_2 X_{it,c} + \alpha_3 X_{it,c} * \Delta M_{tc} + \varepsilon_{it} \quad (2.6)$$

Here, the annual loan growth of bank $i$ for period $t$ in country $c$, $\Delta \ln(loans)_{it,c}$, is regressed against its lags, $\Delta \ln(loans)_{it,c-1}$, on the bank market structure proxied by the Lerner index, $Lerner_{it,c}$, on a set of macrovariables, $\Delta M_{tc}$, on the vector of bank-specific characteristic for period $t$ in country $c$, $X_{it,c}$, the interactions of these characteristics and macrovariables, $X_{it,c} * \Delta M_{tc}$, and the error term. The macrovariables are changes in short-term interest rates, a proxy for monetary policy stance; a change in annual output growth, a measure of GDP growth and a change in inflation which is measured by Consumer Price Index (CPI). The interaction with GDP growth and inflation is to take account of differences in changes in loan demand as a result of changes in output. The regression results are presented to table 2.5. The findings are reported in three columns, where column 1 is the monetary policy indicator, column 2 is GDP growth and inflation is reported in column 3.

The effect of monetary policy shocks on bank lending is significantly more pronounced among banks in column 1. This outcome suggests that, tightening of monetary policy stance reduces bank lending in developing countries. The finding is consistent with

monetary policy theory and confirms existing empirical research that shows bank lending increases when policy induced interest rates falls. For example, a one unit decrease in interest rates as a result of monetary expansion will lead to an increase in bank lending by more than 5 unit points *ceteris paribus*. Concerning the effect of the degree of market power on bank lending, the result shows that developing countries banks with market power supply more loans. A similar result is found for bank size. Larger banks tend to extend more loans when demanded. The estimations with Capitalization as a bank characteristic show a significant and negative linear relationship between bank equity position and the supply of bank loans among selected banks. The negative and significant relationship indicates that banks in developing countries are more inclined towards stabilizing their capital position than using the funds to supply new loans to borrowers. The relationship between bank lending and liquidity is also unambiguously negative and significant implying that fewer loans are supplied when banks increase their liquidity level. The possible explanation for this result is that banks in developing countries accumulate liquid resources for stability rather than for intermediation.

The interaction of Lerner index and monetary policy on one hand and its effect on the supply of loans on the other hand, show a negative and statistically significant relationship. The implication of a negative coefficient is that monetary policy is more effective in an environment of imperfect markets. That is, in tightening the monetary policy indicator, the monetary authorities in developing countries will succeed in reducing the supply of bank loans in a less competitive banking market. This result provides evidence in support of a stronger relationship between market imperfection and the effectiveness of the monetary policy instruments. Regarding the interactions with other bank-specific characteristics, the study finds that the size of a bank, the level of equity and liquidity position positively interact with the monetary policy indicator on bank lending. Well capitalised and liquid banks are in a better position to shield their loans from monetary policy changes. They achieve this by resorting to a higher amount of equity funds as well as using their buffer of liquid assets. With regard to size, the positive interaction with monetary policy stance demonstrates how bigger banks in developing countries are able to raise external funds from the capital markets in

financing their loan supply during monetary policy shocks. Moreover, and in line with the bank lending channel, large, liquid and well-resource banks are better able to buffer their lending activity against external shocks (Kishan and Opiela (2000), Gambacorta and Mistrulli (2004), and Altunbas et al. (2010)). Thus bigger, well capitalised and liquid banks in developing countries react less when there is a monetary shock. Tightening of monetary policy could therefore have less effect on the supply of bank loans. In sum, specific to my dataset for developing countries, the bank lending channel operates through the structure of the local banking market.

The regression results in columns 2 and 3 of table 2.5 (where the macrovariable is GDP growth and inflation respectively), show a similar linear relationship result to that of column 1 (monetary policy stance). That is, there is a positive coefficient for the Lerner index and that of bank size while equity and liquidity have a negative relationship. However, the coefficient on the interaction term on Lerner index and bank size is less significant in columns 3 and 4, meaning that loan growth does not respond to the interaction between banking structure and the size of a bank to GDP growth and inflation. Conversely, the effect of equity and liquidity on the response of bank lending to changes in the rate of inflation is negative and positive respectively. This means that an increase in the liquidity position of banks reduces the negative consequence of an increase in the rate of inflation. The reverse position holds for an increase in the capitalization level of banks in relation to an increase in the rate of inflation.

Having identified a differential response of bank lending to changes in macrovariables, the next step is to examine whether there are regional differences of bank lending behaviour in response to changes in monetary policy stance. Similar to table 2.4, banks are grouped into four regions: Africa; Asia-Pacific; Central and Eastern European Countries and Latin America. The regression results are reported in table 2.6. In all cases as expected the monetary policy indicator has a negative coefficient for all the groupings, though relatively insignificant among Asian and Latin American banks. Thus tightening of the monetary policy indicator reduces bank lending in respective countries. On the interaction term with the Lerner index, though the results have a negative sign, it is only significant and pronounced in African and Latin

American banks. The effectiveness of monetary policy is weak in Asia and CEEC where the level of competition is high enough to influence the changes of a monetary policy shock on bank lending.

### 2.5.3 Effect of insolvency risk on banks' response to monetary policy stance

As the above results provide evidence in support of a stronger relationship between market imperfection and the effectiveness of the monetary policy instrument, this section further investigates the impact of bank's insolvency risk on the loan growth. Ideally, market-risk based indicators could be employed as a measure of bank risk. A few authors, for example (Altunbas et al., 2010) use the expected default frequency (EDF) as a measure of risk-taking. Even though such a database is not available for large sample of banks in emerging markets, the underlying assumption in the use of EDF is that its changes reflect a change in the bank risk taking which may not hold especial during a crisis (Tabak et al., 2010). In this regard, an accounting-based risk measure is used. *Z-score* is used as a bank risk condition in the following equation:

$$\Delta \ln(loan)_{it,c} = \beta_0 + \beta_1 \Delta \ln(loan)_{it-1} + \beta_2 Risk_{it,c} + \alpha_1 \Delta M_{tc} + \alpha_2 X_{it,c} + \alpha_3 X_{it,c} * \Delta M_{tc} + \alpha_4 Risk_{it,c} * \Delta M + \varepsilon_{it} \quad (2.7)$$

The above model specification is similar to that used in (Altunbas et al. 2010) and designed to examine whether bank with different levels of credit and insolvency risk react differently to monetary policy. In equation (2.7) the annual loan growth of bank $i$ for period $t$ in country $c$, $\Delta \ln(loan)_{it,c}$, is regressed against its lags, $\Delta \ln(loan)_{it,c-1}$, on bank risks, $Risk_{it,c}$, on a set of macro variables, $\Delta M_{tc}$, on the vector of bank-specific characteristic for period $t$ in country $c$, $X_{it,c}$, the interactions of these characteristics and macro variables, $X_{it,c} * \Delta M_{tc}$, the interaction of bank risk and macro variables, $Risk_{it,c} * \Delta M_{tc}$, and an error term. Here the bank-specific characteristics are the bank size, liquidity and capitalization. The macro variables are changes in short-term interest rates, a proxy for monetary policy stance; a change in annual output growth, a measure of GDP growth and a change in inflation which is measured by Consumer Price Index (CPI). The interaction with GDP growth and inflation is to take care of differences in changes in loan demand as a result of changes in output. The regression results are

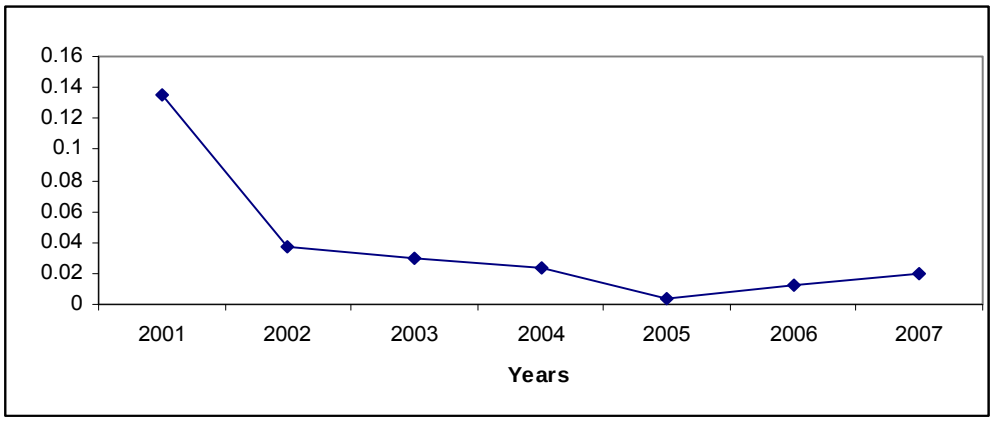
presented in table 2.7. The findings are reported in columns, where column 1 is the monetary policy indicator, column 2 is GDP growth while column 3 is inflation.

On the issue of bank solvency, there is some level of evidence that the level of bank stability influence banks' capacity to provide lending. The coefficient of Z-score is positive and statistically significant across all specifications. This implies that lower risk banks have financial strength to supply more loans. A unit fall in insolvency risk of a bank *other factors being equal*, will increase bank lending by more than 2 percent. The result further suggests that stable banks can attract external finance that enables the bank to have a positive consequence on bank loan supply. Similar results of the effects of bank size, capitalization level and liquidity on bank lending, though the magnitude is slightly different to the results reported in table 2.5. The interaction term between *Z-score* and monetary policy has a negative sign suggesting that low insolvency risk banks in emerging markets are less able to reduce the sensitivity of loan growth to a change in monetary policy. There are several reasons in the literature why stable banks might reduce their lending during monetary shocks: deteriorating balance sheet of borrowers (Bernanke et al. 1996), future risk perception and outlook of banks (Disyatate 2010), pro-cyclicality of banks' equity, leverage and the funding sources (Shin 2008), increasing effect of lending standards on supply of loans and economic activities (Berrospide and Edge 2008).

Graphical presentation is employed to further analyse the response of bank risk condition to monetary policy stance. Figure 2.2 depicts loan growth of the selected developing/emerging economies' banks; figure 2.3 shows bank risk condition measured by (Z-score), while figure 2.4 illustrates the monetary policy indicator, measured using short-term interest rates. Figure 2.5 represents the interaction term between *Z-score* and monetary policy stance and the loan growth. A rise in the insolvency risk of banks from 2001 to 2004 corresponds with a fall in growth of bank loans. The same period saw an inverse relationship between loan growth and the monetary policy indicator. These relationships confirm the theoretical propositions of bank lending channel that supply of bank loans decreases when monetary policy stance is tightened. Similarly, bank capacity to supply loans falls when they have high

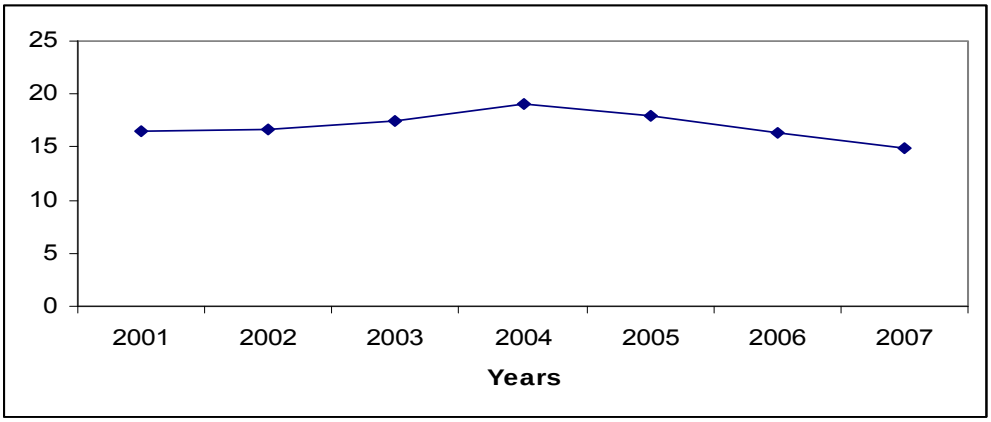
insolvency risk. The relationship between the interaction term of *Z-score* and monetary policy stance on one hand, and the loan growth on the other is negative implying that stable banks are less sensitive in their response to the tightening of monetary policy stance. However, 2006 onwards depicts a positive relationship suggesting that banks with lower insolvency risk are not only able to extend large amounts of loans, but also able to insulate their supply of loans from monetary policy shocks. It also explains how banks in emerging economies analyse their insolvency risk over a lengthy period and response appropriately to policy shocks. This simple pictorial analysis is by no small means sufficient enough to suggest that the causality between bank risk conditions, monetary policy stance, and the loan growth in the selected countries is time bound, and cannot be captured by regression analysis. Therefore, there is the need for further empirical tests especially cross-section country specific analysis, but this is beyond the scope of current research.

**Figure 2.2**
**Loan growth of selected banks in the emerging economies**



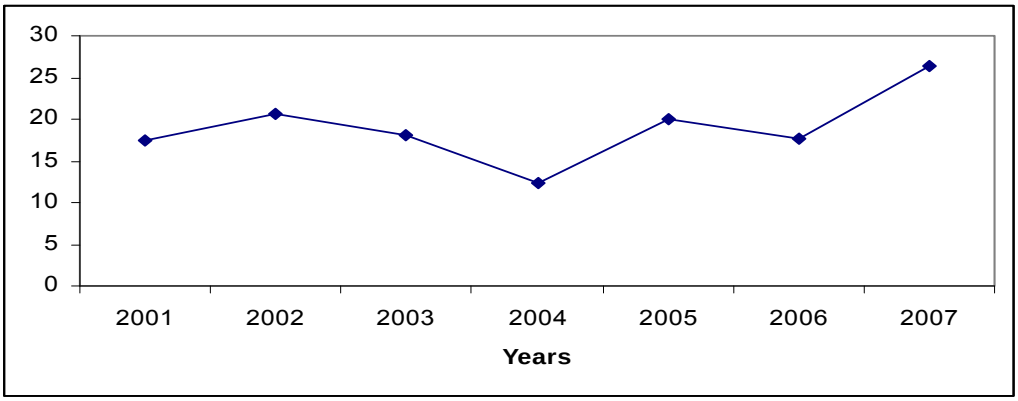

**Source: Bankscope and author's calculation**
**Data is aggregated across the years**

**Figure 2.3**
**Insolvency risk of banks in the sample**



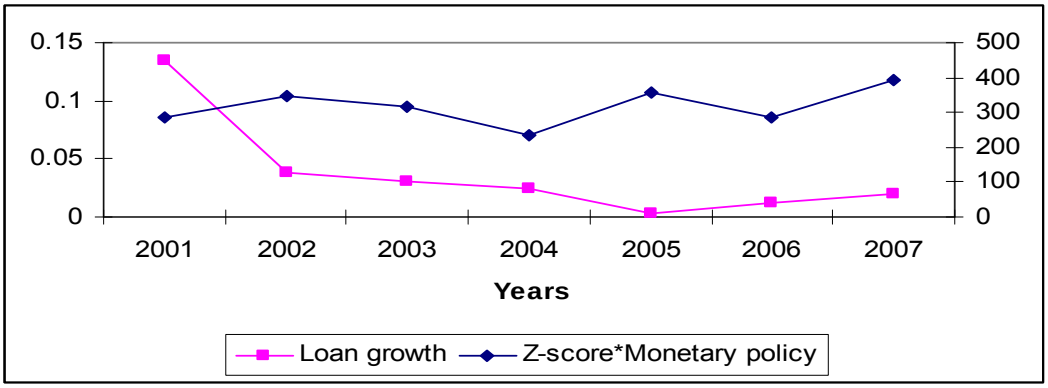

**Source: Bankscope and author's calculation**
**Data is aggregated across the years**

**Figure 2.4**
**Short-term interest rate of emerging economies**




**Source: WDI and Bankscope and author's calculation**
**Data is aggregated across the years**

**Figure 2.5**
**Response of bank risk condition to monetary policy stance**




**Source: Bankscope and author's calculation**
**Data is aggregated across the years**

Next in this section is to analyse the effect of bank insolvency risk on lending as a result of changes in the economic and business cycle which may be due to diverse perceptions of this risk. That is, the introduction of additional interaction terms by combining insolvency risk measure with the growth rate in nominal GDP and inflation rate. The results reported in column 2 of table 2.7 indicate that the interaction term of Z-score with GDP growth is negative and statistically significant, while other coefficients remain unchanged. On the interaction between Z-score and inflation (reported column 3 of table 2.7), the result as expected is positive and significant indicating that stable banks are more sensitive to inflation changes and this affect the supply of loans. Thus a change in the inflation level has less influence on bank lending for banks with low insolvency risk.

### 2.5.4 Response of bank resource allocation to a monetary policy

This subsection of the chapter focuses on change to bank resource allocation in response to a monetary policy shock. Specifically it identifies and test for the existence of a lending channel in emerging markets. In order to correctly identify a monetary contraction, a reduction should not only be observed in loans but also securities holdings of banks (Gambacorta 2005). A reduction in bank loans resulting in an increase in the securities portfolio could be the result of a reallocation of bank assets which is independent from exogenous monetary shocks. The empirical specification designed to test for the existence in bank lending is based on (Kashyap and Stein 1995) as:

$$\Delta \ln(Y)_{it,c} = \beta_0 + \beta_1 \Delta \ln(Y)_{it,c-1} + \beta_2 Risk_{it,c} + \beta_3 Lerner_{it,c} + \alpha_1 \Delta MP_{tc} + \alpha_2 X_{it,c} + \alpha_3 X_{it,c} * \Delta MP_{tc} + \alpha_4 Risk_{it,c} * \Delta MP_{t,c} + \alpha_5 Lerner_{it,c} * \Delta MP_{t,c} + GDP_{t,c} + Infla_{t,c} + \varepsilon_{it} \quad (2.8)$$

The model given in equation (2.8) includes interaction terms that are the product of the monetary policy stance with the *Lerner index* (a measure of degree of market power), *Z-score* (a measure of insolvency risk), and a vector of bank specific characteristics. $Y_{it,c}$ is the loans or securities of bank $i$ in period $t$ in country $c$. $Y_{it,c-1}$ is the observation on the same bank in the same county in the previous year. $Risk_{it,c}$ is the insolvency risk

while $Lerner_{it,c}$ is the measure of market power, the bank-specific characteristics $X_{it,c}$ are the bank size, liquidity and capitalization. $MP_{t,c}$ is the monetary policy indicator. GDP growth, $GDP_{t,c}$ and inflation, $Infla_{t,c}$ are included in the model to control for demand effect, cyclical movements as well as serving to isolate the monetary policy component of short-term interest rate changes. The regression result is presented in table 2.8. The findings are reported in two columns, where column 1 has loan growth as the dependant variable and column 2 has securities growth as the dependent variable.

Here, the analysis focuses on measuring the effects of monetary policy tightening on banks' securities holding. This test is necessary as reduction in bank lending in the aftermath of monetary tightening might simple reflect a reallocation of bank assets, with banks increasing their security holdings. A bank lending channel exists if a contraction in deposits leads not only supply of bank loans, but also security holdings decrease (Kashyap and Stein (1995), and Stein (1998)). The result of the monetary policy stance on securities is negative meaning that tightening of monetary policy will lead to a significant reduction in bank securities holdings. This result has three implications (Gambacorta 2005): first of all, bank security holdings are actually used by banks to shield their loan portfolio. Second, the reallocation of resources from loans to security holdings following a monetary policy contraction does not reject the existence of a bank lending channel. Thirdly, the decline in bank security holdings could be greater for smaller and poorly capitalised banks. This is because both small and less capitalised banks may have a greater need to sell their securities to obtain the additional funds to finance their lending. These further results for equation (2.8) on securities coupled with the results for equation (2.5) on the sensitivity of loan growth to core deposits growth supports the existence of a bank lending channel in emerging economies.

### 2.5.5 Robustness tests

To test the robustness of the benchmark results, some variations are made to the estimation of equation (2.6). The first is the regression using both random effects and system generalised method of moments estimators (system GMM). For the system GMM, dynamic panel-data estimation, two-step System General Method of Moment, Windmeijer-correct standard error, small sample adjustments, and orthogonal deviation

estimators are employed. It also addresses any endogeneity issues related to benchmark estimations. Several diagnostic tests are conducted to ensure that the models are fits and the estimations are precised and consistent. Table 2.9 reports the results and the diagnostic tests.[9] The regression results in terms of the sign of the variables of interest, monetary policy stance and the Lerner index are the same irrespective of the estimation techniques used (Fixed effects, random effects or system GMM). However, the magnitude is slightly higher when using random effects and System GMM on the monetary policy indicator. One percent increase in short-term interest rates (the proxy for monetary policy stance) *ceteris paribus* will reduce supply of loans by 0.5% and 3.5% using random effects and system GMM respectively. A similar result is found for the Lerner index and all the interactions except the interaction term with liquidity that has an insignificant result when the random effects estimation method is used. Thus tightening of monetary policy is more effective in less competitive environments.

The second robustness test concerns the construction of the Lerner index, a proxy for the measurement of the degree of market power. An alternative to the conventional version of Lerner index (which previous studies have relied upon) is explored as a measure of market structure. Maudos and De Guevara (2007) contend that the conventional Lerner index has a weakness in that the market power could have emanated from the deposit market because of the inclusion of funding costs in equation (2.2). Therefore, an alternative version of Lerner index; the funding-adjusted, is employed to account for market power which may not have been previously obtained in the deposit market and which according to (Turk Ariss 2010) may provide a better basis for investigation of the implication of the degree of market power on the bank lending channel in emerging markets. The findings are reported in table 2.10. Employing the funding-adjusted version of Lerner index has very little difference on the effect on bank loan supply. The interaction term is still negative and statistically significant implying that an increase in the degree of market power increases the effect of change in monetary policy stance. In other words, the result of the Lerner

[9] Diagnostic tests are made and reported in table 2.9: (1) The instruments count, (2) The Hansen test for over identification restriction which the null hypothesis is that instruments are exogenous (3) The Arellano-Bond tests for first and second order serial correlation in the residuals which the null hypothesis is that there is no serial correlation and (4) The F-test for joint significance of instruments.

index is the same irrespective of the version of the Lerner index used. Monetary policy is more effective in a less competitive market. The other variables equally carry the same sign and are of relatively similar magnitude in their coefficients.

## 2.6 Conclusion

This chapter contributes to the empirical literature on the existence and importance of the relationship between bank market structure and risk conditions on one hand and bank lending channel for monetary policy transmission on the other. Considering the banking structure-risk-lending channel hypothesis in assessing banks' response to macroeconomic shocks is new in the monetary policy transmission literature. The study is conducted in the context of emerging and developing economies. Two stage procedures are used: first is the construction of a Lerner index as a proxy for the degree of bank market power and second is to use the result to test its relationship with the loan growth and the growth of core deposits. This is to investigate whether banks with market power are constrained by the availability of loanable funds which is a necessary condition for the existence of a bank lending channel. The findings are consistent in that the Lerner index interaction with deposits is negative and significant implying that developing country banks with market power are less sensitive to core deposits.

With these results, the effect of annual bank loan growth on bank market structure, on monetary policy stance and on the interactions between the degree of market power and monetary policy shocks is investigated. The result is that the coefficient of the interaction term is significantly negative in all the estimations demonstrating the effect of the choice of monetary policy indicator on loan growth rates of banks. The core result is that banks in developing markets with high degree of market power are less sensitive to changes in monetary shocks to supply loans. In less competitive banking environments, the effectiveness of monetary policy stance on the supply of loans is 12.40 times more than for larger banks and 1.87 times more than for liquid banks in mitigating the adverse effects of monetary policy shocks. In other words, in tightening monetary policy indicators, the authorities in developing countries will

succeed in reducing the supply of bank loans if the banking environment is less competitive.

On the issue of bank solvency, there is some level of evidence that the level of bank stability influence banks' capacity to provide lending. The positive relationship between bank risk condition indicator and loan growth implies that lower risk banks have financial strength to supply more loans. The result further suggests that stable banks can attract external finance that enables the banks to have positive consequence on the bank loan supply. Interestingly, the finding reveals that banks characterised by low insolvency risk are unable to supply more loans when monetary policy stance is tightened.

Several variations are made to the model in order to test its robustness. This includes regional groupings, the alternative construction of Lerner index (funding-adjusted version), the model specifications and different estimation techniques. The results are similar to the canonical model and thus provide empirical evidence in support of the argument that bank market structure and the risk conditions influence the effect of monetary policy transmission mechanism.

Finally, this chapter makes these recommendations for policy makers: as the chapter underscores the significance of the need for effective institutional and regulatory frameworks that can resolve and offset the negative consequences of further increases in bank market power on the effectiveness of monetary policy through the bank lending channel. These regulatory and institutional measures are needed to deal with the effects of the current crisis on financial development as well as economic growth.

The main implication of this chapter is that, bank risk conditions and that of its market structure need to be considered in addition to traditional indicators (i.e. bank size, liquidity and capitalisation) in assessing banks' capacity, ability and willingness to finance economic activities.

**Table 2.1: Summary statistics averaged for the period 2000-2007**

| | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|
| | ***Aggregate*** | ***0.1991*** | ***0.4195*** | ***0.4396*** | ***0.4691*** | ***0.4918*** | ***0.4746*** | ***0.4592*** | ***0.4278*** |
| | Africa | 0.2751 | 0.3919 | 0.3953 | 0.4459 | 0.4656 | 0.4324 | 0.4112 | 0.3541 |
| Loans to assets | Asia | 0.1730 | 0.3739 | 0.4316 | 0.4603 | 0.5410 | 0.4731 | 0.4459 | 0.4296 |
| | CEEC | 0.1283 | 0.4090 | 0.4658 | 0.5033 | 0.5139 | 0.5265 | 0.5171 | 0.5033 |
| | Latin America | 0.1605 | 0.5182 | 0.4973 | 0.4743 | 0.4827 | 0.4890 | 0.4846 | 0.4709 |
| | ***Aggregate*** | ***0.1503*** | ***0.3266*** | ***0.3549*** | ***0.3574*** | ***0.3692*** | ***0.3358*** | ***0.3071*** | ***0.2653*** |
| | Africa | 0.1869 | 0.3097 | 0.3543 | 0.3511 | 0.3617 | 0.3247 | 0.3045 | 0.2721 |
| Securities to asset | Asia | 0.1302 | 0.2796 | 0.2953 | 0.3163 | 0.3908 | 0.3190 | 0.2763 | 0.2388 |
| | CEEC | 0.1366 | 0.3963 | 0.4027 | 0.3831 | 0.3740 | 0.3498 | 0.2907 | 0.2422 |
| | Latin America | 0.1086 | 0.2953 | 0.3289 | 0.3611 | 0.3641 | 0.3495 | 0.3542 | 0.3001 |
| | ***Aggregate*** | ***0.3034*** | ***0.6785*** | ***0.7041*** | ***0.7347*** | ***0.7534*** | ***0.7306*** | ***0.6829*** | ***0.6328*** |
| | Africa | 0.3815 | 0.6080 | 0.6223 | 0.6742 | 0.6769 | 0.6748 | 0.6325 | 0.5856 |
| Deposits to liabilities | Asia | 0.2593 | 0.5219 | 0.5740 | 0.6157 | 0.7496 | 0.6350 | 0.5687 | 0.5411 |
| | CEEC | 0.2428 | 0.7943 | 0.8509 | 0.8504 | 0.8498 | 0.8340 | 0.7650 | 0.6995 |
| | Latin America | 0.2581 | 0.7615 | 0.7504 | 0.7734 | 0.7774 | 0.7622 | 0.7445 | 0.6949 |
| | ***Aggregate*** | ***1,147.9*** | ***2,672.6*** | ***3,376.8*** | ***4,162.3*** | ***5,186.7*** | ***5,498.6*** | ***6,107.3*** | ***7,198.6*** |
| | Africa | 333.8 | 459.7 | 553.6 | 737.7 | 865.1 | 496.3 | 524.2 | 647.1 |
| Bank size ($m) | Asia | 6,238.2 | 14,562.5 | 19,020.4 | 23,874.8 | 30,508.8 | 32,658.3 | 35,669.5 | 41,622.2 |
| | CEEC | 383.3 | 1,300.1 | 1,472.9 | 1,669.5 | 1,967.0 | 2,386.9 | 2,868.5 | 3,503.4 |
| | Latin America | 579.2 | 1,403.7 | 1,664.1 | 1,866.4 | 2,106.2 | 2,462.7 | 2,877.5 | 3,434.4 |
| | ***Aggregate*** | ***0.0645*** | ***0.1304*** | ***0.1322*** | ***0.1361*** | ***0.1394*** | ***0.1340*** | ***0.1220*** | ***0.1074*** |
| | Africa | 0.0776 | 0.1200 | 0.1182 | 0.1264 | 0.1338 | 0.1327 | 0.1143 | 0.0999 |
| Equity ratio | Asia | 0.0617 | 0.0949 | 0.0865 | 0.0978 | 0.1110 | 0.0874 | 0.0747 | 0.0611 |
| | CEEC | 0.0488 | 0.1382 | 0.1433 | 0.1352 | 0.1318 | 0.1254 | 0.1166 | 0.0984 |
| | Latin America | 0.0617 | 0.1630 | 0.1744 | 0.1810 | 0.1792 | 0.1781 | 0.1748 | 0.1641 |

| | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|
| | ***Aggregate*** | ***0.1554*** | ***0.3436*** | ***0.3607*** | ***0.3650*** | ***0.3704*** | ***0.3430*** | ***0.3177*** | ***0.2774*** |
| | Africa | 0.2021 | 0.3567 | 0.3916 | 0.3796 | 0.3866 | 0.3544 | 0.3365 | 0.2924 |
| Liquidity | Asia | 0.0845 | 0.1857 | 0.2015 | 0.2152 | 0.2656 | 0.2504 | 0.2290 | 0.2215 |
| | CEEC | 0.1312 | 0.4103 | 0.3963 | 0.3773 | 0.3631 | 0.3263 | 0.2897 | 0.2384 |
| | Latin America | 0.1401 | 0.3271 | 0.3517 | 0.4144 | 0.4147 | 0.4021 | 0.3746 | 0.3363 |
| | ***Aggregate*** | ***0.0365*** | ***0.0917*** | ***0.1044*** | ***0.0942*** | ***0.0864*** | ***0.0823*** | ***0.1262*** | ***0.0795*** |
| | Africa | 0.0505 | 0.0716 | 0.0658 | 0.0854 | 0.0879 | 0.0631 | 0.0712 | 0.0596 |
| Internal Fund | Asia | 0.0096 | 0.0368 | 0.0515 | 0.0695 | 0.1407 | 0.1431 | 0.0238 | 0.0198 |
| | CEEC | 0.0173 | 0.1391 | 0.1016 | 0.1246 | 0.0940 | 0.0748 | 0.2700 | 0.3203 |
| | Latin America | 0.0518 | 0.1024 | 0.2192 | 0.0860 | 0.0388 | 0.0922 | 0.1051 | -0.1711 |
| | ***Aggregate*** | ***0.0675*** | ***0.1325*** | ***0.1679*** | ***0.2101*** | ***0.2336*** | ***0.2355*** | ***0.2320*** | ***0.1926*** |
| | Africa | 0.1045 | 0.1151 | 0.1777 | 0.2553 | 0.2566 | 0.2448 | 0.2630 | 0.2481 |
| Lerner index | Asia | 0.0301 | 0.1210 | 0.1714 | 0.1848 | 0.2402 | 0.1931 | 0.1435 | 0.1236 |
| | CEEC | 0.0377 | 0.1418 | 0.1673 | 0.1897 | 0.2170 | 0.2214 | 0.2049 | 0.1720 |
| | Latin America | 0.0579 | 0.1621 | 0.1465 | 0.1637 | 0.2060 | 0.2633 | 0.2635 | 0.1536 |
| | ***Aggregate*** | ***7.1889*** | ***16.454*** | ***16.738*** | ***17.534*** | ***19.050*** | ***17.932*** | ***16.332*** | ***14.912*** |
| | Africa | 7.0308 | 11.232 | 11.216 | 13.468 | 14.049 | 13.563 | 12.397 | 10.706 |
| Z-score | Asia | 10.339 | 17.255 | 17.882 | 18.747 | 29.979 | 26.203 | 23.725 | 22.256 |
| | CEEC | 6.5297 | 23.453 | 24.164 | 22.831 | 22.196 | 20.590 | 18.306 | 16.740 |
| | Latin America | 6.3990 | 16.847 | 16.926 | 17.674 | 17.809 | 17.783 | 16.804 | 16.155 |
| | ***Aggregate*** | ***0.1970*** | ***0.0445*** | ***0.0522*** | ***0.0441*** | ***0.0404*** | ***0.0312*** | ***0.0313*** | ***0.0261*** |
| | Africa | 0.0277 | 0.0413 | 0.0427 | 0.0387 | 0.0405 | 0.0337 | 0.0375 | 0.0286 |
| Bad loans | Asia | 1.4022 | 0.0614 | 0.0689 | 0.0667 | 0.0663 | 0.0323 | 0.0260 | 0.0223 |
| | CEEC | 0.0180 | 0.0272 | 0.0269 | 0.0214 | 0.0191 | 0.0162 | 0.0158 | 0.0203 |
| | Latin America | 0.0128 | 0.0638 | 0.0950 | 0.0714 | 0.0528 | 0.0462 | 0.0435 | 0.0315 |

**Source: Bankscope and author's calculation. The data set comprises of 978 banks in 55 countries**
**Note: All the calculations are in percentages except bank size which is in million of US dollars**

**Table 2.2**
**Pair-wise correlation coefficient between selected variables**

Pair wise correlation coefficient estimated on sample of 978 banks across 55 countries during the period 2000-2007. * implies significant at 5% or more. L**oan to assets** ratio is used as a measure of bank loan portfolio. Securities are calculated as total securities divided by total assets. The degree of market power is proxied by the **Lerner Index** with the higher scores indicating a higher degree of pricing power. **Z-score** is defined as $Z = (ROA + E/TA)/\sigma(ROA)$, where $ROA$ is the rate of return on assets, $E/TA$ is the total equity to total assets**. Size** is natural log of total assets. Equity ratio measures the capitalization level of selected banks and liquidity is calculated as total liquid assets divided by total assets. Short-term interest rate is included to capture the stance of **monetary policy**. The **GDP growth** accounts for the differences in economic developments across countries. **Inflation** is the rate of inflation based on the CPI. The monetary policy ($\Delta M_t$) is interacted with various measures of financial constraints (including Lerner index, Z-score, size, equity and liquidity).

| | Loan to asset | Securities to assets | Lerner index | Z-score | Size | Equity | Liquidity | Lerner index * $\Delta M_t$ | Z-score * $\Delta M_t$ | Size* $\Delta M_t$ | Equity *$\Delta M_t$ | Liquidity *$\Delta M_t$ | Monetary policy | GDP growth | Inflation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loan to assets | 1.000 | | | | | | | | | | | | | | |
| Securities to assets | -0.856* | 1.000 | | | | | | | | | | | | | |
| Lerner index | -0.057* | 0.123* | 1.000 | | | | | | | | | | | | |
| Z-score | 0.136* | -0.086* | 0.117* | 1.000 | | | | | | | | | | | |
| Size | 0.175* | -0.077* | 0.050* | 0.186* | 1.000 | | | | | | | | | | |
| Equity | -0.124* | 0.123* | 0.131* | 0.098* | -0.426* | 1.000 | | | | | | | | | |
| Liquidity | -0.686* | 0.612* | 0.069* | -0.10* | -0.207* | 0.038* | 1.000 | | | | | | | | |
| Lerner index* $\Delta M_t$ | 0.029* | -0.031* | -0.066* | -0.052 | 0.015 | 0.013 | -0.035* | 1.000 | | | | | | | |
| Z-score* $\Delta M_t$ | 0.038* | -0.024 | 0.058* | -0.056 | 0.063* | -0.048 | -0.031* | 0.654* | 1.000 | | | | | | |
| Size* $\Delta M_t$ | 0.051* | -0.038* | 0.083* | 0.011 | 0.025* | -0.007 | -0.044* | 0.634* | 0.819* | 1.000 | | | | | |
| Equity* $\Delta M_t$ | 0.059* | -0.047* | 0.067* | -0.011 | 0.060* | -0.11* | -0.031* | 0.511* | 0.655* | 0.553* | 1.000 | | | | |
| Liquidity* $\Delta M_t$ | 0.087* | -0.075* | 0.061* | 0.024 | 0.050* | -0.020 | -0.097* | 0.630* | 0.754* | 0.815* | 0.652* | 1.000 | | | |
| Monetary policy | -0.14* | 0.048* | 0.001 | -0.12* | -0.090* | 0.042* | 0.127* | 0.137* | 0.129* | 0.208* | 0.128* | 0.229* | 1.000 | | |
| GDP growth | -0.04* | 0.038* | 0.081* | -0.02* | 0.070* | -0.015 | 0.045* | 0.024 | 0.129* | 0.110* | 0.026* | 0.062* | -0.055* | 1.000 | |
| Inflation | -0.18* | 0.043* | 0.026* | -0.20* | -0.302* | 0.137* | 0.243* | 0.035* | 0.017 | 0.038* | -0.006 | 0.015 | 0.527* | 0.068* | 1.000 |

**Source: Bankscope, World Development Indicators and author's own calculation**

**Table 2.3**
**The sensitivity of loan growth to deposit growth and bank market power**

The dependent variable is *loan growth* which is defined as a percentage change in total loans. The *deposits growth* is measured as a percentage change in total deposits. The degree of market power is proxied by the *Lerner Index*. The natural logarithm of total assets which valued in US dollars is proxied for *bank size*. *Securities* is calculated as total securities divided by total assets and *Internal fund* is measured as the sum of net profit before extraordinary items and loan loss provisions relative bank loans at the end the period. *Binding leverage* is approximated by equity ratio of les than 4%. The deposit growth is interacted with various measures of financial constraints (including Lerner index, log of total assets, securities, internal capital and the binding leverage). *Inflation* is the rate of inflation based on the CPI. Growth in total output is proxied for *GDP growth*. All regressions are estimated using country and time fixed effects and clustering at bank level. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1% 5% and 10% level respectively

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Deposit growth | 0.426*** | 0.397*** | 0.277*** | 0.324*** | 0.364*** | 0.633*** |
| | (0.019) | (0.042) | (0.026) | (0.015) | (0.019) | (0.063) |
| Lerner index | 0.039*** | 0.028*** | 0.027*** | 0.028*** | 0.0301*** | 0.042*** |
| | (0.010) | (0.010) | (0.010) | (0.010) | (0.010) | (0.010) |
| Log assets | -0.003 | -0.002 | -0.003 | -0.003 | -0.003 | -0.0004 |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| Securities | -0.12*** | -0.13*** | -0.139*** | -0.133*** | -0.139*** | -0.140*** |
| | (0.013) | (0.013) | (0.014) | (0.013) | (0.013) | (0.013) |
| Internal capital | -0.033 | -0.029 | -0.027 | -0.025 | -0.029 | -0.043** |
| | (0.021) | (0.021) | (0.021) | (0.021) | (0.021) | (0.021) |
| Binding leverage | -0.060* | -0.082** | -0.081** | -0.092** | -0.101*** | -0.059* |
| | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) |
| Lerner index*deposit growth | -0.40*** | | | | | -0.454*** |
| | (0.047) | | | | | (0.0517) |
| Log assets*deposit growth | | -0.015** | | | | -0.028*** |
| | | (0.007) | | | | (0.008) |
| Securities*deposit growth | | | 0.094 | | | 0.106* |
| | | | (0.057) | | | (0.060) |
| Internal capt*deposit growth | | | | -0.118 | | 0.115 |
| | | | | (0.091) | | (0.102) |
| Binding lev*deposit growth | | | | | -0.256*** | -0.491*** |
| | | | | | (0.070) | (0.079) |
| Inflation | -0.0005 | -0.0005 | -0.0006 | -0.0005 | -0.000 | -0.0005 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| GDP growth | 0.0006 | -0.0003 | -0.0001 | -0.0003 | -0.0004 | 0.0007 |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Constant | 0.100*** | 0.098*** | 0.107*** | 0.110*** | 0.111*** | 0.079** |
| | (0.032) | (0.033) | (0.032) | (0.032) | (0.032) | (0.032) |
| Observation | 4649 | 4649 | 4649 | 4649 | 4649 | 4649 |
| Country fixed effects | Y | Y | Y | Y | Y | Y |
| Time fixed effects | Y | Y | Y | Y | Y | Y |
| Clustering level | Bank | Bank | Bank | Bank | Bank | Bank |

**Table 2.4**
**The sensitivity of loan growth to deposit growth and market power: Regional Analysis**

The dependent variable is *loan growth* which is defined as a percentage change in total loans. The *deposits growth* is measured as a percentage change in total deposits. The degree of market power is proxied by the *Lerner Index*. The natural logarithm of total assets which valued in US dollars is proxied for ***bank size***. *Securities* is calculated as total securities divided by total assets and *Internal fund* is measured as the sum of net profit before extraordinary items and loan loss provisions relative bank loans at the end the period. *Binding leverage* is approximated by equity ratio of les than 4%. The deposit growth is interacted with various measures of financial constraints (including Lerner index, log of total assets, securities, internal capital and the binding leverage). *Inflation* is the rate of inflation based on the CPI. Growth in total output is proxied for *GDP growth*. The results are presented in columns, basing on the continental groupings. Africa refers to banks selected in Sub-Saharan African countries; Asia for banks in Asia-pacific, Europe for selected banks in Central and Eastern European countries and America for selected banks in Latin America countries. All regressions are estimated using country and time fixed effects and clustering at bank level. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1% 5% and 10% level respectively.

| | Africa | Asia | Europe | Latin America |
|---|---|---|---|---|
| Deposit growth | 0.7702*** | -0.418*** | 1.0420*** | -0.1036 |
| | (0.1804) | (0.1799) | (0.1104) | (0.1357) |
| Lerner index | 0.0527* | 0.0149 | 0.0877*** | 0.0280 |
| | (0.0292) | (0.0118) | (0.0183) | (0.0196) |
| Log assets | -0.0210* | 0.0362*** | 0.0149** | -0.0007 |
| | (0.0114) | (0.0068) | (0.0064) | (0.0089) |
| Securities | -0.1206*** | -0.150*** | -0.1117*** | -0.194*** |
| | (0.0394) | (0.0172) | (0.0217) | (0.0278) |
| Internal capital | -0.1343* | 0.0902 | -0.2573*** | 0.0463 |
| | (0.0741) | (0.0924) | (0.0410) | (0.0310) |
| Binding leverage | 0.0254 | -0.0179 | 0.0369 | 0.0097 |
| | (0.0963) | (0.0468) | (0.0498) | (0.0670) |
| Lerner index*deposit growth | -0.4452*** | -0.512*** | -0.7702*** | -0.470*** |
| | (0.1385) | (0.1374) | (0.1264) | (0.0828) |
| Log assets*deposit growth | -0.0039 | 0.0534*** | -0.0870*** | 0.1083*** |
| | (0.0263) | (0.0212) | (0.0170) | (0.0214) |
| securities*deposit growth | -0.5377*** | 0.5553*** | 0.6081*** | 0.2659*** |
| | (0.1941) | (0.1048) | (0.1156) | (0.1032) |
| Internal capital*deposit growth | 0.3247 | -0.4779 | -0.8847*** | 0.5482*** |
| | (0.3160) | (0.8555) | (0.2579) | (0.1463) |
| Binding leverage*deposit growth | -0.9900*** | 0.9732*** | -0.7466*** | -0.371*** |
| | (0.3063) | (0.1728) | (0.1590) | (0.1412) |
| Inflation | 0.0192*** | -0.0044 | -0.0080*** | 0.0053 |
| | (0.0058) | (0.0030) | (0.0031) | (0.0054) |
| GDP growth | -0.0144** | 0.00008 | -0.0097 | 0.0019 |
| | (0.0074) | (0.0046) | (0.0062) | (0.0078) |
| Constant | 0.1946*** | -0.259*** | -0.0155 | 0.0700 |
| | (0.0757) | (0.0624) | (0.0508) | (0.0689) |
| Observation | 1020 | 877 | 1528 | 1224 |
| Country fixed effects | Y | Y | Y | Y |
| Time fixed effects | Y | Y | Y | Y |
| Clustering level | Bank | Bank | Bank | Bank |

**Table 2.5**

**The response of Loan growth to macro variables**

The dependent variable is *loan growth* which is defined as a percentage change in total loans. This is regressed against the degree of market power, bank characteristic and interaction of these variables with macro variables. The degree of market power is proxied by the *Lerner Index*. The bank characteristics include the natural logarithm of total assets which valued in US dollars is proxied for *bank size*; *equity* measures the capitalization level of selected banks and *liquidity* is calculated as total liquid assets divided by total assets. The macro variables ($\Delta M_t$) are short-term interest rate; a measure of *monetary policy* stance, *inflation* is the rate of inflation based on the CPI and growth in total output which is proxied for *GDP growth*. All regressions are estimated using country and time fixed effects and clustering at bank level. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1% 5% and 10% level respectively.

| | **Macro variables** | | |
|---|---|---|---|
| | **1** | **2** | **3** |
| | **Monetary policy** | **GDP growth** | **Inflation** |
| ΔMonetary policy | -0.5047*** | -0.0156 | 0.0203 |
| | (0.1602) | (0.0281) | (0.0242) |
| Lerner index | 0.0245** | 0.0233** | 0.0394*** |
| | (0.0121) | (0.0121) | (0.0119) |
| Log assets | 0.0227*** | 0.0237*** | 0.0167*** |
| | (0.0056) | (0.0056) | (0.0056) |
| Equity | -0.2827*** | -0.2943*** | -0.3758*** |
| | (0.0386) | (0.0379) | (0.0378) |
| liquidity | -0.1053*** | -0.0992*** | -0.1127*** |
| | (0.0147) | (0.0149) | (0.0148) |
| Lerner index*$\Delta M_t$ | -0.5408*** | 0.0029 | -0.0059 |
| | (0.1329) | (0.0133) | (0.0082) |
| Log assets*$\Delta M_t$ | 0.0436* | -0.0011 | -0.0002 |
| | (0.0238) | (0.0009) | (0.0005) |
| Equity*$\Delta M_t$ | 1.2054*** | 0.0312 | -0.0509*** |
| | (0.2044) | (0.0257) | (0.0180) |
| liquidity*$\Delta M_t$ | 0.2890* | 0.0033 | 0.0177** |
| | (0.1646) | (0.0108) | (0.0090) |
| Loan growth$_{-1}$ | -0.1209*** | -0.1417*** | -0.1225*** |
| | (0.0161) | (0.0159) | (0.0160) |
| GDP growth | 0.0105** | 0.0115** | 0.0103** |
| | (0.0047) | (0.0059) | (0.0047) |
| Inflation | 0.0006 | 0.0015 | 0.0032 |
| | (0.0028) | (0.0028) | (0.0037) |
| Constant | -0.0147* | -0.0210 | 0.0311 |
| | (0.0394) | (0.0402) | (0.0399) |
| Observation | 3963 | 3900 | 3935 |
| Country fixed effects | Y | Y | Y |
| Time fixed effects | Y | Y | Y |
| Clustering level | Bank | Bank | Bank |

**Table 2.6**

**Response of Loan Growth to monetary policy stance: Regional Analysis**

*Loan growth* is the dependent variable that is regressed against the monetary policy stance, the degree of market power, a set of bank characteristic and interaction of these bank characteristics variables with monetary policy stance. The degree of market power is proxied by the *Lerner Index.* The bank characteristics include the natural logarithm of total assets which valued in US dollars is proxied for *bank size*; *equity* measures the capitalization level of selected banks and *liquidity* is calculated as total liquid assets divided by total assets. Short-term interest rate is proxied for *monetary policy* stance. *Inflation* is the rate of inflation based on the CPI and the growth in total output which is proxied for *GDP growth*. The results are presented in columns, basing on the continental groupings. Africa refers to banks selected in Sub-Saharan African countries; Asia for banks in Asia-pacific, Europe for selected banks in Eastern and Central European countries and America for selected banks in Latin America countries. All regressions are estimated using country and time fixed effects and clustering at bank level. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1% 5% and 10% level respectively

| | **Africa** | **Asia** | **Europe** | **America** |
|---|---|---|---|---|
| $\Delta$Monetary policy$_t$ | -1.5372*** | -0.4073 | -1.2889** | -0.3223 |
| | (0.5492) | (0.7633) | (0.6040) | (0.2552) |
| Lerner index | 0.0062 | 0.0172 | 0.0333 | 0.0316** |
| | (0.0245) | (0.0137) | (0.0218) | (0.0277) |
| Log assets | 0.0320*** | 0.0513*** | 0.0183** | 0.0362*** |
| | (0.0119) | (0.0091) | (0.0083) | (0.0155) |
| Equity | -0.19859** | 0.1240*** | -0.2713*** | -0.4431*** |
| | (0.0940) | (0.0446) | (0.0673) | (0.0877) |
| liquidity | -0.1211*** | -0.0855*** | -0.0675** | -0.1150*** |
| | (0.0298) | (0.0198) | (0.0287) | (0.0311) |
| Lerner index* $\Delta$Monetary policy | -0.9503** | -0.4141 | -0.1254 | -0.5449*** |
| | (0.3924) | (0.5721) | (0.4150) | (0.2136) |
| Log assets *$\Delta$Monetary policy | 0.1571** | 0.0920 | 0.0883 | 0.0177* |
| | (0.0671) | (0.0784) | (0.0727) | (0.0465) |
| Equity *$\Delta$Monetary policy | 2.8497** | -1.8229 | 2.0032* | 0.8897*** |
| | (1.0989) | (1.9867) | (1.1701) | (0.3141) |
| liquidity *$\Delta$Monetary policy | 0.9297** | -0.8335 | 0.8593* | 0.3327* |
| | (0.4567) | (0.8226) | (0.4781) | (0.2808) |
| Loan growth$_{-1}$ | -0.0812*** | -0.2618*** | -0.0620** | -0.2147*** |
| | (0.0295) | (0.0376) | (0.0266) | (0.0373) |
| GDP growth | 0.0106 | 0.0105 | -0.0093 | 0.0233** |
| | (0.0084) | (0.0078) | (0.0079) | (0.0138) |
| Inflation | 0.0098 | -0.0009 | -0.0058 | 0.0166 |
| | (0.0061) | (0.0044) | (0.0043) | (0.0084) |
| Constant | -0.0015 | -0.4066*** | -0.0000 | -0.1262 |
| | (0.0691) | (0.0775) | (0.0676) | (0.1108) |
| Observation | 886 | 748 | 1289 | 1040 |
| Country fixed effects | Y | Y | Y | Y |
| Time fixed effects | Y | Y | Y | Y |
| Clustering level | Bank | Bank | Bank | Bank |

**Table 2.7**

**Effect of insolvency risk on banks' response to monetary policy stance**

The dependent variable is *loan growth* which is defined as a percentage change in total loans. This is regressed against insolvency risk, bank characteristic and interaction of these variables with macro variables. The insolvency risk is proxied by the ***Z-score.*** The bank characteristics include the natural logarithm of total assets which valued in US dollars is proxied for *bank size; equity* measures the capitalization level of selected banks and *liquidity* is calculated as total liquid assets divided by total assets. The macro variables ($\Delta M_t$) are short-term interest rate; a measure of *monetary policy* stance, *inflation* is the rate of inflation based on the CPI and growth in total output which is proxied for *GDP growth*. All regressions are estimated using country and time fixed effects and clustering at bank level. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1% 5% and 10% level respectively.

| | **Macro variables** | | |
|---|---|---|---|
| | **1** | **2** | **3** |
| | **Monetary policy** | **GDP growth** | **Inflation** |
| $\Delta$ Monetary policy$_t$ | -0.0542*** | -0.0085* | -0.0151*** |
| | (0.0169) | (0.0049) | (0.0051) |
| Z-score | 0.0235*** | 0.0371*** | 0.0142*** |
| | (0.0074) | (0.0091) | (0.0080) |
| Size | 0.0193*** | 0.0162*** | 0.0186*** |
| | (0.0054) | (0.0060) | (0.0057) |
| Equity | -0.4451*** | -0.4806*** | -0.3899*** |
| | (0.0487) | (0.0667) | (0.0536) |
| liquidity | -0.1050*** | -0.1297*** | -0.1161*** |
| | (0.0147) | (0.0237) | (0.0185) |
| Z-score *$\Delta M_t$ | -0.0073** | -0.1488* | 0.1677*** |
| | (0.0028) | (0.0870) | (0.0467) |
| Size *$\Delta M_t$ | 0.0070*** | -0.0254 | 0.0015 |
| | (0.0020) | (0.0347) | (0.0186) |
| Equity *$\Delta M_t$ | 0.1009*** | -0.0328 | -1.213*** |
| | (0.0218) | (0.7042) | (0.3334) |
| liquidity *$\Delta M_t$ | 0.0130 | 0.3336 | 0.0841 |
| | (0.0164) | (0.2854) | (0.1398) |
| Loan growth$_{-1}$ | -0.1309*** | -0.1329*** | -0.1459*** |
| | (0.0156) | (0.0156) | (0.0155) |
| GDP growth | 0.0123*** | 0.0297*** | 0.0147*** |
| | (0.0046) | (0.0084) | (0.0047) |
| Inflation | 0.0014 | 0.0030 | -0.0102*** |
| | (0.0028) | (0.0030) | (0.0036) |
| Constant | -0.0304 | -0.0166 | 0.0240 |
| | (0.0417) | (0.0443) | (0.0436) |
| Observation | 4048 | 4048 | 4048 |
| Country fixed effect | Y | Y | Y |
| Time fixed effect | Y | Y | Y |
| Clustering level | Bank | Bank | Bank |

**Table 2.8**
**Response of bank resource allocation to a monetary policy stance**

The dependent variable in column (1) is *loan growth* which is defined as a percentage change in total loans and that of column (2) is the growth of bank *securities* which is measured as a percentage change in total securities holdings. These are regressed against risk, the degree of market power and bank characteristic and interaction of these variables with monetary policy stance. The insolvency risk is proxied by the ***Z-score.*** The degree of market power is proxied by the *Lerner Index*. The bank characteristics include log of total assets which valued in US dollars is proxied for *bank size*; *equity* measures the capitalization level of selected banks and *liquidity* is calculated as total liquid assets divided by total assets. *GDP growth* and *inflation* are included to control for demand effect, cyclical movements as well as serving to isolate the *monetary policy* component of short-term interest rate changes. All regressions are estimated using country and time fixed effects and clustering at bank level. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1%, 5% and 10% level respectively.

| | Column (1) | Column (2) |
|---|---|---|
| Δ Monetary policy$_t$ | -0.0463*** | -0.5320*** |
| | (0.0171) | (0.0868) |
| Lerner index | 0.0148 | -0.0996 |
| | (0.0136) | (0.0682) |
| Z-score | 0.0219** | 0.0147 |
| | (0.0087) | (0.0427) |
| Size | 0.0231*** | 0.00393 |
| | (0.0057) | (0.0288) |
| Equity | -0.4334*** | -0.4240* |
| | (0.0527) | (0.2416) |
| liquidity | -0.1061*** | 0.4927*** |
| | (0.0148) | (0.0752) |
| Lerner index* ΔMonetary policy | -0.0288** | 0.1002 |
| | (0.0128) | (0.0656) |
| Z-score *ΔMonetary policy | -0.0062** | 0.0469*** |
| | (0.0030) | (0.0159) |
| Size *ΔMonetary policy | 0.0070*** | 0.0372*** |
| | (0.0020) | (0.0105) |
| Equity *ΔMonetary policy | 0.0849*** | 0.1513 |
| | (0.0235) | (0.1201) |
| liquidity *ΔMonetary policy | 0.0157 | 0.2938*** |
| | (0.0166) | (0.0839) |
| Loan growth$_{-1}$[a] | -0.12947*** | |
| | (0.0159) | |
| Securities growth$_{-1}$[b] | | -0.1389*** |
| | | (0.0128) |
| GDP growth | 0.0104** | -0.0063 |
| | (0.0047) | (0.0243) |
| Inflation | 0.0013 | 0.0092 |
| | (0.0028) | (0.0147) |
| Observation | 3994 | 4110 |
| Country fixed effect | Y | Y |
| Time fixed effect | Y | Y |
| Clustering level | Bank | Bank |

[a,]Loan growth$_{-1}$ and [b]securities growth$_{-1}$ were not used as regressors in column 2 and 1 respectively. This is because the objective of this section is to test for the existing of bank lending channel in emerging markets. More so, the effect of investment in securities on loan growth is reported in table 2.3 and 2.4 and explained accordingly.

**Table 2.9**
**Robustness checks of regression results**

The dependent variable is *loan growth* and is regressed against the degree of market power, bank characteristic and interaction of these variables with macro variables. The degree of market power is proxied by the *Lerner Index.* The bank characteristics include the natural logarithm of total assets which valued in US dollars is proxied for *bank size*; *equity* measures the capitalization level of selected banks and *liquidity* is calculated as total liquid assets divided by total assets. The macro variables ($\Delta M_t$) are short-term interest rate; a measure of *monetary policy* stance, *inflation* and growth in total output which is proxied for ***GDP growth***. For the estimation, random effect and dynamic panel-data estimation, Two-step System GMM, Windmeijer-correct standard error, small-sample adjustments, and orthogonal deviation are used. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1% 5% and 10% level respectively. On SYS GMM we tests: (1) Observation (2) The instruments count, (3) The Hansen test for over identification restriction which the null hypothesis is that instruments are exogenous (4) The Arellano-bond tests for first and second order serial correlation in the residuals which the null hypothesis is that there is no serial correlation. (5) The F-test for joint significance of instruments.

| | **Macro variables** | | | **Macro variables** | | |
|---|---|---|---|---|---|---|
| | Monetary policy | GDP growth | Inflation | Monetary policy | GDP growth | Inflation |
| | **Bank-level RE** | | | **System GMM** | | |
| ΔMonetary policy | -0.544*** | -0.053** | -0.002 | -3.576*** | -0.396** | -0.087 |
| | (0.156) | (0.026) | (0.023) | (1.183) | (0.176) | (0.089) |
| Lerner index | 0.035*** | 0.036** | 0.045*** | 0.032 | 0.012 | 0.032 |
| | (0.008) | (0.008) | (0.008) | (0.034) | (0.016) | (0.042) |
| Log assets | -0.011*** | -0.011*** | -0.012*** | -0.003 | -0.009* | -0.002 |
| | (0.001) | (0.001) | (0.001) | (0.005) | (0.005) | (0.006) |
| Equity | -0.143*** | -0.131*** | -0.178*** | -0.254** | -0.194 | -0.277** |
| | (0.019) | (0.018) | (0.019) | (0.122) | (0.156) | (0.140) |
| liquidity | -0.027*** | -0.018** | -0.030*** | 0.083** | 0.047*** | 0.057*** |
| | (0.009) | (0.009) | (0.009) | (0.036) | (0.017) | (0.018) |
| Lerner index*$\Delta M_t$ | -0.629*** | -0.005 | -0.013** | -0.443 | 0.057* | -0.076** |
| | (0.127) | (0.012) | (0.008) | (0.862) | (0.034) | (0.034) |
| Log assets*$\Delta M_t$ | 0.055** | -0.000 | -0.000 | 0.189* | -0.000 | -0.002 |
| | (0.022) | (0.000) | (0.000) | (0.107) | (0.002) | (0.001) |
| Equity*$\Delta M_t$ | 1.28*** | 0.007 | -0.055*** | 4.256*** | -0.027 | 0.030 |
| | (0.198) | (0.024) | (0.017) | (1.284) | (0.112) | (0.111) |
| liquidity*$\Delta M_t$ | 0.1519 | 0.004 | 0.014 | 2.511** | -0.065** | 0.043 |
| | (0.154) | (0.010) | (0.008) | (1.218) | (0.029) | (0.040) |
| Loan growth$_{-1}$ | -0.002 | 0.005 | -0.006 | 0.140*** | 0.135*** | 0.136*** |
| | (0.014) | (0.014) | (0.014) | (0.057) | (0.051) | (0.050) |
| GDP growth | 0.017*** | 0.018*** | 0.016*** | 0.048*** | 0.038** | 0.032* |
| | (0.003) | (0.004) | (0.003) | (0.016) | (0.018) | (0.018) |
| Inflation | 0.008*** | 0.008*** | 0.013*** | 0.015 | 0.017** | 0.022* |
| | (0.002) | (0.002) | (0.002) | (0.009) | (0.008) | (0.013) |
| **Diagnostics tests** | | | | | | |
| No. of observations | 3963 | 3900 | 3935 | 3935 | 3823 | 3906 |
| Number of instruments | | | | 106 | 107 | 106 |
| Hasen | | | | 101.09 | 99.78 | 101.88 |
| P-value | | | | 0.161 | 0.204 | 0.148 |
| AB2 | | | | 1.52 | 2.69 | 1.52 |
| P-value | | | | 0.129 | 0.007 | 0.128 |
| F-test | | | | 10.22 | 12.07 | 15.82 |

**Table 2.10**
**Response of Loan Growth to Macro variables: Alternative measure of Lerner index**

The dependent variable is *loan growth* which is defined as a percentage change in total loans. This is regressed against the degree of market power, bank characteristic and interaction of these variables with macro variables. The degree of market power is proxied by the *Lerner (funding adjusted) Index.* The bank characteristics include the natural logarithm of total assets which valued in US dollars is proxied for ***bank size***; ***equity*** measures the capitalization level of selected banks and ***liquidity*** is calculated as total liquid assets divided by total assets. The macro variables ($\Delta M_t$) are short-term interest rate; a measure of *monetary policy* stance, *inflation* is the rate of inflation based on the CPI and growth in total output which is proxied for ***GDP growth.*** All regressions are estimated using country and time fixed effects and clustering at bank level. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1% 5% and 10% level respectively.

| | **Macro variables** | | |
|---|---|---|---|
| | **Monetary policy** | **GDP growth** | **Inflation** |
| $\Delta$Monetary policy$_t$ | -0.2968* | -0.0171 | 0.0315 |
| | (0.1680) | (0.0284) | (0.0241) |
| Lerner (funding adjusted) version | -0.0221 | -0.0168 | -0.0168 |
| | (0.0163) | (0.0162) | (0.0161) |
| Log assets | 0.0244*** | 0.0260*** | 0.0191*** |
| | (0.0055) | (0.0055) | (0.0056) |
| Equity | -0.2741*** | -0.2834*** | -0.3586*** |
| | (0.0377) | (0.0371) | (0.0371) |
| liquidity | -0.1022*** | -0.0929*** | -0.1084*** |
| | (0.0147) | (0.0149) | (0.0148) |
| Lerner index(funding adjusted) *$\Delta M_t$ | -0.5982*** | 0.0157 | -0.0155 |
| | (0.1771) | (0.0151) | (0.0100) |
| Log assets*$\Delta M_t$ | 0.0559** | -0.0024* | 0.0007 |
| | (0.0262) | (0.0014) | (0.0009) |
| Equity*$\Delta M_t$ | 1.0194*** | 0.0296 | -0.0367** |
| | (0.1865) | (0.0264) | (0.0177) |
| liquidity*$\Delta M_t$ | 0.2643 | -0.00009 | 0.0168* |
| | (0.1660) | (0.0110) | (0.0091) |
| Loan growth$_{-1}$ | -0.1102*** | -0.1282*** | -0.1110*** |
| | (0.0161) | (0.0158) | (0.0160) |
| GDP growth | 0.0122** | 0.0131** | 0.0121** |
| | (0.0047) | (0.0059) | (0.0048) |
| Inflation | 0.0013 | 0.0023 | 0.0038 |
| | (0.0028) | (0.0028) | (0.0037) |
| Constant | -0.0123 | -0.0272 | -0.0216 |
| | (0.0388) | (0.0392) | (0.0452) |
| Observation | 3929 | 3865 | 3904 |
| Country fixed effects | Y | Y | Y |
| Time fixed effects | Y | Y | Y |
| Clustering level | Bank | Bank | Bank |

# *Chapter III*

## DOES BANK COMPETITION AND DIVERSIFICATION LEAD TO GREATER STABILITY?

**Does bank competition and diversification lead to greater stability?**


## Abstract

A tension exists in the literature as to whether or not competition contributes to banking stability. On one side, proponents of the so called 'charter value' hypothesis argue that banks with greater market power are able to protect their charter value because they are not income constrained. On the other side, are those who hold the view that banks in uncompetitive markets are prone to originate riskier loans which are detrimental to their stability. Using a panel dataset of 978 banks, Panzar and Rosse (1987) H-statistic and the Lerner index as measures of the degree of competition in the banking sector, and employing three stage least squares (3sls) estimation techniques, this chapter provides additional empirical insight into these conflicting views by arguing that competition affects banks' solvency not only through the traditional channels, but also through decisions to diversify their business activities. The core finding is that competition increases stability as diversification *across* and *within* both interest and non-interest income generating activities of banks increases. The results are robust to an array of controls including alternative methodology, variable specifications and the regulatory environments that banks operate in.

## 3.1 Introduction

Competition in banking is important for the efficiency of production of financial services, the quality of financial products and the degree of financial innovation (Vives (2001), and Claessens and Laeven (2004)). The literature has identified six reasons why competition in the financial sector is important: firstly, for firms and households to access financial services (Beck et al., 2004), secondly, for external financing (Rajan and Zingales (1998), and Claessens and Laeven (2005)), thirdly, for efficient management of financial intermediaries (Berger and Hannan 1998), fourthly, for the stability of the financial system (Boyd et al. (2004), and Schaeck et al. (2009)), fifthly, for the improvement of the monetary policy transmission rate to bank market rates (van Leuvensteijn et al., 2008), and finally, for overall industrial and economic growth (Cetorelli and Gambera (2001), and Allen and Gale (2004)).

On the competition-stability relationship, the literature is inconclusive especially for non-industrial countries (Berger et al. 2004). Proponents of the so called 'charter value' hypothesis argue that banks with greater market power are able to protect their charter value because they are not income constrained and are less likely to take on more risk that would affect their stability. This according to some studies enables banks to act more prudently thus lowering their insolvency risk (Keeley (1990), Hellman et al. (2000), Matutes and Vives (2000), and Repullo (2004)). There are others who reject this hypothesis with the view that banks in uncompetitive markets are prone to not only originating riskier loans which are detrimental to their stability, they are also prone to exacerbating moral hazard issues by setting high loan rates that affect borrowers' financial position (Mishkin (1999), and Caminal and Matutes (2002), Boyd and Nicolo, (2005)). This chapter revisits the debate on the competition-stability nexus, by examining the relationship between competition, diversification and stability. Specifically, it empirically analyse these questions: Is bank diversification a response to the competitive environment? Does the decision to diversify affect bank stability? In support of a non-structural new empirical industrial organisation; portfolio and intermediation theories, the results suggest that strategic decisions by banks to diversify their activities in response to the competitive environment affects their stability.

Vives (2010) conducts a survey on the trade-off between competition and stability in banking and reveals two basic channels through which competition affects stability. Competition may affect stability either by exacerbating the coordination problem of depositors/investors on the liability side and fostering bank runs and/ or panics which may be of a systemic nature, or increasing the incentive to take risk on either the liability and/or assets side thereby raising failure probabilities. The 2007 financial crisis has also identified bank funding structure and financial innovation in bank activities as potential sources through which competition may affect stability. Banks especially in the UK and US that mostly rely on wholesale funding have been seen to be severely affected by the crisis, while those in Canada and Australia have been resilient because of their reliance on depository funding (OECD 2010). Equally, financial instruments such as loans sales, credit defaults and derivatives have also turned out to be important sources of instability in the financial sector. This study is proposing that competition pressurizes banks to adopt strategies to diversify and this decision directly affects bank insolvency risk.

Apart from changes in the competitive environment that trigger banks to diversify their activities, Gardener and Molyneux (1990); banks other decisions to diversify include: a strategy to hedge against insolvency risk that reduces the occurrences of costly financial distress (Froot and Stein 1998); a mechanism to improve profitability and operational efficiency especially if the scale and the scope of the bank's operations increase (Landskroner et al. 2005); to reinforce the function of banks as delegated monitors, thereby increasing the volume of intermediation, Baele et at. (2007); and to lower cyclical variations in profits if returns across bank operations are non-perfectly correlated (Acharyer et al. (2006), and Lepetit et al. (2008a)). Despite these reasons, the impact of diversification on bank insolvency risk has been mixed. Stiroh (2004), Acharya et al. (2006), Hirttle and Stiroh (2007) and Mercieca et al. (2007) find no benefits for diversification. On the contrary, researchers such as Campa and Kedia (2002), landskroner et al. (2005), Baela et al. (2007) and Sanya and Wolfe (2010) reveal that diversification increases bank stability. Though the above arguments present a sound theoretical and empirical underpinning of the relationship between competition, diversification and stability, to the best of my knowledge this

chapter is the first to investigate the role of diversification in the competition-stability relationship employing a microeconomic dataset for banks in developing and emerging economies.

The main contribution of this chapter is to empirically analyse the significance of diversification on the relationship between competition and stability. It is a novel approach in this area of research. To achieve this, the three stage least squares (3SLS) is employed to simultaneously analyse the effect of diversification on competition and stability. It controls for the well-known econometric problems introduced by the endogeneity bias from both the competitive measure and revenue diversification. The Panzar and Rosse (1987)'s *H-statistic* is employed as a measure of banking competition. This measure is relatively superior to other methods for competition because it is drawn from bank micro data and accounts for bank-specific differences in the production function. In addition, the Panzar and Rosse (1987) model provides a better theoretical measure of competition and has been used to estimate the competitiveness of banking industries. An alternative competitive measure, Lerner index and methodological specification, instrumental variables, 2sls estimations techniques are also employed to check the robustness of the results. Revenue diversification is measured by constructing Herfindahl Hirschman Indices (HHI) for each bank. This measure accounts for diversification between banks' major activities: net-interest income and non-interest income (Mercieca et al. 2007). On bank overall performance measures, Z-score; risk adjusted profits; bank capitalization level; and the ratio of non-performing loans to total gross loans are used. The Z-score uses bank level data and potentially measures the accounting distant to default for a given bank. It measures the overall bank insolvency risk (Boyd et al. 2009); the risk adjusted profit is used as a measure of profitability; the volume of non-performing loans to total gross loans measures bank loan portfolio risk; while the equity capital to asset ratio accounts for the bank capitalization level (Berger et al. 2009).

The results show that competition increases bank stability. This is because banks make decisions to diversify their portfolio in response to the competitive environment in which they operate. Furthermore, the results show that competition does not only

improve stability, it also enhances banks' performance measured by risk adjusted return on assets (RAROA) and on equity (RAROE). More importantly, these relationships hold when non-performing loan ratio and bank capitalization are used as measures of stability. On contestability, the results reveal that the regulatory initiative that requires high regulatory capital and protects property rights reduces insolvency risk. The overall contribution of this chapter is to show empirically that competition increases bank stability, but the effect could be due to the strategic decision that banks make to diversify their portfolio in response to the competitive environment in which they operate. Liberalizing emerging economies' financial sectors also saw a positive impact on stability.

The rest of the chapter is organised as follows: section (3.2) reviews both theoretical and empirical arguments on the relationship between banking sector competition, diversification, and stability, section (3.3) specifies the measurement and construction of the key variables used, section (3.4) contains the data and econometric specifications, while section (3.5) discusses and presents the empirical results, and finally, section (3.6) concludes.

## 3.2 Literature review

### 3.2.1 Theoretical overview on competition-stability nexus

The theoretical literature on the link between competition and stability is inconclusive. On one hand competition in banking improves stability and in contrast, others argue that competition adversely affects banking stability. Those with the 'competition-fragility view' suggest that monopolistic banks operating in uncompetitive banking systems may enhance profits and reduce financial fragility by maintaining higher levels of capital that protects them from external economic and liquidity shocks. Indeed, a bank with more market power enjoys higher profits and has more to lose if it takes on more risk (Vives 2010). In support of this argument, (Keeley, (1990), and Hellman et al. (2000)) provide the so-called 'franchise value' hypothesis. As a higher franchise value will result in higher opportunity costs when bankruptcy occurs, bank managers as well as shareholders may not accept risky

investments that could affect the stability of the firm and thereby jeopardize their future earning streams. Matutes and Vives (2000) also consider an imperfect competition model where banks are differentiated, have limited liability and there are social costs of failure. They show that, deposits rate is high when competition is intense and the social cost of failure is high. Furthermore, Boot and Thankor, (2000) suggest that because large banks tend to engage in credit rationing, they have fewer, but higher quality credit investments which enhance their financial soundness. Besides, market power in the banking sector could lead to higher quality of loan portfolios, improved capital allocation and thus maximize economic growth. (Manove et al. (2000), and Cetorelli and Peretto (2000)) models suggest that increased concentration in the banking sector and reduction in information asymmetry gives incumbent banks the opportunity to screen and differentiate between low and high quality borrowers. Larger banks are also in a position to diversify their loan-portfolio risks more efficiently because of their economies of scale and operations. In addition, large banks engage in cross-border activities which enable them to gain economies of scale and scope through geographic risk diversification (Boyd and Prescott (1986), and Meon and Weill (2005)). On the issue of monitoring, Allen and Gale (2000) argue that a banking system with fewer large banks may be easier to monitor. Therefore, supervision of banks may be effective and the risk of systemic crisis resulting from contagion may be diminished.

The proponents of the 'competition-stability view' on the other hand, argue that larger banks are often more likely to receive public guarantees and thus, are inefficiently managed and likely to fail. Under Mishkin (1999), the so-called 'too-big-to-fail' concept posits that as banks become too large, the moral hazard problem becomes more severe for the manager who takes on risky investments with the knowledge of being protected under the government's safety net. Moreover, the higher loan rates charge by monopolistic banks may induce borrowers to take on risky investments to compensate higher loan repayments. Thus, the likelihood of loan defaults may increase and induce a higher probability of bank failure (Boyd and De Nicolo, 2005). It is argued that a bank's size is associated with organisational complexity making it difficult to manage efficiently. Also, the bank's size allows it to expand across

multiple geographical markets, business lines and complex financial instruments which can be detrimental to their stability.

There are others who find competition-stability relationship to be ambiguous (Caminal and Matutes, (2002), Boyd and De Nicolo (2005), and Martinez-Miera and Repullo (2008)). The ambiguity of the relationship has to do with issues related to the cost of monitoring and credit rationing. Caminal and Matutes (2002) argue that when monitoring costs of loans are high, banks do not monitor their borrowers regardless of the market structure they operate, though banks in a competitive market are more likely to fail due to their low lending rates. Again, on monitoring costs, it is only a bank with monopoly power that has a bigger incentive to exert monitoring effort and thus faces no need to credit-ration loan applicants. In such a situation Caminal and Matutes (2002) argue that a monopoly bank will be exposed to more aggregate risk than a competitive bank and thus more likely to fail. However, in a case where the monitoring cost is very low, every bank will monitor and this results in quality capital. In this latter case a bank failure is independent of market structure (Caminal and Matutes, 2002). Thus when both firms and banks have to monitor their investments there is a potential ambiguous relationship between competition and risk-taking.

### 3.2.2 Evidence on competition-stability relationship

Recent empirical literature on the relationship between competition and banking system stability has revealed ambiguous results. De Nicolo et al. (2004) use the 500 largest conglomerate financial firms across 90 countries and reveal that a higher level of systemic risk is positively associated with a concentrated banking system. Similarly, De Nicolo and Loukoianova (2006) use a large sample of bank observations in 133 developing countries and find a positive and significant relationship between bank concentration and bank risk of failure. The result is even stronger when bank ownership is controlled and strongest when state-owned banks have sizeable market shares. Uhde and Heimeshoff (2009) use a dataset of 25 countries within the EU and find a negative relationship between bank concentration and financial soundness. In contrast to De Nicolo et al. (2004), De Nicolo and Loukoianova (2006), and Uhde and Heimeshoff (2009)), Beck et al. (2006a. 2006b)

provide empirical evidence that suggest that increased banking concentration does not result in higher banking system fragility. They use a dataset on 69 countries over the period 1980-1997. Schaeck and Cihak (2010) and Schaeck et al. (2009), find evidence for the trade off between competition and banks' risk-taking behaviour. Their study reveals that banks hold higher capital buffers when operating in a more competitive environment and that competitive banking system are less prone to experience systemic crisis. Berger at al. (2009) find support for the 'two views', using dataset of 23 industrialised economies. On the competition-stability, their study reveals that banks with a higher degree of market power bear significantly more loan portfolio risk. For the competition-fragility view, their findings suggest that banks with more market power have less overall risk exposure. Boyd et al. (2009) employ two dataset (2,500 US banks and a panel dataset of about 2,600 banks in 134 emerging economies) find that banks' probability of failure is positively and significantly related to concentration. Turk Ariss (2010) reveals that an increase in the degree of market power increases bank stability as well as banks' profit efficiency for a sample of 821 banks across 60 countries. A comprehensive review of the theoretical and empirical literature on the likely trade-off between competition and stability shows that competition may increase instability because of the failure of banks to effectively manage their liabilities as well as banks having incentives to take risk (Vives, 2010).

### 3.2.3 What drives these differences in the literature?

Theoretical literature as reviewed in section 3.2.1 provides no distinction among the various competitive measures. However, the empirical evidence makes a series of ambiguous and contrasting results, depending on the data, sample size, period examines and the measurements of competition and stability as well as the channel of the instability. Three different approaches (structural, contestability and direct or non-structural) have been used in the literature to measure competition, with each having a different impact on financial sector stability. For example, studies such (Beck et al. (2006a), De Nicolo and Loukoianova, (2006), Boyd et al. (2009), and Uhde and Heimesoff (2009)) employ structural methodology like concentration ratio as a proxy for competition and have contrasting effect on Z-score, a measure of stability. Those who use the so called new empirical industrial organisation approach such as H-

statistic and Lerner index, to some extent produce similar effects of competition on stability. These include (Berger et al. (2009), Schaeck et al. (2009), and Schaeck and Cihak, (2010)). Thus the tension in the literature has to do with the measurement of the market structure and the endogeniety problem associated with measurement. Furthermore, the empirical literature on the competition-stability relationship makes very little of the channel through which banking sector competition may affect stability. This gap is what Chapter III attempts to provide.

### 3.2.4 Does diversification influence the relationship between competition and stability?

Studies that investigate the direct relationship between diversification and stability also produce inconclusive results. Kwan (1998) employs 23 U.S domestic holding bank reveals that diversifying of US holding bank into securities activities increases risk. This view is supported by (Morgan and Samolyk (2003), Stiroh (2004), Acharya et al (2006), and Mercieca et al. (2007)). Morgan and Samolyk (2003) document that diversification is not associated with better loan performance. Stiroh (2004) shows that non-interest income is quite volatile, highly correlated with net-interest income, and it is linked with higher risk and lower risk-adjusted profits, while Mercieca et al. (2007) show no benefits from diversification for small European banks. This view has recently been countered by the argument that diversification reduces risk of bank portfolio and improves performance and stability. De Jonghe and Vande Venet (2008) conduct a panel data analysis over the period 1989-2004 and find diversification across non-interest income generating activities improves bank's franchise values within the European banking system. Using cross-country data, Elsas et al. (2010) find that firms' performance improves while stability was enhanced when banks diversify their activities. Sanya and Wolfe (2010) on their part employ a cross-country study of revenue diversification of banks in emerging markets and find that banks insolvency risk decreases and profitability enhanced when diversified both across and within non-interest generating activities. All these studies on the effect of diversification on insolvency risk did not take into consideration the market structure in which the banks are operating. This is where this chapter sheds some light by

investigating the effect of revenue diversification on the relationship between competition and stability.

In summary, regarding the relationship of interest, studies using non-structural new empirical industrial organisation (such as H-statistic and Lerner index) measure of bank market structure are more unanimous on whether or not competition affects stability than those that employ structural methodology (like concentration ratio) in measuring bank market power. Further investigation into causes of the discord in this strand of the literature reveals that the channels of instability, the measurement of market structure, that of stability, and estimation techniques are factors that continue to foster the disparity in results, with data and the country and sample analysed playing a less critical role. Table 3.1 summarises some of the key papers in the literature on the competition-stability nexus that has been reviewed in this chapter.

**Table 3.1: Overview on empirical literature on competition stability relationship**

| Author (s) | Measure of competition | Measure of stability | Estimating methods | Results |
|---|---|---|---|---|
| Keeley (1990) | Market-to- book assets ratios | Capital-to-asset ratios and interest cost of large CD's | 150 largest US's BHC's. 2SLS estimators was used | Banks with more market power hold more capital and have lower default risk |
| De Nicolo et al. (2004) | Consolidation and conglomeration | Z-index | Largest 500 financial firms across 90 countries. OLS was used to test the relationship | Bank consolidation and conglomeration may not yield more resilient banking system |
| Gan (2004) | The log of one plus the number of thrifts in town. Inverse measure of concentration | Bank market value and risk measured as the ratio of real estate investment and/or brokered deposit to total assets | 252 US thrift firms. OLS estimators were used. | Competition reduces franchise value and the reduced franchise value induces risk taking |
| De Nicolo and Loukoianova (2006) | Concentration | Z-score | A data on 133 non-industrialised countries. Panel regression was used for the estimation | Concentrated banking markets are more prone to risk of failure when ownership is included in the estimation |
| Beck et al. (2006a) | Concentration | A discrete regress that take 1 if the country is going through systemic crisis and 0 if it is no | A data on 69 countries. A robust logit probability model was used to test the relation | Crises are less likely with economies of more concentrated banking systems |
| Schaeck and Cihak (2010) | H-statistic and concentration | Banks' capital to assets ratio | 2,600 European banks | Banks in competitive environments tend to hold more capital |
| Uhde and Heimesoff (2009) | Concentration | Z-score | 225 banks across 25 EU countries and estimation were conducted using panel regression with country-specific random-effect model. | The national banking market concentration has a negative impact on European banks' financial soundness. |
| Berger et al. (2009) | Lerner index | Z-index and the ratio of non-performing loans to total loans | 8,235 across 23 industrialised countries. GMM estimators were used | Banks with a higher degree of market power have less overall risk exposure. The result also show that market power increases loan portfolio risk |

**Overview on empirical literature on competition stability relationship (cont.)**

| Author(s) | Measure of Competition | Measure of stability | Estimating methods | Results |
|---|---|---|---|---|
| Schaeck et al. (2009) | H-statistic | A discrete regress that take 1 if the country is going through systemic crisis and 0 if it is not | Across 45 countries. Duration analysis and a logit probability model | Competitive banking systems are less prone to experience a systemic crisis. Also, it exhibits increased time to crisis |
| Boyd et al. (2009) | Concentration | Z-score | Two dataset: (1) 2,500 U.S banks and (2) 2,600 banks across 134 emerging economies. Cross-sectional and panel data regression | Banks' probability of failure is positively related to concentration |
| Turk Ariss (2010) | Lerner index | Z-index, risk-adjusted return on assets and risk-adjusted return on equity | A sample of 821 banks in 60 developing countries | An increase in the degree of market power leads to greater efficiency and bank stability |

**Source: Author's own compilation**

Thus, there is no consensus regarding the relationship between market structure and banking stability and no prior study examines banking competition vis-à-vis diversification and stability. To the best of my knowledge, this chapter of the thesis is the first to investigate the relationship between competition, diversification and stability of banks in emerging and developing economies. Though prior research mainly in industrialised economies presents a sound theoretical and empirical evidence of the effect of competition in banking on stability; they have excluded banks decision to diversify which is particularly important when the competitive environment is high among financial intermediaries.

## 3.3 Evaluation methods

The overriding objective of this chapter is to investigate whether or not revenue diversification influences the relationship between competition and stability. First, it is to evaluate competitive conditions across emerging and developing countries. Using two distinct indicators, as the literature on market structure are inconclusive regarding the best measure of competitive environments. In the second subsection, different measures of revenue diversification are presented. Five different measures are used to explain overall bank performance. Bank-specific characteristics, regulatory and institutional variables are also controlled to analyse the relationship of interest.

### 3.3.1 Measurement of the degree of banking competition

**Panzar and Rosse' H-Statistic**

Studies on banking competition have used different instruments to measure competition. For example there are those that employ techniques from the new empirical industrial organisation literature (non-structural) such as the Lerner index; the Breshnahan mark-up test; and the Panzar and Rosse H-statistic. While other studies use methodology that is structural and not based on industrial organisation, for example the structure-conduct-performance (SCP) paradigm of (Mason (1939), Bain (1951), and Berger (1995)) versus efficient structure hypothesis of (Demesetz (1973), and Peltzman (1977)). This method uses banking concentration such as Herfindahl-Hirschman Index (HHI) as a measures competition with higher score signalling higher

market power. However, Claessens and Laeven (2004) have shown that banking concentration does not necessarily measures the degree of competition and this can not be used to denote bank market structure.

Panzar and Rosse (1987) H-statistic is used as a measure of banking sector competition. Panzar and Rosse (1987) define a measure of competition, the $H$, as the sum of the elasticities of the reduced-form revenue function with respect to factor prices. They show that this statistic can reflect the structure and the conduct of the market to which the firm belongs; it represents the percentage variation of the equilibrium revenue derived from the unit percent increase in price of all factors used by the firm. Matthews et al. (2007) illustrated that the profit for bank $i$ is given as revenue minus costs as:

$$\pi_i = R_i^{'}(q_i, n, z_i) - C_i^{'}(q_i, w_{i,_k}, x_i),\ i=1,2.....n \tag{3.1}$$

Where $R_i^{'}$ represent revenue and $C_i^{'}$ is the costs of bank $i$. Output of bank $i$ is denoted by $q_i$ and $n$ represents the number of banks in the industry. $w_i$ is the vector of $m$ input prices for bank $i$ while $z_i$ and $x_i$ represent vectors of exogenous variables that shift the revenue and cost functions respectively. Bank $i$ thus maximises profit where marginal revenue is equal to marginal cost as:

$$\frac{\partial R_i}{\partial q_i}(q_i, n, z_i) - \frac{\partial C_i}{\partial q_i}(q_i, w_i, x_i) = 0, i = 1,2.....n \tag{3.2}$$

Adopting a similar line of argument for market level yield, in equilibrium, the zero profit condition will yield the following equation as:

$$R_i^*(q_i^*, n^*, z_i^*) - C_i^*(q_i^*, w_i, x_i),\ = 0$$

Where the asterisks represent equilibrium values. H-statistic measures market power by the extent to which the revenue $\left(\partial R_i^*\right)$ is affected by a change in factor

prices $\left(\partial w_k^*\right)$. The Panzar and Rosse (1987) H-statistic measures competition as a sum of the input price elasticities as:

$$H = \sum_{k=1}^{m} \frac{\partial R_i^* w_{i,k}}{\partial w_{i,k} R_i^*} \tag{3.3}$$

According to Panzar and Rosse (1987), H is negative when the competitive structure is a monopoly, a perfectly colluding oligopoly, or a conjectural variations short-run oligopoly; as under this condition an increase in input price will increase marginal cost, reduce equilibrium output and subsequently reduce total firm revenue. Under perfect competition, where there is free entry and free exit (this is based on Chamberlinian model) and where bank products are regarded as perfect substitutes for one another, will produce the perfectly competitive solution as demand elasticity approaches infinity. In this case H is equal to one. An increase in input prices raises both marginal and average cost without altering the optimal output of any individual bank (Bikker and Haaf, 2002). If H is between zero and unity, the market structure is characterised by monopolistic competition.

$H$ is an increasing function of the demand elasticity *e*, that is, the less market power is exercised on the part of banks, the higher $H$ becomes. This implies that, $H$ is not only used to reject certain types of market behaviour, but its magnitude serves as a measure of competition. The $H$ is estimated from the following reduced-form revenue equation on pooled samples for each country as:[10]

$$\ln(P_{it}) = \alpha + \beta_1 \ln(W_{1,it}) + \beta_2 \ln(W_{f,it}) + \beta_3 \ln(W_{k,it}) + \gamma_1 \ln(X_{1,it}) + \gamma_2 \ln(X_{2,it}) + \gamma_3 \ln(X_{3,it}) + \gamma_4 \ln(X_{4,it}) + \delta D + \varepsilon_{it} \tag{3.4}$$

Where $P$ is the ratio of net total income to total assets (proxy for output price), $W_l$, $W_f$, and $W_k$ indicate respective input prices for labour, deposit funds and physical cost of capital. Some control variables are included at the individual bank level.

[10] See Gutierrez de Rozas (2007) for detailed derivation of the Panzar and Rosse (1987) model.

Specifically, $X_1$ is the ratio of equity to total assets; $X_2$ is the ratio of total loans to total assets, $X_3$ is the loanable (funding) fund to total assets and $X_4$ controls for potential size effect and is calculated as the logarithm of total assets. $D$ is a vector of year dummies to reflect the effect of technological changes, which translate into the movement of the cost function over the period.

Traditional approaches in the literature have used either gross interest or total income as a dependent variable. The use of net total income as non-interest income has increased dramatically in recent times. According to Casu and Girardone (2006) in a competitive environment, the distinction between interest and non-interest income is less relevant, as banks compete for profits on both fronts. Moreover, the existence of accounting differences across the countries (Bonin et al. 2005) is an additional argument in favour of a broader view of bank revenue. The net total income concept comprises of interest income, net commission income, net trading income and other net operating income.

On the input prices, there seems to be no disagreement on the inputs used by banking firms namely the price of deposit funds, the price of labour, and physical capital. These are respectively calculated as the ratio of interest expenses to total deposits and money market funding, labour cost to total assets[11], and other operating and administrative expenses to total assets. The input prices are followed by setting bank-specific factors which are intended to allow for bank heterogeneity and to control for the differences in business mix, risk and size. These variables account for risk propensity captured by the equity to assets ratio; variations in the relative weight of the loan portfolio measured as total loans to total assets, the importance of deposits in the balance sheet captured by loanable funds to total assets and the possible impact of scale economies measured by the logarithm of total assets.

Following (Claessens and Laeven (2005), Staikouras and Koutsomanoli-Fillipaki (2006), Yeyati and Micco (2007), and Gutierrez de Rozas (2007)) the natural log of

[11] In the absence of data on total number of employees, the ratio of labour cost to total assets is used as a proxy for the unit cost of labour.

all variables is taken to estimate equation (3.4) using OLS with year fixed and bank-specific effects and GLS with fixed bank-specific effects and time dummies. All the variables enter into equation (3.4) in logarithmic form in order to improve the regression's goodness of fit and to reduce possible simultaneous bias (De Bandt and Davis, 2000). The H-statistics is calculated as the sum of the elasticities of the total interest income with respect to the three input prices, that is $H=\beta_1+\beta_2+\beta_3$. In order that the results provide close estimates of the true value of the H-statistic for each jurisdiction, the average of the four ways of estimating H is taken.[12]

It is a necessary requirement that the H-statistic test must be taken on observations that are in long-run equilibrium. According to Staikouras and Koutsomanoli-Fillipaki (2006) this empirical test is justified on the grounds that competitive capital markets will equalise risk-adjusted rates of return across banks such that, in equilibrium rates of return should not be correlated with input prices. To test for this validity, the dependent variable of equation (3.4) is replaced by the Return on Assets (ROA) as follows:

$$\ln(ROA_{it}) = \alpha + \beta_1 \ln(W_{1,it}) + \beta_2 \ln(W_{f,it}) + \beta_3 \ln(W_{k,it}) + \gamma_1 \ln(X_{1,it}) + \gamma_2 \ln(X_{2,it}) + \gamma_3 \ln(X_{3,it}) + \gamma_4 \ln(X_{4,it}) + \delta D + \varepsilon_{it} \quad (3.5)$$

A value of $H<0$ indicates non-equilibrium, while $H=0$ is equilibrium. It is also argued that if a sample is not in long-run equilibrium, it is true that $H<0$ no longer proves monopoly, but it remains true that $H>0$ disproves monopoly or conjectural variation short-run oligopoly,[13] and in accordance of Belaisch (2003) a test of significance is run for the H-statistic to determine whether the market structure is monopoly, monopolistic competition or perfect competition.

[12] H1 to H4. H1 is estimated using pooled OLS with bank-specific and time dummies and gross interest income as dependent variable in the reduced-form revenue equation. H2 is estimated using pooled GLS with time dummies and gross interest income as dependent variable in the reduced-form revenue equation. H3 is estimated using pooled OLS with bank-specific and time dummies and total income as dependent variable in the reduced-form revenue equation. H4 is estimated using pooled GLS with time dummies and gross interest income as dependent variable in the reduced-form revenue equation. See Claessens and Laeven (2004 and 2005) for detailed calculations.

[13] See Shaffer (2004).

Though the theoretical foundation for non-structural new empirical industrial organisation measures is stronger than those structural methods but the non-structural measures have some drawbacks. For instance, the H-statistic imposes restrictive assumptions on banks' cost functions. It concludes that increases in input prices make total revenue and marginal costs not to move together in imperfectly competitive markets and it is only valid if the industry is in equilibrium, which is very rare. Despite the drawbacks, this approach is increasingly used in empirical research because it measures banks' behaviour and thus competition directly (OECD 2010). Table 3.2 summarises the key research in the banking sector that have employed H-statistics as a measure of the degree of market power.

**Table 3.2: Summary literature on measuring bank competition using Panzar-Rosse methodology**

| Authors | Countries considered | Period | Results |
|---|---|---|---|
| Gelfand and Spiller (1987) | Uruguay | 1977-1980 | Monopolistic competition |
| Nathan and Neave (1989) | Canada | 1982-1984 | Monopolistic competition |
| Molyneux et al. (1994) | 5 EU countries | 1986-1989 | Monopolistic competition, Monopoly for Italy |
| Vesala (1995) | Finland | 1985-1992 | Monopolistic competition in (1985-1988) then in (1991-1992), but perfect competition in (1989-1990) |
| Molyneux et al. (1996) | Japan | 1986-1988 | Monopoly in (1986), and perfect competition in (1988) |
| Hondroyiannis et al. (1999) | Greece | 1993-1995 | Monopolistic competition |
| Barajas et al. (2000) | Colombia | 1985-1998 | Monopolistic competition |
| Bikker and Groeneveld (2000) | 15 EU countries | 1989-1996 | Monopolistic competition |
| Bikker and Haaf (2002) | 23 OECD countries | 1990-1998 | Monopolistic competition |
| Coccorse (2002) | Italy | 1988-1996 | Monopolistic competition, perfect competition in (1992/1994) |
| Hempell (2002) | Germany | 1993-1998 | Monopolistic competition |
| Belaisch (2003) | Brazil | 1997-2000 | Oligopoly |
| Yeyati and Micco (2003) | 8 Latin America countries | 1993-2002 | Monopolistic competition |
| Drakos and Konstantinous (2005) | 10 Eastern EU countries | 1992-2000 | Monopolistic competition except Latvia Monopoly |
| Weill (2004) | 12 EU countries | 1994-1999 | Monopolistic competition |
| Claessens and Laeven (2004) | 50 countries | 1994-2001 | Monopolistic competition |
| Coccorese (2004) | Italy | 1997-1999 | Monopolistic competition |
| Utrero-Gonzalez (2004) | Spain and UK | 1996-2002 | Monopolistic competition |
| Gelos and Rolds (2004) | 8 L. American and Eastern EU countries | 1994-1999 | Monopolistic competition, except Argentina and Hungary |
| Jiang et al. (2004) | Hong Kong | 1992-2002 | Perfect competition |
| Staikouras and Koutsomanoli-Fillipaki (2006) | 5 EU countries | 1998-2002 | Monopolistic competition |
| Casu and Girardone (2006) | 15 EU countries | 1997-2003 | Monopolistic competition |
| Yildirim and Philippatos (2007) | 14 Eastern EU countries | 1993-2000 | Monopolistic competition |
| Gutierrez de Rozas ( 2007) | Spain | 1986-2005 | Monopolistic competition |
| Matthews et al. (2007) | UK | 1980-2004 | Monopolistic competition |
| Schaeck et al. (2009) | 35 countries | 1998-2005 | Monopolistic competition |
| Schaeck and Cihak (2010) | 10 EU countries | 1999-2004 | Monopolistic competition |
| Delis (2010) | 22 CEEC | 1996-2006 | Some are monopolistic while others have market power |

**The reports of the main studies that applied Panzar-Rosse approach in banking industry with their respective main result. This is an update of Staikouras and Koutsomanoli-Fillipaki (2006)**

***Lerner index***

To test for the robustness of the results, Lerner index is employed as an alternative measure of degree of competition for the sample. The index is a type of new empirical industrial organisation and provides direct measure of degree of market power as it represents the mark-up of price over marginal cost (Berger et al. 2009). Also, it shows the degree to which a banking firm increases its marginal price beyond marginal cost and shows an accurate indicator of market power compare to the concentration ratio measures (OECD 2010). Lerner index is calculated as:

$$Lerner_{it} = (\Pr ice_{it} - MC_{it}) / \Pr ice_{it} \tag{3.6}$$

Where $\Pr ice_{it}$ is the price of the total assets. $MC_{it}$ is the marginal cost of producing an additional unit of output. The $MC_{it}$ is derived from the translog cost function as:

$$\ln Cost_{it} = \beta_0 + \beta_1 \ln Q_{it} + \frac{\beta_2}{2} \ln Q_{it}^2 + \sum_{k=1}^{3} \gamma_{kt} \ln W_{k,it} + \sum_{k=1}^{3} \phi_k \ln Q_{it} \ln W_{k,it} +$$
$$\sum_{k=1}^{3} \sum_{j=1}^{3} \delta_{ij} \ln W_{k,it} \ln W_{j,it} + \sum_{i=1}^{3} (\delta_i / 2) \ln W_{t,ij}^2 + \sum_{k=1}^{2} \eta_k trend^k$$
$$\sum_{i=1}^{3} \varsigma_i \ln W_{t,ij} trend + v \ln Q_{tj} trend + \varepsilon_j \tag{3.7}$$

Where $Cost_{it}$ is the bank's total costs including financial and operating cost; $Q_{it}$ represents a proxy for bank output measured as total assets and $W_{k,it}$, represent the three input prices discussed in section 3.3.1. The cost function is estimated separately using a panel data for each country in the sample. This allows for the parameters of the cost function to vary from one country to another reflecting different technology. Fixed effects are also introduced to capture the influence of variables specific to each bank. Once the cost function is estimated, its first derivative with respect to the output evaluated for each bank in the sample, is the marginal cost as:

$$MC_{it} = \frac{Cost_{it}}{TA_{it}}\left[\beta_1 + \beta_2 \ln TA_{it} + \sum_{k=1}^{3}\phi_k \ln W_{k,it} + \delta_3 Trend_{it}\right] \quad (3.8)$$

The index is interpreted as follows: the Lerner index with higher value implies higher pricing power and less competitive market conditions.

### 3.3.2 Diversification measures

In line with Stiroh (2004) and Mercieca et al. (2007) revenue diversification is measured by constructing Herfindahl Hirschmann Index (HHI) for each bank. This measure accounts for diversification between major activities. The revenue $HHI_{(REV)}$ diversification for each bank is therefore calculated as follows:

$$HHI_{(REV)} = \left(\frac{NON}{NETOP}\right)^2 + \left(\frac{NET}{NETOP}\right)^2 \quad (3.9)$$

Where:

$$NETOP = NON + NET$$

$NON$ represents non-interest income; net-interest income is captured by $NET$ ; and $NETOP$ accounts for net-operating income. Equation (3.9) is interpreted as: a rise in HHI shows an increase in revenue concentration and less diversification. This process is repeated for the construction of diversification within non-interest activities:

$$HHI_{(NON)} = \left(\frac{COM}{NON}\right)^2 + \left(\frac{TRD}{NON}\right)^2 + \left(\frac{OTOP}{NON}\right)^2 \quad (3.10)$$

Where:

$$NON = COM + TRD + OTOP$$

Revenue from commission income is captured by $COM$. $TRD$ is trading income and $OTOP$ captures other operating income. Higher values indicate greater concentration.

### 3.3.3 Overall performance measures

This chapter does not employ episodes of banking crises as a proxy for banking instability, in contrast to (Demirguc-Kunt and Detragiache (2005), Beck et al. (2006a),

and Schaeck et al. (2009)). Though the number of bankruptcies could serve as an indicator for financial crisis, its significance according to Uhde and Heimeshoff (2009) may be distorted. The reasons being that: banking crises are announced and described differently across countries, thus, it is difficult to define and determine the actual start and the end date of a banking system failure. Secondly, having banking crises may imply a regulatory failure. Therefore competent supervisory bodies may be reluctant or fail to announce banking failures that have occurred within their national boarders, thirdly, failures of systemic banks are typically prevented by implementing financial restructuring programmes to forestall contagion and thus systemic crises. For these reasons, the measure as used by (Boyd et al. (2009), Uhde and Heimeshoff (2009), and Berger et al. (2009)) is followed to estimate bank insolvency risk using the (Z-score), risk-adjusted profit, (RAROA and RAROE) for bank profitability, loan portfolio risk (Bad loan/loan ratio) and capitalization level (equity/asset ratio). Detailed measurement of each of the performance variables are discussed below.

***Insolvency risk (Z-score)***

Z-score is used as a measure of insolvency risk. It measures the number of standard deviations that a bank's profit must fall to drive it into insolvency. The index potentially measures the accounting distant to default for a given institution and it is calculated as:

$$Z - score = \frac{average\,ROA + average\,E/TA}{\sigma ROA} \tag{3.11}$$

Where, $average\,ROA$ is the average rate of return on assets of a bank, $average\,E/TA$ represents average bank equity in percent of total assets and $\sigma ROA$ is the standard deviation of return on assets. According to De Nicolo et al. (2004), the bank stability indicator increases with higher profitability and capitalization levels, and decreases with unstable earnings reflected by a higher standard deviation of return on assets. Thus from an economic point of view, the Z-score initially measures the probability of a bank becoming insolvent when the value of assets becomes lower than the value

of debt. This means that a higher (lower) Z-score implies a lower (higher) probability of insolvency risk[14].

***Risk adjusted performance measure***

Additionally, bank-specific data is used to calculate two risk adjusted performance measures of return on assets $(ROA)$ and return on equity $(ROE)$ and then dividing $ROA$ and $ROE$ by their respective standard deviation $(\sigma)$ as:

$$RAR_{ROA} = \frac{ROA}{\sigma_{ROA}} \qquad RAR_{ROE} = \frac{ROE}{\sigma_{ROE}} \tag{3.12}$$

Where $ROA$ is the ratio of income before tax to total assets and $ROE$ is calculated as net income divided by total equity.

***Non-performing loans (Bad loans)***

The ratio of non-performing loans to total gross loans is used to proxy for loan portfolio risk. The use of loan losses as a proxy for loan portfolio risk must take into account two *caveats* according to Boyd et al. (2009): (1) the risk should not imply a higher risk of bank failure if the assets allocation tilts towards a larger holding of risk free assets. (2) the measures at best should capture the default risk related to the loan portfolio. For the purpose of this chapter, the measures of loan quality have an independent effect in so far as they related to the probability of borrower failure to honour their obligation and that a higher value indicates a riskier loan portfolio. It is calculated as non-performing loans to total loans (For the rest of the discussion the term bad loans will be use to represent the ratio).

***Bank capitalization***

Capitalization ratio is used as a proxy for bank stability because the 1998 Basel Accord has made banks increasingly focus on managing their capital base as a buffer against default. Martin (1977) also argues that the default risk of banks is directly

[14] Ideally, market-risk forward-looking indicators such as expected default frequency (EDF) and modified Merton (1974) distance-to-default are employed as a measure of bank risk-taking. However, a market database is not available for the large sample of banks in emerging markets.

related to the risk inherent in a bank's asset portfolio and its capitalization. Allen et al. (2005) on their part build a model to show that banks' equity capital are normally higher in competitive credit markets where, in their opinion, good lending opportunities are scarce. Bank capitalization level is measured as the ratio of equity capital to total assets where a higher ratio indicates lower bank insolvency risk.

### 3.3.4 Controls for bank-specific and regulatory variables

The following variables are controlled so that any potential independent effect they may have on the relationship between competition and stability does not impact on the core relationship between competition, revenue diversification and stability. This includes bank-specific, institutional and regulatory variables.

The ratio of total loan to total assets (***loan/asset***) explores banks' investment mix and it is calculated as total loans divided by total assets.

Deposits to total liability ratio (***deposit/liability***) is used as a measure of funding structure and liquidity sources of banks. Following Demirguc-Kunt and Huizinga (2010) who examine the effect of funding strategy on bank risk behaviour, and Ratnovski and Huang (2009) who explore factors behind Canadian banks' relative resilience during 2007 credit turmoil, the bank funding structure is measured as total deposits as a percentage of total liabilities.

Return on Assets ***(ROA)*** measures bank performance in terms of the ability to generate profits after considering operating expenses. Thus it takes into account operating income and expenses. ROA is calculated as profit before tax as a percentage of total assets.

Financial liberalisation index is a database constructed by Abiad, Detragiache and Tressel (2010) that recognises the multi-faceted nature of ***financial reform*** and records financial policy changes along seven different dimensions: credit controls and reserve requirements; interest rate controls; entry barriers; state ownership; policies on securities markets; prudential regulations and supervision of the banking sector and

restrictions on the capital account. The liberalization index measures financial reforms that have taken place during the period and it ranges from 0 to 21 with the highest score indicating fully reformed. The Financial Reform Index (normalised) is a binary value (0-1) with 1 indicating fully reformed. However, the only limitation of the dataset is that it covers the period up to 2005.

Capitalization index measures overall ***capital stringency*** and it has been found to reduce bank insolvency risk. Behr et al. (2010) sample 421 banks across 61 countries and reveal that regulatory capital is effective in reducing risk-taking in a country where the banking system is more competitive. Capitalization index ranges from 0 to 9, with a higher value indicating greater stringency.

***Official supervisory power*** measures whether the banking regulators have the power or the authority to take decisive actions to correct and prevent problems. This according to Barth, Caprio and Levine (2001, 2004) describe quantitatively the degree to which supervision authorities may intervene to promote prudential banking environments. The index ranges from 0 to 16 with higher values indicating more supervisory power. Also, their database can be used to assess the relationships between official supervisory resources, power and independence to banking sector on one hand, and the extent of private-sector monitoring, restrictions on bank activities and the level of moral hazard created by deposit insurance scheme on the other (Barth et al. 2004). However, this chapter analyse supervisory power in the context of regulators ability to take actions to prevent banking problems.

***Property rights*** measures the degree to which a country laws protect private property rights and the degree to which government enforces those laws. It is an index from the Economic Freedom Indicators of the Heritage Foundation and it is scaled from 0 to 100 with higher values indicating greater freedom and legal property protection rights respectively.

***GDP growth*** is used to control for the general economic development, macroeconomic stability, and institutional framework as these are likely to affect

banking system performance in a country (Claesens and Laeven, 2004). The nominal GDP growth is measured as the annual rate of growth of GDP.[15]

***Inflation*** measured as the annual growth rate of the CPI index. While GDP growth captures the possible effect of the business cycle, the banking system is less likely to be more competitive when it is subject to high inflation, in that, prices of financial services such as interest rates will be less informative.

In addition to the variables discussed, the use of instrumental variables (IV) technique helps to explicitly specify the instruments. Three instruments that are found in the literature to affect competition and banking stability are used: activity restrictions, banking and financial freedom and bank size. Schaeck and Cihak (2010) use similar instruments with a two stage least square (2SLS) estimator. ***Activity restrictions*** measure the degree to which national authorities allow banks to engage in activities that generate non-interest income. That is, it indicates the limits imposed on commercial banks to participate in securities markets, insurance and real estate activities. The measure varies from 4 to 16 with higher scores indicating more restrictions. The ***banking freedom*** variable provides an overall measure of the openness of the banking sector and the extent to which banks are free to operate their businesses. The measure describes a country's financial climate and assigns an overall score between 0 and 100 percent, with a higher percentage score signifying more freedom. Natural logarithm of total assets is used as a proxy for ***bank size***.

## 3.4 Data Sources and Econometric methods

### 3.4.1 Data Sources

This chapter employs both micro-bank level and macro-country level data. Bank level data is taken from the most recent Bankscope database. Series are yearly, covering a sample of 978 banks across 55 countries during the eight year period, 2000–2007. As the study focuses on bank intermediation, I opt for unconsolidated balance sheet data whenever possible even though in some cases I have to depend on consolidated

[15] The nominal GDP growth is used as the objective of this section is to control for the business cyclical movements on banks performance in addition to harmonise all the other variables.

statements because of data unavailability. The sample includes all commercial banks, cooperative banks, development banks, savings banks, real estate and mortgage banks for which annual data is available for some period of the years during the period 2000-2007. To ensure that I do not omit banks that are important players in the deposit and/or loan markets, I also include medium and long term credit banks and specialised government institutions as these banks remain important in emerging and developing countries. The use of bankscope has an advantage in that the accounting information on banks are standardised. The Panzar and Rosse (1987) H-Statistic are based on a sample that includes observations from countries with at least 50 bank-year observations. Macro data are obtained from the World Development Indicator of the World Bank and International Financial Statistics database of the International Monetary Fund and some cases, the respective central banks. The series includes GDP growth, inflation, exchange rates, average policy interest rates, and money market rates. Activity restrictions, capital stringency and supervisory power variables are obtained from Barth, Caprio and Levine (2001, 2004) while the banking freedom and property rights variables are obtained from the Heritage Foundation. Liberalization index is obtained from Abiad Detragiache and Tressel (2010).

### 3.4.2 Estimation methods and procedures

The analysis of the relationship of interest follows a structural model proposed by Keeley (1990). The equations are presented simultaneously as follows:

$$Z_{it} = \alpha_0 + \alpha_1 H_{it} + D_{it} + \sum_{j=4}^{k} \alpha_j X_{i,j} + \varepsilon_{it} \tag{3.13}$$

$$D_{it} = \alpha_0 + \alpha_1 H_{it} + \sum_{j=4}^{k} \alpha_j X_{i,j} + \varepsilon_{it} \tag{3.14}$$

Where the $Z_{it}$ is a proxy for bank stability of bank $i$ in period $t$, $H_{it}$ is competition measured using Panzar Rosse's H-Statistic model, the $D_{it}$ is bank revenue diversification , the variables $X_{i,j}$ are a set of $\{k\}$ variables controlling for bank-specific characteristics, the respective countries' macroeconomic environments and

regulatory variables. $\alpha's$ are the parameter vectors; and $\varepsilon_{it}$ is the unobserved disturbances.

To account for an endogeneity bias in the model, a three-stage-least–square (3sls) simultaneous equation model is used. Stability, competition and revenue diversification are specified as endogenous variables. 3sls estimates systems of structural equations that contain endogenous variables among the explanatory variables. It produces estimates from a three-step process: firstly, it develops instrumented values for all endogenous variables; then obtains a consistent estimate for the covariance matrix of the equation disturbances, and finally, performs a GLS-type estimation using the covariance matrix (Greene, 2003). Furthermore, in the presence of an endogeneity bias and correct specification of structural equations models, the 3sls produces more consistent and precise estimates of coefficients than those produced by two stage least square (2sls) (Mantecon (2009), and Deng et al. (2007)).

## 3.5 Empirical results

### 3.5.1 Descriptive statistics

Table 3.3 shows summary statistics for the key variables used in this study. All bank-specific variables are averaged by bank during the period 2000-2007, while that of the country-level variables are averaged by country over the period under study. The countries are grouped into regions and this follows the World Bank Developing indicators groupings. The groupings are Africa, Asian, Central and Eastern European countries (CEEC) and Latin America.

Within the sample period, the average H-statistic is (0.65) showing that the banking systems of the selected countries are characterised by monopolistic competition. Moreover, Latin America appears to have the most competitive banking system in the sample, with an average H-statistic of (0.68). On the measures of overall bank performance, while Asian banks appear to be the most stable and most profitable, the region with the highest insolvency risk is Africa. However, over the period, banks in

Latin America on average hold the highest level of capital ratios, of about (20%) of their total assets compared to the aggregate sample of (15%). The 15 percent aggregate equity ratio implies that just less than a quarter of the assets of the selected banks are financed with equity capital.

Regarding revenue diversification, CEEC banks are less diversified within non-interest income generating activities. On the pattern of intermediation, on average (51%) of the sample banks' assets are extended as loans with Asian banks providing more than (56%) of their assets as loans. The least in the sample is the African banks whose total average loan portfolio is (48%). Of the liabilities of the sample banks, (79%) constitute core deposits. This means that more than three quarters of emerging countries assets are finance by core deposits. Total asset measures denominated in US dollars is used as a proxy for bank size. Asian banks are largest in the sample. The average size of an Asian bank is 30.1billion US dollars.

Table 3.4 shows competitive environment indicators for the selected countries banking system. Panzar and Ross (1987) H-statistic is employed as a proxy for the degree of competition. It is calculated as the average of implied H-statistics from four different structural models estimated for each country for the eight year-period; 2000-2007 and it is based on the Claessen and Laeven (2004) estimation methodology. H1 is estimated using pooled OLS with bank-specific and time dummies and gross interest income as the dependent variable in the reduced-form revenue equation. H2 is estimated using pooled GLS with time dummies and gross interest income as the dependent variable in the reduced-form revenue equation. H3 is estimated using pooled OLS with bank-specific and time dummies and total income as the dependent variable in the reduced-form revenue equation. H4 is estimated using pooled GLS with time dummies and gross interest income as the dependent variable in the reduced-form revenue equation. The four different measures according to (Claessen and Laeven, 2004) provide relatively close estimates, suggesting that the techniques are robust to estimate H-statistic for each country. As each technique has some related merits and demerits, the average of the four estimates are considered as the measure of competitive indicator. The score of *H-statistic* (with the exception of Tanzania)

varies between 0.65 and 0.80 meaning that the best description of the degree of competition among selected banks is monopolistic competition. Also, the estimation result provides no strong pattern among the countries within the groupings.

Pair-wise correlation coefficients presented in table 3.5 is a first step in analysing whether or not revenue diversification influences the relationship between competition and stability. The correlation coefficient between *H-statistic* and the corresponding overall performance measure (*Z-score*, *RAROA, RAROE, Bad loans, and equity/assets*) suggest some degree of benefit accruing to banks operating in a highly competitive environment. However, the insignificant coefficient between *H-statistic* and *Z-score* could imply that competition per se does not necessarily influence stability. The decision to diversify within a market reduces bank insolvency risk, improves performance and enhances competition. On the exposure of banks to non-interest income generating activities *(Non_inc*$^2$) and reliance on fee and commission income (*com_inc*$^2$), the results suggest non-linearity. This means that, there could be a point of operation where further exposure would decrease banks performance.

Bank portfolio mix captured by (*loan/asset*) ratio is associated with reduced insolvency risk, increased risk-adjusted profits (*RAROA and RAROE*), increased competitive indicators and enhanced diversification within non-interest income generating activities. The possible explanation for this correlated relationship is that banks with large loan portfolios may first seek to diversify their activities especially in the existing market as a growth strategy. Then use the return from their loan portfolio to finance new business activities. Furthermore, the pair-wise correlation coefficient results also show that bank size is positively correlated with loan/asset ratio, insolvency risk and risk-adjusted performance.

Finally, on macroeconomic controls, the correlation coefficients reveal that economic growth increases stability and enhances profits, but reduces the holding of equity capital. The rate of inflation on the other hand has an insignificant correlation coefficient on all bank performance indicators.

### 3.5.2 Does revenue diversification affect the competition-stability relationship?

This section analyses the relationship between competitive indicators and the measures of performance, as well as further investigating whether revenue diversification affects these relationships. Table 3.6 reports the 3SLS regression results that have bank insolvency risk (Z-score) for column 1, risk-adjusted profits (*RAROA and RAROE*) for column 2 and 3 respectively, capitalisation ratio (equity/assets) for column 4 and loan portfolio risk with the ratio of non-performing loans to total loans (bad loans) for column 5 as the dependent variables. Column 6 uses an alternative measure of revenue diversification (HHIrev). In addition, the table reports the F-statistics which provides a test for the joint significance of the regression coefficients as well as the set of three instruments employed in the regression estimates.

Table 3.6 is also divided into two panels. Panel A presents the main relationship of interest between competition and performance. It also shows the independent effect of competition on bank performance. Panel B on the other hand shows the impact of competition on revenue diversification. As earlier stated, the main argument of this chapter is to examine whether or not revenue diversification influences the competition-stability relationship. Panel B shows if this hypothesis holds for the selected sample of banks in the developing and emerging economies. That is, Panel B indicates whether or not banks diversify their activities as a result of greater competition.

In Panel A of table 3.6, the coefficient of H-statistic is positive and statistically significant implying that an increase in banking competition has a significant positive effect on the overall stability of banks in emerging and developing markets. This finding correspond to the 'competitive-stability view' in the theoretical literature and is generally consistent with empirical findings of (De Nicolo et al. (2004), and Uhde and Heimesheff (2009)) - that an increase in the competitiveness of national banking systems increases bank financial soundness. However, this result contrasts by not supporting theory (Beck et al. 2006a) or empirical work on the 'competition-fragility view' (Berger et al. 2009). The next analysis is the association between *H-statistic* and

risk-adjusted return on assets (RAROA) and that of Equity (RAROE). The *H-statistic* has a positive association with both RAROA and RAROE suggesting that banks in emerging countries profit from operating in more competitive banking environments. This finding is also in line with the general concept that competition brings about efficiency and innovation, which reduces costs, and which in turn translates into higher rates of return. This return is in both absolute terms and on a risk-adjusted basis.

Column 4 of table 3.6 seeks to establish whether banks operating in highly competitive banking markets hold more equity capital. Banks hold equity capital as a cushion to absorb any losses emanating from their operations. The literature is inconclusive on the effect of the degree of competition on equity capital holding. While Berger et al. (2009) findings suggest that bank capitalisation level is high for banks with higher market power, Schaeck and Cihak, (2010) find the opposite, that competition provides incentives for banks to maintain higher capital ratios. Table 3.6 provides no significant evidence to support the fact that banking system structure explains capitalisation level of banks in emerging and developing countries. Regarding the relationship between H-statistics and loan portfolio risk (bad loan), the result is negative and significant. This means that a high degree of competition, *ceteris paribus*, is linked to low loan losses as a proportion of total loans. In an environment where banking competition is high, bank interest rate are generally low, borrowers return on investment increases which will in turn decrease the risk of default and consequently non-performing loans will be lower. Furthermore, low cost of capital also enables borrowers to increase their return on capital, increase cashflow from the investment and thus be able to pay their bank loans. This finding is also consistent with the 'competition-stability view' of (Boyd and De Nicolo, 2005) that greater bank competition is associated with low loan losses.

Bank funding structure *(deposit/liabilities*) and that of lending (*loan/asset*s) have been found to have an impact on bank insolvency risk. Banks depending on wholesale funding have been severely affected during the current financial crisis while those in Australia and Canada for example have been resilient to the crisis because they relied

mostly on depository funding (OECD 2010). These two bank-specific variables are controlled and reported in Panel A of table 3.6. The coefficient of *loan/assets* is positive on both insolvency risk and profitability but negative on capitalization and loan portfolio risk. This means that bank lending in developing countries is associated with a decrease in capitalization ratio, lower loan portfolio risk, and higher performance and therefore an increase in the financial soundness of banks. Intuitively, banks that provide quality loans hold low levels of capital and consequently do not need additional capital to absorb losses. Furthermore, the profitability level of such banks is enhanced because low provisions are made in connection to loan losses. The result provides no evidence of negative consequences of depository funding of banks in developing countries. Growth in GDP improves profitability and reduces the non-performing loan ratio.

**3.5.2.2 Additional analysis of insolvency risk and the role of diversification.**

The relationship between competition and stability as reported in table 3.6 is well established in banking literature. The ambiguity is on the channels of instability. In order to further analyse whether or not competition affects insolvency risk through diversification, there has to be an independent effect of the degree of competition on diversification (Sanya 2009). That is, the extent to which high levels of competition impact on diversification. This means that *H-statistic* must influence *HHI(non)* and *HHI(rev)* significantly.

Using the equations (3.13) and (3.14), the regression results in Panel B are simultaneously estimated with those in Panel A. In table 3.6 the coefficient for *H-statistic* reported in Panel B is negative and statistically significant across all specifications. The same results are obtained when *HHI(rev),* an alternative measure of revenue diversification is used in column 6. These results imply that competition exerts pressure on banks in emerging /developing economies to diversify both across and within non-interest income generating activities.[16] The results also show that banks prefer to diversify within the market they already operate in compared to a new market. This is because the coefficient of the impact of competition on HHI(non) is

[16] Lower level of Herfindahl-Hirschman index (HHI) indices means increased diversification.

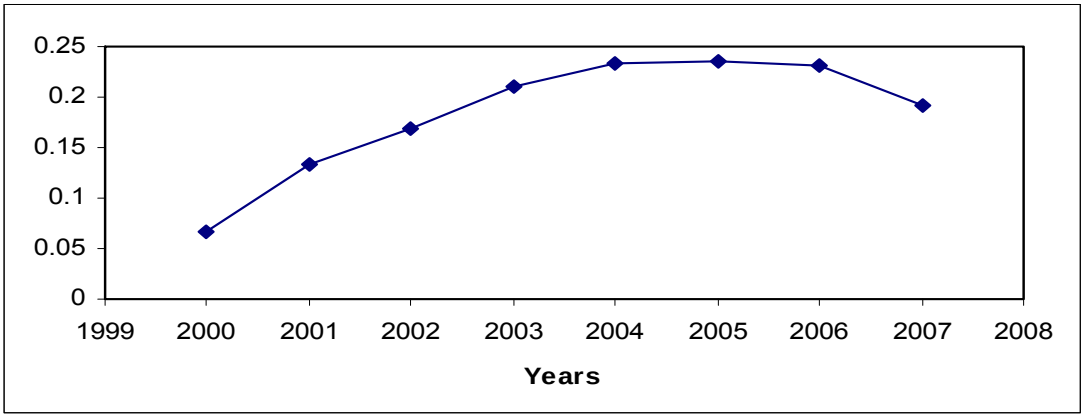
relatively larger than that of HHI(rev). Again, it could be a precautionary strategy as banks take into account risk of entering into a new market. Similar results are reported when *Lerner index*, an alternative measure of the degree of competition is used in table 3.7. Thus, Panel B of both table 3.6 and 3.7 confirm that the degree of competition has an independent effect on diversification. In a whole, the results of table 3.6 and 3.7 provide empirically, an additional channel (revenue diversification) through which competition may affect insolvency risk of banks in developing and emerging markets.

### 3.5.3 **Alternative measures of market structure**

Table 3.7 presents the relationship between competition, revenue diversification and bank insolvency risk using alternative measures of competition. Lerner index measures the degree to which a bank can increase its price over and above marginal cost and represents a more accurate indicator of market power. Here, the index is used to check the robustness of the earlier findings. The results are similar to that of results using H-statistic reported in table 3.6. Though the sign and the level of significant is the same, the magnitude of the coefficient is slightly different. The high degree of competition in developing countries, *ceteris paribus*, reduces bank insolvency risk, increased performance, holding of more equity capital and reduces risk of loan portfolio.

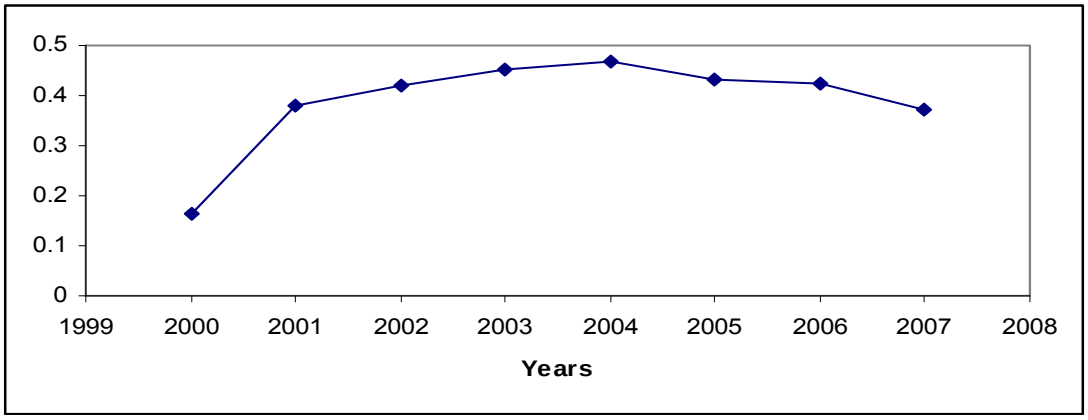
In addition to the regression results reported in table 3.6 and 3.7, figures 3.1 to 3.4 are used to further discuss the effect of revenue diversification on competition-stability relationship. The data is aggregated by averaging individual bank years across countries over the period, 2000-2007. Figure 3.1 shows the trend of degree of competition (*Lerner index*), in emerging/developing markets, figure 3.2 depicts the level of revenue diversification (*HHInon*) during the period, while figure 3.3 illustrates the level of insolvency risk, measured using (*Z-score*). The chart on figure 3.4 represents the performance of the sample banks measured by *RAROA*.

**Figure 3.1**
**Degree of competition in emerging markets as measured by Lerner index**




**Source: Bankscope and author's calculation**
**Data is aggregated averaging across years, 2000-2007**

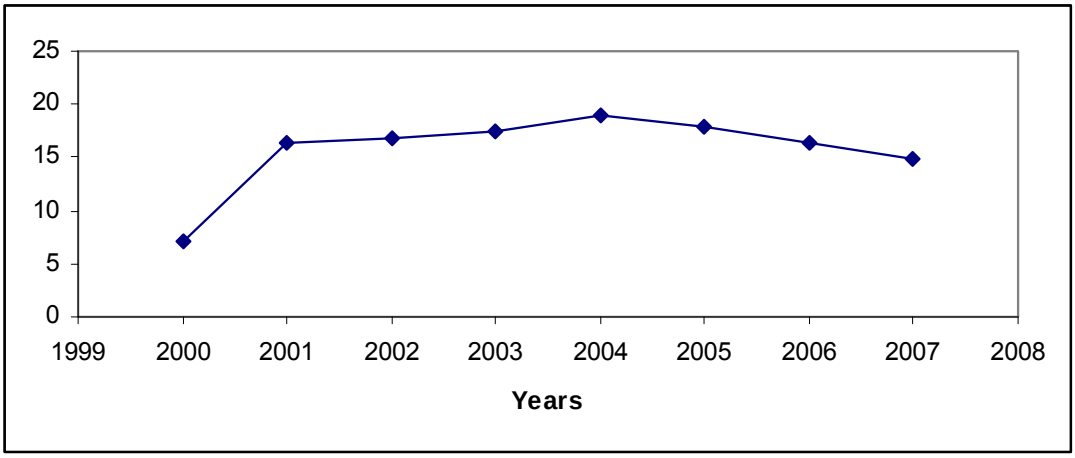
**Figure 3.2**
**Revenue diversification of banks in emerging/developing economies (HHInon)**




**Source: Bankscope and author's calculation**
**Data is aggregated averaging across years, 2000-2007**

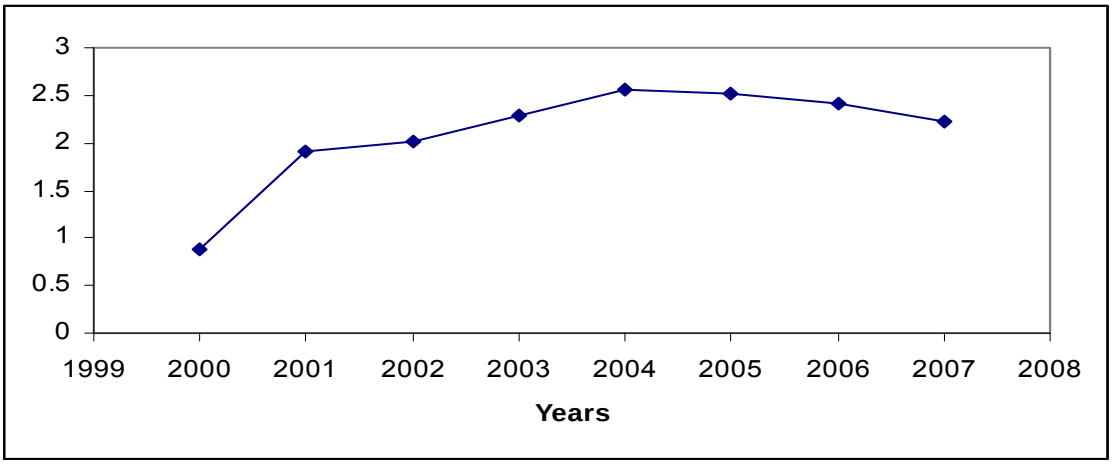
Both figure 3.1 (Lerner index) and 3.2 (HHInon) depict the same trend over the sample period. Increasing at the initial period until 2004 and falling thereafter. A similar pattern is shown in figure 3.3 and 3.4 in respect to insolvency risk and profitability. Greater bank competition is associated with higher revenue diversification, greater bank solvency and higher profitability. The degree of competition among banks at the early part of 2000s is low and this corresponds with the level of diversification during that period. However, during 2004-2007, when the competitive environment of emerging/developing economies increases, diversification and stability increase, supporting the assertion that competition by no small means exerts pressure on banks to diversify their activities and this enables them to reduce their insolvency risk.

**Figure 3.3**
**Insolvency risk level of banks in emerging/developing economies (Z-score)**




**Source: Bankscope and author's calculation**
**Data is aggregated averaging across years, 2000-2007**

**Figure 3.4**
**Performance of banks in emerging/developing economies (RAROA)**




**Source: Bankscope and author's calculation**
**Data is aggregated averaging across years, 2000-2007**

### 3.5.4 Alternative methodological specification

This section analysis the relationship of interest between competition and bank stability using two stage least square (2SLS) regression. Though the use of 2SLS regression does not necessarily need an explicit specification of the baseline equation (3.13 and 3.14) competitive measures (H-statistic and Lerner index), insolvency risk (Z-score) and revenue diversification (HHInon or HHIrev) are still treated as endogenous. The same three set of instruments are also used as discussed in section 3.3.4. In addition, 2sls is used so that diagnostic tests can be conducted to assess the fit of the model in a single equation model.

The results are presented in table 3.8 and are similar to that reported in table 3.6 and 3.7. The direction of the sign and the significant of the coefficients remain the same. The only different between the results reported on table 3.6 and 3.7 and that of table 3.8 is the standard error. The standard error of 2sls is relatively larger than those produce in table 3.6 and 3.7 using 3sls. This finding supports the earlier argument that 3sls yields more precise and consistent estimates than 2sls. The use of these two estimation techniques shows that greater bank competition increases stability with higher level of diversification. The results of bank-specific control variables remain unchanged as it is the control of macroeconomic variables.

Furthermore, the use of 2sls allows for several diagnostic tests to be carried out. Two test, Sargan N*R2 and Basman tests are reported for over identification restriction measures of instruments exogeneity. The result rejects the alternative hypothesis that the instruments correlate with the error term in column 1, 4, 5, and 6. The null hypothesis is that the instruments are uncorrelated with the unobserved term. The $R^2$ measures the goodness of fit while the p-value of the f-test takes into account the significance of instruments. The wu-Hausman F-test and Durbin-wu-Hausman Chi2 specification compare the difference between the use of instrumental variable (IV) and ordinary least squares (OLS). In sum, the results using 2sls estimating techniques show that competition improves the financial soundness of banks that diversify their activities.

### 3.5.5 Financial reforms, supervisory and regulatory controls

Financial liberalisation, regulatory and institutional environments impact on banking sector competition. For instance regulatory measures such as lower barriers to entry and fewer restrictions on bank activities have been found to improve systemic stability (Beck et al. 2006a). Regressions in table 3.9 examine the impact of bank overall risk (z-score) while controlling additionally for financial liberalisation index (financial reforms), regulatory and institutional variables (capital stringency and supervision power) and risk of expropriation (property right). 3sls regression is used as an estimator and to address collinearity problems, the additional variables enter into the regression one at a time. Even when financial reforms, supervision power,

property rights and capital stringency index are controlled, the results suggest that greater banking competition and revenue diversification remain positively associated with bank stability.

Table 3.9 also reports the results including financial reforms as an additional control variable. The coefficient is positive and statistically significant implying that in emerging/developing economies that has it banking system fully reforms, increases stability. The coefficient on the supervision power is negative, that of property right and capital stringency are positive. The negative coefficient of official supervision power corresponds to the 'grabbing-hand view' that powerful supervision bodies may use their powers to benefits favoured constituents (Barth et al. 2004). Legal protection on private property and the judicial efficiency in enforcing these laws increase stability. The results also provide the effectiveness of capital regulation in reducing risk-taking.

## 3.6 Conclusion

This chapter sheds some light on the relationship between competition and stability. Theoretical and empirical examinations of the relationship between competition and bank insolvency risk are inconclusive. Competition has long been seen to decrease bank stability by exacerbating risk and reducing bank incentives to behave prudently. This view has been countered by the argument that competition in the banking sector reduces the risk of banks' portfolios (OECD 2010). This chapter contributes to the literature by analysing how revenue diversification of banks in developing and emerging economies affects the relationship between competition and stability.

Different risk exposure indicators are used as dependent variables to proxy for bank stability: the *Z-score* as a measure of overall bank risk, the risk adjusted profit as a measure of profitability, the volume of non-performing loans to total gross loans is used to measure the bank loan portfolio risk, the equity capital to asset ratio to account for the bank's capitalization level. To account for the simultaneity and

address endogeneity, and to provide precise and consistent parameter estimates, 3sls regression estimates are used.

The results show a positive and significant relationship between competition and stability. More importantly, this positive and significant relationship holds when risk adjusted profits are used as a dependent variable. This means that greater competition in a banking sector enhances stability. On competition and bank capitalization, the results show that diversified banks that operate in a competitive environment tend to hold relatively more equity capital though the result is relatively insignificant. The results also indicate that a competitive and diversified banking system is associated with less risky loan portfolios.

Similar results are found when alternative measures of the degree of competition and different methodological specifications are employed. Even when financial reforms, supervision power, property rights, capital stringency index and macroeconomic variables are controlled, the results suggest that competition and revenue diversification remain positively associated with bank stability. The core findings of this chapter correspond to the 'competitive-stability view' in the theoretical literature and are generally consistent with prior empirical findings that banks that operate in an uncompetitive banking industry are prone to originating riskier loans which are detrimental to their stability. The overall results provide empirically, an additional channel through which competition may affect insolvency risks of banks in developing /emerging markets.

The results thus add more evidence on the current debates on whether or not competition improves stability. It also provides valuable insights for regulatory authorities, banking supervisors and market participants about the role of diversification in competition and stability relationships. In conclusion, the findings provide no evidence to support regulatory initiative that restricts both banking sector competition and diversification activities.

## Table 3.3
## Summary statistics on selected bank level variables

Table 3.3 presents summary statistics on selected bank-specific variables. *H-statistic*s is a measure of competitiveness in the banking sector as discussed in section 3.3.1. The degree of market power is proxied by the *Lerner Index* or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *Z*-score is a measure on insolvency risk. Risk adjusted return on assets *(RAROA)* and of equity *(RAROE)* measure overall performance. Bank *equity* represents average capitalization level and is used as a proxy for the degree of risk. *Bad loans* are a proportion of non-performing loans to total loans and it is used as a measure of bank portfolio risk. *HHI(rev)* and *HHI(non)* measure revenue diversification across interest income and within non-interest income generating activities respectively. *Commission^2* is a square of commission income to non-interest income and *NON^2* is the square of non-interest income to net operating income. *Loans* and *deposits* are ratios of loan to assets and deposits to liabilities respectively. They measure portfolio mix of banks. The bank *size* is the average total assets and *ROA* measures profitability

| Variables | | Mean | Median | SD | Min | Max |
|---|---|---|---|---|---|---|
| **Market structure** | | | | | | |
| H-statistics | **Aggregate** | **0.65** | **0.64** | **0.19** | **0.09** | **1.08** |
| | Africa | 0.64 | 0.65 | 0.19 | 0.09 | 1.08 |
| | Asia | 0.66 | 0.68 | 0.19 | 0.17 | 0.84 |
| | CEEC | 0.62 | 0.64 | 0.21 | 0.13 | 0.95 |
| | L. America | 0.68 | 0.63 | 0.15 | 0.43 | 0.92 |
| Lerner index | **Aggregate** | **0.25** | **0.26** | **0.24** | **-0.97** | **0.99** |
| | Africa | 0.28 | 0.30 | 0.26 | -0.97 | 0.99 |
| | Asia | 0.22 | 0.25 | 0.21 | -0.96 | 0.99 |
| | CEEC | 0.21 | 0.23 | 0.22 | -0.90 | 0.88 |
| | L. America | 0.27 | 0.29 | 0.27 | -0.96 | 0.99 |
| **Bank insolvency risk** | | | | | | |
| Insolvency risk (Z-score) | **Aggregate** | 18.69 | 13.65 | 17.49 | -0.97 | 171.92 |
| | Africa | 14.47 | 11.07 | 14.67 | -0.78 | 171.92 |
| | Asia | 24.15 | 19.02 | 19.37 | -0.91 | 128.18 |
| | CEEC | 22.11 | 17.62 | 18.45 | -0.54 | 134.24 |
| | L. America | 15.78 | 10.71 | 16.04 | -0.97 | 122.14 |
| Risk adjusted return on assets (RAROA) | **Aggregate** | **2.48** | **1.98** | **2.90** | **-5.10** | **24.35** |
| | Africa | 2.57 | 2.21 | 2.92 | -5.10 | 24.35 |
| | Asia | 3.30 | 2.61 | 3.53 | -2.78 | 23.76 |
| | CEEC | 2.46 | 2.09 | 2.55 | -3.32 | 18.57 |
| | L. America | 1.92 | 1.30 | 2.63 | -2.85 | 14.61 |
| Risk adjusted return on equity (RAROE) | **Aggregate** | **2.53** | **1.97** | **3.00** | **-4.82** | **22.22** |
| | Africa | 2.32 | 1.94 | 2.54 | -4.82 | 18.76 |
| | Asia | 3.57 | 2.72 | 3.69 | -2.78 | 22.22 |
| | CEEC | 2.47 | 2.03 | 2.70 | -2.78 | 20.16 |
| | L. America | 2.14 | 1.44 | 3.04 | -3.23 | 22.04 |
| Ratio of equity to assets (Equity) | **Aggregate** | **0.15** | **0.11** | **0.15** | **0.00** | **1.00** |
| | Africa | 0.15 | 0.11 | 0.13 | 0.01 | 1.00 |
| | Asia | 0.10 | 0.07 | 0.11 | 0.00 | 0.87 |
| | CEEC | 0.14 | 0.10 | 0.11 | 0.01 | 0.98 |
| | L. America | 0.20 | 0.12 | 0.20 | 0.01 | 0.99 |
| Ratio of bad loan to loans (Bad loans) | **Aggregate** | **0.08** | **0.04** | **0.11** | **0.00** | **0.99** |
| | Africa | 0.11 | 0.07 | 0.12 | 0.00 | 0.87 |
| | Asia | 0.08 | 0.05 | 0.09 | 0.00 | 0.99 |
| | CEEC | 0.06 | 0.03 | 0.08 | 0.00 | 0.91 |
| | L. America | 0.08 | 0.03 | 0.11 | 0.00 | 0.98 |

**Source:** Bankscope and author's own calculation
The data comprises of 978 banks across 55 countries over the period, 2000-2007

**Summary statistics on selected bank level variables (cont.)**

| Variables | | Mean | Median | SD | Min | Max |
|---|---|---|---|---|---|---|
| **Diversification** | | | | | | |
| Revenue diversification (HHIrev) | **Aggregate** | **0.60** | **0.56** | **0.14** | **0.05** | **0.99** |
| | Africa | 0.59 | 0.54 | 0.12 | 0.50 | 0.99 |
| | Asia | 0.63 | 0.59 | 0.12 | 0.50 | 0.99 |
| | CEEC | 0.54 | 0.53 | 0.14 | 0.05 | 0.99 |
| | L. America | 0.65 | 0.62 | 0.13 | 0.50 | 0.99 |
| Diversification within non-interest income (HHInon) | **Aggregate** | **0.54** | **0.51** | **0.16** | **0.24** | **1.00** |
| | Africa | 0.54 | 0.50 | 0.16 | 0.33 | 0.99 |
| | Asia | 0.53 | 0.50 | 0.16 | 0.33 | 0.99 |
| | CEEC | 0.56 | 0.53 | 0.14 | 0.33 | 0.99 |
| | L. America | 0.52 | 0.47 | 0.17 | 0.24 | 0.99 |
| Commission income to non-interest income (Com^2) | **Aggregate** | **0.31** | **0.27** | **0.25** | **0.00** | **0.99** |
| | Africa | 0.36 | 0.31 | 0.26 | 0.00 | 0.99 |
| | Asia | 0.24 | 0.17 | 0.23 | 0.00 | 0.98 |
| | CEEC | 0.35 | 0.32 | 0.23 | 0.00 | 0.99 |
| | L. America | 0.28 | 0.25 | 0.25 | 0.00 | 1.00 |
| Non-interest income to net operating revenue (Non ^2) | **Aggregate** | **0.18** | **0.13** | **0.18** | **0.00** | **1.00** |
| | Africa | 0.18 | 0.15 | 0.15 | 0.00 | 0.99 |
| | Asia | 0.13 | 0.09 | 0.15 | 0.00 | 0.92 |
| | CEEC | 0.17 | 0.14 | 0.15 | 0.00 | 0.98 |
| | L. America | 0.21 | 0.11 | 0.24 | 0.00 | 1.00 |
| **Bank-specific control variables** | | | | | | |
| Ratio of loan to assets (Loans) | **Aggregate** | **0.51** | **0.53** | **0.21** | **0.00** | **0.99** |
| | Africa | 0.48 | 0.47 | 0.20 | 0.01 | 0.99 |
| | Asia | 0.56 | 0.55 | 0.16 | 0.00 | 0.98 |
| | CEEC | 0.53 | 0.57 | 0.20 | 0.00 | 0.97 |
| | L. America | 0.49 | 0.51 | 0.23 | 0.00 | 0.99 |
| Ratio of deposits to liabilities (Deposits) | **Aggregate** | **0.79** | **0.88** | **0.23** | **0.00** | **0.99** |
| | Africa | 0.78 | 0.88 | 0.24 | 0.00 | 0.99 |
| | Asia | 0.78 | 0.87 | 0.23 | 0.00 | 0.99 |
| | CEEC | 0.85 | 0.91 | 0.18 | 0.00 | 0.99 |
| | L. America | 0.74 | 0.82 | 0.25 | 0.00 | 0.99 |
| Total assets in US $billion (Size) | **Aggregate** | **6.9** | **0.5** | **45.4** | **0.0** | **1266** |
| | Africa | 1.0 | 0.2 | 4.6 | 0.0 | 68.4 |
| | Asia | 30.1 | 4.8 | 104 | 0.0 | 1266 |
| | CEEC | 2.1 | 0.6 | 4.5 | 0.0 | 50.5 |
| | L. America | 2.5 | 0.4 | 6.6 | 0.0 | 100. |
| Return on assets (ROA) | **Aggregate** | **0.02** | **0.02** | **0.05** | **-0.87** | **0.54** |
| | Africa | 0.03 | 0.03 | 0.05 | -0.62 | 0.54 |
| | Asia | 0.01 | 0.01 | 0.02 | -0.22 | 0.17 |
| | CEEC | 0.01 | 0.01 | 0.02 | -0.28 | 0.27 |
| | L. America | 0.01 | 0.02 | 0.06 | -0.87 | 0.29 |

**Source: Bankscope and author's own calculation**
**The data comprises of 978 banks across 55 countries over the period 2000-2007**

**Table 3.4**
**H-statistics of banking system of the selected countries**

Panzar and Ross (1987) *H-statistic* is calculated as the average of implied H-statistics from four different structural models estimated for each country for the eight year-period; 2000-2007 and it is based on the Claessen and Laeven (2004) approach. H1 is estimated using pooled OLS with bank-specific and time dummies and gross interest income as dependent variable in the reduced-form revenue equation. H2 is estimated using pooled GLS with time dummies and gross interest income as dependent variable in the reduced-form revenue equation. H3 is estimated using pooled OLS with bank-specific and time dummies and total income as dependent variable in the reduced-form revenue equation.H4 is estimated using pooled GLS with time dummies and total income as dependent variable in the reduced-form revenue equation.

| | H1 | H2 | H3 | H4 | H-statistics |
|---|---|---|---|---|---|
| Benin | 0.719 | 0.341 | 0.508 | 0.370 | 0.484 |
| Burkina Faso | 0.083 | -0.013 | 0.221 | 0.063 | 0.089 |
| Cameroon | 0.9952 | 0.9319 | 0.7582 | 0.5503 | 0.8089 |
| Cote d'Ivoire | 0.7480 | 0.7986 | 0.6596 | 0.4044 | 0.6527 |
| Ghana | 0.6468 | 0.6091 | 0.5593 | 0.4646 | 0.5700 |
| Nigeria | 0.5617 | 0.6300 | 0.5159 | 0.4447 | 0.5381 |
| Senegal | 0.2910 | 0.9772 | 0.4540 | 0.6954 | 0.6044 |
| Kenya | 0.8580 | 0.6010 | 0.7540 | 0.8040 | 0.7543 |
| Uganda | 0.4402 | 0.5945 | 0.5309 | 0.6447 | 0.5526 |
| Tanzania | 1.4148 | 1.0222 | 1.2420 | 0.6584 | 1.0843 |
| Ethiopia | 0.3928 | 0.5542 | -0.1230 | 0.4139 | 0.3095 |
| Angola | 0.9955 | 0.3473 | 0.7455 | 0.7057 | 0.6985 |
| Botswana | 0.6988 | 0.4827 | 0.6446 | 0.4715 | 0.5744 |
| Malawi | 0.7595 | 0.7664 | 0.5980 | 0.5417 | 0.6664 |
| Madagascar | 0.3022 | 0.1916 | 0.3589 | 0.1847 | 0.2594 |
| Mauritius | 0.7588 | 0.7773 | 0.7588 | 0.7773 | 0.7681 |
| Mozambique | 0.2761 | 0.4058 | 0.9879 | 0.5881 | 0.5645 |
| Namibia | 0.7892 | 1.0119 | 0.5492 | 0.9375 | 0.8220 |
| South Africa | 0.8388 | 0.3728 | 0.9455 | 0.6890 | 0.7115 |
| Swaziland | 1.8683 | 0.9345 | 0.3613 | 0.4042 | 0.8921 |
| Zambia | 0.2467 | 0.4536 | 0.5480 | 0.4670 | 0.4288 |
| Zimbabwe | 0.6259 | 0.7535 | 0.3259 | 0.6148 | 0.5800 |
| China | 0.4982 | 0.6859 | 0.5368 | 0.6921 | 0.6032 |
| Hong Kong | 0.8320 | 0.4771 | 0.8966 | 0.5080 | 0.6784 |
| India | 1.4050 | 0.5319 | 0.7184 | 0.6703 | 0.8314 |
| Philippines | 0.5514 | 0.4462 | 0.3937 | 0.3126 | 0.4260 |
| Singapore | -0.3960 | -1.0932 | 1.0725 | 1.1085 | 0.1730 |
| South Korea | 0.8908 | 0.7876 | 0.8908 | 0.7876 | 0.8392 |
| Thailand | 0.6085 | 0.6247 | 0.5460 | 0.5446 | 0.5810 |
| Albania | 0.7340 | 1.7805 | 0.2205 | 1.0398 | 0.9437 |
| Belarus | 0.7629 | 0.7231 | 0.8867 | 0.7836 | 0.7891 |
| Bulgaria | 0.2798 | 0.3462 | 0.4091 | 0.6017 | 0.4092 |
| Croatia | 0.5491 | 0.3997 | 0.2470 | 0.2730 | 0.3672 |
| Czech | 0.4761 | 0.1805 | 0.4046 | 0.2374 | 0.3246 |
| Estonia | -1.0090 | 0.1722 | 0.7440 | 0.6166 | 0.1310 |
| Hungary | 0.7270 | 1.1808 | 0.8360 | 1.0691 | 0.9532 |
| Latvia | 0.5910 | 0.5682 | 0.7350 | 0.6610 | 0.6388 |
| Lithuania | 0.5460 | 0.7821 | 0.5810 | 0.7440 | 0.6633 |
| Poland | 0.9846 | 0.7679 | 0.9050 | 0.7150 | 0.8431 |
| Romania | 0.8403 | 0.8687 | 1.0150 | 0.8830 | 0.9018 |

**H-statistics of banking system of the selected countries (cont.)**

| | H1 | H2 | H3 | H4 | H-statistics |
|---|---|---|---|---|---|
| Russia | 0.5492 | 0.4900 | 0.6579 | 0.6359 | 0.5833 |
| Slovak Rep | 0.1385 | 0.3415 | 0.8280 | 0.6342 | 0.4856 |
| Slovenia | 0.5784 | 0.4553 | 0.5430 | 0.5838 | 0.5401 |
| Ukraine | 0.6602 | 0.6014 | 0.6874 | 0.6157 | 0.6412 |
| Argentina | 0.5773 | 0.6208 | 0.5460 | 0.6460 | 0.5975 |
| Bolivia | 0.4137 | 0.3541 | 0.5782 | 0.5158 | 0.4654 |
| Brazil | 0.7020 | 0.7938 | 0.8669 | 0.8684 | 0.8078 |
| Chile | 0.8290 | 0.9310 | 0.7910 | 1.0334 | 0.8961 |
| Columbia | 0.2538 | 0.7602 | 0.6400 | 0.5706 | 0.5562 |
| Costa Rica | 0.1335 | 0.4803 | 0.7887 | 0.7618 | 0.5411 |
| Mexico | 0.9220 | 0.9220 | 0.9080 | 0.9080 | 0.9150 |
| Panama | 0.6885 | 0.6209 | 0.5218 | 0.6720 | 0.6258 |
| Paraguay | 0.7500 | 0.7166 | 0.7808 | 0.7210 | 0.7421 |
| Uruguay | -0.0036 | 0.2735 | 0.7486 | 0.7171 | 0.4339 |
| Venezuela | 1.0715 | 0.1817 | 0.7413 | 0.7180 | 0.6781 |

**Source: Bankscope and author's own calculation**
**The data comprises of 978 banks across 55 countries over the period 2000-2007**

## Table 3.5
## Pair-wise correlation coefficient between key selected variables

The table presents pair-wise correlation coefficients estimated on sample of 978 banks across 55 countries for the period, 2000-2007. * implies significant at 5% or more. Z-score is a measure on insolvency risk. Risk adjusted return on assets *(RAROA)* and of equity (RAROE) measure overall performance. Bank *equity* represents average capitalization level and is used as a proxy for the degree of risk. The degree of market power is proxied by the *Lerner Index* or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *H-statistic*s is a measure of competitiveness in the banking sector as discussed in section 3.3.1. *HHI(rev)* and *HHI(non)* measure revenue diversification across interest income and within non-interest income generating activities respectively. *Commission^2* is a square of commission income to non-interest income and *NON^2* is the square of non-interest income to net operating income. *Loan* is a ratio of loan to total assets and it is used as a measure of bank loan portfolio. The *GDP growth* accounts for the differences in economic developments across countries. *Inflation* is the rate of inflation based on the CPI

| | Z-score | RAROA | RAROE | Equity | Lerner index | H-statistics | HHI(non) | HHI(rev) | NON^2 | Com^2 | Loans | Size | GDP growth | Inflation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Z-score | 1.000 | | | | | | | | | | | | | |
| RAROA | 0.689* | 1.000 | | | | | | | | | | | | |
| RAROE | 0.512* | 0.758* | 1.000 | | | | | | | | | | | |
| Equity | 0.134* | -0.135* | -0.162* | 1.000 | | | | | | | | | | |
| Lerner index | 0.067* | 0.236* | 0.218* | 0.131* | 1.000 | | | | | | | | | |
| H-statistics | -0.017 | 0.034* | 0.024* | -0.027* | -0.061* | 1.000 | | | | | | | | |
| HHI(non) | -0.053* | -0.037* | -0.068* | 0.045* | 0.070* | 0.015 | 1.000 | | | | | | | |
| HHI(rev) | 0.020 | 0.007 | 0.016 | 0.117* | 0.118* | -0.043* | -0.002 | 1.000 | | | | | | |
| NON^2 | -0.127* | -0.121* | -0.133* | 0.075* | 0.033* | -0.070* | 0.108* | -0.018 | 1.000 | | | | | |
| Com^2 | -0.019 | 0.074* | 0.047* | -0.110* | -0.039* | 0.041* | 0.531* | -0.032* | -0.206* | 1.000 | | | | |
| Loans | 0.107* | 0.100* | 0.105* | -0.124* | -0.057* | 0.042* | -0.080* | 0.066* | -0.264* | 0.098* | 1.000 | | | |
| Size | 0.061* | 0.102* | 0.051* | -0.081* | 0.035* | 0.016 | 0.036* | 0.088* | -0.067* | 0.055* | 0.037* | 1.000 | | |
| GDP growth | 0.048* | 0.095* | 0.092* | -0.086* | 0.080* | -0.020 | 0.063* | -0.037* | -0.021 | 0.036* | 0.026* | 0.089* | 1.000 | |
| Inflation | -0.022 | -0.012 | -0.022 | 0.020 | 0.016 | -0.013 | -0.019 | 0.025* | -0.015 | 0.000 | -0.037* | -0.002 | -0.199* | 1.000 |

**Source: Bankscope, World Development Indicator and author's own calculations**

**Table 3.6**
**Three stage least square (3SLS) regression results of bank performance**

The dependant variables for panel A are measures of bank overall performance: Z-score, RAROA, RAROE, Equity/asset, and Bad loan ratio and dependent variable for panel B are measures of revenue diversification: HHI(non) and HHI(rev). These are regressed on selected explanatory variables: *H-statistic*s is a measure of competitiveness in the banking sector as discussed in section 3.3.1. *HHI(rev)* and *HHI(non)* measure revenue diversification across interest income and within non-interest income generating activities respectively. *NON^2* is the square of non-interest income to net operating income. *Loans* and *deposits* are ratios of loan to assets and deposits to liabilities respectively. *Commission^2* is a square of commission income to non-interest income. ROA is return on assets and it measures profitability. The regression use instruments for *H-statistics* and the instruments used are (1) *activity restrictions*, an index of regulatory restriction on bank activities; (2) *banking freedom* provide overall measures of the openness of the banking sector and (3) natural logarithm of total assets in millions of US$ *(size*). The dependent variables and the measures of competitive structure are treated as endogenous. The parameters are estimated with the small sample adjusted standard errors in parenthesis. ***, **, and * indicates statistical significance at the 1%, 5% and 10% level respectively. P-value of f-test takes into account for the significance of identifying instruments.

| | | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|---|
| | | **Dependent variables** | | | | | |
| | | Z-score | RAROA | RAROE | Equity/assets | Bad loan | Z-score |
| | | | | | | | **Alternative measure of revenue diversification** |
| | | | | | | | **HHI(rev)** |
| **Panel A** | | | | | | | |
| | H-statistics | 0.897*** | 1.030*** | 1.166*** | 0.004 | -0.127*** | 1.439*** |
| | | (0.257) | (0.304) | (0.306) | (0.031) | (0.025) | (0.300) |
| | HHI(non) | -0.909*** | -0.208 | -0.357* | -0.105** | -0.054*** | |
| | | (0.157) | (0.190) | (0.194) | (0.019) | (0.018) | |
| | Non income^2 | -0.703*** | -0.698*** | -0.765*** | 0.024** | 0.043*** | -0.745*** |
| | | (0.092) | (0.112) | (0.115) | (0.011) | (0.012) | (0.090) |
| | Loans | 0.290*** | 0.102 | 0.013 | -0.033*** | -0.039*** | 0.496*** |
| | | (0.080) | (0.097) | (0.100) | (0.009) | (0.010) | (0.091) |
| | Deposits | 0.034 | 0.172* | 0.162* | -0.101*** | -0.004 | 0.016 |
| | | (0.075) | (0.091) | (0.093) | (0.009) | (0.009) | (0.107) |
| | GDP growth | 0.028 | 0.111*** | 0.107*** | -0.008** | -0.038** | 0.0002 |
| | | (0.028) | (0.034) | (0.035) | (0.003) | (0.003) | (0.026) |
| | HHI(rev) | | | | | | -1.527** |
| | | | | | | | (0.758) |
| **Panel B** | | **Dependent variables** | | | | | |
| | | HHI(non) | HHI(non) | HHI(non) | HHI(non) | HHI(non) | HHI(rev) |
| | H-statistics | -0.270*** | -0.265*** | -0.259*** | -0.274*** | -0.153*** | -0.098*** |
| | | (0.034) | (0.035) | (0.034) | (0.034) | (0.029) | (0.035) |
| | Com income^2 | 0.371*** | 0.369*** | 0.371*** | 0.372*** | 0.415*** | -0.013* |
| | | (0.008) | (0.008) | (0.008) | (0.008) | (0.009) | (0.007) |
| | Loans | -0.086*** | -0.087*** | -0.084*** | -0.085*** | -0.046*** | 0.063*** |
| | | (0.010) | (0.011) | (0.011) | (0.010) | (0.012) | (0.009) |
| | ROA | -0.116 | 0.093 | 0.096 | -0.195*** | -0.054 | 0.338*** |
| | | (0.075) | (0.090) | (0.094) | (0.071) | (0.083) | (0.067) |
| | Deposits | -0.131*** | -0.130*** | -0.128*** | -0.133*** | -0.122*** | -0.097*** |
| | | (0.010) | (0.010) | (0.010) | (0.010) | (0.011) | (0.009) |
| | GDP growth | 0.006 | 0.009** | 0.009** | 0.006* | 0.009** | -0.006** |
| | | (0.003) | (0.004) | (0.004) | (0.003) | (0.003) | (0.003) |
| Panel A | No of obs | 4137 | 3879 | 3841 | 4166 | 2758 | 4871 |
| | F-stats | 32.91*** | 15.29*** | 16.69*** | 29.29*** | 35.05*** | 36.67*** |
| Panel B | No. obs | 4137 | 3879 | 3841 | 4166 | 2758 | 4871 |
| | F-stats | 347.06*** | 324.69*** | 325.03** | 351.82** | 318.70*** | 31.88** |

**Table 3.7**
**Three stage least square (3SLS) regression results of bank performance using alternative measure of market structure**

The dependant variables for panel A are measures of bank overall performance: Z-score, RAROA, RAROE, Equity/asset, and Bad loan ratio and dependent variable for panel B are measures of revenue diversification: HHI(non) and HHI(rev). These are regressed on selected explanatory variables: The degree of market power is proxied by the *Lerner Index* or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *HHI(rev)* and *HHI(non)* measure revenue diversification across interest income and within non-interest income generating activities respectively. *NON^2* is the square of non-interest income to net operating income. *Loans* and *deposits* are ratios of loan to assets and deposits to liabilities respectively. *Commission^2* is a square of commission income to non-interest income. Ratio of securities/assets is measured as total investment of banks in securities divided by total assets. The regression use instruments for *Lerner index* and the instruments used are (1) *activity restrictions*, an index of regulatory restriction on bank activities; (2) *banking freedom* provides overall measures of the openness of the banking sector and (3) natural logarithm of total assets in millions of US$ *(size*). The dependent variables and the measures of competitive structure are treated as endogenous. The parameters are estimated with the small sample adjusted standard errors in parenthesis. ***, **, and * indicates statistical significance at the 1%, 5% and 10% level respectively. P-value of f-test takes into account for the significance of identifying instruments

| | | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|---|
| | | **Dependent variables** | | | | | |
| | | Z-score | RAROA | RAROE | Equity/assets | Bad loan | Z-score |
| | | | | | | | **Alternative measure of revenue div** |
| | | | | | | | **HHI(rev)** |
| **Panel A** | | | | | | | |
| | Lerner index | -0.881** | -1.995*** | -1.078** | -0.164*** | 0.548*** | 0.471*** |
| | | (0.360) | (0.394) | (0.441) | (0.044) | (0.063) | (0.073) |
| | HHI(non) | -0.553*** | 0.231 | -0.093 | -0.089*** | -0.071** | |
| | | (0.157) | (0.194) | (0.198) | (0.020) | (0.028) | |
| | Non income^2 | -0.638*** | -0.352*** | -0.660*** | 0.065*** | -0.030* | -0.900*** |
| | | (0.094) | (0.117) | (0.127) | (0.012) | (0.016) | (0.086) |
| | Loans | 0.311*** | 0.223** | 0.022 | -0.023** | -0.028* | 0.367*** |
| | | (0.082) | (0.101) | (0.104) | (0.010) | (0.017) | (0.085) |
| | Deposits | -0.121 | 0.00009 | -0.021 | -0.121*** | 0.039** | 0.033 |
| | | (0.087) | (0.101) | (0.106) | (0.011) | (0.015) | (0.083) |
| | GDP growth | 0.013 | 0.064* | 0.078** | -0.001 | -0.056*** | -0.068*** |
| | | (0.030) | (0.033) | (0.036) | (0.003) | (0.005) | (0.024) |
| | HHI(rev) | | | | | | -0.380 |
| | | | | | | | (0.488) |
| **Panel B** | | | | | | | |
| | | **Dependent variables** | | | | | |
| | | HHI(non) | HHI(non) | HHI(non) | HHI(non) | HHI(non) | HHI(rev) |
| | Lerner index | 0.571*** | 0.442*** | 0.522*** | 0.615*** | 0.452*** | 0.057*** |
| | | (0.085) | (0.056) | (0.060) | (0.080) | (0.080) | (0.009) |
| | Com income^2 | 0.390*** | 0.381*** | 0.393*** | 0.391*** | 0.424*** | -0.011 |
| | | (0.011) | (0.009) | (0.010) | (0.011) | (0.011) | (0.008) |
| | Loans | -0.034 | 0.013 | 0.029 | -0.067** | 0.009 | 0.245*** |
| | | (0.034) | (0.026) | (0.028) | (0.033) | (0.030) | (0.020) |
| | Deposits | -0.045*** | -0.072*** | -0.056*** | -0.039** | -0.076*** | -0.087*** |
| | | (0.017) | (0.013) | (0.014) | (0.017) | (0.015) | (0.009) |
| | Securities/asset | 0.031 | 0.113*** | 0.103*** | -0.008 | 0.040 | 0.196*** |
| | | (0.038) | (0.028) | (0.030) | (0.037) | (0.035) | (0.021) |
| | GDP growth | -0.007 | 0.001 | 0.003 | -0.009 | -0.005 | -0.004 |
| | | (0.006) | (0.004) | (0.004) | (0.006) | (0.005) | (0.003) |
| Panel A | No. of obs | 4103 | 4466 | 3811 | 4127 | 2726 | 4161 |
| | F-stats | 23.91*** | 12.48*** | 11.61*** | 30.75*** | 23.87*** | 35.62*** |
| Panel B | No. of obs | 4103 | 4466 | 3811 | 4127 | 2726 | 4161 |
| | F-stats | 198.92** | 274.45*** | 237.35*** | 204.24** | 228.98 | 50.31*** |

**Table 3.8**
**Regression results of bank performance: IV estimation**

The dependant variables are measures of overall performance: Z-score, RAROA, RAROE, Equity/asset, and Bad loan ratio. These are regressed on selected explanatory variables: *H-statistic*s is a measure of competitiveness in the banking sector as discussed in section 3.3.1. *HHI(rev)* and *HHI(non)* measure revenue diversification across interest income and within non-interest income generating activities respectively. *NON^2* is the square of non-interest income to net operating income. *Loans* and *deposits* are ratios of loan to assets and deposits to liabilities respectively. *GDP growth* measures business cycle fluctuation. *Inflation* is the rate of inflation based on the CPI. The degree of market power is proxied by the *Lerner Index* or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. The regression for column (1), (2), (3), (4) and (6) use instruments for H-statistics and regression for column (5) employ instruments for Lerner index. The instruments used for specification are 1,3 4,5 and 6 are (1) activity restrictions, which is an index of regulatory restriction on bank activities; (2) *banking freedom* provides overall measures of the openness of the banking sector and (3) natural logarithm of total assets in millions of US$ *(size*), while in specification 2, the activity restriction is dropped and replace with entry restriction. The parameters are estimated with the small sample adjusted standard errors in parenthesis. ***, **, and * indicates statistical significance at the 1%, 5% and 10% level respectively. Panel B reports diagnostic test: Two tests (Sargan N*$R^2$ and Basmann test) are reported for overidentifying restrictions measures instruments exogeneity. The R2 measures the goodness of fit while the p-value of F-test measures the significant of identifying instruments. The Wu-Hausman F-test and Durbin-wu-Hausman chi2 specification compare the difference between the IV and the OLS estimators. Regression column 6 is exactly identified and thus has 0.000 for both Sargan N*R sq and Basmum test. Bank and country fixed effect are excluded from the estimation

| | | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|---|
| | | **Dependent variables** | | | | | |
| | | Z-score | RAROA | RAROE | Bad loan | Z-score | Z-score |
| | | | | | | Alternative measures of competitive structure and revenue diversification | |
| | | | | | | Lerner index | HHI(rev) |
| **Panel A** | | | | | | | |
| | H-statistics | 3.840*** | 2.245*** | 1.744*** | -0.144*** | | 3.653*** |
| | | (0.444) | (0.364) | (0.337) | (0.046) | | (0.585) |
| | HHI(non) | -0.245** | -0.150 | -0.303*** | -0.019* | -0.051 | |
| | | (0.110) | (0.113) | (0.111) | (0.011) | (0.127) | |
| | Non income^2 | -0.436*** | -0.645*** | -0.743*** | 0.058*** | -0.652*** | -0.453*** |
| | | (0.113) | (114) | (0.113) | (0.012) | (0.135) | (0.118) |
| | Loans | 0.355*** | 0.110 | 0.036 | -0.044*** | 0.207* | 0.349* |
| | | (0.092) | (0.095) | (0.095) | (0.010) | (0.109) | (0.186) |
| | Deposits | 0.420*** | 0.402*** | 0.370*** | -0.010 | -0.495*** | 0.445 |
| | | (0.095) | (0.926) | (0.090) | (0.010) | (0.115) | (0.308) |
| | GDP growth | 0.127*** | 0.108*** | 0.0758** | -0.034*** | 0.113*** | 0.132*** |
| | | (0.033) | (0.329) | (0.032) | (0.003) | (0.040) | (0.038) |
| | Inflation | -0.174*** | -0.077*** | -0.076*** | -0.001 | -0.146*** | -0.188*** |
| | | (0.019) | (0.318) | (0.019) | (0.002) | (0.021) | (0.039) |
| | Lerner index | | | | | -3.721*** | |
| | | | | | | (0.560) | |
| | HHI(rev) | | | | | | -0.029 |
| | | | | | | | (2.543) |
| **Panel B** | **Diagnostic tests** | | | | | | |
| | Test for overid: | | | | | | |
| | Sargan N*R-sq test | 2.00 | 34.45*** | 70.22*** | 0.117 | 2.38 | 0.000 |
| | Basmann test | 2.00 | 34.64*** | 71.17*** | 0.116 | 2.37 | 0.000 |
| | No. of observation | 4899 | 4564 | 4524 | 3195 | 4849 | 5352 |
| | R2 (uncentered) | 0.82 | 0.19 | 0.24 | 0.40 | 0.79 | 0.82 |
| | F-test (p-value) | 36.91*** | 19.81*** | 20.43*** | 31.49*** | 27.93*** | 35.41*** |
| | Wu-Hausman F-test | 147.44** | 45.95*** | 27.66*** | 3.43*** | 131.69*** | 37.02*** |
| | Durbin-wu-Hausman | 143.39** | 45.58** | 27.55*** | 3.44*** | 128.44*** | 73.16*** |

**Table 3.9**
**3SLS regression results of bank insolvency risk: Controlling for regulatory variables**

The dependant variable for panel A is Z-score and measures bank insolvency risk and that of panel B is HHI(non) which is a measure of revenue diversification. These variables are regressed on selected explanatory variables. *H-statistic*s is a measure of competitiveness in the banking sector as discussed in section 3.3.1. *HHI(non)* measures revenue diversification within non-interest income generating activities respectively. *NON income*$^2$ is the square of non-interest income to net operating income. *Loans* and *deposits* are ratios of loan to assets and deposits to liabilities respectively. Four regulatory and supervisory variables are included in the baseline regression: Financial reforms, supervisory power, property right and capital index. Higher values of *financial reforms* indicate fully reformed. *Supervisory power* measures whether the authorities have the power to take specific action to correct and prevent problems. It also ranges from 0 to 16 with higher values indicating more supervisory power. Higher score of *property right* indicate certainty of legal protection of property right and limited expropriation risks. *Capital index* measures overall capital stringency. It ranges from 0 to 9, with a higher value indicating greater stringency. The regression use instruments for *H-statistic*s and the instruments used are (1) *activity restrictions* which is an index of regulatory restriction on bank activities; (2) *banking freedom* provides overall measures of the openness of the banking sector and (3) natural logarithm of total assets in millions of US$ *(size*). The dependent variables and the measures of competitive structure are treated as endogenous. The parameters are estimated with the small sample adjusted standard errors in parenthesis. ***, **, and * indicates statistical significance at the 1%, 5% and 10% level respectively. Country and bank fixed effects are not included in the estimates.

| | | **Dependent variable: Z-score** | | | | |
|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) |
| **Panel A** | H-statistics | 0.897*** | 2.327*** | 1.863*** | 1.194*** | 2.394*** |
| | | (0.257) | (0.262) | (0.249) | (0.256) | (0.264) |
| | HHI(non) | -0.909*** | -0.629*** | -0.590*** | -0.490*** | -0.543*** |
| | | (0.157) | (0.170) | (0.164) | (0.158) | (0.172) |
| | Non income$^2$ | -0.703*** | -0.463*** | -0.546*** | -0.508*** | -0.423*** |
| | | (0.092) | (0.098) | (0.094) | (0.091) | (0.099) |
| | Loans | 0.290*** | 0.347*** | 0.279*** | 0.346*** | 0.387*** |
| | | (0.080) | (0.086) | (0.084) | (0.079) | (0.086) |
| | Deposits | 0.034 | 0.142* | 0.115 | 0.164** | 0.205** |
| | | (0.075) | (0.082) | (0.078) | (0.075) | (0.082) |
| | GDP growth | 0.028 | 0.102*** | 0.058** | 0.118*** | 0.103*** |
| | | (0.028) | (0.029) | (0.028) | (0.027) | (0.030) |
| | Financial reform | | 0.272*** | | | |
| | | | (0.107) | | | |
| | Supervision power | | | -0.376*** | | |
| | | | | (0.083) | | |
| | Property right | | | | 0.475*** | |
| | | | | | (0.045) | |
| | Capital index | | | | | 0.239*** |
| | | | | | | (0.037) |
| **Panel B** | | **Dependent variables** | | | | |
| | | HHI(non) | HHI(non) | HHI(non) | HHI(non) | HHI(non) |
| | H-statistics | -0.270*** | -0.301*** | -0.283*** | -0.284*** | -0.264*** |
| | | (0.034) | (0.032) | (0.027) | (0.033) | (0.032) |
| | Com income^2 | 0.371*** | 0.372*** | 0.372*** | 0.372*** | 0.371*** |
| | | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) |
| | Loans | -0.086*** | -0.085*** | -0.085*** | -0.086*** | -0.086*** |
| | | (0.010) | (0.010) | (0.011) | (0.010)_ | (0.010) |
| | ROA | -0.116 | -0.023 | -0.043 | -0.068 | -0.028 |
| | | (0.075) | (0.077) | (0.076) | (0.076) | (0.075) |
| | Deposits | -0.131*** | -0.131*** | -0.131*** | -0.131*** | -0.129*** |
| | | (0.010) | (0.010) | (0.010 | (0.010) | (0.010) |
| | GDP growth | 0.006 | 0.004 | 0.005 | 0.005 | 0.006 |
| | | (0.003) | (0.003) | (0.004) | (0.003) | (0.004) |
| Panel A | Number of observations | 4137 | 4137 | 4137 | 4137 | 4137 |
| | F-statistic | 32.91*** | 33.20*** | 28.46*** | 50.34*** | 33.30*** |
| Panel B | Number of observations | 4137 | 4137 | 4137 | 4137 | 4137 |
| | F-statistic | 347.06*** | 339.93*** | 350.68** | 344.89*** | 350.38** |

# *Chapter IV*

## THE IMPACT OF MARKET POWER AND FUNDING STRATEGY ON BANK PERFORMANCE

# The impact of market power and funding strategy on bank performance

**Abstract**

This chapter investigates the implications of market power and funding strategies for bank performance using a sample of 978 banks in 55 emerging and developing countries over an eight year period, 2000-2007. It provides additional insight by examining the complex interlocking of three key variables that are important for regulators: the degree of market power, funding sources and banks' performance. The results show that market power increases when banks use internal funding to diversify into non-interest income generating activities. The core finding is that, high performance of banks in emerging and developing countries can be explained by the degree of market power, credit risk, implicit interest payments and internal bank capital. On the whole, the results suggest that performance of banks with market power is significantly more sensitive to internally generated funds than they are to deposit and wholesale funding.

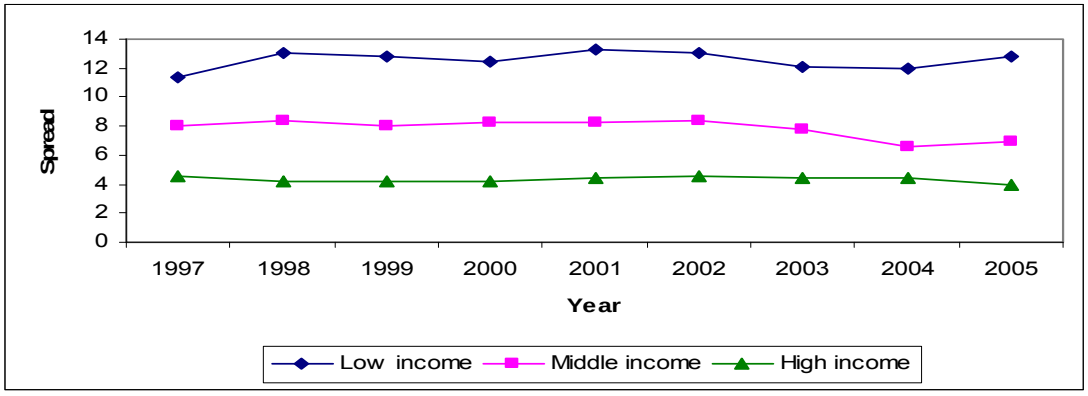
## 4.1 Introduction

Banks play a key role in financing economic activities in a country. By its very nature, banking is an attempt to manage multiple and seemingly opposing needs. Banks accept deposit and assure savers that their deposits are liquid and secure. They extend credit as well as liquidity to borrowers through lines of credit (Kashyap et al., 2002). Channelling funds from lenders to borrowers is the primary intermediation function of banks. In order to achieve this greater social welfare, it is important that the intermediation function is carried out with the lowest possible cost. Accordingly, the lower the cost of banks' interest margin, the lower the social cost of financial intermediation. The effectiveness of a banking system in the intermediation process is often measured by examining the spread between lending and deposit rates as well as assessing the extent of operational efficiencies of the banking system (Taci and Zampieri, 1998). In line with this, the banking literature has concentrated on analysing the determinants of bank performance especially that of interest margins. This was pioneered by the seminal paper of Ho and Saunders (1981). Their paper which conceptualise banking firms as intermediaries between lenders and borrowers, finds that the interest margin has two basic components; the degree of competition of the markets and the interest rate risk to which the bank is exposed. Allen (1988) widens it to permit the existence of different types of credits and deposits; McShane and Sharpe (1985) change the source of interest rate risk using money markets instead of the interest rates on credits and deposits. Angbazo (1997) extends the model to take into account credit risk as well as interest rate risk. Wong (1997) demonstrates how cost, regulation, credit risk and interest rate conditions jointly determine the optimal bank interest decision and with market power positively influences interest margin.

These earlier studies do not reflect the variation of interest margins across-countries and across levels of economic development. A close look at figure 1 suggests that interest margins vary widely across countries with the interest margin of low and middle income economies being higher than that of high income countries. For example in 2005, the average interest margin of low income countries (12.75%) was thrice that of higher income economies (3.89%). The relative size of cross-economies interest margins appears to be the same over the period 1997-2005. What is not

known is whether the higher interest margins in these low income economies are good or bad from a social welfare point of view. On one hand according to Saunders and Schumacher (2000) narrow margins may be indicative of relatively competitive banking systems with a low level of intermediation costs and regulatory taxes; and on the other hand, relatively large margins may bring a degree of stability for a banking system as banks buffer their profit to capital so as to insulate themselves from macroeconomic shocks.

**Figure 4.1**
**Interest rate spread across countries based on the level of income**




**Source: World Development indicator (September 2009) and author's estimation**

Employing a cross-country study, Saunders and Schumacher (2000) decompose bank margin into a regulatory component, market structure and risk premium component and reveal a trade-off between assuring bank solvency (high capital–to-asset ratios) and lowering the cost of financial services to consumers (low net-interest margins) among six OECD countries. Claeys and Vander Vennet (2008), show that concentration, operational efficiency, capital adequacy and risk behaviour are factors influencing the interest margin of Central and Eastern European countries. Maudos and Fernandez de Guevara (2004) demonstrate that the fall in interest margins in the European banking system is due to relaxation of competitive conditions and the Carbo Valverde and Fernandez (2007) study reveals that the relationship between bank margins and market power varies significantly across bank specialization with market power increasing as output becomes more diversified towards non-traditional activities for European countries. However, these studies do not empirical analyse the link between three key variables that are important for regulators: performance,

degree of market power and the funding strategies of banks. Pagano (1993) shows that market power allows banks to charge higher loan rates and compensate savers with lower deposit rates thus, reducing the equilibrium quantities of funds available for credit and hence generating a direct negative effect on the rate at which an economy can grow. However, an increase in the degree of market power enhances the profitability level which according to (Saunders and Schumacher, (2000), and Turk Ariss, (2010)) provides greater bank stability. This chapter therefore investigates the implications of bank market power and funding strategies on overall performance. This study is being conducted in the context of developing countries as figure 4.1 shows that banks in emerging and developing countries make high profits.

The objective of this chapter is two fold: first, is to examine the determinants of market power and funding structure of banks in developing countries. It is important from an economic policy perspective to identify the various sources of market power as it is only when these sources are identified that action might be taken to reduce the social inefficiency associated with the existence of market power (Maudos and Nagore, 2005). Second, it investigates the implications of bank market power and funding strategies for bank performance. Here instead of documenting trends in the relative importance of funding strategies (Demirguc-Kunt and Huizinga, 2010) and market power (Maudos and De Guevara (2007), it takes the determinants of market power and the funding structure as estimated in the first objective and examine the relationship as well as the sensitivity of market power and funding modes on interest margin, return on assets and insolvency risk at the individual bank level. The second objective includes testing of the impact of market structure, bank funding structure and the stance of monetary policy on bank insolvency risk. This is very important as changes in the financial system of developing countries couple with the changes in the prudential regulation could have increased the effect of the perception, pricing and the risk management behaviour of banks (Borio and Zhu 2008).

The Lerner index is used to construct a measure of market power, and to avoid any bias emanating from a bank exercising market power in the deposits market, and as there is no consensus in the literature regarding how best to assess the degree of bank

market power (Carbó et al.2009), the study employs two different specifications of Lerner: a conventional Lerner (Berger et al., 2009) and a funding-adjusted Lerner (Maudos and De Guevara, 2007) to investigate the impact of market power on bank performance. Three funding modes have been identified in the sample: deposit funding, non-deposit /wholesale funding and internal capital funding. Finally, three measures of performance are used in this chapter: net-interest margin for the spread between deposit and lending rates, return on assets for bank profitability, and Z-score for the measurement of overall bank insolvency risk.

The results demonstrate that on average funding-adjusted Lerner index is larger than that of the conventional Lerner index suggesting that the latter has been underestimating the degree of market power. Moreover, the results reveal that larger, growing and highly capitalised banks have market power. Similarly, diversifying into non-interest income activities using internal capital enhances bank market power. Equally, smaller, highly capitalised and efficiently managed banks employ internally generated funds for their investments. High net-interest margin, high return of assets of banks in emerging and developing countries can be explained by the degree of market power, credit risk and implicit interest payments and internal bank capital. Also, the result shows that banks that rely on internal capital and deposit funding are safer than those that finance their assets with wholesale funds. On the whole, the results suggest that performance of banks in emerging economies with market power is significantly more sensitive to internally generated funds than they are to either deposit or wholesale funding.

The rest of the chapter is organised as follows: Section (4.2) reviews detailed existing literature, summarising theoretical, empirical, methodology and results of other studies analysing the determinants of bank performance. Section (4.3) constructs various specifications of Lerner index, proxy for the degree of market power, the three funding modes, other controlled variables used and estimation methodology used to achieve the stated objectives. Section (4.4) contains the data and empirical results. Section (4.5) concludes.

## 4.2 Literature review

This section provides a review of the related literature on bank performance. It begins with a theoretical overview of the three principles underlying net-interest margins, then follows with a discussion of the empirical literature including methods and results on the micro-bank-specific and macro-country level variables that affect bank profitability and insolvency risk.

### 4.2.1 Theoretical literature explaining net-interest margin

Theoretical principles explaining bank net-interest margin can either be described in terms of a 'monopoly model', 'dealership model' or 'behavioural model.

**Monopoly model**

The monopoly model developed by the seminal work of Klein (1971) considers the banking firm's main activity as the production of deposits and loans through intermediation services and is represented by the following cost function:

$$C = f(D, L) \tag{4.1}$$

Where $D$ is the volume of deposits while $L$ is the volume of loans produced by the bank. The assumption in line with equation (4.1) is that a banking firm pursues its activities in an environment characterised by the presence of imperfect competition in both deposit and credit markets. That is, the bank has monopolistic power to set interest rates in at least one of the markets where it conducts its operations (especially in the credit market where it behaves as a price setter). Klein (1971) contends that the monopoly power of a bank can then be used to explain the scale of operations, its asset and liability structure as well as its decision to affect the rate of return on liabilities (deposits) and assets (loans). Thus, with this approach, a banking firm's spread reflects primarily its ability to charge a price higher than the marginal cost of providing the services in both loan and deposit markets. Oreiro and de Paula (2010) provide a context where $r$ is the prevailing interest rate on the inter-bank market; $r_L$ is the interest rate charged on loans generated by the bank; and $r_D$ is the interest rate

paid to depositors with the bank. $\alpha$ is the reserve requirements expressed as a proportion of the deposits; the $\varepsilon_L$ is the interest elasticity of loan demand; $\varepsilon_D$ is the interest elasticity of deposit supply; $C_L$ is the marginal cost of loan services; and $C_D$ is the marginal cost of deposits services. Assuming that the banking firm is risk neutral and that its behaviour is directed to maximising profits, the optimal interest margin on loan and deposits according to Freixas and Rochet (1997) is presented as:

$$\frac{1}{\varepsilon_L^*} = \frac{r_L^* - (r + C_L)}{r_L^*} \tag{4.2}$$

$$\frac{1}{\varepsilon_D^*} = \frac{r(1-\alpha) - C_D - r_D^*}{r_D^*} \tag{4.3}$$

Equations (4.2) and (4.3) suggest that a bank operating in an imperfectly competitive environment sets the prices of its loans and deposit services in a manner equal to the Lerner index which is the inverse of the interest elasticity of the loan demand and deposit supply functions. Equation (4.2) and (4.3) are interpreted as, the lesser the sensitivity of loan demand and deposit supply functions to interest rate variations, the greater the bank's margin in both loan and deposit taking operations, and, thus the greater the banking firm spread. However, if the banking firm operates in an oligopolistic market where it grants loan and takes deposit, then the optimal interest margin on loans and deposits is given as:

$$\frac{s}{\varepsilon_L^*} = \frac{r_L^* - (r + C_L)}{r_L^*} \tag{4.4}$$

$$\frac{s}{\varepsilon_D^*} = \frac{r(1-\alpha) - C_D - r_D^*}{r_D^*} \tag{4.5}$$

Here, $s$ is the market share of the $n^{th}$ bank. Equations (4.4) and (4.5) illustrate bank interest margins on loan supply and deposit taking and it is a growing function of a bank's market share. It is interpreted to mean that: a reduction in the number of

banking firms resulting from either a merger or acquisition increases bank concentration and thus interest spreads. The key result of this model according to (Costa da Silva et al. 2007) is that, banking firm spread is a growing function of the degree of overall banking sector concentration.

**Dealership model**

The second model to explain bank spreads is the dealership model introduced by Ho and Saunders (1981). This views the bank as a dynamic dealer, setting interest rates on loans and deposits to balance the asymmetric arrival of loan demand and deposit supplies. The Non-synchronous arrival of loans and deposits generates a cost for the bank given that it will have to hold either a long or short position in the money market. This therefore exposes the bank to changes in the money market interest rate (i.e. interest rate risk). Estrada et al. (2006) provide an intuitive illustration: suppose a new deposit (loan) is contracted at a long-term interest rate, $r_D$ $(r_L)$. If this deposit (loan) arrives earlier than a new loan (deposit), the bank will have to invest (borrow) the funds at the short-term money market interest rate, $r$. In performing its intermediary function, the bank faces a reinvestment (refinancing) risk at the end of the decision period should the short-term interest rate, $r$, fall (rise). The bank therefore transfers these costs associated with the uncertainty in the provision of deposits and loan operations to the economic agents. Thus, participation of each bank in the market occurs by setting a deposit and loan interest rate, $r_D$ and $(r_L)$ that depends on these costs:

$$r_D = r - a \qquad (4.6)$$
$$r_L = r + b$$

Where $r$ is the expected interest rate in the money market, $a$ and $b$ are the financial cost related to the provision of deposits and loans respectively. In the dealership model, the profit maximizing bank is expected to maximise its utility of terminal wealth as:

$$s = a+b=\frac{\alpha}{\beta}+\frac{1}{2}R\sigma_i^2 Q \quad (4.7)$$

According to Ho and Saunders (1981), $s$ is the pure margin, $a$ is the mark up on deposits, $b$ is the mark up on loans, $\alpha/\beta$ measures the relative market power, $R$ is the bank's risk aversion, $\sigma_i^2$ is the variance of the interest rate on loans and deposits and the $Q$ is the size of the banks' transaction. There have been extensions to Ho and Saunders (1981) model to account for time series and cross section (McShane and Sharpe, 1985), for cross–elasticities of demand between bank products (Allen, 1988), for default risk and different size classes of bank (Angbazo, 1997), for bank operational cost (Maudos and Fernandez de Guevara, 2004), for identical banks with respect to their degree of risk aversion (Estrada, 2006), for a multi-product framework that reflects more adequately the diversification of banks' output (Carbo Valverde and Rodriguez Fernandez, 2007), and for the cost of goods (Madura and Zarruk, (1995), and Wong, (1997)).

**Behaviour model**

The monopoly model as well as the dealership model and its extensions have two main limitations. According to Hanweck and Ryu (2005), monopoly and dealership models are single-horizon, static models in which bank assets and liabilities are considered homogenous and accordingly priced at prevailing loan and deposit rates and on the basis of the reference rate. In practice however, bank portfolios are characterised by heterogeneous assets and liabilities with different security, maturity and re-pricing structure that mostly go beyond a single horizon. The second limitation on these models is that the banking sector is treated as either being homogenous or as having heterogeneous traits that is based only on the assets size of banks. Conversely, banks with different products usually differ in terms of their business models, pricing power and more importantly the funding structure and exogenous shock. All these accounts for the net-interest margin sensitivity to interest-rate and other related shocks. Perhaps, the best known behavioural model on interest margin is one developed by Hanweck and Ryu (2005). The model of bank behaviour in relation to net-interest margins assume that at each period a bank can significantly but not completely select the amount of its investment in assets and liabilities of

different re-pricing frequencies, given past choices that are immutable. In modelling bank responses to credit and interest rates risks and shareholders maximization value, Hanweck and Ryu (2005) argue that 'not only do bank managers have to choose the optimal financial service product mix and geography diversification, they also need to set the lending rate and fees, hedge credit quality and volatility changes, manage their liability structure and gauge the moods of the equity and debt markets to favourable or unfavourable news so as to increase or protect shareholder value.' Given these motivations and the ability of banks to change their portfolios and their positions as interest rate takers, and assuming that banks operate to maximise shareholders value over a 12 month horizon, Hanweck and Ryu (2005) model the determinants of interest margin as being the function of changes for different groups of banks in response to credit, interest-rates and term-structural shocks.

Another important contribution using a behavioural model on interest margin is that of Lepetit et al. (2008b). They test for possible cross-selling behaviour of interest and non-interest products by examining the determinants of the risk premium charged by banks on their loans using the European banking system. Their results reveal that higher reliance on fee-based activities is associated with lower lending rates and that borrower default risk is under priced in the lending rates charged by banks with fee-income shares. Carbo Valverde and Rodriguez Fernandez (2007) on their part make a significant contribution by developing a theoretical model that includes how traditional and non-traditional activities impact on bank net-interest margin. The objective of their model is to identify the effect of specialization on bank margins using a multi-output model for European banks. In order to achieve this objective, they estimate a dynamic model with the view that banks need to match the random deposit supply function and the random demand of lending and non-traditional activities across periods. Their results show that expansion into non-traditional activities causes an increase in market power, and a marginal decrease in spread due to cross-subsidization.

### 4.2.2 Evidence of determinants of net-interest margin

The empirical literature on bank spreads suggests that bank interest margins are mostly influenced by the type and the level of bank market structure, administrative and other operating costs, the fraction on non-performing loans, the size of the operating capacity, the level of risk aversion, regulatory, monetary and macroeconomic shocks. Saunders and Schumacher (2000) decompose bank margins of selected OECD countries into a regulatory component, market structure and risk premium component and reveal a trade-off between assuring bank solvency and lowering the cost of financial services to consumers. Claeys and Vennet, (2008), investigate the determinants of bank interest margins in Central and Eastern European (CEE) countries and suggest that relatively high bank margins in CEE countries are influenced by imperfect competitive markets, low operational efficiency, low capital adequacy and high influence of foreign and state owned banks. The fall in bank spreads in the European banking sector during 1993-2000 is mainly due to the relaxation of competitive conditions in addition to the reduction of operating costs, interest rate risk and credit risk (Maudos and Fernandez de Guevara, 2007). On the relationship between bank spreads and the degree of competition, Carbo Valverde and Rodriguez Fernandez (2007) contend that market power varies significantly across bank specifications with market power increasing as bank output of seven European countries become more diversified towards non-interest activities. Similarly, Demirguc-Kunt et al. (2004) find that high net-interest margin and large overhead cost of banks is closely associated with banks that are smaller, less liquid, less capitalised, have low non-interest income and banks with a large market share.

Brock and Rojas-Suarez (2000) study bank spreads of seven Latin American countries in 1990s and find that while at micro level, liquidity and capital risk affect banks' margin, interest rate volatility, inflation and GDP growth influence bank spreads at the macro level. However, the results differ across countries according to Brock and Rojas-Suarez (2000). Employing a large data from 1999-2002, Gelos (2009) finds that, the prevalence of high bank spreads among 14 Latin American countries is as a result of high interest rates, less efficiency and large reserve requirements. In Brazil, high

spreads can be largely accounted for by the policy that required banks to invest half of their deposits in reserves and mandatory credit (Sousa-Sobrinho, 2010).

Cross-country studies on Sub-Saharan African banking spreads emphasise bank size, activity diversification and private ownership as variables that affect banks return on assets (Flamini et al., 2009). On an Africa country specific study, Birungi (2005) and Beck and Hesse (2009) identify bank net-interest margins in Uganda to be driven by overhead costs, sectoral composition of loans and other time invariant bank characteristics. Chirwa and Mlachila (2004) reveal that Malawian bank spreads are influenced by monopoly power, reserve requirements, high bank discount rates and inflation, while Enendu (2003) and Hesse (2007) find that regulatory, monetary policy as well as macroeconomic factors impact on ex-ante bank spread in Nigeria. These studies are yet to provide reasonable channels through which policy shocks and imperfect competitive environments impact on bank spreads and allocation of resources to the private sector.

### 4.2.3 Funding structure and bank performance

This section reviews details findings of the key studies in the funding structure of bank and assess the effect of the funding strategies on overall bank performance measures (used in this chapter as net-interest margin, return on assets and insolvency risk). A fall in deposit lowers the net-interest margin of banks if a decline in deposits from customers is offset with increase in wholesale (non-deposits) funding reduces the net-interest income of a bank (Demirguc-Kunt and Huizinga (2010). This is because change in the funding structure given a particular assets mix will result in higher interest expense. Norden and Weber (2009) investigate the funding modes of German banks and its implication on profitability during 1992-2002, reveal that a declining of amount deposits and its substitution with wholesale funding unfavourably affects the bank net-interest margin.

Some of the prior literature on funding structure and banks' risk taking is centred on the ability of resource providers to monitor the activities of banks. Diamond (1984) established theoretically that, banks need to be partially equity-financed in order to

provide bankers with appropriate incentive to monitor projects they financed. In contrast, Calomiris (1999) shows that subordinated debts can perform the functions of monitoring a bank if it cannot avail of deposit insurance. Thus non-deposit funding in a bank funding structure can reduce bank fragility through better monitoring. Though both deposit and non-deposit funding improve bank risk taking through monitoring, studies suggest that both tend to carry different risks in causing potential liquidity crisis[17] and also different in terms of speed and the size of charges in funding cost. On potential liquidity crisis and relying on wholesale funding, Huang and Ratnovski (2010) content that wholesale financiers may have an incentive to withdrawal funding because of cheap and noisy signals of bank solvency, thus making solvent banks fail. Regarding the differences in terms of speed and funding cost, Rajan (1992) finds that wholesale financing may duly foreclose on a firm that has a project with negative present value, but higher interest rate is levied if the project is to continue. Demirguc-Kunt and Huizinga (2010) reveal that banking strategies that rely mostly on attracting non-deposit funding negative affect banks' risk. They sample 1,334 banks across 101 countries and argue that their findings are consistent with the demise of the U.S investment banking sector. Poghosyan and Cihak (2009) on their part examine 5,708 banks in the 25 European Union countries from 1996-2008 and find that non-deposit funding can distinguish sound banks from vulnerable banks. Ratnovski and Huang (2009) analyse pre-balance sheet structural fundamentals of Canadian banks and compared with banks in OECD countries. The result is that the deposit funding has been the key factor behind the relative resilience of Canadian banks during the 2007 financial crisis.

## 4.3 The research model and variables construction

### 4.3.1 The research model

The technique used in investigating the link between market power, funding structure and overall bank performance, does not only consider credit and interest rate risk in a bank behavioural model, or assess the implications of funding modes on risk and return, but it is also firmly rooted of in the new empirical industrial organisation

[17] That is either through a bank run or a sudden halting of wholesale funding.

literature on bank funding strategies. Various funding sources, their interaction with the competitive measures and the bank performance are examined. The technique is based on the assumption that bank performance, in each of the product service mix of banks' loans and deposits (here include all the funding modes of banks), results from the monopolistic competition among the banks operating in the markets. For a profit maximizing bank that faces an inelastic demand function for loans or an inelastic supply function of deposits, the performance of a banking firm, financing its assets from various sources in a given period depends on the market structure that the bank operates in, its funding strategies, bank-specific characteristics, as well as regulatory, macro and monetary environments of the bank. The empirical model which investigates these relationships is presented as follows:

$$performance_{it,c} = \alpha_1 performance_{it,c} + \alpha_2 Lerner_{it} + \alpha_3 fs_{it,c} + \left(Lerner_{it,c} * fs_{it,c}\right) + \sum_{j=3}^{k} \alpha_j X_{ij} + \varepsilon_{it} \quad (4.8)$$

Where $performance_{it,c}$ is the overall bank performance measure (net-interest margin, return on assets and insolvency risk) of bank $i$ in country $c$ at period $t$; $performance_{it,c-1}$ is the observation on the same bank in the same county in the previous year. $Lerner_{it,c}$ is the Lerner index, a proxy for degree of market power of a bank $i$ in country $c$ in period $t$, $fs_{it,c}$ is the funding structure for bank $i$ in country $c$ in period $t$, $\left(Lerner_{it,c} * fs_{it,c}\right)$ is the interaction between market power and the funding sources of bank $i$ in country $c$ at period $t$, the variable $X_{i,j}$ are a set of $\{k\}$ variables controlling for bank-specific characteristics, respective countries' macroeconomic environments and contestability variables. $\alpha's$ are the parameter vectors; and $\varepsilon_{it}$ is the unobserved disturbance.

### 4.3.2 Market Power

Prior studies on banking structure use different instruments to measure the competitive environments of the banking firm. These instruments include new empirical industrial organisation literature such as: the Lerner index; the Breshnahan

mark-up test; the Panzar and Rosse' H-statistic; conduct parameter and those that are not based on industrial organisation which include the structure-conduct-performance (SCP) paradigm of Mason (1939) versus the efficient structure hypothesis of Berger (1995). In this chapter a Lerner index is employed to measure market power. This index captures more information about the actual price-setting behaviour of banks in relation to their cost structure than the size of banks measured either in terms of deposits, relative size of balance sheets or income generated (Hawtrey and Liang, 2008). The construction of a Lerner index follows that of Maudos and Nagore (2005) and Fernandez de Guevara et al. (2005) which is based on the Monti-Klien imperfect competition model by Freixas and Rochet (1997). In line with Fernandez de Guevara et al. (2005) empirical approach, and employing the definition of Lerner (1943), the spread between price and marginal cost can be expressed as a percentage and defined as the 'Lerner Index as:

$$Lerner\ Index = (P_{TA,it} - MC_{TA,it}) / P_{TA,it} \tag{4.9}$$

The Lerner index in equation (4.9) suggests the extent to which the monopolist's market power allows it to fix a price above marginal cost. The primary assumption is that the flow of banking goods and services produced by banks which is proportional to its total assets (Fernandez de Guevara et al., 2005). With this assumption, price is constructed to include both interest and non-interest income, where $P_{TA}$ is the price of the total assets. $MC_{TA}$ is the marginal cost of producing an additional unit of output. The $MC_{TA}$ is derived from the following translog cost function as:

$$\begin{aligned} \ln Cost_{it} = {} & \beta_0 + \beta_1 \ln TA_{it} + \frac{\beta_2}{2} \ln TA_{it}^2 + \sum_{k=1}^{3} \gamma_{kt} \ln W_{k,it} + \sum_{k=1}^{3} \phi_k \ln TA_{it} \ln W_{k,it} + \\ & \sum_{k=1}^{3}\sum_{j=1}^{3} \delta_{ij} \ln W_{k,it} \ln W_{j,it} + \sum_{i=1}^{3} (\delta_i / 2) \ln W_{t,ij}^2 + \sum_{k=1}^{2} \eta_k trend^k \\ & \sum_{i=1}^{3} \varsigma_i \ln W_{t,ij} trend + v \ln TA_{tj} trend + \varepsilon_j \end{aligned} \tag{4.10}$$

Where *Cost* is the bank's total costs including financial and operating cost; $TA_i$ represents a proxy for bank output measured as total assets and $W_1$, $W_2$ and $W_3$ indicate the input price of deposit funds, labour and capital and these are respectively calculated as the ratio of interest expenses to total deposits and money market funding, labour cost to total assets,[18] and other operating and administrative expenses to total assets. The cost function is estimated separately using a panel data for each country in the sample. This allows for the parameters of the cost function to vary from one country to another and reflecting different technologies. Fixed effects are also introduced to capture the influence of variables specific to each bank. Once the cost function is estimated, its first derivative with respect to the output (total assets) evaluated for each bank in the sample, is the marginal cost. Hence, a marginal cost is calculated for each banking firm as:

$$MC_{it} = \frac{Cost_{it}}{TA_{it}}\left[\beta_1 + \beta_2 \ln TA_{it} + \sum_{k=1}^{3} \phi_k \ln W_{k,it} + \delta_3 Trend_{it}\right] \tag{4.11}$$

The index is interpreted as follows: the Lerner index with higher value implies higher pricing power and less competitive market conditions. There is a possible setback associated with the Lerner index (termed here conventional Lerner) as estimated above. The MC estimation following equation (4.10) is likely to reflect some form of monopoly power emanating from deposit markets, based on the bank's ability to fund at a relatively low price. In pricing their loans, bank managers cover their funding costs, factor in a risk premium to reflect the uncertainty surrounding the loan contracting problem and charge an extra premium to reflect their market power (Turk Ariss 2010). Thus, a form of deposit market power is already reflected in the loan pricing. According to Maudos and De Guevara (2007) adding financing costs and consequently the price of deposits in the cost function captures the effect of market power in banking and this may bias the results. They add that excluding funding costs in the equation will lead to what they term a 'raw' pricing power that is not biased by market power which had already been obtained in the deposit market while securing funds. Therefore, to estimate a version of equation (4.10) that excludes financing costs

[18] In the absence of data on total employees, the unit cost of labour is expressed in terms of total assets.

in the translog cost function. After calculating an operating MC for each bank at each time period following equation (4.11) but including only two factors (labour cost and physical cost of capital), and derive a funding-adjusted Lerner index from the structural model specified in equation (4.10). Thus, this chapter employs two different specifications of Lerner to analyse the impact of market power and funding strategies of banks on performance: a conventional Lerner (Berger et al., 2009) and a funding-adjusted Lerner (Maudos and De Guevara, 2007). Contrary to the conventional Lerner index, the funding-adjusted version accounts for market power that may have not been previously obtained in the deposit market and which may provide a better basis for analysing the implication of the degree of market power on funding strategies and on performance.

### 4.3.3 Bank performance

There are variations in the banking literature of what constitute bank performance. In theoretical literature, measure such as loan rates, deposit rates and spreads are used, while empirical literature uses measures such as return on assets, return on equity and net-interest margins. In this chapter, net-interest margin (accounting for spread between interest cost and interest income), return on assets (for profitability) and insolvency risk of bank (for bank stability) constitute bank performance.

#### Net-interest margin

Net-interest margin (NIM) is defined as the difference between interest revenue and interest expense expressed as a percentage of average total assets. Spread on the other hand is the difference between the yield rate on average interest earning assets and the cost rate on interest bearing funds, with both elements expressed in percentage terms.[19] According to Olson and Simonson (1982) a bank's interest margin and spread need not be the same unless there are zero non-interest bearing funds. Accordingly, bank interest margin is measured as the difference between interest revenue and interest expenses as a proportion of earning assets (Claeys and Vander Vennet, 2008).

[19] For a detailed difference between interest margin and spread see Wong, (1997).

**Return on Assets**

Return on asset (ROA) is used as a measure of bank profitability. It is calculated as a profit before tax as a percentage of total assets.

**Insolvency risk**

***Z-score*** is used as a measure of insolvency and is defined as $Z = (ROA + E/TA)/\sigma(ROA)$, where $ROA$ is the rate of return on assets, $E/TA$ is the total equity to total assets ratio, and $\sigma(ROA)$ is an estimate of the standard deviation of return on assets. Z-score measures the number of standard deviations that a bank's profit must fall to drive it into insolvency. It is a measure of risk that is monotonically associated with a bank's probability of failure and has been widely used in the empirical banking and finance literature (Boyd et al 2009).

### 4.3.4 Funding modes

Due to globalization, liberalization and competitive credit markets, deposits as a source of funds for banks have steadily declined in importance (Edwards and Mishkin, 1995). The following three sources of funding have been identified in the samples.

**Deposits funding**

This is the funding source from deposits made by a bank's customers and it includes demand, saving and time deposits. Customer deposits are traditionally considered to be the main funding source of banks and to be cheap relative to other sources of funding, and allow banks to maintain relatively high interest spreads (Dinger and von Hagen, (2005), and Ianotta et al., (2007)). Thus, a decline in deposits funding that is offset by increased wholesale funding according to Demirguc-Kunt and Huizinga (2010) reduces the bank's net-interest margin, as the new funding mix, given a particular asset structure will result in higher interest expense. Following Norden and Weber (2009) who examine the evolution of funding modes of German banks, deposits funding is measured as total deposits as a percentage of total assets.

**Non-deposit funding**

This is the funding resources from other banks and other sources that include notes, debenture, short-term bills and all other related debts not covered in the deposits

sources. It is a purchased fund as the banks purchase these funds from other financial institutions. It is a short-term funding with relatively higher interest cost compared to deposits from customers. However, to the extent that non-deposit funding is uninsured and could not be bailed out in the event of non-performance, the providers of these funds have the incentive to monitor the bank and will withdraw their financing if they are in doubt about the bank performance (Demirguc-Kunt and Huizinga, 2010). Non-deposit funding is measured as all other debts (except deposits) divided by total assets.

**Internal funding**

As the name suggests, it is an internally accumulated fund and regarded as the cheapest source of investment financing. It is the firm owns resources accumulated over the period. The appropriate measure of internally generated funds for banking institutions differs from that of non-financial institutions. Studies of non-financial institutions generally measure internally generated cashflow as net-income before extraordinary items plus deprecation. However, according to Houston et al. (1997) banks are not constrained by cashflow as non-financial institutions, though they are limited by the amount of debt financing they can utilise. The definition of internally generated funds is similar to that of Houston et al. (1997) and Ashcraft (2006) as the sum of net profits before extraordinary items and loan loss provisions relative to bank loans at the end of the period.

### 4.3.5 Other control variables

In analysing the relationship between market power, bank performance as well as the funding strategies of banks in developing countries, a number of control variables that affect these relationships are employed. These controls include bank-specific characteristics, institutional variables, and characteristics of the macroeconomic and monetary environments.

**Bank-specific characteristics**

Degree of risk aversion, credit risk, operating size, implicit payments, managerial quality and non-interest income, are the bank-specific variables used to examine the relationships. These variables have been shown to be significant in explaining the relationship between the Lerner index, the bank performance as well as the funding

strategies of banks (Saunders and Schumacher, (2000), Maudos and Fernandez de Guevara, (2004), Maudos and Nagore, (2005), Carbo Valverde and Rodriguez Fernandez, (2007), Maudos and De Guevara, (2007), Claeys and Vander Vennet, (2008), and Demirguc-Kunt and Huizinga, (2010)).

The ideal specification for a bank's degree of ***risk aversion*** has not been well defined in the literature. Hawtrey and Liang (2008) use securities plus other assets as a proportion of total loans as a proxy for risk aversion. Though the measure could be appropriate, the components of securities and other assets are difficult to define. In this study, following the approach used by (Maudos and Fernandez de Guevara (2004), Maudos and Nagore (2005), and Claeys and Vander Vennet (2008)), the ratio of bank's equity to total assets is employed as a measure of the degree of risk aversion and the level of capitalization. C*eteris paribus,* risk adverse bank managers tend to impose an extra premium on interest margin as a compensation for holding non-diversifiable risk. Secondly, banks with high equity ratios face lower bankruptcy and funding costs and consequently have a higher Lerner index.

***Credit risk*** according to BIS (2000), 'is the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms'. Ratio of total loans to assets is used as a proxy for credit risk. The argument put forward for the use of this measurement is that banks charge additional interest margin to compensate for exposure to expected and unexpected credit risk, thus banks net-interest margin as well as market power will be high. Again risk of default or non-payment requires the bank to apply implicitly a risk premium in charging interest rates for its operations (Claeys and Vander Vennet, (2008), and Maudos and Fernandez de Guevara, (2004)).

***Operating/bank size***, as there is no information available to proxy the transactions made, the logarithm of loans is used as a proxy of banks operating capacity. This variable has been found to have explanatory power for bank performance especially net-interest margin (Maudos and Solisa, 2009). However, in analysing the impact of Lerner index and funding strategies of banks, the logarithm of total assets is used as a

proxy for bank size as suggested by (Maudos and Nagore (2005), and Demirguc-Kunt and Huizinga (2010)).

***Implicit interest payment*** is payment of interest on deposits through service charge remissions and other types of depositor subsidy due to regulatory restrictions on explicit interest payments. In their attempt to cover all banking services, banks impose extra margins in the form of an 'implicit interest payment'. Following Saunders and Schumacher (2000), Maudos and Fernandez de Guevara (2004) and Hawtrey and Liang (2008) implicit payments are calculated as the difference between operating expenses and non-interest income divided by total assets.

The higher the ***quality of management*** the higher the interest margins that the bank imposes on the basis that a high quality management translates into a profitable composition of assets and a low cost composition of liabilities (Maudos and Fernandez de Guevara, 2004). Different measures have been employed as a proxy for management efficiency. Angbazo (1997) use the ratio of earning assets to total assets as a measure of management efficiency; Brock and Franken (2003) employ a loans to employee ratio and find that management efficiency has a negative impact on interest margin and Claeys and Vander Vennet (2008) utilise the inverse of total overhead costs to total assets to measure efficiency and find a negative relationship with interest margins for Central and Eastern European banks. On their part, Maudos and Nagore (2005) use cost to income ratio as a determinant of bank market power while Demirguc-Kunt and Huizinga (2010) use overhead costs as a percent of total assets as a variable explaining funding strategies of banks. In this chapter, operating expenses as a ratio of gross income is used as the proxy of quality of management.

Included in the explanatory variable in explaining the determinants of market power and the funding strategies of banks is the ***non-interest income***. This is to assess whether diversification into non-interest activities enhances banks' ability to acquire market power as well as adopting a particular funding strategy to finance that power. Following (Carbo Valverde and Rodriguez Fernandez (2007), and Lepetit et al.

(2008b)) the ratio of non-interest income as a percentage of total operating income is used as a measure of non-interest income.

**Regulatory variables**

The ***liberalization index*** constructed by Abiad, Detragiache and Tressel (2010) is used as our regulatory variable. The advantage of using the liberalization index is that, the database recognises the multi-faceted nature of financial reform and records financial policy changes along seven different dimensions: credit controls and reserve requirements; interest rate controls; entry barriers; state ownership; policies on securities markets; prudential regulations and supervision of the banking sector and restrictions on the capital account. The liberalization index measures financial reforms that have taken place during the period and it ranges from 0 to 21 with highest score indicating fully reformed. The Financial Reform Index (normalised) is a binary value (0-1) with 1 showing fully reformed. Banks can also be affected by freedom to which they operate. The ***banking freedom*** index provides the overall measures of the openness of the banking sector and the extent to which banks are free to operate their businesses. The study uses the banking freedom index from the Economic Freedom Indicators of the Heritage Foundation. The ***property right*** is included as a measure of risk of expropriation. It measures the degree to which individual country laws protect private property rights and the degree to which its government enforces those laws. Its score ranges from 0 to 100 with the higher score indicate certainty of legal protection of property right and limited expropriation risks (The Heritage Foundation 2010).

**General level of development**

The chapter also controls for the countries' general economic development, macroeconomic stability, and institutional framework as these are likely to affect banking system performance (Claesens and Laeven, 2004). Boyd et al. (2001) find evidence supporting the adverse impact of inflation on banking lending activities. Inflation, GDP growth and per capita GDP are used as macroeconomic environments. ***Inflation*** is the rate of inflation based on the Consumers Price Index (CPI). ***GDP growth*** measures business cycle fluctuations while ***per capita GDP*** accounts for the

differences in economic developments across countries. Short-term interest rate is included to capture the differences in the stance of ***monetary policy***.

### 4.3.6 Estimation methods

Concerning the cross-country determinants of market power and funding patterns of banks, Equation (4.12) and (4.13) are estimated using country and time fixed effects and clustering at the bank level. The inclusion of fixed effects in estimation of these equations (4.12 and 4.13) is to control for other bank specific characteristics that remain quite stable during the estimation period.

$$mp_{it,c} = \alpha_0 + \sum_{j=3}^{k} \alpha_j X_{i,j} + \varepsilon_{it} \tag{4.12}$$

$$fs_{it,c} = \alpha_0 + \alpha_1 mp_{it,c} + \sum_{j=3}^{k} \alpha_j X_{i,j} + \varepsilon_{it} \tag{4.13}$$

Where $mp_{it,c}$ is the market power of bank $i$ in country $c$ at period $t$ and measured by the Lerner Index, $fs_{it,c}$ is the funding source for a bank $i$ in country $c$ at period $t$; the variable $X_{i,j}$ are set of $\{k\}$ variables controlling for bank-specific characteristics, respective countries' macroeconomic environments and regulatory variables. $\alpha's$ are the parameter vectors; and $\varepsilon_{it}$ are the unobserved disturbances.

For equation (4.14) the study follows the argument put forward by Carbo Valverde and Rodriguez Fernandez (2007) that banks maximise wealth by considering both initial and end-of-period information and that previous values of bank performance may affect current performance values. This is because banks need to match the random deposit supply function and the random demand of lending activities and non-traditional activities across the period. Therefore the dynamic model technique is employed to estimate the implication of market power and funding structure on bank performance[20]:

[20] Even though equations (4.12), (4.13) and (4.14) represent plausible simultaneous equation estimation, each equation is estimated separately so as to satisfy specific research hypotheses.

$$Performance_{it,c} = \alpha_1 performance_{it,c-1} + \alpha_2 mp_{it,c} + \alpha_3 fs_{it,c} + \sum_{j=3}^{k} \alpha_j X_{ij} + \varepsilon_{it} \quad (4.14)$$

$$\varepsilon_{it} = \mu_i + \nu_{it}$$

$$E[\mu_i] = E[\nu_{it}] = E[\mu_i \nu_{it}] = 0$$

$performance_{it,c}$ is the overall bank performance measure (net-interest margin, return on assets and insolvency risk) of bank $i$ in country $c$ at period $t$; $performance_{it,c-1}$ is the observation on the same bank in the previous year. $mp_{it,c}$ is the market power, $fs_{it,c}$ is the funding source for a bank $i$ in country in period $t$, the variable $X_{i,j}$ are set of $\{k\}$ variables controlling for bank-specific characteristics, respective countries' macroeconomic environments and regulatory variables. $\alpha's$ are the parameter vectors; and $\varepsilon_{it}$ is the unobserved disturbance. Here the disturbance term $\varepsilon_{it}$ has two components: the $\mu_i$ is an unobserved time-invariant bank-specific effect, and $\nu_{it}$ is the disturbance term.

One immediate problem in applying Ordinary Least Squares (OLS) in estimating equation (4.14) is that $performance_{it,c-1}$ is correlated with fixed effects in the error term which gives rise to 'dynamic panel bias'. Moreover, there is evidence to suggest that OLS produces biases when an attempt is made to control for unobserved heterogeneity and simultaneity. Therefore the estimation strategy used in this section is based on the methodology proposed by Blundell and Bond (1998) and Alvarez and Arellano (2003) in estimating systems of equations in both first difference and levels. As pointed out in Roodman (2009) and Maudos and Solisa (2009), 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 a suitable lagged first differences as instruments. Generally, linear difference and system GMM estimators have one–and–two step variants. The two-step System GMM, Windmeijer (2005) correct standard error, small-sample adjustments, and orthogonal deviation are

used for this chapter. The two step variant uses residuals from the one-step estimates and is asymptotically more efficient than the one-step.[21]

## 4.4 Data and empirical results

### 4.4.1 Data

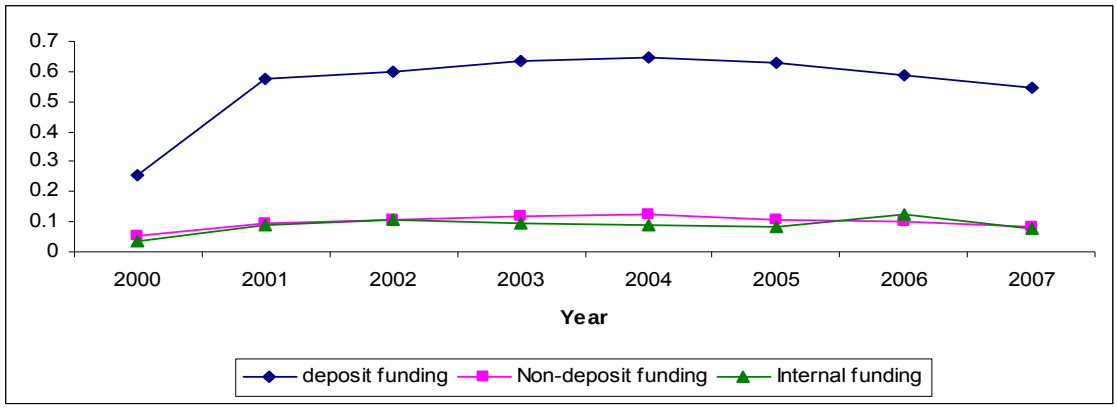
Micro-bank-firm level and macro-country level data are used. Bank level data are taken from the most recent Bankscope database maintained by Fitch/IBCA/Bureau Van Dijk. Series are yearly, covering a sample of 978 banks across 55 developing countries during the eight year period, 2000-2007. As the study focuses on bank intermediation, unconsolidated balance sheet data are opted for whenever possible even though in some cases the researcher has to depend on consolidated statements because of data unavailability. The sample includes all commercial banks, cooperative banks, development banks, savings banks, real estate and mortgage banks for which annual data is available for some period during the years 2000-2007. To make sure that banks that are important players in the deposit and/or loan markets are not omitted, medium and long term credit banks and specialised government institutions are included in the sample. The use of bankscope has an advantage since the accounting information on banks are standardised. This is after necessary adjustments are made for differences in accounting and reporting standards across countries. Liberalization index is obtained from Abiad, Detragiache and Tressel (2010) while banking freedom index is from the Economic Freedom Indicators of the Heritage Foundation. Macro data are obtained from the World Bank Development Indicator and the International Financial Statistics database of the International Monetary Fund and the respective central banks. The series include GDP/GDP per capita growth, inflation, exchange rates, average policy interest rates, the Treasury bill rate, inter-bank rate and money market rate.

[21] Table 4.7, 4.8, 4.9, 4.10, 4.11, 4.12, 4.13, 4.14, 4.15 and 4.16 report the results for the full sample as well as for the regional groups. The diagnostic tests include: (1) The instruments count, (2) The Hansen test for over-identification restriction for which the null hypothesis is that instruments are exogenous (3) The Arellano-Bond tests for first and second order serial correlation in the residuals for which the null hypothesis is that there is no serial correlation and (4) The F-test for joint significance of instruments.

### 4.4.2 Summary descriptive statistics

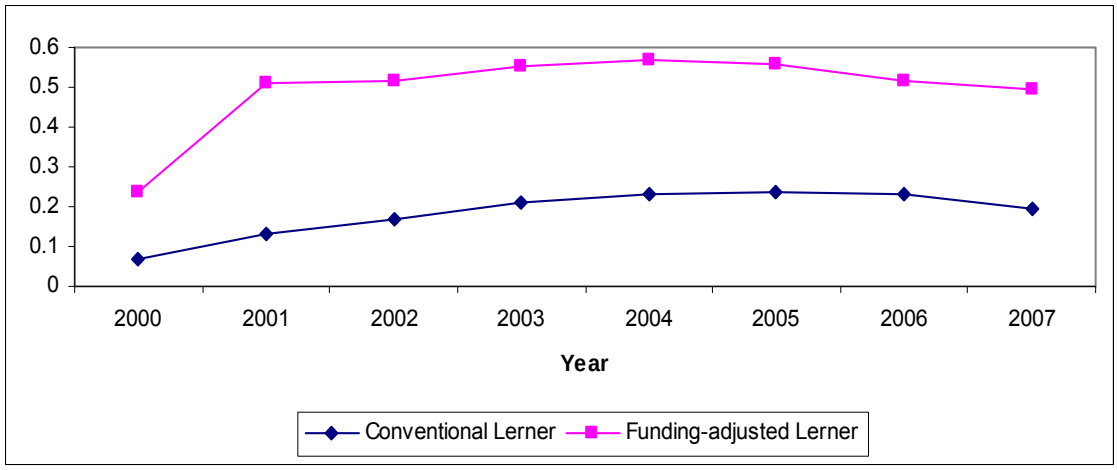
Table 4.1 provides bank-specific variables averaged by countries over the period 2000-2007, table 4.2 provides descriptive statistic for the mean values of funding pattern while table 4.3 deals with bank market power and performance. Asian banks are the largest banks in terms of size. The average bank size of the Asian banks is more than 34,154.691 million US Dollars. Latin American banks are the most capitalised and Argentina's banks having the highest capitalization level in that region. On efficiency measured as cost to income, Asian banks are more efficient with growing banks in Central and Eastern European countries (CEEC). However, Latin American banks are more diversified in terms of generating non-interest incomes. On average 54.9 percent of Asian banks' assets in the sample are extended as loans, the highest in the sample. The least is the African banks whose total average loan portfolio is 49.8 percent. Table 4.2 represents mean values of funding modes of selected banks in the developing countries. Most of the assets of the banks selected are financed by deposits with 71 percent being the highest; CEEC bank assets are financed with deposits. The least deposits funding is for Latin American banks. Figure 4.2 presents funding trends of banks in the selected countries that show that deposit funding has been increasing since 2001 but falls in 2006 when internal funding begins to increase. The rise of internal funding from 2005 shows the importance banks in developing countries attach to that source of funding. Table 4.3 shows the results of the country means of the Lerner index which is in two specifications: conventional and funding-adjusted Lerner index. The figures from the conventional version vary across the countries over 25% with African banks on average pricing around 27% over marginal cost. Similarly, figures from the funding-adjusted version of the Lerner index showing 65% over the marginal cost with the Asian banks being the banks' that exhibit highest market power. The figures from table 4.3 and that of figure 4.3 demonstrate that on average funding-adjusted Lerner index is larger than that of the conventional Lerner index suggesting that the latter has been underestimating the degree of market power. This result, thus justifies the alternative use of both specifications in our analysis. African banks are most profitable in terms of net-interest margin and return on assets while Asian banks have the highest Z-score, making them the most stable banks among the sample.

**Figure 4.2**
**Funding trends of banks in the selected countries**




**Source: Bankscope and authors' estimations**
**Data is aggregated by averaging across years**

**Figure 4.3**
**The trend of degree of market power**




**Source: Bankscope and authors' estimations**
**Data is aggregated by averaging across years**

Table 4.4 presents pair-wise correlation coefficient as a preliminary analysis of the relationship between various Lerner specifications, funding modes and the overall bank performances. The correlation coefficient between Lerner indices and the corresponding overall performance measures (net-interest margin, Return on Assets and insolvency risk) is positive and statistically significant indicating that banks in the emerging and developing countries profit as their share of market power increases. This is intuitive, since banks with large market share are able to mobilise finest resources, benefit from economies of scale, producing at lower cost and thereby increase their return. However, the funding-adjusted version of the Lerner index shows an insignificantly negative relationship with net-interest margin (NIM). On the

correlation between funding structure and overall performance, banks profitability improves with non-deposit and internal capital funding while bank solvency declines with the non-deposits funding.

Next is the pair-wise correlation coefficient between Lerner indices and the various funding strategies. The results show that Lerner indices and the non-deposit funding and internal generated funding (IGF) have positive and statistically significant correlation coefficient with the IGF having a stronger coefficient. Thus banks with the higher market share tend to finance their investments with more IGF.

On the pair-wise correlation coefficient between the interaction of Lerner index and the funding strategy and performance suggest that NIM of banks with market power are significantly more sensitive to the funding sources. Again, the IGF appears to have bigger coefficient implying that the performance of banks with higher market share response to the changing in the internal capital than that of the deposits and non-deposit sources of funding.

Regarding macroeconomic variables, the correlation relationship between GDP growth on one hand and NIM and Z-score on the other, is respectively negative and statistically significant. Thus during economic boom, banks profitability falls and the risk of insolvency increases. Conversely, the correlation between inflation and NIM and ROA is positive and significant while that of Z-score is negative and also significant. The stance of monetary policy is positively correlated with the NIM and ROA and negatively related to Z-score. Taken together these finding suggest that tightening of monetary policy increases profitability margins of banks in emerging and developing countries, while expansion of the stance of monetary policy reduces bank insolvency risk.

### 4.4.3 Regression results

The primary objective of this chapter is to investigate the link between market power, funding structure and the overall performance measures. This is conducted first by identifying the various sources of market power and the variations in funding

structure of banks. Then evaluate the factors that affect NIM and ROA and finally assess how market power and the funding strategies affect banks' insolvency risk.

#### 4.4.3.1 What factors influence bank market power?

This section analyses the empirical results with the aim of identifying various sources of market power of banks in emerging and developing countries. It is only when the sources of market power are identified and the variation in funding patterns of banks are analysed that possible action could be taken to reduce the social inefficiency associated with the existence of market power (Maudos and Nagore, 2005). To begin, table 4.5 presents the results of the regressions that use bank-specific variables, accounting for the respective countries' level of development and monetary policy stance. Following Demirguc-Kunt and Huizinga (2010), the estimated results include country and year fixed effects, and clustering of the errors at the bank level. Two varieties of the Lerner indices are estimated, a conventional Lerner and a funding-adjusted Lerner. Column 1 and 2 relate to convention Lerner, while column 3 and 4 relate to funding-adjusted Lerner.

The size of the bank affects both Lerner indices positively suggesting that larger banks tend to have market power. This result is consistent with the argument that larger banks are efficient, gaining economies of scale and scope and producing at lower cost which enables them to have higher margins (Meon and Weill, 2005). Similarly, non-interest income has a positive and significant relationship with the Lerner index indicating that banks that specialised in generating non-interest income tend to have higher market power. Bank equity is positively related to conventional version of Lerner and significant and negatively to funding adjusted Lerner. The different coefficient sign between the conventional and funding-adjusted indicate that banks with high levels of capital have higher market power if they exercise power in deposit markets. Also, the positive relationship with the conventional Lerner suggest that such banks are able to pay less for deposits and the depositors considered such banks to be more stable. Another significant factor that affects bank market power is the quality of management. The results show that, banks with high quality management have higher market power. The result shows that the inflation level does

not influence bank market power. Macroeconomic variables have a different degree of impact on market power. For instance if the business cycle increases by 1%, the Lerner index decreases by more than 4%, while a 1% increase in the level of economic development transforms to a 3% increase in the level of market power. Conventional and funding-adjusted Lerner indexes are affected with the same variables except *equity ratio* and *bank* and *GDP growth*. While equity has a positive relationship with the conventional Lerner, it associates negatively with funding-adjusted. In the case of *bank* and *GDP growth*, it is significant with the conventional Lerner and insignificant with funding-adjusted Lerner. It has to be emphasized that the rest of the explanatory variables of bank market power maintain their coefficient sign as well as their magnitude after inclusion of the economic freedom and banking freedom variables.

#### 4.4.3.2 The determinants of funding strategies of banks

The next analysis is on the determinants of bank funding patterns where deposit, non-deposit (wholesale) and internally generated funding are used as dependent variables. The findings are presented in table 4.6 with columns: 1 and 2 for deposit funding; 3 and 4 for non-deposit funding and 5 and 6 for internal funding. Bank size has negative association with deposit funding; positive with non-deposit funding and negative with internal funding only when a funding adjusted Lerner index variable is added to the regression. The result suggests that larger banks rely heavily on wholesale funds in financing their operations. As expected, equity ratio has a negative and statistically significant relationship with both deposit and non-deposit funding and positive coefficient on internal funding; indicating that highly capitalised banks finance their investment using internal funds and thus reduce their leverage. In addition, banks in developing countries finance their growth with internally generated funds. The results also show that the coefficient of management quality variable is positive and significant in all the funding modes indicating that efficient banks in developing countries are able to proportionately finance their activities with deposit, non-deposit and internal funds. The conventional version of the Lerner index is included in column 1 for deposit funding, in column 3 for non-deposit funding and column 5 for internal funding. The results show positive and significant association with deposit

and internal funding meaning that banks with market power have deposit and internal funds as their key sources of funding and these sources are considered safe and cheap (Demirguc-Kunt and Huizinga, 2010). Interestingly, funding-adjusted version of Lerner has no significant relationship with the funding modes except internal funds showing that banks that have not already exercised market power in deposits markets increase their internal capital. In addition to the bank-specific and macroeconomic variables, the study includes liberalization index which measures the level of financial reforms that the respective countries have undertaken during the period under study. Liberalisation index has a positive relationship with deposit funding and negative with both non-deposit and internal funds indicating that in a developing country where the financial sector is fully liberalised, deposit funding tends to increase. All the macroeconomic and monetary policy variables included in the regression do not impact on any of the funding modes except per capita income. An increase in GDP per capita increases deposit funding of the selected banks in developing economies.

#### 4.4.3.2 Evaluation of net-interest margin of banks in emerging market

In this section, the relationship between bank market power and funding patterns of banks on one hand and bank net-interest margin on the other are analysed. Table 4.7 presents the regression results that has net-interest margin (NIM) as the dependent variable. The different columns reported relate to different empirical approaches to funding modes (deposit funding, non-deposit funding and internal funding) and the varieties of Lerner index used (conventional and funding-adjusted). All regressions are estimated using dynamic panel-data estimation, Two-step System GMM, Windmeijer-correct standard error, small-sample adjustments, and orthogonal deviation. The regression results show that in general, all the variables considered in the study significantly influence NIM except equity to asset ratio that measures risk aversion of banks. The only positive impact of equity to asset ratio on NIM is when the funding-adjusted Lerner index is controlled. Also the lagged dependent variable, NIM among the explanatory variables is positive and statistically significant illustrating the importance of accounting for previous values of the dependent variable. Credit risk has a positive and significant sign meaning that banks apply a risk premium implicitly to the interest rates charged for their operations. The volume

of total loans granted measuring the operating capacity of bank is negative meaning that banks that specialised in lending appear to offer lower margins. The implicit payment has its coefficient as positive and significant. This according to Maudos and Fernandez de Guevara (2004) shows that banks that charge an extra fee for their services more implicitly through lower remuneration of liabilities, present higher interest margins. Cost to income ratio measures operating efficiency of management in generating income with high value indicating management inefficiency. The sign is negative and significant meaning that an increase in the cost to income ratio by 1% decreases the NIM by 4% *ceteris paribus*. Inflation has a negative and statistically significant relationship with NIM, likewise GDP per capita growth. These results show that banks tend to reduce their interest rates margin during economic turmoil. This result is consistent to Boyd et al.'s (2001) who show a strong negative correlation between inflation and the amount of bank credit, indicating that NIM decreases as inflation increases. However, the positive sign of monetary policy stance shows that banks in developing countries profit from tightening in monetary policy. In column 2, the funding adjusted version of Lerner index is incorporated in the estimation process and the results show that NIM increases when banks increase their market power. When the deposit funding is added in column 3, the Lerner index is still positive and statistically significant. Likewise for deposit funding, it is positive indicating that banks with market power finance their investment with low cost of deposit funds and this increases their NIM. These findings suggest that deposit discipline exists more in developing countries (Martnez Peria and Schmukler, 1999) and that they (depositors) demand relatively low return from banks they perceive to have market power, more capitalised and more stability. In addition, the finding is consistent with Berlin and Mester (1999) findings that banks with high market power have considerable access to cheap deposit funding through a solid local deposit market penetration that enables them to maintain high interest margins. In column 4, as expected, the non-deposit funding is negative and significant meaning that banks in developing countries, though the capital market is relatively undeveloped, finance their loans with purchased funds and that reduces their margins. The explanatory capacity of internal funding deserves special mention. Its statistical significance shows the importance of introducing it in the regression. The sign is positive and its

coefficient is higher compared with the deposit funding. This means that *ceteris paribus a* 1% increase in internal funding generates additional NIM of 8% while deposit funding increasing by only 3%. The high coefficient and significance of internal funding in contrast to deposit and non-deposit funding helps to support the hypothesis that external financing is expensive relative to internally generated funds. This finding also suggest that banks in developing countries are shifting their asset financing with internally generated funds which have been the preserve of holding companies in advanced economies. Houston et al. (1997) find a strong positive relation between loan growth of US bank holding companies and internally capital.

Next, table 4.8 reports results of regressions on the same variables as that of table 4.7. The difference here is that of the measurement of the Lerner index. In table 4.8, the conventional version of Lerner index is used. It shows similar results in terms of sign and magnitude except for column 3 where deposit funding has a negative coefficient. These findings reiterated the earlier argument on the weaknesses of the conventional version of Lerner and also justify the use of other alternative Lerner specifications in measuring the degree of market power. Table 4.9 reports the interaction of the Lerner index and the funding strategies of banks. This is to enable the researcher to investigate whether Lerner index sensitivity of net-interest margin variation depends on the funding strategies of the banks. The results indicate that the sensitivity of net-interest margin to internally generated funds increases as bank market power increases. However, there is no evidence to suggest that interest margin increases for banks with market power and with deposits and non-deposit funding.

Having identified a differential response of banks' NIM to Lerner index and funding modes the next step is to identify whether there are regional differences in the determinants of bank net-interest margin. Here, banks are grouped into four regions in accordance with the World Bank Development Indicators: Africa, Asia, Central and Eastern European countries (CEEC) and Latin America. The regression results are reported in table 4.10. Credit risk impacts positively and statistically significantly on banks in Africa and CEEC signifying that banks in these countries add an extra premium to their loans due to perceived high risk. Implicit interest payment is

positive to all banks showing that banking institutions in emerging and developing countries with high implicit payment set higher margins. Operating capacity has no influence on the banks except Asian banks. Internal funding influences banks' margin positively, with the exception of Asian banks where the sign is negative. The negative sign suggest that Asian banks have a high cost of internal funds which minimises margin. In a whole, there is no significant variation on the determinants of NIM of the sample banks.

#### 4.4.3.4 Alternative measurement of bank's performance: Return on assets

After analysing the relationship between the banks' market power and the funding pattern of banks on one hand and the bank net-interest margin on the other, the next section considers how an alternative measure of bank performance, return on assets is affected by Lerner index and funding pattern. Table 4.11 reports regression results of return on assets. Bank equity to assets ratio is used as a measure of the degree of risk aversion and the result is positive and significant. Likewise banks that assume greater credit risk present higher returns, indicating that highly capitalised banks in developing countries take greater risk that enable them to charge an extra premium to cover operating costs. In this section, the natural logarithm of total assets is used as a proxy for banks size. This accounts for the depreciation cost element on fixed assets. The coefficient here is negative meaning that though larger banks charge high lending rate, incur high other operating cost and that reduces their profits. More implicit payments decrease return on assets. On the influence of macroeconomic factors on banks' return on asset, the study reveals that GDP per capita growth and inflation do not seem to impact on banks' profits. GDP per capita income only impacts profits when Lerner index and non-deposit funding are incorporated as explanatory variables. The non impact of macroeconomic variables on banks' profit is consistent with studies on developing countries. For instance Al-Haschimi (2007) find that macroeconomic environment has only limited effect on banks' margins and; Beck and Hesse (2009) and Chirwa and Mlachila (2004) find similar results for Uganda and Malawi respectively. Generally, in developing countries demand for bank loans declines during economic boom and rises when economic activities fall. Thus the poor link of GDP growth to bank profitability could be attributed to the borrowers' preference of trade credit to

bank loans. This finding is in support of (Coricelli and Roalnd 2008) result that shows that during the periods of increased economic activities, non-financial firms especially those in the emerging economies finance their activities with alternative (such as trade credit) sources to banking credit and vice versa. The introduction of the Lerner index in column 2 is to capture the influence of banks with market power on profits. The results are similar except the management quality variable that now has a positive and significant coefficient, suggesting that efficient managers enable banks to acquire market power which enhances their profit level. Deposit and non-deposit funding in column 3 and 4 respectively do not impact on profitability of banks. However, as expected, internally generated funds significantly influence bank profits.

#### 4.4.3.5 Market power, funding strategies and insolvency risk of banks

This section analyses how a bank's Z-score, an index of bank's insolvent risk, is related to Lerner index, a measure of degree of market power and the funding strategies of banks in emerging and developing countries. The results are presented in table 4.12 that are analogous to the net-interest margin reported in table 4.7 and 4.8 and rate of return on assets regression in table 4.11. Beginning with column 1, the regression results show that Z-score is positively and statistically significantly related to the Lerner index (conventional version of the measure of degree of market power). This finding suggests that an increase in a share of market power increases bank stability. Furthermore, bigger banks with higher capitalization level (equity/assets) and higher loan to assets ratio are estimated to be more stable, while banks operating in emerging and developing economies with higher GDP growth and inflation appear to be less stable. In column 2 the deposit funding enters the regression with a positive coefficient, though statistically insignificant. The next estimation is the column 3 that includes both the Lerner index and non-deposit funding, while the Lerner index is positive the non-deposit funding shares is negative. The negative coefficient of the non-deposit funding shares support the existing finding that banking strategy that depend predominantly attracting non-deposit funding are more risky (Demirguc-Kunt and Huizinga 2010). Finally, column 4 is estimated employing internal funding as a funding strategy of banks. The result is positive and statistically significant indicating that banks that finance their investment with internal generated funds reduces insolvent risk.

The Z-score regressions with funding-adjusted version of Lerner index reported in table 4.13 are very similar to those presented in table 4.12[22]. Specifically, in column 1 and 2, Lerner index continues to have positive and significant coefficients. Similarly, in column 3, the Lerner index and non-deposit funding continues to obtain positive and negative signs respectively, but now the coefficient of Lerner index is significant. To conclude this section, it is interesting to analyse the effect of the stance of monetary policy on bank risk. Though the coefficient is statistically insignificant, the positive sign for both column 1, 2 and 3 of table 4.12 and table 4.13 indicate that expansion of the stance of monetary policy will increase insolvency risk of banks in the developing economies.

#### 4.4.3.6 Determinants of bank performance: controlling for regulatory and supervisory environments

In order to provide precise inference on the relationship between market power, funding structure and bank performance, the regulatory and supervision environments in developing and emerging countries needs to considered thoroughly. There are two reasons for these considerations: first, banks operating in developing economies could drive some benefits resulting from institutional reforms such as liberalization index, adherent to regulatory capital requirement like capital stringency, and freely from governmental controls and influence like banking and financial freedom. Thus, over reliance and emphasizes of the effect of market power and the funding strategies if these reforms are not explicitly included in the model. Second, the effect of all institutional reforms can not possibly be isolated as there are expectations that they are deeply embedded in the fundamentals of banks operations. As a result, the only aspects of the regulatory and supervisory framework that may directly bias the findings are controlled in the estimation. Below are the three regulatory initiatives as well as the resulting effect that holding these variables constant may have on the relationship between market power, funding strategies and performance.

[22] The objective is to assess whether a different version of estimating Lerner index will affect bank risk differently.

#### 4.4.3.7 Banking and financial freedom

First of all, the Heritage Foundation index of banking and financial freedom ***"Banking freedom***" is incorporated into the model to assess the extent to which (if any) banking freedom index influence the relationship of interest. The index is a measure of banking security as well as a measure of independence from government control. The country specific annual banking freedom captures three issues: 1) the extent of state intervention in banks and other financial services; 2) the difficult of opening and operating a financial firm for both domestic and foreign individuals; and 3) government influence on the allocation credits (The Heritage Foundation 2010). The index ranges from 0 to 100 with the higher score indicates greater freedom to conduct banking operation. The result of the regression with the inclusion of "Banking freedom" as a control variable is presented in table 4.14. There is some level of evidence to suggest that higher banking freedom increases performance of banks in developing and emerging economies especially when internal generated funds are employed as source of funding. The results of the relationship of interest remain unchanged.

#### 4.4.3.8 Financial liberalization

Next is to investigate further some unresolved issues in the financial literature on whether financial liberalization has led to more financial development, more stable financial systems, and improved banking efficiency. To this end, additional control variable "***Financial reform***" is included to re-estimate the benchmark model to control for financial liberalization on performance. The index constructed by Abiad, Detragiache and Tressel (2010) recognises the multi-faceted nature of financial reform and records financial policy changes along seven different dimensions: 1-credit controls and reserve requirements; 2-interest rate controls; 3-entry barriers; 4-state ownership; 5-policies on securities markets; 6-prudential regulations and supervision of the banking sector and 7-restrictions on the capital account. The liberalization index measures financial reforms that have taken place during the period and it ranges from 0 to 21 with highest score indicating fully reformed. Table 4.15 reports the results including "financial reforms" as an additional control variable. The coefficient of financial reform is positive on NIM, positive on ROA and negative on Z-score. The negative association between Z-score and the financial reform is irrespective of source of finance though

significant with wholesale funding. These findings suggest that financial liberalization increases risk taking of banks in developing countries especially banks that finance their assets with wholesale funds.

#### 4.4.3.9 Risk of Expropriation

Furthermore, even though the legal protection on private property and the judicial efficiency in enforcing these laws affect bank performance in both developed and developing economies, studies show that they differs across countries and even within firms in the same countries. La Porta et al. (2002) find evidence suggesting that firms' value is higher in countries that have better protection of minority shareholders as well as firms with higher cash flow ownership. They use a sample of 539 large firms from 27 industrialised countries. Klapper and Love (2004) on their part employ firm-level data of 14 developing countries find that firm-level corporate governance provisions matter more in a country with weak legal environments and that investors positively value firm level protection in countries where state level protection is low. Doidge et al. (2007) study legal protection systems for both industrialised and non-industrialised countries. They find that country level characteristics of developed economies explains significant variations of governance rating than that of firm-specific variables, while in developing countries firm-specific characteristic have nothing to do with governance rating. They concluded that access to international capital markets provide incentive for better corporate governance. Given these findings, limiting expropriation risk could have independent positive impact on bank profitability as well as solvency risk of banks especially where it promotes less volatile capital flows, enhances stable ownership partners in banks and increases access to external capital. In this subsection, "property rights" is included as a measure of risk of expropriation. It measures the degree to which a country's laws protect private property rights and the degree to which it government enforces those laws. Its score ranges from 0 to 100 with the higher score indicate certainty of legal protection of property right and limited expropriation risks (The Heritage Foundation 2010). Though the coefficient of property rights is insignificant statistically, the positive sign suggest that performance of banks improve in a country where the government and the legal systems protect individual as well as corporate property rights. The result is presented in table 4.16.

## 4.5 Conclusion

The main contribution of this chapter is to provide empirical evidence on how bank market power and funding patterns perform in terms of producing profitable and stable banks in emerging and developing countries. In particular, using panel dataset of 978 banks in emerging and developing economies during 2000-2007 and employing systems generalised methods of moment estimator (system GMM) the study analyse how funding strategies of banks with market power affect their net-interest margin, return on their assets as well as their insolvency risk. As there is no consensus in the literature regarding how best to assess the degree of bank market power (Carbo et al., 2009), two different specifications of Lerner indices are constructed: conventional Lerner (Burger et al. 2009); and funding-adjusted Lerner (Maudos and De Guevara 2007) to first investigate competitive environment of the sample banks. The chapter provides the following key results:

First, on determinants of the *Lerner index*, the results reveal that larger, growing and highly capitalised banks have a greater degree of market power. This result is consistent with the argument that larger banks are efficient, well resourced and gain and operate economies of scale and scope; have the ability to produce at lower cost and that enables them to have high margin (Meon and Weill, 2005). Similarly, diversifying into non-interest income activities enhances bank market power. With funding strategy, smaller, highly capitalised and efficiently managed banks employ internally generated funds for their investment activities. Internal capital has been found to be increasing and that propels banks in these regions to increase their market power.

Second, with regard to the evaluation of net-interest margin, the study reveals that NIM among the explanatory variables is positively and statistically significant illustrating the importance of accounting for previous values of the dependent variable. Preceding year interest margin enables banks to charge higher premium with the assets being financed with internal capital. Operating size and cost to income ratio affect NIM negatively while credit risk and implicit payment have positive

relationship with the NIM. The study finds evidence that support the fact that the banking system structure explains bank NIM. The results suggest that net-interest margin among banks with market power is significantly more sensitive to internally generated funds than it is with deposits and wholesale funding.

Third, the result also shows that the high degree of market power does not only increase the net-interest margin and profitability level of banks in emerging and developing countries, it also reduces their insolvency risk. Relating bank funding structure to insolvency risk, the results suggest that banks that relay heavily on internal and deposit funding are safer than those that finance their assets with wholesale funds. The results thus share support to the existing findings that banking strategy that depend predominantly attracting non-deposit funding are more risky and less resilient to the crisis. (Demirguc-kent and Huizinga, (2010) and OECD (2010)). On the whole, the results suggest that performance of banks with market power is significantly more sensitive to internally generated funds than it is with either deposit or wholesale funding.

Fourth, regarding economic policy implications, the results allow us to conclude that policies should be targeted at reducing competition, promoting banking and property freedom, fully liberalizing financial systems and increasing the use of banks' internally generated funds in emerging and developing countries.

Finally, other interesting areas also remained open for further research on bank performance especially the high net-interest margins of banks in developing countries. In particular whether in the absence of well-functioning capital market, the high net-interest margin of banks in these countries is to enable banks to plough back profit into their capital for the purpose of maintaining stability.

**Table 4.1**
**Bank-specific variables: averages for the period 2000-2007**

Table 4.1 presents the mean values of countries' bank-specific variables. *Bank size* is the average total assets. *Bank equity* represents average capitalization of respective countries' banks and is used as a proxy for the degree of risk aversion, and *bank growth* is the growth rate of bank assets. The efficiency of management is proxied by *cost to income ratio* which is calculated as operating expenses as a percentage of gross income. *Non-interest income* measures the exposure of a bank to non-interest generating income. *Loan to assets* indicate portfolio mix and measures credit risk of the banks. The mean values of the selected banks for the respective countries over the period 2000-2007 are in percentage terms except for bank size which is in millions of US dollars.

| Countries | Bank size | Equity to asset | Bank growth | Cost to income | Non-interest income | Loan to assets |
|---|---|---|---|---|---|---|
| **Africa** | | | | | | |
| Benin | 252.328 | 0.093 | 0.100 | 0.686 | 0.180 | 0.558 |
| Burkina Faso | 206.334 | 0.088 | 0.138 | 0.636 | 0.161 | 0.603 |
| Cameroon | 475.416 | 0.075 | 0.148 | 0.388 | 0.295 | 0.511 |
| Cote d'Ivoire | 412.053 | 0.092 | 0.093 | 0.758 | 0.232 | 0.625 |
| Ghana | 154.979 | 0.119 | 0.383 | 0.489 | 0.152 | 0.404 |
| Nigeria | 1554.379 | 0.155 | 0.367 | 0.538 | 0.221 | 0.358 |
| Senegal | 344.841 | 0.095 | 0.150 | 0.661 | 0.165 | 0.566 |
| Kenya | 223.723 | 0.186 | 0.167 | 0.610 | 0.129 | 0.563 |
| Uganda | 133.983 | 0.139 | 0.229 | 0.489 | 0.042 | 0.426 |
| Tanzania | 186.985 | 0.132 | 0.258 | 0.761 | 0.143 | 0.385 |
| Ethiopia | 526.012 | 0.116 | 0.259 | 0.408 | 0.236 | 0.592 |
| Angola | 653.683 | 0.128 | 0.437 | 0.753 | 0.318 | 0.240 |
| Botswana | 409.556 | 0.193 | 0.214 | 0.315 | 0.131 | 0.549 |
| Malawi | 62.084 | 0.134 | 0.274 | 0.452 | 0.198 | 0.338 |
| Madagascar | 151.211 | 0.109 | 0.166 | 0.417 | 0.094 | 0.464 |
| Mauritius | 790.854 | 0.183 | 0.135 | 0.321 | 0.167 | 0.583 |
| Mozambique | 223.947 | 0.155 | 0.253 | 0.816 | 0.204 | 0.409 |
| Namibia | 520.161 | 0.311 | 0.177 | 0.369 | 0.122 | 0.732 |
| South Africa | 8104.817 | 0.178 | 0.159 | 0.453 | 0.211 | 0.657 |
| Swaziland | 137.906 | 0.144 | 0.128 | 0.500 | 0.167 | 0.705 |
| Zambia | 129.962 | 0.178 | 0.257 | 0.678 | 0.307 | 0.285 |
| Zimbabwe | 1358.358 | 0.163 | 0.202 | 0.326 | 0.109 | 0.404 |
| **Average** | **773.344** | **0.144** | **0.213** | **0.537** | **0.181** | **0.498** |
| **Asia-Pacific** | | | | | | |
| China | 114463.04 | 0.076 | 0.211 | 0.375 | 0.060 | 0.554 |
| Hong Kong | 36667.383 | 0.121 | 0.121 | 0.265 | 0.136 | 0.446 |
| India | 8742.696 | 0.083 | 0.187 | 0.278 | 0.147 | 0.535 |
| Philippines | 2021.798 | 0.155 | 0.123 | 0.470 | 0.171 | 0.486 |
| Singapore | 19101.744 | 0.231 | 0.096 | 0.238 | 0.169 | 0.479 |
| South Korea | 46427.541 | 0.061 | 0.126 | 0.407 | 0.145 | 0.632 |
| Thailand | 11658.637 | 0.114 | 0.093 | 0.480 | 0.095 | 0.709 |
| ***Average*** | ***34154.691*** | ***0.120*** | ***0.137*** | ***0.359*** | ***0.132*** | ***0.549*** |
| **CEEC** | | | | | | |
| Albania | 963.041 | 0.081 | 0.228 | 0.423 | 0.098 | 0.279 |
| Belarus | 574.866 | 0.202 | 0.371 | 0.490 | 0.282 | 0.578 |
| Bulgaria | 804.534 | 0.140 | 0.302 | 0.543 | 0.153 | 0.529 |
| Croatia | 2110.268 | 0.142 | 0.161 | 0.487 | 0.124 | 0.594 |
| Czech | 8249.652 | 0.080 | 0.146 | 0.361 | 0.191 | 0.422 |
| Estonia | 3226.118 | 0.188 | 0.317 | 0.500 | 0.201 | 0.533 |

| Countries | Bank size | Equity to asset | Bank growth | Cost to income | Non-interest income | Loan to assets |
|---|---|---|---|---|---|---|
| Hungary | 3851.065 | 0.125 | 0.138 | 0.405 | 0.182 | 0.557 |
| Latvia | 904.253 | 0.123 | 0.302 | 0.489 | 0.222 | 0.453 |
| Lithuania | 1649.149 | 0.106 | 0.338 | 0.546 | 0.224 | 0.559 |
| Poland | 2208.249 | 0.134 | 0.195 | 0.426 | 0.230 | 0.477 |
| Romania | 1700.239 | 0.168 | 0.337 | 0.513 | 0.038 | 0.455 |
| Russia | 952.305 | 0.163 | 0.358 | 0.495 | 0.178 | 0.564 |
| Slovak Rep | 2511.623 | 0.161 | 0.094 | 0.476 | 0.150 | 0.449 |
| Slovenia | 3082.484 | 0.095 | 0.195 | 0.420 | 0.172 | 0.592 |
| Ukraine | 829.735 | 0.135 | 0.494 | 0.445 | 0.187 | 0.701 |
| ***Average*** | ***2241.172*** | ***0.136*** | ***0.265*** | ***0.468*** | ***0.175*** | ***0.516*** |
| **Latin America** | | | | | | |
| Argentina | 971.715 | 0.274 | 0.190 | 0.573 | 0.389 | 0.413 |
| Bolivia | 398.414 | 0.193 | 0.031 | 0.633 | 0.200 | 0.613 |
| Brazil | 5375.506 | 0.213 | 0.205 | 0.391 | 0.119 | 0.410 |
| Chile | 5419.344 | 0.178 | 0.139 | 0.385 | 0.146 | 0.615 |
| Columbia | 2257.257 | 0.187 | 0.135 | 0.479 | 0.330 | 0.574 |
| Costa Rica | 529.267 | 0.187 | 0.231 | 0.427 | 0.091 | 0.625 |
| Mexico | 6831.983 | 0.152 | 0.152 | 0.328 | 0.137 | 0.593 |
| Panama | 967.406 | 0.109 | 0.138 | 0.359 | 0.109 | 0.566 |
| Paraguay | 212.786 | 0.125 | 0.202 | 0.322 | 0.334 | 0.453 |
| Uruguay | 758.913 | 0.158 | 0.025 | 0.335 | 0.287 | 0.357 |
| Venezuela | 1205.535 | 0.184 | 0.393 | 0.497 | 0.082 | 0.413 |
| ***Average*** | ***2266.193*** | ***0.178*** | ***0.167*** | ***0.430*** | ***0.202*** | ***0.512*** |

**Table 4.2**
**Average Funding Strategies of Banks in Developing Countries**

This table represents mean values of funding strategies of selected banks in developing countries. *Deposit* and *non-deposit funding* is the share of deposit and non-deposit funding to total assets respectively. The *internal funding* is the sum of net profit before extraordinary items and loan loss provisions relative bank loans at the end the period. The mean values of the selected banks for the respective countries over the period 2000-2007 are in percentage terms.

| Countries | Deposit funding | Non-deposit funding | Internal funding |
|---|---|---|---|
| **Africa** | | | |
| Benin | 0.86884 | 0.01354 | 0.03233 |
| Burkina Faso | 0.85697 | 0.01941 | 0.05586 |
| Cameroon | 0.84615 | 0.03182 | 0.05722 |
| Cote d'Ivoire | 0.83949 | 0.02165 | 0.01098 |
| Ghana | 0.62753 | 0.17770 | 0.13793 |
| Nigeria | 0.64593 | 0.08265 | 0.12057 |
| Senegal | 0.81873 | 0.02921 | 0.04821 |
| Kenya | 0.75231 | 0.04858 | 0.06097 |
| Uganda | 0.56869 | 0.63818 | 0.11620 |
| Tanzania | 0.48287 | 0.54047 | 0.09090 |
| Ethiopia | 0.73723 | 0.12096 | 0.06326 |
| Angola | 0.61822 | 0.17954 | 0.17040 |
| Botswana | 0.77534 | 0.12092 | 0.09241 |
| Malawi | 0.73915 | 0.34411 | 0.19007 |
| Madagascar | 0.80229 | 0.02876 | 0.10634 |
| Mauritius | 0.65452 | 0.21066 | 0.03114 |
| Mozambique | 0.73470 | 0.07066 | 0.05877 |
| Namibia | 0.49443 | 0.25371 | 0.08959 |
| South Africa | 0.58264 | 0.27218 | 0.07610 |
| Swaziland | 0.64848 | 0.19686 | 0.04333 |
| Zambia | 0.65399 | 0.15721 | 0.10878 |
| Zimbabwe | 0.30014 | 0.48968 | 0.27383 |
| ***Average*** | ***0.68403*** | ***0.18402*** | ***0.09251*** |
| **Asia- Pacific** | | | |
| China | 0.74501 | 0.15324 | 0.02421 |
| Hong Kong | 0.76129 | 0.12102 | 0.02122 |
| India | 0.74571 | 0.12778 | 0.03945 |
| Philippines | 0.64612 | 0.16790 | 0.04866 |
| Singapore | 0.58319 | 0.16963 | 0.03924 |
| South Korea | 0.53514 | 0.40351 | 0.02295 |
| Thailand | 0.75961 | 0.10411 | 0.02997 |
| ***Average*** | ***0.68229*** | ***0.17817*** | ***0.03224*** |
| **Eastern Europe** | | | |
| Albania | 0.89790 | 0.01466 | 0.08840 |
| Belarus | 0.69743 | 0.11945 | 0.07035 |
| Bulgaria | 0.75609 | 0.10971 | 0.04211 |
| Croatia | 0.71676 | 0.13119 | 0.02968 |
| Czech | 0.78832 | 0.14019 | 0.03577 |
| Estonia | 0.02325 | 0.08538 | 0.01001 |
| Hungary | 0.77324 | 0.07694 | 0.04768 |
| Latvia | 0.82329 | 0.06061 | 0.05599 |
| Lithuania | 0.83402 | 0.04621 | 0.02295 |
| Poland | 0.73683 | 0.10389 | 0.03582 |

| Countries | Deposit funding | Non-deposit funding | Internal funding |
|---|---|---|---|
| Russia | 0.60089 | 0.21107 | 0.06538 |
| Slovak Rep | 0.76638 | 0.05790 | 0.03191 |
| Slovenia | 0.72050 | 0.16013 | 0.03086 |
| Ukraine | 0.77750 | 0.07801 | 0.04284 |
| ***Average*** | ***0.71130*** | ***0.09893*** | ***0.04367*** |
| **Latin America** | | | |
| Argentina | 0.42761 | 0.28972 | 0.06828 |
| Bolivia | 0.76051 | 0.02478 | 0.04991 |
| Brazil | 0.35279 | 0.33089 | 0.11674 |
| Chile | 0.59111 | 0.17672 | 0.03742 |
| Columbia | 0.69186 | 0.09033 | 0.06603 |
| Costa Rica | 0.76198 | 0.03145 | 0.05023 |
| Mexico | 0.64996 | 0.11170 | 0.02640 |
| Panama | 0.78867 | 0.11367 | 0.07176 |
| Paraguay | 0.68217 | 0.16423 | 0.06095 |
| Uruguay | 0.76022 | 0.12192 | 0.04169 |
| Venezuela | 0.80008 | 0.03482 | 0.12718 |
| ***Average*** | ***0.66063*** | ***0.13547*** | ***0.06515*** |

**Table 4.3**

**Bank Market Power and Performance**

Table 4.3 presents respective countries' banks market power and performance variables. The degree of market power is proxied by the Lerner Index or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. Two varieties of Lerner index are reported: a conventional Lerner and a funding-adjusted Lerner. Three performance measurement variables are used; *Bank net interest margin* (NIM) which is defined as the ratio of net interest income to total earning assets; *Return on Assets* (ROA) which is defined as profit before tax as a percentage of total assets and *Z-score* is defined as $Z = (ROA + E/TA)/\sigma(ROA)$, where $ROA$ is the rate of return on assets, $E/TA$ is the total equity to total assets ratio, and $\sigma ROA$ is an estimate of the standard deviation of return on assets. It measures the number of standard deviations that a bank's profit must fall to drive it into insolvency.

| | **Bank market power** | | **Performance variables** | | |
|---|---|---|---|---|---|
| | Conventional Lerner | Funding adjusted Lerner | Net-interest margin | Return on assets | Z-score |
| ***Africa*** | | | | | |
| Benin | 0.1343 | 0.4768 | 0.0491 | 0.0075 | 10.084 |
| Burkina Faso | 0.0363 | 0.4454 | 0.0580 | 0.0159 | 12.661 |
| Cameroon | 0.5462 | 0.7021 | 0.0409 | 0.0208 | 14.988 |
| Cote d'Ivoire | 0.3712 | 0.2493 | 0.0474 | 0.0058 | 8.343 |
| Ghana | 0.2717 | 0.6836 | 0.0910 | 0.0368 | 11.756 |
| Nigeria | 0.3181 | 0.5334 | 0.0738 | 0.0316 | 14.802 |
| Senegal | 0.3365 | 0.6244 | 0.0517 | 0.0179 | 22.375 |
| Kenya | 0.2584 | 0.5634 | 0.0706 | 0.0208 | 22.143 |
| Uganda | 0.3663 | 0.5496 | 0.1078 | 0.0369 | 11.843 |
| Tanzania | 0.3813 | 0.4934 | 0.0650 | 0.0122 | 13.708 |
| Ethiopia | 0.4244 | 0.5955 | 0.0340 | 0.0273 | 12.369 |
| Angola | 0.1765 | 0.5991 | 0.0538 | 0.0107 | 7.208 |
| Botswana | 0.2214 | 0.7198 | 0.0694 | 0.0444 | 15.830 |
| Malawi | 0.3124 | 0.6140 | 0.1097 | 0.0441 | 9.584 |
| Madagascar | 0.2769 | 0.7790 | 0.0868 | 0.0388 | 9.241 |
| Mauritius | 0.2155 | 0.8098 | 0.0237 | 0.0131 | 27.799 |
| Mozambique | 0.1352 | 0.4202 | 0.0769 | 0.0217 | 12.673 |
| Namibia | 0.3928 | 0.8058 | 0.0683 | 0.0409 | 18.415 |
| South Africa | -0.0133 | 0.5938 | 0.0811 | 0.0386 | 15.132 |
| Swaziland | 0.2108 | 0.4442 | 0.0648 | 0.0296 | 29.294 |
| Zambia | 0.3428 | 0.4460 | 0.0670 | 0.0200 | 8.291 |
| Zimbabwe | 0.2689 | 0.7202 | 0.3441 | 0.0832 | 3.216 |
| **Sub-average** | **0.2720** | **0.5850** | **0.0789** | **0.0281** | **14.171** |
| ***Asia-Pacific*** | | | | | |
| China | 0.1944 | 0.7011 | 0.0228 | 0.0091 | 27.063 |
| Hong Kong | -0.0492 | 0.6772 | 0.0181 | 0.0123 | 66.721 |
| India | 0.2812 | 0.7145 | 0.0388 | 0.0144 | 22.239 |
| Philippines | 0.1431 | 0.6041 | 0.0400 | 0.0123 | 32.610 |
| Singapore | 0.3509 | 0.7995 | 0.0180 | 0.0168 | 32.545 |
| South Korea | 0.3593 | 0.6533 | 0.0280 | 0.0092 | 13.698 |
| Thailand | 0.0726 | 0.6290 | 0.0318 | 0.0083 | 17.238 |
| **Sub-average** | **0.1932** | **0.6827** | **0.0282** | **0.0118** | **30.302** |

| | | | | | |
|---|---|---|---|---|---|
| ***Eastern Europe*** | | | | | |
| Albania | 0.0650 | 0.6039 | 0.0267 | 0.0091 | 15.274 |
| Belarus | 0.2049 | 0.5792 | 0.0708 | 0.0234 | 19.150 |
| Bulgaria | 0.3143 | 0.4825 | 0.0454 | 0.0167 | 25.476 |
| Croatia | 0.3580 | 0.6234 | 0.0403 | 0.0127 | 37.168 |
| Czech | 0.1923 | 0.6491 | 0.0218 | 0.0122 | 23.780 |
| Estonia | 0.2275 | 0.4670 | 0.0307 | 0.0142 | 17.272 |
| Hungary | 0.0828 | 0.5845 | 0.0446 | 0.0168 | 24.562 |
| Latvia | 0.2824 | 0.6156 | 0.0309 | 0.0139 | 25.116 |
| Lithuania | 0.0948 | 0.4640 | 0.0293 | 0.0075 | 25.399 |
| Poland | -0.0487 | 0.6592 | 0.0355 | 0.0098 | 21.645 |
| Romania | 0.0505 | 0.4895 | 0.0693 | 0.0078 | 14.284 |
| Russia | 0.2601 | 0.7138 | 0.0626 | 0.0211 | 19.667 |
| Slovak Rep | 0.3040 | 0.6941 | 0.0331 | 0.0120 | 23.345 |
| Slovenia | 0.3482 | 0.6298 | 0.0285 | 0.0127 | 26.432 |
| Ukraine | 0.1964 | 0.6420 | 0.0606 | 0.0179 | 16.914 |
| **Sub-average** | **0.1955** | **0.5932** | **0.0420** | **0.0138** | **22.366** |
| | | | | | |
| ***Latin America*** | | | | | |
| Argentina | 0.3239 | 0.5998 | 0.0437 | -0.0060 | 6.321 |
| Bolivia | 0.1225 | 0.4473 | 0.0506 | 0.0000 | 12.317 |
| Brazil | 0.4493 | 0.7482 | 0.1197 | 0.0415 | 11.663 |
| Chile | 0.1551 | 0.6562 | 0.0427 | 0.0196 | 31.522 |
| Columbia | 0.3482 | 0.6079 | 0.0379 | 0.0273 | 15.563 |
| Costa Rica | 0.2541 | 0.7210 | 0.0697 | 0.0234 | 36.127 |
| Mexico | 0.2363 | 0.7876 | 0.0421 | 0.0080 | 13.505 |
| Panama | 0.4116 | 0.7427 | 0.0350 | 0.0157 | 26.237 |
| Paraguay | -0.1282 | 0.7174 | 0.0929 | 0.0185 | 16.241 |
| Uruguay | -0.1282 | 0.7344 | 0.0462 | -0.0125 | 8.922 |
| Venezuela | 0.2631 | 0.5563 | 0.1229 | 0.0346 | 14.633 |
| **Sub-average** | **0.2098** | **0.6653** | **0.0640** | **0.0155** | **17.550** |

**Table 4.4**
**Pair-wise correlation coefficient between selected variables**

Pair wise correlation coefficient estimated on sample of 978 banks across 55 countries. * implies significant at 5% or more. **Net-interest margin** is different between interest income and interest cost in relation to total earning assets. **ROA** is the return on assets. **Z-score** is defined as $Z = (ROA + E/TA)/\sigma(ROA)$, where $ROA$ is the rate of return on assets, $E/TA$ is the total equity to total assets ratio, and $\sigma(ROA)$ $\sigma ROA$ is an estimate of the standard deviation of return on assets. It measures the number of standard deviations that a bank's profit must fall to drive it into insolvency the ratio of banks' capital to total assets is used as a proxy to measure the degree of **risk aversion.** Banks' loan to total assets ratio is used as a measure of **credit risk. Size** is natural log of total assets. **Cost to gross income** ratio is used as a proxy for efficiency**.** The degree of market power is proxied by the **Lerner Index** with the higher scores indicating a higher degree of pricing power. **Internal funding** is the funds generated internally and measured as the sum of net profit before extraordinary items and loan loss provisions relative to bank loans at the end of the period. **Deposit funding** is deposit sources of funding while **non-deposit fund** is calculated as all other debts (except deposits) divided by total assets. Short-term interest rate is included to capture the stance of **monetary policy**. The **GDP per capita growth** accounts for the differences in economic developments across countries. Inflation is the rate of inflation based on the CPI. **Lerner *deposit fund, Lerner*non-deposit fundin***g* and **Lerner*internal funding** measure interaction between the Lerner and deposit funding, non-non-deposit funding and internal funding respectively.

| | NIM | ROA | Z-score | Risk aversion | Credit risk | Size | Cost to income | Conventional Lerner index | Funding adjusted Lerner index |
|---|---|---|---|---|---|---|---|---|---|
| NIM | 1.0000 | | | | | | | | |
| ROA | 0.3096* | 1.0000 | | | | | | | |
| Z-score | -0.0819* | 0.1625* | 1.0000 | | | | | | |
| Risk aversion | 0.1768* | 0.0642* | 0.0986* | 1.0000 | | | | | |
| Credit risk | 0.0085 | -0.0297* | 0.1363* | -0.1247* | 1.0000 | | | | |
| Size | -0.2235* | 0.0173 | 0.1863* | -0.4269* | 0.1754* | 1.0000 | | | |
| Cost to income | 0.0637* | -0.2756* | -0.2000* | 0.1034* | -0.0431* | -0.2565* | 1.0000 | | |
| Conventional Lerner index | 0.1012* | 0.4739* | 0.1071* | 0.0489* | -0.0367* | 0.0537* | -0.3377* | 1.0000 | |
| Funding adjusted Lerner index | -0.0221 | 0.2806* | 0.1649* | -0.1171* | 0.0999* | 0.2614* | -0.7461* | 0.3863* | 1.0000 |
| Internal funding | 0.3079* | 0.6320* | 0.0260* | 0.1373* | -0.2812* | -0.1057* | -0.1449* | 0.3334* | 0.2548* |
| Deposit funding | -0.1413* | -0.0808* | 0.0486* | -0.5491* | 0.1104* | 0.1557* | 0.0005 | -0.1055* | -0.0388* |
| Non-deposit funding | 0.1000* | 0.0357* | -0.1349* | 0.0372* | -0.0311* | -0.0811* | -0.0626* | 0.0786* | 0.0916* |
| Lerner*deposit funding | 0.0601* | 0.3833* | 0.1460* | -0.1001* | 0.014 | 0.0866* | -0.2699* | 0.8840* | 0.2651* |
| Lerner*non-deposit funding | 0.1144* | 0.2760* | -0.0623* | 0.0824* | -0.0684* | -0.0421* | -0.1686* | 0.6799* | 0.2373* |
| Lerner*IGF | 0.1959* | 0.3245* | -0.014 | 0.1878* | -0.2310* | -0.1016* | -0.1085* | 0.3312* | 0.0932* |
| Inflation | 0.3951* | 0.0767* | -0.2007* | 0.1372* | -0.1885* | -0.3022* | 0.0681* | 0.0037 | -0.0284* |
| GDP per capital | -0.1503* | -0.0277* | 0.0122 | -0.0065 | 0.0054 | 0.1341* | -0.0232 | 0.0456* | -0.0300* |
| Monetary policy | 0.4552* | 0.0636* | -0.1621* | 0.1109* | -0.1986* | -0.3001* | 0.0111 | -0.0311* | 0.0761* |

**Pair Pair-wise correlation coefficient between selected variables (cont.)**

| | Internal funding | Deposit funding | Non-deposit funding | Lerner * deposit funding | Lerner*non-deposit funding | Lerner*Internal funding | Inflation | GDP per capita | Monetary policy |
|---|---|---|---|---|---|---|---|---|---|
| Internal funding | 1.0000 | | | | | | | | |
| Deposit funding | -0.1266* | 1.0000 | | | | | | | |
| Non-deposit funding | 0.0801* | -0.7902* | 1.0000 | | | | | | |
| Lerner*deposit funding | 0.2554* | 0.1988* | -0.1898* | 1.0000 | | | | | |
| Lerner*non-deposit funding | 0.2380* | -0.4438* | 0.5491* | 0.3800* | 1.0000 | | | | |
| Lerner*IGF | 0.4779* | -0.1268* | 0.0845* | 0.2391* | 0.2949* | 1.0000 | | | |
| Inflation | 0.1906* | -0.1530* | 0.0886* | -0.0292* | 0.0521* | 0.1693* | 1.0000 | | |
| GDP per capital | -0.0512* | 0.0233 | -0.0285 | 0.0400* | 0.0238 | 0.0077 | -0.0318* | 1.0000 | |
| Monetary policy | 0.2043* | -0.1169* | 0.0813* | -0.0746* | 0.0468* | 0.1773* | 0.6696* | -0.2179* | 1.0000 |

**Source: Bankscope, World Development Indicators and the author's own calculation**

**Table 4.5**

**What factors influence bank market power in emerging economies?**

The dependent variable in columns 1 and 2 is the conventional version of Lerner index, and the dependent variable in columns 3 and 4 is the funding-adjusted version. The degree of market power is proxied by the *Lerner Index* or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *Bank size* is proxied by the natural logarithm of total assets valued in US dollars. *Banks' equity* is the bank total equity to asset ratio, measured as equity as a percentage of total assets. *Assets growth* is the growth rate of bank assets. *Management quality* measures efficiency and the ability of management to generate more quality assets. It is measured as earning assets as a percentage to total assets with a higher percentage points indicating a higher efficiency. *Non-interest income* measured the exposure of a bank to non-interest generating income. *Banking freedom* is from the Economic Freedom Indicators of Heritage Founding. It is scaled from 0 to 100 with higher values indicating greater freedom. *Inflation* is the rate of inflation based on the CPI. *GDP growth* measures business cycle fluctuation while per capita GDP accounts for the differences in economic developments across countries. Short-term interest rates are included to capture the stance of *monetary policy*. All regressions are estimated using country and time fixed effects and clustering at the bank level. Robust standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1%, 5% and 10% level respectively.

| | Conventional Lerner index | | Funding adjusted Lerner index | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Bank size | 0.0641*** | 0.0638*** | 0.0891*** | 0.0890*** |
| | (0.0156) | (0.0156) | (0.0064) | (0.0064) |
| Equity | 0.4555*** | 0.4648*** | -0.0787** | -0.0701* |
| | (0.0958) | (0.0959) | (0.0393) | (0.0393) |
| Bank growth | 0.0658*** | 0.0665*** | 0.0001 | 0.0007 |
| | (0.0218) | (0.0218) | (0.0089) | (0.0089) |
| Management quality | 0.1888** | 0.2042** | 0.0823** | 0.0952*** |
| | (0.0795) | (0.0799) | (0.0329) | (0.0330) |
| Non-interest income | 0.2055*** | 0.2053*** | 0.0741*** | 0.0741*** |
| | (0.0443) | (0.0443) | (0.0181) | (0.0181) |
| Banking freedom | | 0.0528* | | 0.0419*** |
| | | (0.0289) | | (0.0118) |
| Inflation | -0.0132 | -0.0128 | 0.0028 | 0.0032 |
| | (0.0084) | (0.0084) | (0.0034) | (0.0034) |
| GDP growth | -0.0499* | -0.0459* | 0.0013 | 0.0047 |
| | (0.0276) | (0.0276) | (0.0112) | (0.0112) |
| GDP per capita | 0.0311** | 0.0307* | -0.0021 | -0.0024 |
| | (0.0161) | (0.0161) | (0.0065) | (0.0065) |
| Monetary policy | 0.0730*** | 0.0734*** | 0.0692*** | 0.0694*** |
| | (0.0143) | (0.0143) | (0.0059) | (0.0059) |
| Constant | -0.7075*** | -0.9336*** | -0.1430** | -0.3242*** |
| | (0.1534) | (0.1970) | (0.0632) | (0.0811) |
| Observation | 4556 | 4556 | 4512 | 4512 |
| Country fixed effects | Y | Y | Y | Y |
| Time fixed effects | Y | Y | Y | Y |
| Clustering level | Bank | Bank | Bank | Bank |

**Table 4.6**
**What account for the variation of bank funding structure in emerging economies?**

The dependent variable is funding structure of bank in the selected sample with columns 1 and 2 taking deposit funding; column 3 and 4 for non-deposit funding; and internal funding taking column 5 and 6. *Deposit and non-deposit funding* is the share of deposit and non-deposit funding to total assets respectively. The *internal funding* is the sum of net profit before extraordinary items and loan loss provisions relative bank loans at the end the period. *Bank size* is proxied by the natural logarithm of total assets valued in US dollars. *Bank equity* is the bank's total equity to asset ratio, measured as equity as a percentage of total assets. *Management quality* measures efficiency of the ability of management to generate more earning assets. It is measured as earning assets as a percentage to total assets with a higher percentage indicating higher efficiency. *Non-interest income* measures the exposure of a bank to non-interest generating income. The degree of market power is proxied by the *Lerner Index* or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *Liberalization* is the financial reforms index constructed by Abiad et al. (2010). *Inflation* is the rate of inflation based on the CPI. *GDP growth* measures business cycle fluctuation while per capita GDP accounts for the differences in economic developments across countries. Short-term interest rate is included to capture the stance of *monetary policy*. All regressions are estimated using country and time fixed effects and clustering at bank level. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1% 5% and 10% level respectively.

| | Deposit funding | | Non-deposits funding | | Internal funding | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Bank size | -0.0109** | -0.014*** | 0.0220*** | 0.0229*** | -0.00003 | -0.015*** |
| | (0.0046) | (0.0047) | (0.0059) | (0.0060) | (0.0039) | (0.0040) |
| Equity | -0.729*** | -0.744*** | -0.418*** | -0.412*** | 0.1487*** | 0.2174*** |
| | (0.0310) | (0.0306) | (0.0400) | (0.0393) | (0.0260) | (0.0254) |
| Bank growth | -0.0140** | -0.0119* | 0.0084 | 0.0080 | 0.0056 | 0.0137** |
| | (0.0066) | (0.0066) | (0.0083) | (0.0082) | (0.0055) | (0.0054) |
| Management quality | 0.0413* | 0.0383 | 0.0596** | 0.0553* | 0.1290*** | 0.1303*** |
| | (0.0247) | (0.0247) | (0.0326) | (0.0322) | (0.0210) | (0.0207) |
| Non-interest income | -0.0264* | -0.029** | 0.0003 | 0.0058 | 0.0346*** | 0.0406*** |
| | (0.0139) | (0.0137) | (0.0165) | (0.0161) | (0.0117) | (0.0114) |
| Conventional Lerner | 0.0122** | | -0.0038 | | 0.0693*** | |
| | (0.0054) | | (0.0066) | | (0.0046) | |
| Funding-adjusted Lerner | | 0.0130 | | -0.0084 | | 0.2252*** |
| | | (0.0125) | | (0.0165) | | (0.0104) |
| Liberalization | 0.1466*** | 0.1422*** | -0.1031** | -0.1000** | -0.088*** | -0.092*** |
| | (0.0391) | (0.0390) | (0.0493) | (0.0488) | (0.0330) | (0.0325) |
| Inflation | -0.0014 | -0.0017 | 0.0005 | 0.0006 | -0.0005 | -0.0024 |
| | (0.0026) | (0.0026) | (0.0036) | (0.0036) | (0.0022) | (0.0021) |
| GDP growth | -0.01067 | -0.0107 | 0.0046 | 0.0046 | 0.0066 | 0.0069 |
| | (0.0082) | (0.0082) | (0.0112) | (0.0110) | (0.0069) | (0.0068) |
| GDP per capita | 0.0093* | 0.0094* | -0.0093 | -0.0090 | -0.0029 | -0.0028 |
| | (0.0051) | (0.0051) | (0.0072) | (0.0072) | (0.0043) | (0.0042) |
| Monetary policy | 0.0026 | 0.0018 | -0.0066 | -0.0065 | 0.0033 | -0.0078** |
| | (0.0046) | (0.0046) | (0.0063) | (0.0063) | 90.00380 | (0.0038) |
| Observation | 3754 | 3736 | 3102 | 3079 | 3759 | 3739 |
| Country fixed effects | Y | Y | Y | Y | Y | Y |
| Time fixed effects | Y | Y | Y | Y | Y | Y |
| Clustering level | Bank | Bank | Bank | Bank | Bank | Bank |

**Table 4.7**
**Evaluation of bank net-interest margin using funding-adjusted version of Lerner index**

The dependent variable is *NIM* which is defined as the ratio of net interest income to total earning assets. The ratio of banks' capital to total assets is used as a proxy to measure the degree of *risk aversion*. Banks' loan to total assets ratio is used as a measure of *credit risk*. The volume of loans granted is proxied as the *operating size* of the bank. *Implicit payment* is total operating expenses net of non-interest revenue expressed as a percentage of total assets. C*ost to income ratio* is used as a measure of operating efficiency. The degree of market power is proxied by the funding-adjusted *Lerner Index*. *Deposit fund* is a ratio of total deposit to assets and *non-deposit fund* is the share of non-deposit funding to total assets. *Internal funds* is internally generated funds. It is measured as the sum of net profits before extraordinary items and loan loss provisions relative to bank loans at the end the period. *Inflation* is the rate of inflation based on the CPI. *P*er *capita GDP* accounts for the differences in economic development across countries. Short-term interest rate is included to capture the stance of *monetary policy*. All regressions are estimated using dynamic panel-data estimation, Two-step System GMM, Windmeijer-correct standard error, small-sample adjustments, and orthogonal deviation. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1%, 5% and 10% level respectively. The following diagnostic tests are also reported: (1) Observation (2) The instruments count, (3) The Hansen test for over identification restriction which the null hypothesis is that instruments are exogenous (4) The Arellano-Bond tests for first and second order serial correlation in the residuals which the null hypothesis is that there is no serial correlation. (5) The F-test for joint significance of instruments.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| $NIM_{-1}$ | 0.3946*** | 0.4514*** | 0.4623*** | 0.4538*** | 0.3648*** |
| | (0.0873) | (0.0652) | (0.0626) | (0.0663) | (0.0589) |
| Risk aversion | 0.0590 | 0.0452** | 0.0403 | 0.0103 | 0.0218 |
| | (0.0525) | (0.0226) | (0.0282) | (0.0221) | (0.0183) |
| Credit risk | 0.0694*** | 0.0497*** | 0.0426*** | 0.0299*** | 0.0525*** |
| | (0.0152) | (0.0102) | (0.0118) | (0.0104) | (0.0096) |
| Operating size | -0.0093*** | -0.005*** | -0.005*** | -0.004*** | -0.0024* |
| | (0.0029) | (0.0018) | (0.0017) | (0.0015) | (0.0013) |
| Implicit payment | 0.4301*** | 0.4293*** | 0.4102*** | 0.3882*** | 0.4788*** |
| | (0.1208) | (0.0978) | (0.1286) | (0.1210) | (0.1105) |
| Cost to income | -0.0473*** | -0.0115 | -0.0031 | 0.0068 | -0.0133 |
| | (0.0150) | (0.0208) | (0.0168) | (0.0148) | (0.0111) |
| Funding-adjusted Lerner | | 0.0397* | 0.0452* | 0.0417* | 0.0077 |
| | | (0.0236) | (0.0239) | (0.0221) | (0.0142) |
| Deposit fund | | | 0.0259* | | |
| | | | (0.0147) | | |
| Non-deposit fund | | | | -0.0256* | |
| | | | | (0.0147) | |
| Internal funds | | | | | 0.0763*** |
| | | | | | (0.0284) |
| Inflation | -0.0077*** | -0.006*** | -0.005*** | -0.006*** | -0.0036** |
| | (0.0028) | (0.0019) | (0.0018) | (0.0019) | (0.0015) |
| GDP per capita | -0.0092*** | -0.007*** | -0.0055* | -0.0042* | -0.0047** |
| | (0.0030) | (0.0029) | (0.0031) | (0.0025) | (0.0022) |
| Monetary policy | 0.0102*** | 0.0136*** | 0.0120*** | 0.0137*** | 0.0141*** |
| | (0.0034) | (0.0033) | (0.0036) | (0.0036) | (0.0029) |
| **Diagnostics tests** | | | | | |
| Number of observations | 4297 | 4658 | 4521 | 3699 | 4547 |
| Number of instruments | 89 | 143 | 137 | 137 | 164 |
| Hansen | 64.91 | 130.63 | 112.33 | 115.49 | 134.44 |
| P-value | (0.739) | (0.371) | (0.654) | (0.574) | (0.744) |
| AB2 | -0.79 | -0.66 | -0.58 | -0.84 | 0.42 |
| P-value | (0.431) | (0.509) | (0.565) | (0.404) | (0.678) |
| F-test | 28.24*** | 32.92*** | 25.09*** | 20.80*** | 50.92*** |

**Table 4.8**
**Evaluation of bank net-interest margin using conventional version of Lerner index**

The dependent variable is *NIM* which is defined as the ratio of net-interest income to total earning assets. The ratio of banks' capital to total assets is used as a proxy to measure the degree of *risk aversion*. Banks' loan to total assets ratio is used as a measure of *credit risk*. The volume of loans granted is proxied as the *operating size* of the bank. *Implicit payment* is total operating expenses net of non-interest revenue expressed as a percentage of total assets. C*ost to income* is used as a measure of operating efficiency. The degree of market power is proxied by the conventional *Lerner Index* with the higher scores indicating a higher degree of pricing power. *Deposit fund* is ratio of total deposit to assets and *non-deposit fund* is the share of non-deposit funding to total assets. *Internal fund* is measured as the sum of net profit before extraordinary items and loan loss provisions relative bank loans at the end the period. *Inflation* is the rate of inflation based on the CPI. The natural logarithm of per *capita GDP* accounts for the differences in economic developments across countries. Short-term interest rate is included to capture the stance of *monetary policy*. All regressions are estimated using dynamic panel-data estimation, Two-step System GMM, Windmeijer-correct standard error, small-sample adjustments, and orthogonal deviation. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1%, 5% and 10% level respectively. The following diagnostic tests are reported: (1) Observations (2) The instruments count, (3) The Hansen test for over identification restriction which the null hypothesis is that instruments are exogenous (4) The Arellano-Bond tests for first and second order serial correlation in the residuals which the null hypothesis is that there is no serial correlation. (5) The F-test for joint significance of instruments.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| $NIM_{-1}$ | 0.3946*** | 0.4261*** | 0.3510*** | 0.4597*** | 0.3846*** |
| | (0.0873) | (0.0779) | (0.0663) | (0.0694) | (0.0751) |
| Risk aversion | 0.0590 | 0.0305 | -0.0095 | 0.0364 | 0.0058 |
| | (0.0525) | (0.0240) | (0.0217) | (0.0246) | (0.0176) |
| Credit risk | 0.0694*** | 0.0452*** | 0.0421*** | 0.0385*** | 0.0375*** |
| | (0.0152) | (0.0110) | (0.0088) | (0.0107) | (0.0090) |
| Operating size | -0.009*** | -0.0038** | -0.0040*** | -0.0041** | -0.0012 |
| | (0.0029) | (0.0017) | (0.0015) | (0.0018) | (0.0013) |
| Implicit payment | 0.4301*** | 0.4459*** | 0.4021*** | 0.3433** | 0.4603*** |
| | (0.1208) | (0.1379) | (0.1269) | (0.1355) | (0.1061) |
| Cost to income | -0.047*** | -0.022** | -0.0211** | -0.0208* | -0.0057 |
| | (0.0150) | (0.0116) | (0.0102) | (0.0126) | (0.0073) |
| Conventional Lerner index | | 0.0359*** | 0.0246** | 0.0209* | 0.0142* |
| | | (0.0123) | (0.0113) | (0.0112) | (0.0084) |
| Deposit fund | | | -0.0230* | | |
| | | | (0.0131) | | |
| Non-deposit fund | | | | 0.0052 | |
| | | | | (0.0099) | |
| Internal funds | | | | | 0.0639** |
| | | | | | (0.0295) |
| Inflation | -0.007*** | -0.0034 | -0.0024 | -0.0033 | -0.0006 |
| | (0.0028) | (0.0023) | (0.0020) | (0.0026) | (0.0020) |
| GDP per capita | -0.009*** | -0.009*** | -0.0080*** | -0.0011 | -0.0033 |
| | (0.0030) | (0.0031) | (0.0028) | (0.0023) | (0.0024) |
| Monetary policy | 0.0102*** | 0.0157*** | 0.0173*** | 0.0191*** | 0.0153*** |
| | (0.0034) | (0.0040) | (0.0028) | (0.0040) | (0.0025) |
| **Diagnostics tests** | | | | | |
| Number of observations | 4297 | 4256 | 4544 | 3403 | 4558 |
| Number of instruments | 89 | 144 | 164 | 165 | 164 |
| Hansen | 64.91 | 146.04 | 147.38 | 158.97 | 165.86 |
| P-value | (0.739) | (0.119) | (0.452) | (0.236) | (0.125) |
| AB2 | -0.79 | -0.43 | -0.45 | -0.50 | 1.47 |
| P-value | (0.431) | (0.670) | (0.650) | (0.614) | (0.141) |
| F-test | 28.24*** | 42.43** | 32.54 | 35.75*** | 46.90*** |

**Table 4.9**

**The sensitivity of NIM to market power and bank funding strategies**

The dependent variable is NIM. The ratio of bank equity to total assets is used as a proxy to measure the degree of *risk aversion*. Bank loans to total assets ratio measures of *credit risk*. The volume of loans granted is proxied as the *operating size* of the bank. *Implicit payment* is total operating expenses net of non-interest revenue expressed as a percentage of total assets. Ratio of *cost to income* is used as a measure of operating efficiency. The degree of market power is proxied by the *Lerner Index*. *Deposit fund* is ratio of total deposit to assets and *non-deposit fund* is the share of non-deposit funding to total assets respectively. *Internal fund* is the internally generated capital. *Inflation* is the rate of inflation based on the CPI. The natural logarithm of per *capita GDP* accounts for the differences in economic development. Short-term interest rate is included to capture the stance of *monetary policy*. We estimate all regressions using dynamic panel-data estimation. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1%, 5% and 10% level respectively.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| NIM | 0.4634*** | 0.5093*** | 0.3887*** | 0.4181*** |
| | (0.0632) | (0.0642) | (0.0741) | (0.0938) |
| Risk aversion | -0.0206 | -0.0018 | -0.0272 | -0.0422 |
| | (0.0269) | (0.0313) | (0.0250) | (0.0310) |
| Credit risk | 0.0326*** | 0.0234** | 0.0403*** | 0.0317*** |
| | (0.0064) | (0.0119) | (0.0086) | (0.0089) |
| Operating size | -0.0040** | -0.0030 | -0.0020 | -0.0006 |
| | (0.0016) | (0.0022) | (0.0014) | (0.0012) |
| Implicit payment | 0.4234*** | 0.4639*** | 0.5237*** | 0.6462*** |
| | (0.1462) | (0.1602) | (0.1184) | (0.1568) |
| Cost to income | -0.0219* | -0.0005 | 0.0018 | -0.0158*** |
| | (0.0131) | (0.0102) | (0.0067) | (0.0059) |
| Conventional Lerner | 0.0037 | 0.0241** | 0.0065 | -0.1104* |
| | (0.0230) | (0.0110) | (0.0099) | (0.0603) |
| Deposit funding | -0.0378* | | | -0.0572** |
| | (0.0210) | | | (0.0258) |
| Lerner X deposit fund | 0.0431 | | | 0.1205* |
| | (0.0307) | | | (0.0709) |
| Non-deposit funding | | -0.0203 | | -0.0586** |
| | | (0.0194) | | (0.0269) |
| Lerner X non-deposit funding | | 0.0459 | | 0.1389* |
| | | (0.0505) | | (0.0763) |
| Internal funds | | | 0.1245*** | 0.1381*** |
| | | | (0.0348) | (0.0415) |
| Lerner X Internal funding | | | 0.0501* | 0.0892*** |
| | | | (0.0270) | (0.0298) |
| inflation | -0.0028 | -0.0062** | -0.0002 | -0.0012 |
| | (0.0023) | (0.0022) | (0.0019) | (0.0020) |
| GDP per capita | -0.0078*** | -0.0045** | -0.00432** | -0.0007 |
| | (0.0025) | (0.0020) | (0.0021) | (0.0020) |
| Monetary policy | 0.0146*** | 0.0177*** | 0.0107*** | 0.0101*** |
| | (0.0031) | (0.0039) | (0.0030) | (0.0033) |
| Diagnostics tests | | | | |
| Number of Observations | 4126 | 3425 | 4013 | 2994 |
| Number of instruments | 186 | 186 | 186 | 280 |
| Hansen | 195 | 194 | 190.34 | 276.41 |
| P-value | 0.064 | 0.075 | 0.104 | 0.194 |
| AB2 | -0.19 | -0.28 | 2.03 | 1.98 |
| P-value | 0.846 | 0.778 | 0.042 | 0.048 |
| F-test | 46.03*** | 57.23*** | 95.34*** | 83.72** |

**Table 4.10**
**Evaluation of banks' NIM: Regional Analysis**

The dependent variable is banks' *NIM* which is defined as the ratio of net interest income to total earning assets. The ratio of bank capital to total assets is used as a proxy to measure the degree of *risk aversion*. Bank loan to total assets ratio is used as a measure of *credit risk*. The volume of loans granted is proxied as the *operating size* of the bank. *Implicit payment* is total operating expenses net of non-interest revenue expressed as a percentage of total assets. C*ost to income* ratio is used as a measure of operating efficiency. The degree of market power is proxied by the *Lerner Index. Internal funds* is measured as the sum of net profit before extraordinary items and loan loss provisions relative bank loans at the end the period. *Banking freedom* measures overall openness of the sector operation. *Inflation* is the rate of inflation based on the CPI. The natural logarithm of per *capita GDP* accounts for the differences in economic development across countries. Short-term interest rate is included to capture the stance of *monetary policy*. The results are presented in columns, basing on the continental groupings. Africa refers to banks selected in Sub-Saharan African countries; Asia for banks in Asia-pacific, Europe for selected banks in Central and Eastern European countries and America for selected banks in Latin America countries. All regressions are estimated using dynamic panel-data estimation, Two-step System GMM, Windmeijer-correct standard error, small-sample adjustments, and orthogonal deviation. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1%, 5% and 10% level respectively. The following diagnostic tests are reported: (1) Observations (2) The instruments count, (3) The Hansen test for over identification restriction which the null hypothesis is that instruments are exogenous (4) The Arellano-Bond tests for first and second order serial correlation in the residuals which the null hypothesis is that there is no serial correlation. (5) The F-test for joint significance of instruments.

| | Africa | Asia | Europe | America | ALL |
|---|---|---|---|---|---|
| $NIM_{-1}$ | 0.6229*** | 0.7632*** | 0.5466*** | 0.3531*** | 0.4063*** |
| | (0.0765) | (0.0790) | (0.0831) | (0.0836) | (0.0802) |
| Risk aversion | 0.0141 | 0.0803*** | 0.0049 | -0.0401* | -0.0264* |
| | (0.0246) | (0.0273) | (0.0169) | (0.0240) | (0.0156) |
| Credit risk | 0.0611*** | -0.0008 | 0.0472*** | 0.0088 | 0.0460*** |
| | (0.0134) | (0.0097) | (0.0114) | (0.0246) | (0.0081) |
| Operating size | -0.0022 | 0.0037*** | 0.0013 | 0.0003 | -0.003*** |
| | (0.0014) | (0.0012) | (0.0016) | (0.0024) | (0.0011) |
| Implicit payment | 0.4463*** | 0.3423** | 0.5302*** | 0.7109*** | 0.5624*** |
| | (0.1016) | (0.1637) | (0.2024) | (0.1456) | (0.1440) |
| Cost to income | -0.0066 | 0.0249* | -0.0089 | -0.0068 | -0.0025 |
| | (0.0117) | (0.0133) | (0.0129) | (0.0129) | (0.0080) |
| Conventional Lerner | -0.0001 | 0.0191 | -0.0002 | 0.0082 | 0.0199** |
| | (0.0140) | (0.0137) | (0.0083) | (0.0112) | (0.0093) |
| Internal funds | 0.1232*** | -0.0257* | 0.1098** | 0.0942*** | 0.1154*** |
| | (0.0310) | (0.0142) | (0.0434) | (0.0357) | (0.0313) |
| Banking freedom | -0.0075 | -0.0157** | -0.0025 | 0.0038 | 0.0018 |
| | (0.0055) | (0.0066) | (0.0031) | (0.0053) | (0.0025) |
| Inflation | -0.0029 | -0.0012 | -0.0015 | 0.0020 | -0.0031* |
| | (0.0023) | (0.0015) | (0.0014) | (0.0034) | (0.0017) |
| GDP per capita | -0.0008 | 0.0008 | -0.0005 | -0.0034 | -0.0050** |
| | (0.0017) | (0.0035) | (0.0023) | (0.0024) | (0.0020) |
| Monetary policy | 0.0076*** | 0.0082*** | 0.0050** | 0.0066* | 0.0088*** |
| | (0.0023) | (0.0024) | (0.0021) | (0.0034) | (0.0018) |
| **Diagnostics tests** | | | | | |
| Number of observations | 931 | 789 | 1400 | 1041 | 4161 |
| Number of instruments | 133 | 123 | 138 | 136 | 138 |
| Hansen | 127.67 | 119.02 | 137.99 | 133.11 | 144.40 |
| P-value | (0.180) | (0.149) | (0.112) | (0.147) | (0.047) |
| AB2 | 2.03 | -1.47 | 0.55 | 1.42 | 1.66 |
| P-value | (0.043) | (0.141) | (0.581) | (0.157) | (0.097) |
| F-test | 52.16*** | 29.91*** | 60.56*** | 25.85*** | 53.19*** |

**Table 4.11**
**Determinants of the Return on Assets (ROA) of bank**

The dependent variable is ROA which is defined as profit before tax as a percentage of total assets. The ratio of bank equity to total assets is used as a proxy to measure the degree of *risk aversion*. Bank loan to total assets ratio is used as a measure of *credit risk. Implicit payment* is total operating expenses net of non-interest revenue expressed as a percentage of total assets. Ratio of earning assets to total assets is used as a measure of *management quality*. The degree of market power is proxied by the *Lerner Index. Deposit funding* is the ratio of total deposit to assets and *non-deposit funding* is the share of non-deposit funding to total assets respectively. *Internal funding* is the internally generated funds. It is measured as the sum of net profit before extraordinary items and loan loss provisions relative bank loans at the end the period. *Inflation* is the rate of inflation based on the CPI. *Per capita GDP* accounts for the differences in economic development across countries. Short-term interest rate is included to capture the stance of *monetary policy*. All regressions are estimated using dynamic panel-data estimation, Two-step System GMM, Windmeijer-correct standard error, small-sample adjustments, and orthogonal deviation. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1%, 5% and 10% level respectively. The following diagnostic tests are presented: (1) Observations (2) The instruments count, (3) The Hansen test for over identification restriction which the null hypothesis is that instruments are exogenous (4) The Arellano-Bond tests for first and second order serial correlation in the residuals which the null hypothesis is that there is no serial correlation. (5) The F-test for joint significance of instruments.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Return on assets$_{-1}$ | 0.0974* | 0.1358*** | 0.1255*** | 0.0976** | 0.0907** | 0.1009** |
| | (0.0570) | (0.0397) | (0.0369) | (0.0451) | (0.0400) | (0.0413) |
| Risk aversion | 0.0564** | 0.0640*** | 0.04296** | 0.0752*** | 0.0433*** | -0.0077 |
| | (0.0256) | (0.0210) | (0.0182) | (0.0233) | (0.0133) | (0.0261) |
| Credit risk | 0.0226** | 0.0038 | 0.0052 | 0.0133 | 0.0327*** | 0.0316*** |
| | (0.0096) | (0.0088) | (0.0092) | (0.0107) | (0.0063) | (0.0084) |
| Total assets | -0.0047** | -0.0051** | -0.005*** | -0.0045** | 0.0001 | -0.0023* |
| | (0.0023) | (0.0020) | (0.0020) | (0.0022) | (0.0013) | (0.0013) |
| Implicit payment | -0.2985** | -0.1460 | -0.1479 | -0.2078* | -0.0456 | -0.0061 |
| | (0.1356) | (0.1094) | (0.1078) | (0.1082) | (0.0657) | (0.0519) |
| Management quality | -0.0053 | 0.0590** | 0.0420 | 0.0922*** | 0.0310 | 0.0233 |
| | (0.0398) | (0.0305) | (0.0276) | (0.0259) | (0.0208) | (0.0181) |
| Conventional Lerner | | 0.0366*** | 0.0416*** | 0.0296*** | 0.0255*** | 0.0197** |
| | | (0.0112) | (0.0094) | (0.0105) | (0.0068) | (0.0079) |
| Deposit funding | | | -0.0007 | | | -0.0293 |
| | | | (0.0141) | | | (0.0215) |
| Non-deposit funding | | | | -0.0013 | | -0.0404* |
| | | | | (0.0061) | | (0.0221) |
| Internal funds | | | | | 0.1350*** | 0.1543*** |
| | | | | | (0.0196) | (0.0231) |
| inflation | -0.0008 | 0.0024 | 0.0022 | -0.0008 | -0.0003 | -0.0009 |
| | (0.0032) | (0.0022) | (0.0019) | (0.0018) | (0.0012) | (0.0014) |
| GDP per capita | 0.0020 | 0.0018 | 0.0008 | -0.0064** | -0.00316* | -0.0033 |
| | (0.0034) | (0.0028) | (0.0024) | (0.0030) | (0.0018) | (0.0020) |
| Monetary policy | 0.0010 | -0.0028 | -0.0038 | 0.0021 | 0.0036* | 0.0052** |
| | (0.0042) | (0.0036) | (0.0031) | (0.0032) | (0.0021) | (0.0023) |
| **Diagnostics tests** | | | | | | |
| No. of observations | 4320 | 4284 | 4188 | 3742 | 4559 | 3581 |
| No. of instruments | 89 | 116 | 116 | 143 | 145 | 139 |
| Hansen | 78.65 | 105.65 | 10.02 | 109.90 | 119.64 | 102.09 |
| P-value | (0.305) | (0.305) | (0.135) | (0.830) | (0.619) | (0.866) |
| AB2 | -0.29 | 0.75 | 0.85 | 0.34 | 1.02 | 0.77 |
| P-value | (0.771) | (0.452) | (0.393) | (0.734) | (0.307) | (0.444) |
| F-test | 5.16*** | 9.26*** | 10.02*** | 7.08*** | 15.36*** | 24.29*** |

**Table 4.12**
**Determinants of insolvency risk with conventional version of Lerner index**

The dependent variable is *Z-score* defined as $Z = (ROA + E/TA)/\sigma(ROA)$, where $ROA$ is the rate of return on assets, $E/TA$ is the total equity to total assets ratio, and $\sigma(ROA)$ $\sigma ROA$ is an estimate of the standard deviation of return on assets. E*quity/Assets* is used as a proxy to measure the degree of risk aversion. Banks' loan to total assets ratio, *loan/Assets* is used as a measure of credit risk. The degree of market power is proxied by the *Lerner Index* (conventional version) or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *Deposit funding* is ratio of total deposit to assets and *non-deposit funding* is the share of non-deposit funding to total assets respectively. *Internal fund* is the internally generated fund. It is measured as the sum of net profit before extraordinary items and loan loss provisions relative bank loans at the end the period. Short-term interest rate is included to capture the stance of *monetary policy*. *Inflation* is the rate of inflation based on the CPI. The natural logarithm of per *capita GDP* accounts for the differences in economic developments across countries. All regressions are estimated using dynamic panel-data estimation, Two-step System GMM, Windmeijer-correct standard error, small-sample adjustments, and orthogonal deviation. Constant term included but not reported. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1% 5% and 10% level respectively. The following diagnostic tests are presented: (1) Observations (2) The instruments count, (3) The Hansen test for over identification restriction which the null hypothesis is that instruments are exogenous (4) The Arellano-Bond tests for first and second order serial correlation in the residuals which the null hypothesis is that there is no serial correlation. (5) The F-test for joint significance of instruments.

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Z-Score_lag | 0.6285*** | 0.6836*** | 0.7420*** | 0.6743*** |
| | (0.0641) | (0.0530) | (0.0530) | (0.0609) |
| Size | 0.0538* | 0.0624** | 0.0631** | 0.0376 |
| | (0.0284) | (0.0268) | (0.0251) | (0.0274) |
| Equity/Assets | 1.1308*** | 0.5593 | 0.3018 | 0.8848 |
| | (0.4132) | (0.4305) | (0.3512) | (0.4052) |
| Loan/Assets | 0.2940** | 0.1405 | 0.1888 | 0.2699** |
| | (0.1362) | (0.1254) | (0.1379) | (0.1366) |
| Lerner index | 0.3998* | 0.4630** | 0.2058 | -0.1358 |
| | (0.2168) | (0.1919) | (0.2161) | (0.1617) |
| Deposits funding | | 0.0029 | | |
| | | (0.1634) | | |
| Non-deposits funding | | | -0.0637 | |
| | | | (0.1007) | |
| Internal funding | | | | 0.6151** |
| | | | | (0.2788) |
| Monetary policy | 0.0442 | 0.2466* | 0.0334 | -0.3109 |
| | (0.1722) | (0.1304) | (0.1359) | (0.2394) |
| Inflation | -0.4014** | -0.4863*** | -0.1721 | -0.2329 |
| | (0.1787) | (0.1868) | (0.1570) | (0.2499) |
| GDP growth | -2.0178** | -2.9781*** | -3.0713*** | -1.6347** |
| | (0.8288) | (0.7687) | (0.7302) | (0.7511) |
| **Diagnostic tests** | | | | |
| No. of observation | 5243 | 5049 | 4086 | 5103 |
| No. of instruments | 110 | 111 | 111 | 116 |
| Hansen | 105.36 | 95.84 | 89.08 | 116.6 |
| P-value | (0.22) | (0.457) | (0.652) | (0.123) |
| AB2 | 0.42 | 0.44 | 1.58 | 1.47 |
| P-value | (0.674) | (0.66) | (0.115) | (0.142) |
| F-test | 47.47*** | 47.77*** | 54.44*** | 48.82*** |

**Table 4.13**
**Determinants of insolvency risk with funding-adjusted version of Lerner index**

The dependent variable is *Z-score* defined as $Z = (ROA + E/TA)/\sigma(ROA)$, where $ROA$ is the rate of return on assets, $E/TA$ is the total equity to total assets ratio, and $\sigma(ROA)$ $\sigma ROA$ is an estimate of the standard deviation of return on assets. E*quity/Assets* is used as a proxy to measure the degree of risk aversion. Banks' loan to total assets ratio, *loan/Assets* is used as a measure of credit risk. The degree of market power is proxied by the *Lerner Index* (funding-adjusted version) or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *Deposit funding* is ratio of total deposit to assets and *non-deposit funding* is the share of non-deposit funding to total assets respectively. *Internal fund* is the internally generated fund. It is measured as the sum of net profit before extraordinary items and loan loss provisions relative bank loans at the end the period. Short-term interest rate is included to capture the stance of *monetary policy*. *Inflation* is the rate of inflation based on the CPI. The natural logarithm of per *capita GDP* accounts for the differences in economic developments across countries. All regressions are estimated using dynamic panel-data estimation, Two-step System GMM, Windmeijer-correct standard error, small-sample adjustments, and orthogonal deviation. Constant term included but not reported. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1% 5% and 10% level respectively. The following diagnostic tests are presented: (1) Observations (2) The instruments count, (3) The Hansen test for over identification restriction which the null hypothesis is that instruments are exogenous (4) The Arellano-Bond tests for first and second order serial correlation in the residuals which the null hypothesis is that there is no serial correlation. (5) The F-test for joint significance of instruments.

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Z-Score_lag | 0.6679*** | 0.7141*** | 0.7685*** | 0.6408*** |
| | (0.0649) | (0.0604) | (0.0562) | (0.0546) |
| Size | 0.0518* | 0.0322 | 0.0440* | 0.0292 |
| | (0.0269) | (0.0306) | (0.0259) | (0.0278) |
| Equity/Assets | 1.1829*** | 0.5539 | 0.4228 | 0.8216** |
| | (0.4149) | (0.4520) | (0.3445) | (0.3683) |
| Loan/Assets | 0.2620* | 0.1211 | 0.1473 | 0.2781** |
| | (0.1375) | (0.1389) | (0.1344) | (0.1395) |
| Conventional Lerner index | 0.5023* | 0.4285*** | 0.2904** | -0.3762 |
| | (0.2746) | (0.1583) | (0.1388) | (0.3337) |
| Deposits funding | | 0.0254 | | |
| | | (0.1676) | | |
| Non-deposits funding | | | -0.0986 | |
| | | | (0.1065) | |
| Internal funding | | | | 0.6741** |
| | | | | (0.3377) |
| Monetary policy | 0.0134 | 0.2298 | 0.0418 | -0.1398 |
| | (0.1660) | (0.2432) | (0.1584) | (0.2180) |
| Inflation | -0.3810** | -0.7361** | -0.2546 | -0.3377 |
| | (0.1817) | (0.3047) | (0.1740) | (0.2435) |
| GDP growth | -1.1130 | -1.9765*** | -2.4436*** | -1.5194* |
| | (0.7291) | (0.7481) | (0.6912) | (0.8002) |
| **Diagnostic tests** | | | | |
| No. of observation | 5216 | 5038 | 4068 | 5078 |
| No. of instruments | 110 | 111 | 111 | 116 |
| Hansen | 108.21 | 106.73 | 90.3 | 117.1 |
| P-value | (0.167) | (0.193) | (0.617) | (0.116) |
| AB2 | 0.75 | 0.39 | 1.38 | 1.21 |
| P-value | (0.453) | (0.700) | (0.167) | (0.226) |
| F-test | 45.77*** | 43.17*** | 53.74*** | 42.00*** |

**Table 4.14**
**Evaluation of bank performance: Controlling for banking freedom**

The dependent variables are performance measures, Net-interest margin (NIM), Return on assets (ROA), and bank insolvent risk, Z-score. E*quity/Assets* is used as a proxy to measure the degree of risk aversion. Banks' loan to total assets ratio, *loan/Assets* is used as a measure of credit risk. The degree of market power is proxied by the *Lerner Index*. *Deposit funding* is ratio of total deposit to assets and *non-deposit funding* is the share of non-deposit funding to total assets respectively. *Internal fund* is the internally generated fund. It is measured as the sum of net profit before extraordinary items and loan loss provisions relative bank loans at the end the period. Higher values of *banking freedom* signify higher freedom from government controls. Short-term interest rate is included to capture the stance of *monetary policy*. *Inflation* is the rate of inflation based on the CPI. The natural logarithm of per *capita GDP* accounts for the differences in economic developments across countries. Dynamic panel-data estimation, Two-step System GMM, Windmeijer-correct standard error, small-sample adjustments, and orthogonal deviation are used. Constant term included but not reported. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1% 5% and 10% level respectively. The following diagnostic tests are presented: (1) Observations (2) The instruments count, (3) The Hansen test for over identification restriction which the null hypothesis is that instruments are exogenous (4) The Arellano-Bond tests for first and second order serial correlation in the residuals which the null hypothesis is that there is no serial correlation. (5) The F-test for joint significance of instruments.

| | NIM | ROA | Z-Score | NIM | ROA | Z-Score |
|---|---|---|---|---|---|---|
| NIM_lag | 0.670*** | | | 0.661*** | | |
| | (0.087) | | | (0.082) | | |
| ROA_lag | | 0.134*** | | | 0.110*** | |
| | | (0.040) | | | (0.038) | |
| Z-Score_lag | | | 0.789*** | | | 0.773*** |
| | | | (0.042) | | | (0.049) |
| Equity/Assets | -0.111*** | 0.001 | 0.139 | -0.020 | 0.040** | -0.122 |
| | (0.0263) | (0.019) | (0.373) | (0.031) | (0.017) | (0.408) |
| Loan/Assets | 0.044*** | 0.030*** | -0.266 | 0.050*** | 0.029*** | -0.599* |
| | (0.015) | (0.010) | (0.306) | (0.011) | (0.006) | (0.316) |
| Size | -0.003 | -0.002* | 0.038** | -0.006** | -0.001 | 0.025 |
| | (0.002) | (0.001) | (0.020) | (0.002) | (0.001) | (0.024) |
| Lerner index | -0.007 | 0.023** | -0.178 | 0.0004 | 0.032*** | 0.087 |
| | (0.013) | (0.009) | (0.214) | (0.010) | (0.007) | (0.243) |
| Non-deposits funding | -0.006 | -0.003 | -0.104 | | | |
| | (0.012) | (0.006) | (0.123) | | | |
| Deposits funding | | | | 0.007 | 0.006 | -0.167 |
| | | | | (0.012) | (0.007) | (0.199) |
| Internal Funding | 0.088* | 0.141*** | 0.065 | 0.085* | 0.141*** | -0.444 |
| | (0.048) | (0.030) | (0.512) | (0.046) | (0.024) | (0.522) |
| **Banking freedom** | -0.006 | 0.008 | 0.049 | 0.003 | 0.008** | 0.175** |
| | (0.007) | (0.005) | (0.112) | (0.006) | (0.003) | (0.087) |
| Monetary policy | 0.039 | -0.004 | -0.063 | 0.0002 | 0.006 | 0.018 |
| | (0.034) | (0.034) | (0.273) | (0.040) | (0.012) | (0.393) |
| Inflation | 0.087** | 0.021 | 0.116 | 0.091* | 0.020 | 0.287 |
| | (0.040) | (0.037) | (0.301) | (0.050) | (0.013) | (0.482) |
| GDP growth | -0.005 | -0.078 | -0.0784 | -0.131 | -0.022 | -0.099 |
| | (0.079) | (0.065) | (0.547) | (0.081) | (0.038) | (0.494) |
| **Diagnostic tests** | | | | | | |
| No. of observation | 4027 | 4019 | 4035 | 4977 | 4948 | 4962 |
| No. of instruments | 111 | 111 | 83 | 111 | 111 | 83 |
| Hansen | 104.19 | 103.35 | 86.53 | 110.61 | 97.1 | 85.27 |
| P-value | (0.201) | (0.218) | (0.101) | (0.103) | (0.365) | (0.119) |
| AB2 | -0.8 | -0.55 | 1.64 | -0.25 | -0.35 | 0.98 |
| P-value | (0.421) | (0.581) | (0.102) | (0.802) | (0.727) | (0.326) |
| F-test | 46.01*** | 14.79*** | 74.92*** | 41.95*** | 19.63*** | 46.43*** |

**Table 4.15**
**Evaluation of bank performance: Controlling for financial reforms**

The dependent variables are performance measures, Net-interest margin NIM, Return on assets, ROA and bank insolvent risk, Z-score. E*quity/Assets* is used as a proxy to measure the degree of risk aversion. Banks' loan to total assets ratio, *loan/Assets* is used as a measure of credit risk. The degree of market power is proxied by the *Lerner Index. Deposit funding* is ratio of total deposit to assets and *non-deposit funding* is the share of non-deposit funding to total assets respectively. *Internal fund* is the internally generated fund. It is measured as the sum of net profit before extraordinary items and loan loss provisions relative bank loans at the end the period. Higher values of *financial reforms* indicate fully reformed. Short-term interest rate is included to capture the stance of *monetary policy*. *Inflation* is the rate of inflation based on the CPI. The natural logarithm of per *capita GDP* accounts for the differences in economic developments across countries. Dynamic panel-data estimation, Two-step System GMM, Windmeijer-correct standard error, small-sample adjustments, and orthogonal deviation are used. Constant term included but not reported. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1% 5% and 10% level respectively. The following diagnostic tests are presented: (1) Observations (2) The instruments count, (3) The Hansen test for over identification restriction which the null hypothesis is that instruments are exogenous (4) The Arellano-Bond tests for first and second order serial correlation in the residuals which the null hypothesis is that there is no serial correlation. (5) The F-test for joint significance of instruments.

| | NIM | ROA | Z-Score | NIM | ROA | Z-Score |
|---|---|---|---|---|---|---|
| NIM_lag | 0.613*** | | | 0.583*** | | |
| | (0.100) | | | (0.071) | | |
| ROA_lag | | 0.058 | | | 0.101*** | |
| | | (0.037) | | | (0.038) | |
| Z-Score_lag | | | 0.778*** | | | 0.788*** |
| | | | (0.047) | | | (0.040) |
| Equity/Assets | -0.085*** | -0.002 | 0.376 | -0.029 | 0.037 | 0.529 |
| | (0.030) | (0.024) | (0.284) | (0.027) | (0.023) | (0.377) |
| Loan/Assets | 0.043*** | 0.028*** | 0.062 | 0.035*** | 0.029*** | 0.128 |
| | (0.016) | (0.010) | (0.184) | (0.010) | (0.008) | (0.153) |
| Size | -0.006*** | -0.0005 | 0.054** | -0.008*** | -0.0004 | 0.046** |
| | (0.002) | (0.001) | (0.025) | (0.001) | (0.001) | (0.022) |
| Lerner index | -0.026* | 0.038*** | 0.013 | -0.0001 | 0.047*** | 0.140 |
| | (0.015) | (0.013) | (0.161) | (0.008) | (0.011) | (0.180) |
| Non-deposits funding | -0.003 | -0.004 | -0.101 | | | |
| | (0.010) | (0.008) | (0.124) | | | |
| Deposits funding | | | | 0.004 | 0.013 | 0.013 |
| | | | | (0.016) | (0.010) | (0.153) |
| Internal Funding | 0.097** | 0.163*** | -0.193 | 0.048** | 0.130*** | -0.120 |
| | (0.040) | (0.031) | (0.349) | (0.022) | (0.028) | (0.271) |
| **Financial reforms** | 0.009 | 0.017 | -0.642* | 0.003 | 0.021 | -0.617 |
| | (0.045) | (0.030) | (0.375) | (0.042) | (0.024) | (0.393) |
| Monetary policy | 0.045 | -0.0001 | -0.110 | 0.061 | 0.020 | 0.010 |
| | (0.029) | (0.027) | (0.084) | (0.038) | (0.027) | (0.151) |
| Inflation | 0.019 | 0.033 | -0.103 | -0.020 | 0.007 | -0.264 |
| | (0.033) | (0.026) | (0.127) | (0.040) | (0.020) | (0.176) |
| GDP growth | -0.136 | -0.021 | -2.629*** | -0.211** | -0.048 | -1.866 |
| | (0.096) | (0.060) | (0.703) | (0.090) | (0.047) | (0.701) |
| Diagnostic tests | | | | | | |
| No. of observation | 3486 | 3485 | 3455 | 4249 | 4230 | 4213 |
| No. of instruments | 111 | 111 | 138 | 111 | 111 | 138 |
| Hansen | 91.46 | 108.95 | 120.28 | 98.24 | 110.44 | 138.68 |
| P-value | (0.526) | (0.124) | (0.476) | (0.335) | (0.105) | (0.117) |
| AB2 | -1.39 | -0.44 | 1.55 | -0.98 | -0.24 | 0.76 |
| P-value | (0.166) | (0.659) | (0.122) | (0.325) | (0.808) | (0.445) |
| F-test | 29.40*** | 13.25*** | 51.91*** | 33.04*** | 16.89*** | 59.73*** |

**Table 4.16**
**Evaluation of bank performance: Controlling for risk expropriation**

The dependent variables are performance measures, Net-interest margin (NIM), Return on assets (ROA), and bank insolvent risk, Z-score. E*quity/Assets* is used as a proxy to measure the degree of risk aversion. Banks' loan to total assets ratio, *loan/Assets* is used as a measure of credit risk. The degree of market power is proxied by the *Lerner Index*. *Deposit funding* is ratio of total deposit to assets and *non-deposit funding* is the share of non-deposit funding to total assets respectively. *Internal fund* is the internally generated fund. It is measured as the sum of net profit before extraordinary items and loan loss provisions relative bank loans at the end the period. Higher score of property right indicate certainty of legal protection of property right and limited expropriation risks. Short-term interest rate is included to capture the stance of *monetary policy*. *Inflation* is the rate of inflation based on the CPI. The natural logarithm of per *capita GDP* accounts for the differences in economic developments across countries. Dynamic panel-data estimation, Two-step System GMM, Windmeijer-correct standard error, small-sample adjustments, and orthogonal deviation are used. Constant term included but not reported. Standard errors are reported in parentheses. ***, **, and * indicates statistical significance at the 1% 5% and 10% level respectively. The following diagnostic tests are presented: (1) Observations (2) The instruments count, (3) The Hansen test for over identification restriction which the null hypothesis is that instruments are exogenous (4) The Arellano-Bond tests for first and second order serial correlation in the residuals which the null hypothesis is that there is no serial correlation. (5) The F-test for joint significance of instruments.

| | NIM | ROA | Z-Score | NIM | ROA | Z-Score |
|---|---|---|---|---|---|---|
| NIM_lag | 0.644*** | | | 0.593*** | | |
| | (0.099) | | | (0.075) | | |
| ROA_lag | | 0.033 | | | 0.052 | |
| | | (0.038) | | | (0.041) | |
| Z-Score_lag | | | 0.774*** | | | 0.704*** |
| | | | (0.045) | | | (0.068) |
| Equity/Assets | -0.064** | -0.007 | 0.282 | -0.035 | 0.023 | 0.750 |
| | (0.025) | (0.021) | (0.445) | (0.025) | (0.024) | (0.541) |
| Loan/Assets | 0.039** | 0.023** | -0.053 | 0.037*** | 0.029 | 0.376 |
| | (0.015) | (0.010) | (0.399) | (0.009) | (0.020) | (0.368) |
| Size | -0.004* | -0.001 | 0.030 | -0.007*** | -0.001 | 0.135** |
| | (0.002) | (0.001) | (0.020) | (0.002) | (0.001) | (0.044) |
| Lerner index | -0.032** | 0.037*** | -0.1557 | -0.002 | 0.059*** | 0.055 |
| | (0.013) | (0.011) | (0.213) | (0.008) | (0.014) | (0.262) |
| Non-deposits funding | 0.001 | 0.002 | -0.072 | | | |
| | (0.010) | (0.006) | (0.123) | | | |
| Deposits funding | | | | -0.001 | 0.001 | 0.031 |
| | | | | (0.013) | (0.009) | (0.182) |
| Internal Funding | 0.096** | 0.163*** | 0.109 | 0.033 | 0.105*** | -0.005 |
| | (0.039) | (0.029) | (0.416) | (0.023) | (0.026) | (0.458) |
| **Property rights** | -0.007 | 0.009 | 0.228 | 0.004 | 0.008 | -0.159 |
| | (0.010) | (0.006) | (0.187) | (0.010) | (0.006) | (0.203) |
| Monetary policy | 0.0518* | 0.006 | -0.071 | 0.043 | 0.015 | 0.206 |
| | (0.026) | (0.024) | (0.308) | (0.028) | (0.018) | (0.500) |
| Inflation | 0.003 | 0.029 | 0.251 | 0.014 | 0.021 | 0.614 |
| | (0.039) | (0.031) | (0.276) | (0.042) | 0.031 | (0.895) |
| GDP growth | -0.126 | 0.0006 | 0.553 | -0.140* | -0.072 | 0.412 |
| | (0.100) | (0.048) | (0.656) | (0.076) | (0.049) | (1.150) |
| **Diagnostic tests** | | | | | | |
| No. of observation | 4031 | 4028 | 4036 | 4962 | 4936 | 4929 |
| No. of instruments | 111 | 111 | 83 | 111 | 84 | 84 |
| Hansen | 97.21 | 102.05 | 86.61 | 98.56 | 73.34 | 73.84 |
| P-value | (0.362) | (0.245) | (0.100) | (0.327) | (0.250) | (0.252) |
| AB2 | -1.28 | -0.36 | 1.55 | -0.54 | -0.22 | 1.15 |
| P-value | (0.201) | (0.719) | (0.121) | (0.586) | (0.828) | (0.252) |
| F-test | 30.12*** | 10.27*** | 85.65*** | 35.48*** | 19.18*** | 71.59*** |

# *Chapter V*

# CONCLUSION

## 5.1 OVERVIEW

This thesis focuses on bank market structure and the effect of changes to this structure on intermediation strategies. The consequences of the changes of banking market structure on resource allocation is important, as the 2007 financial crisis has shown the crucial function of banks is extending credit to the economy especially during and after financial distress. This final chapter offers overall concluding remarks for each of the three core preceding chapters. It highlights the unique and specific contributions of each chapter to the existing literature, acknowledges limitations of the selected techniques and methodology, provides public policy implications of this research and finally identifies various areas for further research.

## 5.2 Chapter II: Bank competition, financial stability and bank lending channel in emerging markets

Chapter II presents the starting point of the analysis of market structure and the intermediation strategies of banks. This first core chapter conducts an empirical analysis of how the degree of competition and bank risk conditions affect monetary policy transmission through the lending channel. Most previous studies on the bank lending channel either on country specific or cross-country have centred on the existence, gauging of its potency, on its overall importance, on identification and distributional effects of monetary policy transmission mechanisms. Little attention has been given to the effect of banking structure and bank risk conditions on the response of bank lending to monetary policy shock. The argument in favour of the banking structure-risk-lending channel hypothesis is that monetary policy does not only affect bank reserves either through open market operations or reserve requirements, but also impacts on marginal cost through interest rates paid on the banks liabilities. Also, due to innovation in the financial system, traditional variables such as bank size, liquidity and equity may not be enough to assess banks' ability to provide additional loans (Altunbas 2010). Furthermore, changes in the financial system coupled with changes in prudential regulation could have changed the effect of the perception, pricing and the risk management behaviour of banks especially those in the developing countries (Borio and Zhu 2008).

Employing a large panel dataset of 978 banks of 55 countries, and construction of a Lerner index model as a measure of market structure, this chapter shows that an increase in the degree of bank market power increases the response of bank lending to monetary policy stance. This means that in tightening the monetary policy indicator, the monetary authorities will succeed in reducing the supply of bank loans in a less competitive market. This result provides evidence in support of a stronger link between market imperfection and the effectiveness of the monetary policy instruments. The result in this chapter also reveals that the level of insolvency risk influences banks' capacity to provide lending. The positive association between bank stability and bank loan growth implies that lower risk banks have financial strength to supply more loans. The result further suggests that stable banks can attract external finance that enables the bank to have positive consequence on the bank supply. The finding is also sensitive to three bank-specific control variables; bank size, liquidity and capitalisation level. The main implication of these findings are that, bank risk conditions and that of its market structure need to be considered in addition to traditional indicators (i.e. bank size, liquidity and capitalisation) in assessing banks' ability and willingness to finance economic activities.

### 5.3 Chapter III: Does bank competition and diversification lead to greater stability?

Chapter III builds upon the initial findings of chapter II and extends the analysis of market structure to bank performance and insolvency risk. Theoretical and empirical examination of competition and bank insolvency risk find their relationship to be ambiguous. Competition has long been seen to decrease bank stability because it exacerbates risk and reduces bank incentives to behave prudently. This view has been countered by the argument that competition in the banking sector reduces bank insolvency risk (OECD 2010). To this end, this chapter contains empirical investigation of the relationship between competition and stability. The main contribution is to empirically analyse the significance of revenue diversification on the relationship between competition and stability. Prior studies have not considered the role of revenue diversification in the competition-stability relationship. As a result, two related hypothesis are tested in this chapter: 1) the level of revenue diversification

among emerging banks is positively related to the degree of competition, and 2) diversification strategy of banks operating in competitive environments is risk efficient. The novelty of this chapter is the role of revenue diversification in assessing whether or not the degree of competition affects bank stability. It also provides some insight into the effect of the financial reforms, institutional, regulatory and supervisory environments on the relationship between competition and stability. Using a panel dataset of 978 banks, Panzar and Rosse (1987) H-statistic and the Lerner index as measures of degree of competition in banking sector, and employing the three stage least squares (3sls) estimation techniques, Chapter III shows that competition increases bank stability as diversification across and within both interest and non-interest income generating activities of bank increases. The results support the previous studies that competition increases bank stability by revealing robust evidence for this positive link when revenue diversification of banks is controlled. A vast array of robustness checks support the core results. The results hold when alternative measures of the degree of competition and different methodological specifications are used. Even when financial reforms, supervision power, property right, capital stringency index and macroeconomic variables are controlled, the results suggest that competition with revenue diversification remain positively associated with bank stability. The core findings of this chapter correspond to the 'competitive-stability view' in the theoretical literature and generally consistent with empirical findings that banks that operate in an uncompetitive banking industry are prone to originating riskier loans which are detrimental to their stability. The overall results provide empirically, an additional channel through which competition affects insolvency risks of banks in emerging markets.

### 5.4 Chapter IV: The impact of market power and funding strategy on bank performance

Chapter IV employs a different approach to analysing bank performance and stability, by focusing on bank funding structure and a variety of measures of market power. The main contribution of this chapter is to provide empirical evidence on how bank market power and funding patterns perform in terms of producing profitable and stable banks in developing countries. In particular, using a panel dataset of 978 banks in emerging

and developing economies during 2000-2007 and employing systems generalised methods of moment estimator (system GMM) the chapter analysis how funding strategies of banks with market power affect their net-interest margin, return on their assets as well as their insolvency risk. It starts with construction of a choice of Lerner indexes: conventional Lerner (Burger et al., 2009); and funding-adjusted Lerner index (Maudos and De Guevara, 2007) to investigate competitive environment of the sample banks. This is because there is no consensus in literature regarding how best to assess the degree of bank market power (Carbo et al., 2009). This chapter provides the following key results:

First, on determinants of the *Lerner index*, the results reveal that larger, growing and highly capitalised banks have greater degree of market power. This result is consistent with (Meon and Weill, 2005) argument that larger banks are efficient, well resourced and operating economies of scale and scope; have the ability to produce at a lower cost and that enables them to have high margins. Similarly, diversifying into non-interest income activities enhances bank market power. Second, for their funding strategy, smaller, highly capitalised and efficiently managed banks employ internally generated funds for their investment activities. Third, the high net-interest margins (NIM) of banks in emerging and developing countries can be explained by the degree of market power, credit risk and implicit interest payments. The results suggest that net-interest margin among banks with market power is significantly more sensitive to internally generated funds than they are with deposits and wholesale funding. Fourth, the high degree of market power does not only increase the NIM and profitability level of banks in emerging and developing countries, it also reduces their insolvency risk. Finally, relating bank funding structure to insolvency risk, the results reveal that banks that rely heavily on internal and deposit funding are safer than those that finance their assets with wholesale funds. The results thus support existing findings in the literature that banking strategy that depends predominantly on attracting non-deposit funding is more risky and less resilient to the crisis. (Demirguc-kent and Huizinga (2010), and OECD (2010)).

## 5.5 Summary and public policy implications

This thesis makes several contributions to the growing body of literature on market structure and intermediation strategies. In line with this, various specifications are proxied for market structure (Panzar and Rosse, 1987) H-statistic, two specifications of the Lerner index: conventional and funding-adjusted Lerner index), different estimation techniques (system generalised methods of moments (system-GMM) estimators, three stage least square (3sls) and General least square (GLS) including, no effect, fixed effects and random effects) a broad measures of performance (net-interest margin, return on assets, insolvency risk) and a large panel dataset of 978 banks across 55 countries are employed for the purpose of this thesis. While firm-level data on emerging market is not readily available, the author of this thesis spent an immoderate amount of time and energy collecting this data. Furthermore, though the study focuses on the emerging and developing markets and given the relation between finance and the real economic, the benefits of conducting research in these economies have a chance to make an impact beyond developing economies. Bekaert and Harvey (2002) put it that, 'the benefits and the subsequent impact of research on emerging economies on economic growth can not be merely measured in absolute dollar terms, but in the number of people that are elevated from a desperate subsistence level to a more adequate standard of living'.

The findings of the thesis give rise to five very important public policy considerations. First, Chapter II uncovers a strong link between market imperfection and the effectiveness of monetary policy indicators, there is a need for policy makers, regulatory authorities and banking supervisors to put forward regulatory and institutional frameworks that can revolve, resolve and offset the negative consequences of further increases in bank market power on the effectiveness of monetary policy transmission through the bank lending channel. These measures are needed to address the effect of the current crisis on financial development and economic growth.

Second, this thesis also unveils the important role of bank insolvency risk in determining banks' ability and willingness to supply new loans and also sheltering

them in the long-run from the effect of monetary policy shocks. Thus in formulating public policy on how banks can finance economic activities especially in the aftermath of a financial crisis, bank market structure and that of its risk conditions must be considered in addition to the traditional standard bank-specific characteristics (size, liquidity, and capitalisation).

Third, several policy recommendations are made of findings on the relationship between competition, revenue diversification and stability. Given the results of revenue diversification role in the competition-stability relationship, there is no convincing nor compelling evidence to restrict bank activities. Banks must be allowed to venture into activities that enable them to generate non-interest income. In this case variables such as bank governance, managerial structure and bank-specific characteristics that affect bank investment decisions should be subjected to regulatory scrutiny.

Fourth, the fact that the level of bank market power and funding strategies affect bank performance and stability, to some extend, this should be of high relevance to policy makers, regulatory authorities and owners. For policy makers and regulatory authorities, Chapter IV has the following recommendations: 1) as high degree of market power of banks does not only increase the net-interest margin and profitability of the banks, it also reduces their insolvency risk; the regulatory authority should introduce guidelines that enhance banks to have a considerable level of market power. Considerable bank market power is needed, because too much or too little market power will affect negatively bank risk taking behaviour and stability (Liu et al., 2010). 2) internal capital has been found to play a significant role in enhancing bank market power and reducing insolvency risk. So does deposit funding sources. Thus regulatory initiative that allows banks to withhold a significant portion of their profits for growth purposes must be pursued. For bank managers, mechanisms should be put in place to attract deposits or investments as well as adopting strategies that will give rise to more internal capital. With regard to market participants, if investors are aware that internal capital and a depository source of funding produces profitable and stable banks, the

sizeable amount of their investment should be directed towards banks with considerable market power.

Finally, findings of this thesis show that market power in itself is not detrimental to bank activities, but the level and the application of it could affect bank risk-taking. Therefore, regulatory, supervisory and competition authorities should co-ordinate to put in place a comprehensive regulatory framework that would allow banks to have a substantial amount of market power that is robust and consistent with any competition policy.

## 5.6 LIMITATIONS OF THE THESIS

Though the present thesis offers very strong results and a wide range of implications for regulatory authorities, policy makers, owners, bank mangers as well as the general public, an evaluation of the fit of the selected techniques, methods and methodology is not out of place.

First, is the construction of the H-statistic, a measure of the degree of competition. H-statistic is a single measure based on the price elasticity of input cost and it is valid if the industry is in equilibrium. However, it is very rare to have a industry in equilibrium. Also the measure of H-statistic ignores bank differences such as size, geographical location and products differentiation even though bank size is controlled. The alternative to H-statistic in measuring competition is the Lerner index. Lerner index measures price mark-up over marginal cost. It overcomes the single measure of H-statistic as it provides separate values for each of the banks in the industry and also is able to distinguish different products of a bank. The only setback of this measure is the difficulty in gathering data on prices and marginal cost.

This thesis employs both H-statistic and Lerner index as a measure of market structure. The use of the two new empirical industrial organisation methods to measure market structure provide relatively close estimates of competitive environments of the selected samples. Also, as each measure has some related advantages and disadvantages, using the two measures in a single study serve as a good indicator of

the level of competition among banks. Furthermore, H-statistic and Lerner index are increasingly use in empirical research and are so far considered as a better measurement of bank behaviour than the concentration ratio which does not necessarily measure the level of competition and cannot be used as a proxy for differences in market structure (Claesens and Laeven 2004).

Second, the thesis makes use of several estimation techniques including system generalised methods of moments (system-GMM) estimators, three Stage Least Square (3SLS) and Generalised Least Square (GLS) including, no effect, fixed effects and random effects). Though Chapter II uses no effect, fixed effect and random effect regression, the best model in this area is selected on the basis of the likelihood ratio and Hausman test (Greene 2003).

Third, as fixed and random effects could not account for the endogeneity bias especially in the simultaneous equation model, a 3sls simultaneous equation is employed in Chapter III, where competition, revenue diversification and stability are specified as endogenous. Two Stage Least Square (2SLS) regression also performs the same function as that of 3sls, but in the presence of endogeneity and correct specification of the structural equations model, the 3sls produces more consistent and precise estimates of coefficient than those produced by 2sls (Mantescon 2009).

Fourth, in Chapter IV, the system-GMM methodology as proposed by Blundell and Bond (1998) is used to address dynamic panel bias and endogeneity problems. The method used is very complex and has a problem of generating many instruments that can even weaken the Hansen test. Even though the use of this methodology is new in the literature, (Roodman 2009) suggests that the instruments counts should not exceed the number of individual units in the panel and the importance of reporting in each study, the instrument used and other specifications including either the use of difference or system-GMM, first difference or orthogonal deviation, one or two-step estimation, on robust cluster-robust or Windmeijer-corrected cluster-robust error. Chapter IV addresses the endogeneity concerns, reports all the specifications and we can see the results are precise, robust and consistent.

Finally, concern has been raised about the use of listed bank data in emerging economies. The selection of listed banks may cause more than just sample bias. Listed banks in the emerging economies are relatively large in size, more stable, have better access to technology and innovation, are more liquid, have access to external capital, and acquire more market power which puts them in a better position to overcome any macroeconomic shocks and thus limit the general applicability of my results. In this thesis, selection bias is avoided as all banks are sampled including all commercial banks, cooperative banks, development banks, savings banks, real estate and mortgage banks for which annual data is available. As the study focuses on bank intermediation and market structure, unconsolidated balance sheet data are opted for. To ensure that banks that are important players in the deposit and/or loan markets are not omitted, medium and long term credit banks and specialised government institutions are included as they remain important in these countries. This is after necessary adjustments are made for differences in accounting and reporting standards across countries. Observations with out-liers such as zero and /or negative capitalization are dropped. Also, observations for capitalization above the 98$^{th}$ percentile were dropped. In addition, loan growth rate observations above 99$^{th}$ percentile of the distribution were equally dropped. Thus many efforts are made to ensure the reliability of the dataset used in this thesis.

## 5.7 AVENUES FOR FUTURE RESEARCH

This thesis employs comprehensive analysis, coverage and methodology. Like all quality and good research, the results of this thesis ignite research ideas; create a forum for discussion while advancing debates in the different areas of the finance and banking literature. The following are some areas for further research:

First, considering the graphical results of the link between bank risk conditions and the effectiveness of monetary policy presented in Chapter II, further research is needed to combine the rich heterogeneity of panel data with that cross-section country specific regression analysis. Employing this technique will not only offer the best of the two methods, it also allows the researcher to analyse the convergence of the real

effect in terms of output as well as the behaviour of the financial intermediaries. This cannot be achieved if either method is used.

Second, while Chapter II explores the relationship between competition, bank risk and the monetary policy effects, a reverse causality may also be possible. Monetary policy may influence competition as well as risk-taking behaviour of banks. A more detailed study is needed to unravel whether the current expansion of monetary policy indicator (especially after the 2007 financial crisis) affect perception and risk behaviour of banks across countries.

Third, a survey methodology should be used to comprehensively solicit views of practitioners especially top bank managers of whether or not competition among banks influences bank insolvency risk. Furthermore, whether managers decision to diversify bank activities play any significant role in the relationship between competition and stability.

Fourth and finally, further research is also needed on bank performance, in particular the high spreads of banks in developing countries. Whether the absence of well-functioning capital markets in some of these countries, the high net-interest margin in these countries is to enable banks to plough back profit into their capital for the purpose of maintaining stability. Elsewhere, Turk Ariss (2010) finds a high degree of bank market power, enhances profit efficiency, which leads to stability, but falls short of providing whether the degree of market power and efficiency is as a result of high net-interest margins.

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