An International Study of Bank Performance: From the Perspective of Sustainability and Externality

A thesis submitted for the degree of Doctor of Philosophy

By

Ali Mirzaei

Economics and Finance, School of Social Sciences

Brunel University

London, UK

September 2012

Abstract

The thesis assesses bank performance from two aspects: growth sustainability and the externality impact on the growth of non-financial industries. With regard to sustainability, the study considers two issues. One is financial performance with a focus on understanding what determines profitability and stability, particularly the role of market structure in generating profits. The second aspect is that of exploring what drives bank growth. Do banks grow through a competitive process or a non-competitive one? In the context of externality, the thesis investigates whether bank competition and stability contribute to the growth of non-financial industries. The thesis starts by investigating the effects of market structure on profitability and stability using the sample data of 1929 banks from 40 countries including both emerging and advanced economies over 1999-2008. It attempts to examine which school of theories provide more explanatory power to profitability and stability in banks: the traditional structure-conduct-performance (SCP) or relative-market-power (RMP) hypotheses. The results show that a greater market share leads to higher bank profitability in favour of the RMP theory evidenced in advanced economies; however interestingly there is no evidence in support of these theories in emerging economies. Furthermore, the RMP effect appears more sustainable when compared with the SCP. This suggests that a more concentrated banking system may be more vulnerable to financial stability. Regarding the second aspect of banking sector performance, we look at an issue of competition by employing data from around 5850 banks across 49 economies during 2001-2010. We employ different industrial economics theories to estimate the degree of bank competition. The results show that bank competition varies across countries in terms of competition intensity and process. Some banks compete more intensity for efficiency and some compete less. Interestingly, all indicators show that emerging banking markets are less competitive than their counterparts in advanced economies. Furthermore, the thesis explores whether competition and stability in the banking sector can affect the growth and market structure of nonfinancial industries and hence economic growth. Empirical evidence from 23 industries for 48 emerging and advanced economies shows robustly that a more vigorously competitive and thus efficient banking sector allows financially dependent industries to grow faster through supporting small firms and new entrants that disconcentrate market structure. Policy implication is clear: competition, rather than market structure, is what we need for restructuring our banks that can help economic growth.

Acknowledgments

This thesis has benefited from a number of people and I am very grateful for their help and support. First and foremost, I would like to express my deepest appreciation to my supervisor Professor Guy Liu for his thoughtful guidance, effortful help and inspiring encouragement. I also want to thank my second supervisor Dr. Tomoe Moore for her invaluable support and contributions to the empirical aspect of the thesis.

I would also like to thank all my supervisors form the UNIDO and IMF during the summer internship programs in these two international organizations, especially to my Mr Mithat Kulur, Unit Chief of Investment and Technology Promotion Branch of UNIDO, and Ms Cheng Hoon Lim, Unit Chief of Monetary and Capital Markets Department of IMF. Working in these two prestigious UN related agencies was a wonderful experience, and their advice was tremendously helpful.

My particular thanks are given to my wife for her full virtual support to me in pursuing the goals that I wanted. I very appreciate her for her understanding me in my difficult times I had. Without her love, I would not have been able to make it to where I am today. My thanks also go to other my families for their supports.

Finally, my thanks are to PhD students, colleagues and faculties of Economics and Finance Department of Brunel University. I really enjoyed our seminars, conferences and discussions. It was my great pleasure to study in this friendly collectively.

Declaration of Co-Authorship

Chapter 3 was written in collaboration with Dr Tomoe Moore. One part of Chapter 3 was published in Economics Bulletin and its extension has been advised to re-submit to the Journal Banking and Finance.

Table of Contents

List of Tables

List of Figures

CHAPTER 1

Introduction

1.1. Context and Background

The financial sector contributes to economic growth and development by providing various financial services. The financial sector can also improve both the quantity and quality of real investment and thereby contribute to long-term prosperity by increasing income per capita. In this context, an efficient and stable financial sector reduces the cost and risk of producing and trading goods and services and thus makes an important contribution to raising the standard of living. Furthermore, as part of the financial sector, financial intermediaries including the banking system, play a central role in facilitating trade, allocating capital and generating various products. The services provided by financial intermediaries, including project evaluation, savings mobilization, risk management, and facilitating transactions are necessary for technological improvement and economic growth. The challenge is to foster an efficient and competitive banking system, while maintaining sufficient regulatory oversight to promote confidence in the safety and soundness of the financial system.

The international banking industry has undergone substantial structural reforms over the last two decades, with both external and domestic factors affecting its structure and performance. Furthermore, there have been fundamental changes in the behaviour of banks; they now focus far more on profitability and comprehensive asset management than they did before. It is therefore important for governments to ensure that, despite such dramatic changes, the banking system remains stable and efficient. Such a banking development can lead to private and infrastructural projects being financed effectively, thus assisting capital allocation process to be more efficient. In this context, the indicators of bank performance, such as profitability ratios, are an important predictor of unstable economic conditions. A profitable banking system is likely to absorb negative shocks, thus maintaining the stability of the financial system.

In the same manner, the banking industry of both emerging and advanced economies was significantly deregulated in the early 1990s. Concurrently to the process of deregulation, banking industries have also experienced an important process of consolidation and recently exhibited an upward trend in concentration, especially in advanced countries. Also, the new wave of financial regulations, in the context of macroprudential policies, arising from systemic risk, has changed the shape of the banking system. Such a trend also exerts a significant impact on bank performance. These real effects seem to be particularly substantial in emerging countries. The effect is indeed more important in emerging economies, with relatively higher dependence on external financing for their growing investment opportunities. The financial system of the emerging economies is characterised by the dominant role of the banking sector, with the capital market segment for long-term finance being illiquid and underdeveloped. Thus, comparing the performance of banking sector in emerging and advanced economies is important and can assist regulators in emerging economies to adopt appropriate policies.

Another factor that has led economists to emphasize the important role of the banking sector is the collapse of the real estate and mortgage market (recent crisis), which originated from US and spread over the world. This is causing long-term problems for the banking sector. It has been shown in the literature that financial crises have a significant and permanent effect on economic growth. Specifically, by destabilizing the financial sector, financial crises affect the performance of the real economy through reducing the availability of credit and increasing uncertainty about future gains, and thus decreasing the level of investment and consumption. A key potential contributor to the performance of non-financial firms is the financial crisis itself, in the form of a negative shock to the supply of external finance needed by non-financial firms. The deep financial crisis has also raised new questions about the relationship between competition and stability. The underlying issue is whether there is a significant trade-off between competition and stability.

Given the indisputable importance of the banking industry, the performance of banks has been a major issue for various stakeholders, such as bankers, investors, regulators, and international financial organizations. The analysis of market power is especially important, because it translates into a higher cost of financial intermediation, a lower volume of savings and investment, all of which in turn

lowers economic growth. The processes of reducing market power are important for encouraging competitive conditions in a banking sector. Furthermore, competition is generally accepted as a positive force in most industries; it is supposed to have a positive impact on an industry's efficiency, and on the quality of provision credit, innovation and international competitiveness. The past twenty years have witnessed a process of liberalization, deregulation and unprecedented financial-sector reform in both developing and developed countries. The question is whether such changes in banking sector foster competition in order to improve the productivity, efficiency and profitability of the banking systems and also to increase both national and international competitiveness.

Finally, the importance of financial development for economic growth has been analysed extensively in recent years. Economists have provided robust empirical evidence that broader, deeper financial markets are strongly associated with future economic growth (Demirguc-Kunt and Maksimovic, 1998; Rajan and Zingales, 1998; Levine et al., 2000, among others). Furthermore, a strand of the recent literature provides empirical evidence on the contribution of the banking sector for promoting economic growth, through more efficient resource allocation. However, few studies have attempted to investigate the role of a banking market structure on the growth of nonfinancial sectors. The theory makes conflicting predictions about the relationship between bank market structure and access to and the cost of credit. On the one hand, social welfare theory suggests that exercising market power increases inefficiency, reducing the quantity of products supplied and raising the prices. On the other hand, information asymmetries and agency problems might result in a positive or nonlinear relationship between the market power of the banking sector and the amount of credit supplied to opaque borrowers. Similarly, from an empirical perspective, studies have derived conflicting results.

In this context, this thesis attempts to investigate: i) the effects of market structure on bank profitability and stability, ii) the state of bank competition, and iii) the effect of bank competition and stability on the growth and market structure of nonfinancial industries. Distinguishing between emerging and advanced economies, these questions are discussed on the basis of using three different comprehensive and unique datasets.

It is argued that banking sectors in emerging markets are characterised by higher market power, relatively weak legal systems, high levels of networking and corruption in their respective financial systems, which might limit the strength of competitive forces compared to those in developed banking systems. On the other hand, following financial market deregulation in the late 1980s in many emerging countries, their banking markets have been subjected to several structural changes: Innovation in financial products and services, removing barriers to entry, hosting foreign banks, developments in information technology, liberalisation of the financial sector, and the internationalisation of banking activities are the prominent features. Delis (2012), however, empirically find that financial reform may not have translated into the improvement of banking competition in countries with weaker institutions and a lower level of institutional development. This is compared with the case in developed countries, which have developed financial, legal and regulatory systems as well as strong protections for private property and economic freedom. These issues seem to necessitate the study by distinguishing emerging from advanced economies in order to trace the differences in findings in the theoretical arguments in literature.

1.2. Motivation, aims and objectives

As discussed, in most emerging and advanced economies, intermediary institutions play a crucial role as in the process of asset allocation, and hence having a sound and healthy financial sector is always the main concern of policy makers. There is broad consensus in the literature that a healthy system of this nature contributes to an efficient allocation of real economic resources across time and space, and an efficient management of wealth and capital accumulation. Profitability and stability are crucial indictors of banking system health. A sound and profitable banking sector is better able to withstand negative shocks and contribute to the stability of the financial system as a whole. Banks can increase their profitability through either improving their cost efficiency or exerting market power. However, the latter approach to raising profits can reduce total social welfare. Furthermore, the efficiency and stability of the banking system is a crucial concern for monetary and supervisory authorities. An important issue in this respect, which has received little

attention in the literature, is how and to what extent a trade-off prevails between profitability on the one hand and stability on the other. This provides a motivation to contribute to the current debate on the role of bank concentration in the context of both profitability and stability.

Competition and efficiency in the banking sector are also important for social welfare, since they are associated with low prices, high quality and the promotion of business innovation. That is, competition between banks should be encouraged to allow the market as a whole to become more efficient. How banks are affected by increased competitive pressures, depends partly on how efficiently they are run. The literature contains several models for estimating the degree of competition. However, assessing the degree of competition appropriately in the financial markets remains an open issue. So far, studies have relied on only one of the various competitiveness measures and researchers have not yet attempted to examine empirically, whether or not different approaches yield similar results. This is important, as recent empirical studies call into question the use of market concentration, for example, as an indicator of bank competition (Claessens and Laeven, 2005; Carbo et al., 2006). The study of industrial organisation views that concentration and competition can be spread. In a concentrated market, competition can also grow. This contradictory motives us to look at an issue on whether there is rival competition in banking sector where market structure is usually concentrated.

Moreover, competition as a part of banking sector performance is further assessed in terms of its impact on economic growth. Most studies rely on quantitative financial magnitudes, such as the size of financial markets and the amount of credit allocated, rather than on qualitative considerations. This also suggests a need to study how banks' relative ability to intermediate funds efficiently, which is a quality-based measure of financial development, complements conventional quantity-based measures in promoting economic growth. Analysing the role of the banking system, as a fundamental element of the financial sector for promoting growth, has received less attention. Yet, as banks expand and contract the availability of credit to firms, they affect corporate investments and economic activity.

In this context, the present thesis has two main objectives. Specifically, the thesis assesses bank performance from two aspects: growth sustainability and the externality of fostering the growth of non-financial industries. With regard to sustainability, the study considers two issues. One is financial performance with a focus on understanding what determines profitability and stability, particularly the role of market structure in generating profits. The second aspect is that of exploring what drives bank growth. Do banks grow through a competitive process or a non-competitive one? In the context of externality, the thesis investigates whether bank competition and stability contribute to the growth of non-financial industries. To reach these objectives we use three different and comprehensive datasets. Furthermore, we distinguish systematically emerging and advanced economies in order to understanding, in a cross-country context, whether the performance of the banking sector and the responsiveness of the real economy to a given finance shock, differs for emerging and advanced economies, given their different types of financial system, monetary and exchange rate regimes, and the extent of credit expansion.

We hope that the findings of this research will foster the formulation of policies that stabilize the financial sector and promote economic growth. In particular, the empirical findings may have several implications for policy makers as follows: i) analyses of the joint effect of bank-market concentration on profitability and stability can assist policy makers in setting policies that alleviate the potential trade-offs between bank performance on the one hand and bank soundness on the other, ii) since policy makers are traditionally in favour of using market structure indicators to gauge the degree of bank competition, analyses of different competitiveness indicators should assist them in developing valid and viable competitiveness tests and methodologies, and finally iii) the link between banking performance and the conduct of nonfinancial firms can also assist policy makers in monitoring firm behaviour with respect to setting prices for their products.

1.3. Research method and data

In this thesis, we used various research techniques in pursing our analysis. In particular, a combination of statistical description, different economic models and different econometric tests has been applied. Various theories of industrial

organization, ranging from traditional to new empirical approaches, have been used to evaluate market concentration, competition and their impact on stability of the banking sector. Also, a wide variety of micro and macro panel data econometric techniques, including OLS, GMM and IV are used to explore the different research questions. These methods have been employed to make full use of the available rich datasets and to address common econometric concerns, such as heterogeneity, endogeneity, sample selection bias, etc. Finally, the econometric analyses, calculations, tables and charts are prepared with Microsoft Excel, Eviews and STATA.

The thesis draws on three unique and comprehensive datasets. For the first empirical chapter, the dataset includes 1929 banks in 40 emerging and advanced economies over the period 1999-2008. Emerging economies cover 23 Eastern European and the Middle Eastern countries, while advanced economies cover 17 in Western Europe. The second empirical chapter uses bank-level data for around 5850 banks over the period 2001-2010 for 49 emerging and advanced economies. We select 24 emerging markets, based on the Standard and Poor's classification, and select all 25 advanced OECD economies. Finally, the third chapter complements the dataset of the second chapter with sectoral level data covering 23 industries for 48 emerging and advanced economies. The countries are the same as those used for the second empirical chapter, excluding Taiwan that has missing data for certain industry sectors.

The datasets used are considered to be the most up to date and comprehensive bank-level and industry-level data for emerging and advanced economies. Nearly 90% of the total assets of the banking system of each country under study are covered in the datasets. Complementing the data from different databases, such as BankScope, IMF, World Bank, UNIDO, UN, Heritage Foundation, etc. help to ensure that all important variables are included, which facilitates a detailed analysis of the bank performance. In Appendix Table 1-1, we present the names of 135 variables derived either from the databases or calculating manually. This allows for a broad comparison of the empirical approaches across methods, which is not disturbed by differences in the underlying data set. However, we have not used the data for all these 135 variables, due to missing information for some variables, or irrelevance on the part of some other variables.

1.4. Contributions

The main focus of this thesis is to evaluate sustainability and externality of banking industry across countries. The evaluation is made on the basis of empirical analysis of bank performance with respect to profitability, stability and competition for bank business growth, and further competition impact on the growth of non-financial industries. The main contributions of the thesis are highlighted below:

1- Does high profitability mean high stability of a bank? This question is hardly studies in existing literature. On the one hand, a profitable banking system is likely to absorb negative shocks, thus maintaining the stability of the financial system. On the other hand, an inadequate regulatory bank environment with a greater information asymmetry, may lead to high profitability, but is associated with high risk premia, which can cause financial instability. The investigation of such a joint effect on both the profitability and stability with respect to market structure is pursued to address the question. The policy implication of understanding the question is clear: at which profitability circumstance can be conductive to bank stability.

2- Do banks grow through a competitive process? Bank business cannot sustain if its business growth is not made through competitive conditions. This gives importance to evaluate the question. Evaluation of competition in a banking sector is controversial in existing studies. Some define banking sector with competition while others do not. Empirical studies are not clear because different theories are applied. To challenge the controversially in the literature, the thesis combines all of theories in related to competition evaluation to look at the issue comparatively and correlatively between economic theories and methods, making a distinctive approach of the thesis from existing studies.

3- Another distinction in assessing the degree of competition is to directly look at how competition selects efficient banks to growth by applying the theory of competition and efficiency developed by Hay and Liu (1997). This alternative but powerful measure of competition seems to be used hardly in banking studies. The notion is simple: a firm with high cost efficiency grows

more than those with less efficiency if market is competitive. The thesis applies this idea to estimate bank competition across 49 countries in the world. This is the first attempt, to our best knowledge, that this approach has been applied to the study of bank competition.

4- Does a banking sector create positive externality or an impact on stimulating growth of other industries and so the whole economy? Little attention has been paid for the issue on economic growth with bank performance. This thesis fills the gap by investigating how banking competition and stability affect the growth and market structure of manufacturing sectors. This is the first attempt to assess the effect of bank stability on nonfinancial industry empirically.

5- How do banks in emerging markets perform differently from banks in developed economies? We systematically compare the two groups in terms of profitability, stability and competition. The comparison provides us with good understanding on policy issues needed to be addressed in providing by governments at different stages of economic development.

1.5. The structure of the thesis

This thesis consists of a literature review and three main empirical chapters investigating the performance of a banking sector in emerging and advanced economies and its performance impact on industry growth. The first empirical chapter starts by analysing the impact of banking market structure on profitability and stability. In the second empirical chapter, the analysis is extended to bank competition. In this chapter, we assess the state of bank competition, using different indicators to examine their consistency. We also take a combined measure of different assessments in ranking countries. In the third empirical chapter, the impact of bank competition and stability on industry growth is investigated. For each empirical chapter separately, a unique dataset, including data for both emerging and advanced economies, as well as being based on different econometric techniques, are used, in order to make full use of the data in answering respective research questions.

Chapter 2 provides a brief literature review on the background of banking performance and the role of a banking sector in promoting economic growth. We first present research in literature regarding the determinants of bank performance based on the traditional structure-conduct-performance (SCP) paradigm and the relative-market-power (RMP) hypothesis. The importance of market structure for financial stability is also considered. We then review the existing literature on measuring the state of bank competition. We finally review the studies on the role of banking market structure in promoting economic growth.

Chapter 3 presents the first empirical analysis. The first empirical topic is about financial sustainability and its determination, which is an attempt to understand how profitability and stability is determined in banks. We aim to address some fundamental questions. Firstly, can the hypotheses of RMP and SCP be applied to an emerging market banking system in terms of profitability and stability? Secondly, why are banks operated in the emerging economies more profitable than their counterparts in advanced economies? Thirdly, what other bank-specific and macroeconomic factors do determine profitability and stability? We systematically compare banks in emerging market with their counterparts in advanced markets. The main empirical findings are as follows. As in many studies presented in banking literature, we find a positive relationship between profitability and market share in advanced economies: banking systems in developed countries are generally biased toward the RMP hypothesis. However, the data do not seem to support the hypothesis on the profitability in emerging market banking systems. The results also show that the more concentrated banking system in advanced economies is, the more vulnerable it is to a systemic risk, and to a lesser degree in emerging economies, supporting the concentration-fragility hypothesis. Bank-specific variables and financial structures seem to exert a significant effect on both types of banks; in particular, a higher interest rate spread increases profitability and stability. For banks in emerging markets the spread seems to be one of the key factors to increase their profitability. Finally, there is evidence that bank profitability and also stability are enhanced by the decreased number of banks in emerging countries, implying entry to bank business at a low cost that can be in question for stability.

Chapter 4 assesses the state of bank competition by applying different theoretical ideas as well as proposing a new competition index, namely efficiency

competition. The consistency of these theories in assessing competition is examined. We use a rich bank-level data for 49 emerging and advanced countries in order to explore the above issues internationally. The scale of analysis is extended to a panel database of some 5850 bank for the last ten years of available data (2001-2010). By doing so, the results of data estimation reveal that bank revenues appear to be earned under conditions of monopolistic competition; there is a decline in the intensity of competition over time across countries worldwide; and advanced banking systems are more competitive than their counterparts in emerging economies.

Chapter 5 analyses the externalities of banking sector. Specifically, we analyse the effect of bank competition and stability on the growth of nonfinancial sectors. We first test the effect of bank competition and stability on the growth of nonfinancial industries. The empirical effect depends on how competition is measured according to different theories. We next investigate whether a competitive and stable banking sector affects the market structure of nonfinancial industries. In fact, we find empirically that competition and stability in banking systems can lower the average firm size that can facilitate industry entry. Using data 23 industrial sectors in 48 emerging and advanced economies, we find robust empirical evidence that a more vigorously competitive banking sector helps financially-dependent industries not only to grow faster but also to disconcentrate their market structure. Furthermore, the stability of a banking system is essential for economic growth. By splitting the sample according to emerging and advanced economies, we find that such effects are noticeably different. Finally, the results are remarkably sensitive to different measures of competition, suggesting that a good measure of bank competition matters empirically in identifying not only for competition but also impact of competition on economic growth.

Chapter 6 concludes and proposes policy implication of the research.

1.6. Appendix

Table AP 1-1: Variables used for the thesis and their codes for econometric analyses. Sources: BankScope, UNIDO, IMF, World Bank, Heritage Foundation, etc, and own calculations.

Row	Variable	Code	Row	Variable	Code	Row	Variable	Code
1	Bank Name	**Bank_name**	46	Interest Income on Loans	**IIOL**	91	Efficiency production	**effic_prod**
2	Bank code	**Bank_code**	47	Other Interest Income	**OII**	92	Efficiency total cost	**effic_tcost**
3	Year	**Year**	48	Dividend Income	**DI**	93	Interest spread=Lending-Deposit	**Int_spe**
4	Country_code	**Co_code**	49	Interest Expense on Customer Deposits	**IEOCD**	94	overheads/ave.market.overheads	**ove_average**
5	Econmy_code	**ec_code**	50	Other Interest Expense	**OIE**	95	(overheads-personnel)/ave.market.overhead	**ooe_average**
6	Country Name	**Co_Name**	51	Total Non-Interest Operating Income	**TNIOI**	96	(ovehead to asset/yearly_ove_to_ass)*100	**ove_t_ta_t_ave**
7	Listed/ unlisted /delisted	**Listed_code**	52	Personnel Expenses	**PE**	97	((ovehead-personel) to asset/yearly_ove_to_a	**ooe_t_ta_t_ave**
8	Cons. code	**Cons_code**	53	Other Operating Expenses	**OOE**	98	log(total cost)	**logt_cost**
9	Number of recorded shareholders	**NORS**	54	Total Non-Interest Expenses	**TNIE**	99	log(overheads)	**logt_cost_overh**
10	Specialisation	**Spe_code**	55	Loan Impairment Charge	**LIC**	100	log(iiol-nir+tnie)	**logt_cost**
11	Number of Employees	**NOE**	56	Operating Profit	**OP**	101	log(ta)	**logta**
12	Number of Branches	**NOB**	57	Residential Mortgage Loans	**RML**	102	log((iiol-nir)/ta)	**z1**
13	Total Assets	**TA**	58	Other Mortgage Loans	**OML**	103	log(pe/ta)	**z2**
14	Deposits & Short term funding	**DASTF**	59	Other Consumer/ Retail Loans	**OCL**	104	log(ooe/fa)	**z3**
15	Equity	**EQI**	60	Corporate & Commercial Loans	**CACL**	105	log(iiol/ta)	**q1**
16	Net Income	**NI**	61	Cash and Due From Banks	**CADFB**	106	log((iiol+ooi)/ta)	**q1_1**
17	Loan Loss Reserve / Gross Loans	**LLRTGL**	62	Repos and Cash Collateral	**RACC**	107	log(eqi/ta)	**eqi1**
18	Capital Funds / Liabilities	**CFTL**	63	Common Equity	**CE**	108	log(loan/ta)	**loan1**
19	Net Interest Margin	**NIM**	64	Non-controlling Interest	**NCI**	109	OECD_code=1 OECD countries	**OECD_code**
20	Return on Average Assets (ROAA)	**ROAA**	65	Interest Income on Loans/Gross Loans	**IIOLTAGL**	110	Overall Score-Economic freedom	**Inst1_EF**
21	Return on Average Equity (ROAE)	**ROAE**	66	Interest Expense / Customer Deposits	**IEOCDTACD**	111	Property Rights	**Inst2_PR**
22	Cost to Income Ratio	**CTI**	67	Non-Interest Income/ Gross Revenues	**NIITGR**	112	KKZ Institution Index	**Inst3_KKZ**
23	Loans	**LOAN**	68	Non-Interest Expense/ Gross Revenues	**NIETGR**	113	Financial Freedom	**Cont1_FF**
24	Loans and Advances to Banks	**LAATB**	69	Non-Interest Expense/ Average Assets	**NIETAA**	114	Fraction of entry applications denied	**Cont2_AD**
25	Fixed Assets	**FA**	70	Taxes/ Pre-tax Profit	**TTPTP**	115	Activity restriction	**Cont3_AR**
26	Deposits from Banks	**DFB**	71	Operating Profit / Risk Weighted Assets	**OPTRWA**	116	Explicit deposit insurance scheme	**Cont4_DI**
27	Long term funding	**LTF**	72	Tier 1 Regulatory Capital Ratio	**TIER1**	117	Life insurance premium volume as a share of	**Inspe1_LI**
28	Loan Loss Reserves	**LLR**	73	Total Regulatory Capital Ratio	**TRCR**	118	Non-Life insurance premium volume as a shar	**Inspe2_NLI**
29	Total Liabilities & Equity	**TLAE**	74	Core Tier 1 Regulatory Capital Ratio	**CORE_TIER1**	119	Percent of total bank assets foreign owned	**Own1_FR**
30	Impaired Loans (Memo)	**IL**	75	Impaired Loans(NPLs)/ Gross Loans	**NPLTGL**	120	Percent of total bank assets government own	**Own2_STA**
31	Liquid Assets (Memo)	**LA**	76	Interbank Assets/ Interbank Liabilities	**INT**	121	Number of banks in economy	**NOB_E**
32	Intangibles (Memo)	**INTAN**	77	sigma_roaa	**sigma_roaa1**	122	Required Reserves	**Cont5_RR**
33	Off Balance Sheet Items	**OFF**	78	Total Assets all	**ASS_ALL**	123	legal origin	**LEG_ORI**
34	Hybrid Capital (Memo)	**HC**	79	Market share_total assets	**MS_ASS**	124	Domestic credit provided by banking sector (%	**DCPBB_GDP**
35	Subordinated Debts (Memo)	**SD**	80	concentration assets	**Conc_Ass**	125	Domestic credit to private sector (% of GDP)	**DCTPS_GDP**
36	Net Interest Revenue	**NIR**	81	Concentration_Loans	**Conc_Loan**	126	GDP growth (annual %)	**GDP_GROW**
37	Other Operating Income	**OOI**	82	Concentration_Deposits	**Conc_Dep**	127	GDP per capita, PPP (constant 2005 internatio	**GDP_PC**
38	Net Gains (Losses) on Trading and I	**NGOTAD**	83	Concentration_Deposits	**Conc_Dep**	128	Inflation, consumer prices (annual %)	**INF_CPI**
39	Net Fees and Commissions	**NFAC**	84	Total yearly assets	**Ty_ass**	129	Interest rate spread (lending rate minus depo	**IRS_COUN**
40	Overheads	**OVE**	85	Total yearly loans	**Ty_loan**	130	Market capitalization of listed companies (% o	**MCLC_GDP**
41	Loan Loss Provisions	**LLP**	86	Total yearly deposits	**Ty_Dep**	131	Real interest rate (%) (FR.INR.RINR)	**RIR_COUN**
42	Tax	**TAX**	87	Deposit rate	**Dep_rate**	132	Stocks traded, total value (% of GDP)	**STTV_GDP**
43	Dividend Paid	**DP**	88	Lending rate	**Len_rate**	133	Stocks traded, turnover ratio (%)	**STTR_PER**
44	Total Capital	**TC**	89	Efficiency overheads	**effic_overh**	134	Interbank rates > 3-month or 90-day rates and	**INT_BAN_RAT**
45	Net-Charge Offs	**NCO**	90	Lending rate	**Len_rate**	135	Population	**POPU_LEV**

Chapter 2

Literature Review

This chapter reviews the existing theoretical and empirical literature in relation to topics of the thesis. More specifically, Section 2.1 presents a literature review regarding bank market structure, profitability, and stability. Section 2.2 reviews literature on models regarding the evaluation of competition for the banking sector. Finally, Section 2.3 reviews the theory and empirical studies on the effects of financial development on economic growth.

2.1. Bank Market Structure, Profitability and Stability

2.1.1. Bank Market Structure and Profitability

Existing literature suggests three hypotheses concerning the relationship between market structure and performance. The first hypothesis is the traditional structure–conduct-performance (SCP) (see Bain, 1956). The SCP paradigm assumes that extra profits are the result of a higher concentration enabling banks to collude. The second hypothesis is the relative-market-power (RMP) that the supernormal profits are due to firms with well-differentiated products that can increase market share by exercising their relative market power in pricing products. Thirdly, the hypothesis is of the efficient structure hypothesis (Demsetz, 1973), which suggests that earning higher profits is owing to greater efficiency, which facilitates banks in obtaining both greater profitability and market shares. The efficiency structure hypothesis is usually divided into the X-efficiency and scale efficiency hypotheses (Berger 1995). Lastly, aside from these theories, various authors have also investigated other factors explaining bank profitability, such as bank-specific and macroeconomic factors (e.g. Athanasoglou *et al.*, 2008).

Historically, most of research on the determinants of bank performance is based on the SCP paradigm. The SCP postulates that market structure influences the conduct or behaviour of a firm through, for example, pricing and investment policies; this in turn influences corporate performance. Bourke (1989), for example,

established a positive relationship between market concentration and bank profitability in Europe, North America, and Australia. For European banking markets, Maudos and de Guevara (2004) highlight a statistically significant positive correlation between concentration and bank interest margins for the period 1993–2000. Moreover, Demirguc-Kunt and Huizinga (1999) can be considered in regard to banks throughout the world, whilst Molyneux and Thornton (1992) focus attention on Europe. In contrast, however, Smirlock (1985) reports that concentration does not explain bank profit rates for 2,700 state banks operating in the USA. Goldberg and Rai (1996) also fail in establishing a positive association between concentration and profitability for a sample of large banks located in 11 European countries for the period 1988–1991. Regarding the relative market hypothesis, in an influential study by Berger (1995), the author finds a great deal of support for the RMP hypothesis where market share is positively associated with profitability. Overall, the empirical studies explaining the profit–structure relationship usually focus mainly on the US (Berger, 1995) and European countries (Goddard *et al*., 2004; Vander Vennet, 2002).

Some of the recent research made an attempt to explain the market structure hypothesis with the profit-efficiency relationship by specifying x-efficiency and scale-efficiency (Berger, 1995)[1] using the methods of the stochastic frontier analysis (SFA) and the data envelopment analysis (DEA). Claeys and Vander Vennet (2008), amongst others, investigated the determinants of bank interest margins in the Central and Eastern European countries with an attempt to empirically understand whether or not the high profit margins of banks are caused by a low degree of efficiency and/or non-competitive market conditions. By employing the SFA techniques, the scholars found that there is evidence to support the SCP hypothesis, and low operational efficiency is reflected in high bank interest margins in these countries. In Seelanatha (2010), by utilising the DEA approach (a non-parametric approach), the findings suggest that the performance of banks in Sir Lanka depends on levels of efficiency but not on market power in terms of market share and market concentration. This is contrasted with the findings of the study by Tregenna (2009), who investigated the effects of market structure, bank size, and operational

[1] X-efficiency asserts that firms with superior management of production and technologies have lower costs and therefore higher profits. The scale-efficiency hypothesis claims that firms tend to have equally good management and technology, but some simply produce at more efficient scales than others, and as a result, have lower unit costs and higher unit profits.

efficiency on the high profit of American banks in the pre-crisis period (1994–2005). The main findings include the weak efficiency effect on profitability, but also a robust and positive concentration-profit relationship.

A number of studies have also focused on other key determinants of bank profitability. Some empirical studies looked at the bank-specific and macroeconomic factors that may explain bank profitability by using data either from an individual country or from cross countries. Studies analysing a single country include, amongst others, Berger *et al.* (1987), Berger (1995), Neely and Wheelock (1997), Mamatzakis and Remoundos (2003), Naceur and Goaied (2008), Athanasoglou *et al.* (2008), García-Herrero *et al.* (2009), and Dietrich and Wanzenried (2011). Studies analysing cross countries include, amongst others, Short (1979), Molyneux and Thornton (1992), Demirguc-Kunt and Huizinga (1999), Staikouras and Wood (2004), Goddard *et al.* (2004), Athanasoglou *et al.* (2006), Micco *et al.* (2007) and Pasiouras and Kosmidou (2007).

More specifically, the impact on profitability of bank-specific factors, such as bank size, capital adequacy, operational efficiency, risk and ownership, has been analysed. Regarding the size of a bank, Pasiouras and Kosmidou (2007) report a positive and statistically significant impact of bank size on profitability, thereby suggesting that larger banks benefit from economies of scale. Micco *et al.* (2007) have also highlighted a robust positive relationship between bank profitability and size, although the impact is statistically insignificant. Furthermore, a large body of literature reports a high correlation between the level of equity capital and bank performance (Bourke, 1989; Demirguc-Kunt and Huizinga, 1999; Goddard *et al.*, 2004; Naceur and Goaied, 2001, 2008; García-Herrero *et al.*, 2009). The researchers find that banks that maintain a high level of equity relative to their assets have a high profitability ratio, thus suggesting that the costs of funding for high-equity financed banks is lower as a result of lower prospective bankruptcy costs. Furthermore, using cost to income ratio or overhead to total assets ratio as a proxy of operational inefficiency, Athanasoglou *et al.* (2008) and Goddard *et al.* (2009) report a negative effect of bank inefficiency on profitability.

Regarding the impact of risk, researchers have examined the relationship between the loans to assets ratio and profitability. Whilst some authors report a

negative association between the level of risk and profitability (Bourke, 1989; Molyneux and Thornton, 1992), others find a positive impact on bank profitability. Finally, the ownership status of a bank can also affect its performance. Iannotta *et al*. (2007) and Micco *et al*. (2007), for instance, find that state-owned banks tend to be less profitable, especially in developing countries. Demirguc-Kunt and Huizinga find that foreign-owned banks in developed countries are shown to be less profitable, although Bourke (1989) and Molyneux and Thornton (1992) suggest that ownership status does not contribute to profitability. In addition, some authors report that more recently established banks are more profitable than older ones (Beck *et al*., 2005).

Furthermore, the impact of some macroeconomic variables, such as GDP, interest rate, inflation and taxation, has been analysed in previous studies; particularly, researchers have empirically shown a positive relationship between these variables and bank profitability (e.g., Bourke, 1989; Molyneux and Thornton, 1992; Demirguc-Kunt and Huizinga, 1999; Athanasoglou *et al*., 2008; Albertazzi and Gambacorta, 2009). Finally, a number of other studies suggest that the legal and institutional characteristics of a country matter in explaining profitability (Demirguc-Kunt and Huizinga, 1999; Albertazzi and Gambacorta, 2009). More specifically, Demirguc-Kunt and Huizinga (1999) measured the effects on profitability of a variety of bank and market characteristics, namely taxation, the structure of financial systems, and financial regulations, with their later work (2000) arguing that greater bank development brings tougher competition, higher efficiency, and lower profits.

In attempt to analyse bank-specific and macroeconomic determinants of profitability, Kosmidou *et al*. (2005), for example, analyse the UK commercial banking sector over the period 1995–2002, reporting that all of such factors the cost–income ratio, capital adequacy, liquidity, and loan loss reserves affect profitability significantly. Pasiouras and Kosmidou (2007) measure the effects of capital ratio, cost–income ratio, loans to customers and short-term funding, bank size, inflation, GDP growth, and concentration on bank returns for 584 domestic and foreign commercial banks in the 15 developed EU countries over the period 1995–2001. The effects of all variables were found to be significant—regardless of bank ownership status—with the exception of the concentration ratio. Finally, using data from seven south-eastern European countries over the period 1998–2002, Athanasoglou *et al*. (2006) reported statistically significant relationships between profitability and

determinants such as capital, inflation, operating expenses, size, ownership status, and concentration.

2.1.2. Bank Market Structure and Stability

Concerning the impact of banking market concentration on financial stability, both economic theory and empirical evidence seem to be inconclusive. In the literature, there are two different contrasting views on the relationship between concentration (competition) and stability, namely 'concentration (concentration)-stability' and 'concentration (competition)-fragility' views. By distinguishing concentration from competition, we review the existing literature that analyses the impact of each one on bank soundness, as follows.

Concentration and Stability

With respect to the relationship between market power and bank soundness, with focus on concentration, it is classified into two views; 'concentration-stability' and 'concentration-fragility' (for example, Uhde and Heimeshoff, 2009). Proponents of the 'concentration-stability' view argue that larger banks in concentrated banking sectors reduce financial fragility through at least five channels: (i) larger banks may increase profits, building up high 'capital buffers', hence allowing them to be less prone to liquidity or macroeconomic shocks; (ii) larger banks may increase their charter value, hence discouraging bank managers from excessive risk-taking behaviour; (iii) it is easier to monitor larger but fewer banks, subsequently resulting in the effective action of supervisory bodies, and consequently reducing the risk of a system-wide contagion; (iv) larger banks tend to be subject to providing credit monitoring services; and (v) due to higher economies of scale and scope, larger banks have the potential to diversify loan-portfolio risks efficiently and geographically through cross border activities. Using data on 69 countries during the period 1980–1997, Beck *et al*. (2006) provide strong evidence that, in the concentrated banking system, financial crises are less likely to occur (for further discussion, also see Boyd and Prescott, 1986; Keeley, 1990; Allen and Gale, 2000; Boot and Greenbaum, 1993; Matutes and Vives, 2000; Hellman *et al*., 2000; Boot

and Thakor, 2000; Cordella and Levy Yeyati, 2002; Boyd *et al*., 2004; Meon and Will, 2005).

On the other hand, advocates of the 'concentration-fragility' view argue that larger banks in a concentrated market weaken stability through three channels: (i) larger banks are seen as 'too big to fail' institutions, which receive guarantees from governments, consequently meaning the moral hazard problem becomes more severe; (ii) larger banks tend to charge high loan interest rates as a result of their market power, which may lead to risky projects undertaken by borrowers to compensate for such high rates, the consequence of which could be increased default risks; and (iii) managerial efficiency, such as risk diversification in assets and liabilities may decline, resulting in high operational risk (for further discussion, also see Mishkin, 1999; Boyd and De Nicolo, 2006; Cetorelli *et al*., 2007).

In the following, we highlight and summarise more studies of these two conflicting views. According to the traditional view, market power in banking may be desirable. In theoretical models, Boot and Greenbaum (1993), in addition to Allen and Gale (2004), argue that increasing bank charter value arising from increases in market power feeds financial stability. They emphasise that increasing market share creates incentives for bank managers to act prudently. Such an argument supports the 'concentration-stability' view, and is substantiated by various empirical works. Rhoades and Rutz (1982), for example, conducted the first empirical study on US banks by investigating whether or not the lack of competitive pressure encourages bank managers to take on less risk. Their findings indicate that concentration appears to reduce bank profit volatility. Paroush (1995) also discussed whether merger and acquisition decreases total banking sector risk as a result of increases in market share. Keeley (1990) showed that banks with less market power tend to take-on excessive risk. In a recent study, using data on 69 countries during the period 1980–1997, Beck *et al*. (2006) provide strong evidence that, in more concentrated banking systems, financial crises are less likely to occur; however, they also show that less contestable markets are more subject to systemic risks. Similarly, Beck *et al*. (2006, 2007) show strong evidence that banking systems in concentrated market are more stable. Finally, Carletti and Vives (2008) show that market power may have a moderating effect on bank risk-taking incentives.

In contrast, the findings of other empirical studies support the 'concentration-fragility' view. De Nicolo (2000), for instance, tested the relationship between bank size and an indicator of bank risk, the Z-score, on a sample of listed banks in 21 advanced economies. The results suggest that more market power (larger size) is associated with taking on more risk. Extending the previous work of De Nicolo (2000), De Nicolo *et al*. (2004) took a sample of more than 100 countries' banks with the aim of examining the effect of concentration on risk, subsequently finding that banks with more concentration are more vulnerable to systemic failure, using an indicator of aggregated Z-index as stability. Moreover, Boyd and De Nicolo (2005) argue that higher borrower default rates—which are amplified by a moral hazard—occur when banks are able to impose higher loan interest rates, leading borrowers to invest in less profitable projects. Similarly, by employing the Z-score, Boyd *et al*. (2006) acquire the same evidence in which concentration in either deposits or loans correlated with higher probability of increased risk. Finally, Molyneux and Nguyen-Linh (2008) investigated the relationship between competition and bank risk in South East Asian banking, garnering a result that competition does not increase bank risk-taking. Other recent studies supporting this view include the works of De Nicolo and Loukoianova (2006), Schaeck *et al*. (2006) Schaeck and Cihak (2007), and Koetter and Poghosyan (2009).

Competition and Stability

In a main survey of the literature on bank concentration and competition, Berger *et al*. (2004) distinguish between concentration and broader measures of competition, concluding that competitiveness in banking cannot be gauged through the use of classical concentration indicators. Hence – and in a similar vein to the studies conducted in the arena of concentration and stability – a similar pattern in the literature on competition and stability is observed. More specifically, by employing non-structural measures of competition, two conflicting views indicate that competition either increases or decreases stability. In the following, a summary of both views is provided (for further detail see Carletti and Hartmann, 2003; Schaeck *et al*., 2009a).

A large number of theoretical literature suggest that increased competition leads banks to take-on more risky business strategies, providing support for the

'competition-fragility' nexus (Smith, 1984; Keeley, 1990; Besanko and Thakor, 1993; Staikouras and Wood, 2000; Repullo, 2004). Smith (1984), for instance, posits a theoretical framework concerning the way in which increased competition for bank deposits increases vulnerabilities in the system. Besanko and Thakor (1993) exemplified the case that, as competition becomes severe; banks choose to adopt a risky portfolio strategy.

Empirical studies on interest in the relationship between competition and stability in banking was triggered by the influential work by Keeley (1990), who found that increased competition amongst US banks in the 1980s eroded monopoly rents (charter value), subsequently increasing bank failure. Similarly, Bordo *et al.* (1995) found less failure rate amongst banks of the Canadian banking system during 1920–1980, at which time banks were operated under the oligopolistic structure. Capie (1995) also investigated stability in the UK banking market, and found that, over the period 1840–1940, a less competitive environment resulted in no major crisis. Furthermore, Hellmann *et al.* (2000), Carletti and Hartmann (2003) and Dick (2006) show that competition for deposits can also undermine prudent bank behaviour. Moreover, such findings are also supported by Jimenez *et al.* (2007) in the context of Spanish banks. Through the adoption of the Lerner index, the authors find a negative relationship between loan market power and portfolio risk, highlighting that non-performing loans decrease with a rise in the degree of power in the loan market, thus promoting financial stability.

However, a counter trend has emerged – both at theoretical and empirical levels – which refute the traditional trade-off between market power and bank stability but which bolster the view that competition is beneficial for bank stability – the so called 'competition-stability' view. In a theoretical framework, Caminal and Maututes (2002) argue that banks with intermediate monitoring costs in a monopoly structure may be more subject to originate risky loans portfolio, setting the stage for subsequent problems in the system. Perotti and Suarez (2002) illustrate that merger policy contributes to banking stability when the regulatory agency encourages takeovers of failed firms.

In line with the 'competition-stability' view, a large body of supportive empirical evidence can be found in the literature (for example, De Nicolo, 2000; De

Nicolo *et al*., 2004; Boyd and De Nicolo, 2005; Boyd *et al*., 2006; Schaeck and Cihak, 2008; Uhde and Heimeshoff, 2009; Schaeck *et al*., 2009b). In particular, Boyd and De Nicolo (2005) suggest that the traditional trade-off between competition and stability is not robust against the introduction of loan market competition, with the scholars emphasising that borrowers' moral hazard, and thus risk-taking, is mitigated by lowering loan rates following more competition. Under this view, competition decreases bank risk. In this regard, by gauging the H-statistic, Schaeck *et al*. (2006) test competition and the duration model of systemic risk amongst 38 countries during the period 1980–2003, concluding that more competitive banking systems are more stable than monopolistic systems owing to a lower likelihood of bank failure and a longer time of crisis.

In addition, Levy Yeyati and Micco (2007) took banks in eight Latin American countries, and measured the H-statistic as a proxy of competition; they found a positive association between competition and the Z-index, thus suggesting that competition reduces the inclination to take-on more risks. Finally, in a major study carried out by Berger *et al*. (2008), through employing many concentration/competition indicators, including the Lerner index, as well as using a variety of bank risk measures, such as the Z-score and non-performing loans, the effects of concentration/competition on bank-risk taking is tested. Importantly, the scholars found a higher association between market power and loan risks, but lower in terms of overall bank risk. In addition, they also established mixed results for developing countries. Finally, when taking bank data for 23 developed economies for the period 1999–2005, Berger *et al*. (2009) tested 'competition-fragility/stability' debate, finding that a higher degree of market power is associated with less overall risk exposure (measured by the Z-score), which is markedly consistent with the former view. Moreover, it was also established that market power positively affects loan portfolio risk (measured by NPLs), in support for one element of the later view. They conclude that higher capital ratios may offset this risk.

Finally, despite these two conflicting views, some authors argue that there is no specific relationship between competition and stability, and that vulnerability can arise irrespective of the market structure of the banking sector (Matutes and Vives, 2000; Koskela and Stenbacka, 2000). Allen and Gale (2004), for example, argue that the competition – stability relationship is multifaceted, and thus the trade-off

between competition and stability is improper. Moreover, by reviewing different theoretical models, different solutions for efficient levels of both competition and stability were reached. Whilst Allen and Gale (2004) argue that competition – stability relationship is complex; Beck *et al*. (2004) suggest that bank soundness is enhanced in both more competitive and concentrated markets. Boyd *et al*. (2005) argue that the probability of crisis also depends on a number of other determinants, such as monetary policy. Finally, Berger *et al*. (2009) argue that these two conflicting views may still not give the opposite result, suggesting that the way of selecting indicators to reflect all types of risk is important. For example, they argue that, although loan risk may increase through a high interest rate, banks with higher market power are nevertheless still able to mitigate such risk through more equity capital, which consequently reduces overall bank risk.

To summarise Section 2.1, the existing literature provides a fairly comprehensive review of the effects of market power, financial structure, and banks' activities on risks and returns. However, some questions in relation to emerging market banking systems still need to be addressed. The results of previous studies tend to indicate that the impact of market power on bank performance is positive; however, such a relationship may not be robust for every region in the world, particularly when emerging economies are taken into account. The results of empirical studies are also mixed in regard to the impacts of bank concentration on financial stability, which provides a scope for further investigation. Thus, the third chapter of this study aims to gain greater insight into those factors affecting jointly bank risk and return (especially the role of market structure).

2.2. Measuring the State of Bank Competition

In this section, we review existing studies that have implemented different models with the objective to gauge a degree of competition in the banking sector of an economy.

2.2.1. Panzar and Rosse Model

One of the non-structural indicators of competition used to assess competitive behaviour in financial services is based on the works of Panzar and Rosse (1987,

1982). This methodology (henceforth P&R), extensively applied in banking studies, is based on reduced form revenue functions uses firm-level data. It investigates the market power (*H*-statistic), which is measured by the extent to which changes in factor prices are reflected in revenues with assumption that have no collusion in price setting. Panzar and Rosse show that this statistic can reflect the structure and conduct of the market to which the firm belongs.

In this context, we present an extensive review of the studies that have employed the P&R methodology within the banking sector. In the case of non-EU countries, the first applicant was Shaffer (1982), who applied the P&R methodology to a cross-section of banking firms in New York in 1979, and found that the competitive conduct of banks cannot be characterised as monopolistic or perfectly competitive in the long-run equilibrium, but rather monopolistic competition. Similarly, Nathan and Neave (1989) studied Canadian banks, trust companies, and mortgage companies during the period 1982–1984, and also rejected the hypothesis of monopoly and perfect competition. Molyneux *et al*. (1996) investigated the competitiveness conditions in the Japanese banking system, finding evidence of monopoly and monopolistic competition, suggesting that the lack of contestability in Japanese commercial banks hindered more competition. Finally, in a more recent study, by applying the P&R model for the Korean commercial banks during 1992–2004, Park (2009) finds that the Korean commercial banking market was monopolistically competitive with temporary deviation to the level of competition during the crisis period.

Numerous studies have also applied the P&R model empirically in the Euro zone, in the case of both cross-country and single-country studies. Cross-country studies, such as those of Molyneux *et al*. (1994), Bikker and Groeneveld (2000), De Bandt and Davis (2000), Bikker and Haaf (2002a, 2002b), Weill (2003), Bikker (2004), Boutillier *et al*. (2004), Staikouras and Koutsomanoli-Fillipaki (2006), and Carbo *et al*. (2009), all find that monopolistic competition is prevalent across various European countries. In particular, De Bandt and Davis (2000) estimated the *H*-statistic for France, Germany, and Italy, during1992–1996, separating results for large and small banks within each country, subsequently finding monopolistic competition for large banks and monopoly for small banks in Germany and France. In their study of the competitive structure of the EU banking industry, Bikker and

Groeneveld (2000) estimated the *H*-statistic, finding that the European banking market is characterised by monopolistic competition. In a major study, Bikker and Haaf (2002b) examine competitive conditions and market structure in the banking industry for 23 developed countries, including the EU, over the period 1991–1997. Their findings indicate a monopolistic competition for all countries, in which competition is strong in international markets and weaker in local markets. They also find that competition is worsened by concentration. Boutillier *et al*. (2004) analyse a degree of competition amongst banking firms of the four major European continental banking sectors (Germany, France, Italy, and Spain) between 1993 and 2000. The implementation of the Panzar and Rosse model allows the rejection of the monopolistic competition hypothesis for any of the sectors represented for the period examined. Finally, Staikouras and Koutsomanoli-Fillipaki (2006) investigated the degree of concentration and competition for 15 EU and 10 non-EU countries for the period 1998–2002, the results of which show that European banks were operating under conditions of monopolistic competition.

Individual country studies for European countries by Vesala (1995) for Finland, Hondroyiannis *et al*. (1999) for Greece, Hempell (2002) for Germany, Coccorese (2002) and Coccorese (2004) for Italy, Maudos and Perez (2003) and Carbo *et al*. (2003) for Spain, and Matthews *et al*. (2007) for the UK, all reach similar conclusions that monopolistic competition is widespread in European banking systems. More specifically, Vesala (1995) examined the levels of competition in Finnish banks over the period 1985–1992, and highlights a substantial increase in the level of contestability. By utilising the P&R model, Hondroyiannis *et al*. (1999) examine the competitive condition in the Greek banking system for the period 1993–1995. The results show that bank revenues appear to be earned under conditions of monopolistic competition. By estimating the *H*-statistic separately for savings and cooperative banks, Hempell (2002) examines the German banking system for the period 1993–1998, finding evidence of monopolistic competition, in which the lowest *H*-statistic was reported for cooperative banks. Furthermore, using the *H*-statistic, Coccorese (2004), examines the competitive conditions in the Italian banking industry during the period 1997–1999, finding that banks earned revenues as if they were under conditions of monopolistic competition. Finally, the application of the P&R model was utilised in regard to 12 major British banks for the period

1980–2004 by Matthews *et al*. (2007), who found that British banking is most characterised by the monopolistic competition.

For the case of emerging economies, a growing volume of recent studies, including Drakos and Konstantinou (2003), Gelos and Roldos (2004), Yuan (2006), Yildirim and Philippatos (2007), Turk-Ariss (2009), Delis (2010a), and Demirguc-Kunt and Martinez Peria (2010), have attempted to contribute to the existing literature. In particular, Drakos and Konstantinou (2003) examine competitive conditions for a group of Central and Eastern European banking sectors for the period 1992–2000, finding overall a monopolistic competition. Gelos and Roldos (2004) compared the competitive conditions of a sample of eight Latin America and Central and Eastern European countries over the period 1994–1999, and established that the bank consolidation process, in its early stage, does not decrease competition. Mamatzakis *et al*. (2005) measured the degree of competition within the banking sector of south-eastern European countries over the period 1998–2002, and reached the conclusion that banks earn their interest and total revenue under conditions of monopolistic competition.

In regard to the Chinese banking system, Yuan (2006) examined the competitiveness condition during the period 1996–2000 through employing the P&R method. The study suggested that perfect competition, in many cases, cannot be rejected, and concluded that Chinese banking sector, prior to the entering of foreign banks into local market, was already near in a state of perfect competition. Utilising the H-statistic for 14 Central and Eastern European transition economies for the period 1993–2000, Yildirim and Philippatos (2007) analysed the evolution of competitive conditions within the banking sector. The results suggest that the banking markets of these countries cannot be characterised by the bipolar cases of either perfect competition or monopoly except for the FYR of Macedonia and the Slovak Republic. By utilising the P&R model in 12 Middle East and North African (MENA) banking systems for the years 2000–2006, Turk-Ariss (2009) examined the competitive conditions of commercial banks. The results indicate that, with the exception of the case of North African banks, which operated under monopolistic conditions, the prevailing market structure in the MENA banking sector is mainly monopolistic competitive. Finally, with the application of the P&R method, Delis (2010a) examined the competitive conditions in the banking system of Central and

Eastern European countries during 1999–2006. Delis's results indicate a wide variation in the competitive condition in which the banking system operates under a range of monopolistically competitive to non-competitive. Other emerging-market studies include that of Demirguc-Kunt and Martinez Peria (2010), who examined the Jordanian banking sector over the period 2003–2007, and subsequently suggested that, although concentration has declined, competition remains low—and has even has decreased over time.

2.2.2. Lerner and Boone Models

With the exception of the P&R methodology, two alternative models that have recently attracted many European scholars are the *Lerner model*, developed by Lerner (1934), and the *Boone model*, as developed by Boone *et al*. (2005) and Boone (2008). In the case of empirical work, a number of recent studies have adopted the Lerner index with the aim of identifying the trend in competitive behaviour over time—specifically in European countries (see, for example, Fernández de Guevara and Maudos, 2004; Fernández de Guevara *et al*., 2007; Carbo and Rodrıguez, 2007; Maudos and Fernández de Guevara, 2007). Generally, these studies suggest a worsening of competitive conditions in European banking sectors during the 1990s. Furthermore, some recent studies attempt to apply the Boone indicator in order to gauge the degree of competition within the banking sector (see, for example, Delis, 2010b; Schaeck and Cihak, 2010). The idea is that the profits of banks with lower marginal costs, i.e. higher efficiency, are expected to increase more in competitive as opposed to uncompetitive markets.

2.2.3. Other Non-structural Models

The *conjectural variation model* is another development in non-structural measures, which examines the strategic reactions of competing oligopolies (Shaffer 1989, 1993; Shaffer and Disalvo, 1994; Suominem, 1994; Neven and Roller, 1999). The extensive theoretical literature on oligopoly behaviour has long recognised that major firms in concentrated markets can compete aggressively with one another, which commonly involves firms having to guess the price and quantity reactions to

strategic moves made by one another (so-called conjectural variations). In the case of such relationships, the competitive environment is determined by the strategic reactions of firms, and not necessarily by the structure of the market. The main criticisms of conjectural variations models are that multi-period interpretations of conjectural variations models are impossible, and the conjectures that firms hold are arbitrary. The Iwata (1974) model also provides a framework for estimating conjectural variation values for those banks that supply homogenous products in an oligopolistic market. According to the existing literature, the Iwata measure has been applied to banking only once, which was by Shaffer and DiSalvo (1994). Notably, the researchers found evidence of imperfectly competitive behaviour in a highly concentrated duopoly market.

Another alternative non-structural method that has been often applied in the banking sector is the so-called *Bresnahan method*, which is a model of Bresnahan (1982) and Lau (1982), as expanded in Bresnahan (1989), which takes the condition of general market equilibrium. The basic idea is that profit-maximising firms in equilibrium will choose prices and quantities such that marginal costs equal their (perceived) marginal revenue, which coincides with the demand price under perfect competition or with the industry's marginal revenue under perfect collusion. This parameter simply measures the extent to which the average firm's marginal revenue varies from average revenue, thus indicating the slope of the demand curve and hence the implied market power of firms over price. This approach was first applied to the banking industry by Shaffer (1989, 1993), who took aggregate data for the US loan market and the Canadian banking industry, respectively. Shaffer (1989) strongly rejected collusion, but not perfect competition, for the US banking industry, and similarly, Shaffer (1993) found that, despite structural and regulatory changes, Canadian banks operate in a market exhibiting perfect competition. Applications of this approach to the European banking are numerous, and findings include imperfect competition for the period 1960–1984 for Finnish banking by Suominen (1994), a more collusive carter-like behaviour for six European countries between 1981 and 1989 by Neven and Roller (1999), rejection of perfect competition for the period 1983 and 1997 for the Italian banking sector by Angelini and Cetorelli (2003), non-competitive market for the period 1990–1995 for Portuguese banking sector by Canhoto (2004), and a perfect competition for the period 1993–1999 for Dutch

consumer credit markets by Toolsema (2002). Toolsema's finding is contrary to what is observed by most of European banking studies. Notably, the application of Bresnahan's methodology to other regions is not significant, although Uchida and Tsutsui (2005) used such method and subsequently reported an evidence of improvement in the last quarter of the twentieth century for a study of competition in the context of the Japanese banking system. Finally, Gruben and McComb (2003) find that, prior to 1995; the Mexican banking system was super-competitive, with marginal prices set below marginal costs.

To summarise Section 2.2, so far, different models have been applied to measure the intensity of competition in a banking sector; however, the results of competition assessment are various with different models or theories applied. Carbo *et al*. (2009), for example, examined whether different measures lead to similar results, which was achieved by comparing structural and non-structural competitiveness indicators across 14 different European banking systems during 1995–2001. The main finding is that different results can be obtained by applying different measures concerning the competitive behaviour of the banking sector within and across countries as well as over time. For example, their measure of the bank pricing power indicates that competition in European banking sector may very well be higher than observed by traditional measures and analysis. Thus, in Chapter Four, this issue is revisited. Specifically, by proposing a new method and applying different competitiveness measures, we test the state of bank competition in emerging and advanced economies, and further examine the consistency of these measures in ranking countries for their bank competition.

2.3. Finance and Growth

So far, numerous studies have attempted to identify the determinants of growth. Although there is no unifying theory, several partial theories appear to discuss the role of various factors in determining economic growth: the neoclassical Solow's growth model and theory of endogenous growth. The former theory has emphasised the importance of investment and the latter, developed by Romer and Lucas, has drawn attention to human capital and innovation capacity. Empirical researchers have also used these theories focusing firstly on the issue of economic

convergence/divergence since this could provide a test of validity between the main growth theories, and secondly identifying factors determining economic growth. Studies by, for example, Kormendi and Meguire (1985), Grier and Tullock (1989) Barro, (1991), Barro and Lee, (1993), Chen and Feng (1996), and Feng, (1997) all confirm the so-called conditional convergence of different nations. They are usually find that growth is determined by human capital, fertility, trade, government consumption, the rule of law, political stability, income distribution, inflation and the terms of trade.

In this thesis, we depart from analysing the determinants of growth; rather we focus on the finance-growth nexus. According to the recent literature, development in financial markets contributes to the growth of non-financial firms and, in turn, to economic growth (King and Levine, 1993a, 1993b; Levine and Zervos, 1998; Guiso *et al*., 2004; Levine, 2005; Loayza and Rancière, 2006). Thus, in this section, we first focus on the theories that predict the impact of financial development, in general, on economic growth, and then the theoretical and empirical literature investigating the effect of banking market structure, particularly on the growth and market structure of non-financial firms. Subsequently, we review literature arguing the importance of financial regulations for economic growth, and finally discuss the shortages of relevant literature.

2.3.1. Financial Development and Growth

The argument that states financial markets affect economic growth can be traced back to Schumpeter (1911). Following Schumpeter, the empirical studies by Gurley and Shaw (1955, 1967), Goldsmith (1969), McKinnon (1973) and Shaw (1973) emerged to contribute to research on the financial development-growth nexus. In addition, more recently, substantial theoretical and empirical works on the positive relationship between development in finance and economic growth can be found (for example, King and Levine, 1993b; Obstfeld, 1994; Boyd and Smith, 1996). Such economists have stressed the role of financial development in terms of mobilising savings, improving risk-taking, producing ex-ante information on investment opportunities and capital allocation, easing the exchange of goods and services, and boosting technological innovation—the activities that are essential catalysts for

economic growth. Greenwood and Jovanovic (1990), for instance, developed a model in which financial intermediaries have a better ability to identify productive projects than individual investors. The financial intermediaries also improve the efficiency of capital allocation, and further allow a higher rate of return on capital to be earned, hence supporting economic growth. Thus, the conclusion of the aforementioned studies is that future economic growth is strongly related to development in finance (see also Demirguc-Kunt and Maksimovic, 1998; Levine and Zervos, 1998).

Given an expected positive relationship between financial development and economic growth, scholars have made attempts to investigate how development in finance can influence economic growth. In fact, they try to identify which specific characteristics of financial markets impact on non-financial firms. Jayaratne and Strahan (1996) and Cetorelli and Gambera (2001) analysed the effects of banking structure on a firms' growth, with Levine (1999) examining the role of the quality of legal protection for creditors on economic growth, and La Porta *et al*. (2002) studying the role of state ownership in the banking sector.

However, Rajan and Zingales (1998) argue that the positive relationship commonly established between financial development and economic growth may be owing to failure to take into account the role of an omitted variable, such as saving rates. According to the principal theories of growth, the saving rate is an important explanatory variable of economic growth. Furthermore, development in finance is associated with an economy's capacity to save. Thus, any positive correlation between financial development and economic growth may be the reflection of the relationship between these two variables (financial development and growth) with saving rate. Hence, Rajan and Zingales attempted to identify the specific mechanism through which financial development contributes to economic growth. Notably, the scholars based their idea on the fact that, when a firm faces an investment opportunity, it typically relies on two important resources: one is the internal cash flow generated within the firm, and the second is the external sources of finance, such as banking sectors and capital markets. Owing to outsiders having markedly less control over the borrower's actions and knowing less about what borrowers will do with the funds, the external finance is thought to be costlier (Jensen and Meckling, 1976; Myers and Majluf, 1984). Thus, if development in finance promotes

accounting information and disclosure rules, and improves corporate governance, the cost of access to external sources will be reduced. In such a scenario, those firms which are technologically more dependent on external finance, located in countries with better financial development, have the opportunity to grow fast, and hence enhance economic growth.

2.3.2. Banking Market Structure and Growth (lending relationship)

With the exception of the aforementioned channel developed by Rajan and Zingales, through which financial development may affect economic growth, a strand of literature focuses on the *lending relationship*—another channel through which banking system performance may affect the growth and market structure of non-financial firms.

The existence of market power in a market with perfect information implies that the price is set above the marginal cost. In this sense, the quantity of goods or services traded is less than that at the competitive equilibrium (where price is set to the marginal cost). Thus, banking markets with greater competition generate a lower price of credit and supply more lendable funds, consequently promoting economic growth. However, the existence of asymmetric information between banks and their clients within the banking sector obstructs various exchanges that would have taken place. Boot (2000) emphasises that one way of mitigating asymmetries of information and acquiring soft and informal information by financial intermediaries is to establish *lending relationship* with borrowers. In this sense, banks are able to screen and monitor their clients more efficiently, making possible the supply of lendable funds for heavily financially dependent firms. Furthermore, some studies find that, although lending relationships with borrowers do not lower costs of finance, they nevertheless relax the financial constraints and hence provide more access to finance (Petersen and Rajan, 1994; Elsas and Kanhen, 1998; Harhoff and Karting, 1998; Cole, 1998). Also, Degryse and Van Cayseele (2000) and Chakrabortt and Hu (2006) argue that a lending relationship helps clients to offer fewer assets as guarantee; however, under the lending relationship, banks may obtain more market power and hence the hold-up problem appears.

Regarding the relationship between the degree of competition within banking sectors and firm access to external financing, and, in turn, economic growth in the field of lending relationship, the theoretical work is ambiguous. On the one hand, various theoretical works have suggested that the holdup problem that arises under lending relationships occurs less often in more competitive financial systems, and consequently, firms may be more encouraged to enter into lending relationships (Boot and Thakor, 2000). In such a scenario, firms depending more so on external finance have better excess to financing, and hence grow faster. It is also likely that, under less competition, banking systems provide lower-quality financial services at higher costs, which subsequently hampers growth for financially dependent firms. Furthermore, Cestone and White (2003) have proposed a theoretical framework in which the behaviour of lenders can be affected by the existing of a lending relationship. They show that, the more competition in a financial market, the more incentive there is for lenders to finance newcomers, hence resulting in less industry concentration. Cetorelli (2003) also provides evidence to support the notion that more concentration within banking sector is associated with less entry, and accordingly delays the exit of older firms. On the other hand, various theoretical studies argue that banks operating in more competitive markets may have fewer incentives to invest in lending relationships; thus, industrial sectors that are severely dependent on external financing grow more slowly (Rajan, 1992; Petersen and Rajan, 1995; Chen, 2007). Peterson and Rajan, for example, propose a framework in which it is seen that, in countries wherein banks have more market power, young and unknown firms have better access to credit; in short, therefore, the theoretical literature gives an unclear picture of the relationship between the degree of bank competition and industry growth.

In recent years, a growing body of studies have empirically investigated the effect of banking market structure on firms' access to financing and economic growth in the field of lending relationships (for a survey, see Boot, 2000). The influential work of Petersen and Rajan (1995) provides a framework showing the effects of competition in determining the value of lending relationships. In their model, they show that firms in countries with competitive banking systems are subject to greater financial constraints, as banks with fewer incentives to invest in relationship banking. The paper also offers evidence from American SMEs that

supports this hypothesis. Particularly, their empirical results suggest that a greater degree of concentration (less competition) relaxes financial constraints for firms.

In contrast, however, Angelini *et al*. (1998) analysed the effects of bank–firm relationships on the cost and the availability of credit for Italian firms. In their model, they include the concentration ratios of the loans and deposits markets as the control variables, and find that concentration is not a statistically significant variable. Furthermore, D'Auria *et al*. (1999) assessed the costs of bank credit following relationship banking in Italy corporations, and include the degree of competition (proxied by the Herfindahl-Hirschman index) into the model as a control variable. The findings showed that competition decreases the cost of finance. Similarly, Berlin and Mester (1999) find evidence that there is a negative association between competition and the cost of finance. Finally, Beck *et al*. (2004) find that greater concentration in banking sectors increases financial obstacles, with a greater effect for smaller firms.

Regarding the cross-country analysis of the direct—as opposed to indirect—effect of the banking competition on economic growth, the limited existing studies are all based on the methodology first proposed by Rajan and Zingales (1998). Cetorelli and Gambera (2001), for example, find that banking concentration has a depressing effect on overall economic growth. However, Deidda and Fattough (2002), on the other hand, suggest a negative relationship between banking concentration and industrial growth in only low-income countries, whilst no banking concentration-growth nexus is found in high-income countries.

2.3.3 Banking Market Structure and Manufacturing Sectors

Turning to the impact of bank market structure on the market structure of non-financial firms (aside from growth), there is various scattered evidence. From a historical point of view, Cameron (1967) states that 'competition in the banking is related to the question of competition in industry'. Peterson and Rajan (1995) argue that banks with market power have more incentives to finance young firms as they can exploit future rents when firms eventually become profitable, and hence contribute to an unconcentrated market of non-financial firms. However, one might

argue that older firms are more profitable, and hence banks have greater incentive to enter into the lending relationship with such firms. In such a scenario, more concentration may lead banks to pool funding toward a few older firms of a large size (Spagnolo, 2001), and hence contribute to a concentrated market of non-financial firms. Thus, there are two alternative conjectures regarding the impact of bank competition (concentration) on the market structure of industrial sectors.

Recent empirical evidence shows that more market power amongst banks is associated with less concentration in manufacturing sectors. By applying the empirical methodology of Rajan and Zingales, Cetorelli and Gamberra (2001) assess the impact of banking market structure on growth. Using a sample of 41countries and 36 sectors over 1980–1990, they find that credit access to younger firms in need of external finance is facilitated by a more concentrated banking system. Similarly, di Patti and Dell'Ariccia (2004) use this approach, and find that there is a positive relationship between banking system concentration and firm creation, although concentration reduces credit to informationally opaque firms. Furthermore, adopting Rajan and Zingales' model, di Patti and Dell'Ariccia (2004) use a range of market concentration and market power indicators to test the effect of banking competition on the creation of firms. Using non-financial sectors in Italy, an inverted U-shape relationship was established between bank competition and the creation of firms.

In contrast, Cetorelli (2001) employed the same methodology, and found that, in sectors severely dependent on external finance, banking concentration leads to industry concentration (measured as average firm size), with stronger effects for countries with under-developed financial systems. Cetorelli (2003) also finds evidence to support an association between less competition in a banking sector and less entry firms, as well as a greater existence of older firms. Similarly, Beck *et al*. (2004) find evidence that more concentration in credit market increases financing obstacles for small firms. Using a panel of manufacturing industries in 29 OECD countries, Cetorelli (2004) also garners evidence that the process of enhanced competition in EU banking markets is associated with lower average firm size. Finally, Cetorelli and Strahan (2006) analysed the impacts of banking concentration on the number of firms for US small firms and, with the use of the Herfindahl-Hirschman index, found that potential entrants face less difficulties in gaining access to credit if they are located in less concentrated banking systems.

2.3.4. Regulations, Finance and Growth

Apart from financial development and banking performance, a number of studies have investigated the effects of regulations and institutional quality on banking performance, and in turn, on growth. They find that, whilst the strong legal frameworks—including property rights and banking deregulations—contribute to economic growth, more regulations in the financial sector have a negative impact.

Disclosure requirements stipulated by law can mitigate the degree of asymmetric information, and accordingly ease access to external finance (Berger *et al*., 2004). In regard to the literature reviewed in Levine (2005), financial development is associated with a country's institutional characteristics, such as a legal framework. Moreover, countries with strong legal frameworks have better financial development, which in turn relaxes constraints for firms' access to external funds (La Porta *et al*., 1998; Rajan and Zingales 1998; Beck *et al*., 2000). Jayarantne and Stranhan (1996) test whether or not the liberalisation of the banking sector in different states in the US has any impact on growth, and find that this indeed had a positive effect on a state's growth. Similarly, Demirguc-Kunt and Maksimovic (1998) investigated the role of legal and financial system structure on firms' access to external financing to fund growth, and established that firms located in countries with better developed legal systems have greater access to external funds, and thus grow faster. Furthermore, in this same vein, some authors argue that the quality of institutions in implementing financial transactions can affect the effectiveness of financial sectors in advancing economic growth (for a survey see Beck and Levine, 2005). Levine *et al*. (2000) investigated the importance of legal and accounting systems for levels of financial development, and highlight that differences in financial development can be explained by differences in legal systems and accounting practices. Thus, banking deregulations and legal disclosure requirements may affect economic growth by determining financial development.

In contrast, banking regulations have a depressing effect on economic growth. Bart *et al*. (2001) document various regulatory restrictions imposed on commercial banks in 1999. Using such data, Barth *et al*. (2003) suggest that tighter entry requirements are negatively associated with bank efficiency, causing higher interest margins and higher overhead expenditure, which may increase constraints on

a firm's access to external finance. Similarly, Demirguc-Kunt *et al*. (2004) examined the impact of market structure, regulatory regimes, and institutional factors on the cost of financial intermediation. Using data across 72 countries, they found that tighter regulations on bank entry and bank activities boosted the cost of financial intermediation. Finally, recently, Utrero-Gonzales (2007) analysed the effect of banking regulation and excessive disclosure requirement on 23 industrial sectors in nine European countries over 1990–1999, and found a negative effect of prudential regulations, and a positive impact of investor protection on economic growth.

2.3.5. Limitations of Existing Studies

The major limitation of the aforementioned studies investigating the effect of bank market structure on growth and the market structure of non-financial firms is that they systematically utilise traditional indicators of market concentration in their efforts to gauge the degree of competition. However, recent works, such as those by Claessens and Laeven (2004) and Carbo *et al*. (2009), suggest that different indicators of competition and concentration cannot be used interchangeably due to the fact that different indicators yield different things.

Given the limitation on the use of indicators of market concentration to proxy the degree of competition, two recent studies – Claessens and Laeven (2005) and Maudos and Fernandez de Guevara (2006) – are acknowledged as first in concerning assessment of the impacts of banking competition on economic growth, using of an indicator of competition based on the New Empirical Industrial Organization approaches.

By employing the Rajan and Zingales method and accordingly estimating the degree of competition using the Panzar and Rosse H-statistic framework, Claessens and Laeven (2005) find that financially dependent industries grow faster in countries with greater banking system competition. They also find that market concentration does not contribute in terms of forecasting sector growth, thus supporting the argument of the low degree of correlation between the H-statistic and concentration indicator. They conclude that the most competitive banking systems reduce the cost of lendable funds and hold-up problem. In contrast, Maudos and Fernandez de

Guevara (2006) adopted the same method, gauging the degree of competition with the implementation of the *H*-statistics and Lerner index tools as measures of competition, as well as structural indicators as measures of concentration, with the objective to analyse the impact of banking competition on economic growth. Using data taken from a sample of 53 sectors in 21 countries, the exercise of market power (less competition) was found to enhance economic growth, supporting the literature on the relationship lending. Their results also suggest that one might not use market concentration measures as indicators of the degree of competition.

Furthermore, two other papers (Carbo *et al*., 2007; de Guevara and Maudos, 2009) analyse the relationship between banking system competition and economic growth within the regions of one country as opposed to cross-countries, using the Lerner index with the aim of measuring bank competition. Carbo *et al*. (2007) investigated the effect of bank competition on the financial constraints experienced by Spanish SMEs. De Guevara and Maudos (2009) also assessed the influence of regional financial development and bank competition on firm's growth of the same country. They found an inverted-U effect of monopoly on growth. Importantly, such studies also cast doubt on the use of traditional structural indicators, such as concentration ratios, as indicators of competition.

It is hardly to see any existing study that has made an attempt to investigate the impact of financial instability on the growth and formation of industrial sectors, although numerous studies have analysed the impact of competition on financial stability. The link from the degree of competition to the banking stability is ambiguous; as discussed before, there are two conflicting views that indicate that competition either increases or decreases stability. A large theoretical literature suggests that increased competition leads bank to take on more risky business strategies, providing support to the 'competition-fragility' nexus (Smith, 1984; Keeley, 1990; Besanko and Thakor, 1993; Repullo, 2004). However, a counter trend has emerged both at the theoretical and empirical levels, which refutes the traditional trade-off between market power and bank stability, but bolsters the view that competition is beneficial for bank stability—the so-called 'competition-stability' view (Caminal and Maututes, 2002; De Nicolo *et al*., 2004; Boyd and De Nicolo, 2005; Boyd *et al*., 2006). Thus, since there is no clear relationship between competition and stability, in this study, we employ indicators for both the state of

competition and stability with the aim of examining their real effect on growth and the formation of non-financial firms.

To summarise Section 2.3, existing empirical evidence shows a positive effect of financial development, including banking sector size, on growth. The effect on economic growth induced by banking competition has also been analysed through the review of a number of studies, both directly or via lending relationship. However, given the unclear relationship between banking competition and economic growth, we are motivated to analyse this relationship further by employing a number of other indicators of bank competition, and also to further analyse the impact of banking stability on providing fund, and in turn on the growth and structure of industrial sectors. Thus, Chapter Five will test the effect of bank competition and stability on growth and the market structure of non-financial industries.

CHAPTER 3

Bank Performance I: Financial Sustainability and Its Determination

3.1. Introduction

How do banks perform in terms of its financial sustainability? This chapter will look at this question from two aspects: the profitability and stability of banks. The profitability is about how banks can make financial reward from its banking business to its investment. If the reward is high, the banks will have more incentives and resources to commit themselves for the future of business. Therefore, a good understanding of bank profitability and profit-growing process or profit determination is critical for evaluation of banks' financial sustainability. As our sample statistics shown, overall, banks across countries in the world are quite profitable with an increasing profitability over time reaching return on assets over 1% in 2010. What made this profitability improvement is a question that can help us understanding whether this improvement can be sustainable in the future.

It is argued that the market structure matters for banks' power in setting interest rates that can directly affect their performance. A positive statistical relationship between measures of market structure, such as concentration or market share and profitability has been reported by many banking studies (e.g. Molyneux and Thornton, 1992, Berger, 1995). In the existing literature, there are two schools of thought for such a relationship (Berger, 1995). One of them is the structure-conduct-performance (SCP) paradigm, where, in highly concentrated markets, firms can set prices that are less favourable to consumers as a result of imperfectly competitive markets. In a concentrated banking system, a bank can set higher spreads by imposing higher lending rates and lower deposit rates. The other hypothesis is the relative-market-power (RMP) paradigm where firms with well-differentiated products can increase market share and exercise their market power in pricing products, thus earning supernormal profits. With respect to the impact of market structure on banking stability, both economic theory and empirical evidence are inconclusive. In literature, there are two contrasting views on the relationship between concentration and stability, namely the 'concentration-stability' and the

'concentration-fragility' views. According to the former, more a concentrated banking system may decrease risk through increasing franchise value, whilst the latter suggests that market power gained through concentration increases risk through the setting of higher interest rates. While there is a large literature that banks rationally choose more risky portfolios when confronted with increased competition (less concentration), new studies find risk-incentive mechanisms that banks take on more risk when they become more concentrated.

This chapter empirically re-examines the effect of market structure on both profitability and stability in banking sectors. We utilize data from 23 emerging economies (10 Eastern European and 13 Middle Eastern countries) and 17 Western European countries, containing relatively large panel data for a total of 1929 banks over the period 1999-2008. Incorporating both the traditional SCP and RMP hypotheses, the market structure analyses are performed by regressing bank performance indicators on measures of market power together with bank-specific characters, financial structure variables and macroeconomic conditions. We make an allowance for the differences between banks operated in emerging and developed countries. We aim to address some fundamental questions. Firstly, can the hypotheses of RMP and SCP be applied to the emerging market banking system in terms of profitability and stability? Secondly, why are banks operated in the emerging economies more profitable than their counterparts in advanced economies?[2] Thirdly, to what extent are discrepancies in determinants of bank risk and returns due to variations in factors under the control of bank management and/or factors relating to financial structures? We systematically compare the emerging market banking systems with their counterparts in advanced markets. In particular, identifying the factors that lead to the differences may explain the effectiveness of financial institutions and also help us better understand the banking industry in emerging economies.

The main contributions of this chapter are largely two-fold. Firstly, this is the joint analysis of profitability and stability. The international banking industry has undergone substantial structural reforms over the last two decades. There have been fundamental changes in the behaviour of banks with emphasis not only on

[2] We statistically verify this in Section 3.2.

profitability, but also on stability with comprehensive asset management in recent periods. It is particularly important for emerging countries to ensure that the banking system is stable. Such a banking development should lead to private and infrastructural projects being financed effectively and funds allocated efficiently. As Albertazzi and Gambacorta (2009) argue, because of phenomena such as globalization, growing international financial markets, deregulation and advances in technology, identifying the determinants of bank performance is an important predictor of unstable economic conditions. Athanasoglou et al. (2008) also point out that a profitable banking system is likely to absorb negative shocks, thus maintaining the stability of the financial system. On the other hand, an inadequate regulatory bank environment with a higher degree of information asymmetry may lead to high profitability, but it is indicative of high risk premia, and these can cause financial instability (Hellmann et al., 2000). The investigation of such a joint effect on both profitability and stability of market structure is, to the best of our knowledge, extremely limited. In this chapter, we can analyse whether the relatively high returns of banks are accompanied by increased stability by exerting market power due to less competitive market conditions. If this is the case, the excessive implementation of measures to promote competition may have destabilising effects on banks. Since there is a wider interest in the effect of augmented competition and deregulation on banking systems, our empirical results may provide useful policy implications.

The second contribution is the behaviour of emerging markets. In the new global economy, there has been an increasing interest in measuring profitability in emerging markets. However, studies of the profitability-market power relationship in emerging markets have been limited, being considerably less rigorous, lacking in detailed accounts of the determinants of bank profitability. This chapter fills the gap by widening the scope of explanatory variables, not only in terms of market structure, but also with a wider range of other control factors, without which the model would suffer from the omitted variables.

The importance of our comparative study lies in the development and improvement of the banking sector in emerging economies. The Middle East and the Eastern Europe would appear to be one of the appropriate choices for the study of emerging economies, since each has its unique points of difference. The Middle Eastern banking system is fairly concentrated, which is dominated by Islamic banks

and, at least until the late 1990s, was tightly regulated and protected from foreign competition. Hence, the improvement of the banking environment in this region would provide more opportunities to enter into the international markets. Eastern Europe formerly dominated by state-owned banks has recently converged to the European Union and follows European banking rules. It follows that legal and financial infrastructures need to be established in order to penetrate the major EU markets. The Western banking system is a good benchmark in which banks operate under a highly competitive environment. Indeed, in the preliminary data analysis in Section 3.2, we have found distinctive features in profitability and market structure between these emerging markets and developed EU markets, providing the meaningfulness of our study.

Different determinants call for different policy actions. If profitability and stability determinants can be effectively identified in relation to the market structure, fundamental reform could be undertaken by policy makers. If, on the other hand, determinants were dominated by bank-level variables, promoting more stakeholder power would be desirable. If determinants are clearly identified in relation to macroeconomic variables, actions in terms of bank reform could be undertaken by macroeconomic policy makers.

The main empirical findings are as follows. As in many studies presented in banking literature, we find a positive relationship between profitability and market share in advanced economies: banking systems in developed countries are generally biased toward the RMP hypothesis. However, the data do not seem to support the hypothesis on the profitability in emerging market banking systems. The results also show that the more concentrated banking system in advanced economies is, the more vulnerable it is to a systemic risk, and to a lesser degree in emerging economies, supporting the concentration-fragility hypothesis. Bank-specific variables and financial structures seem to exert a significant effect on both types of banks; in particular, higher interest rate spreads increase profitability and stability. For emerging banks this seems to be one of the key factors to increase their profitability. Finally, there is evidence that bank profitability and also stability are enhanced by the decreased number of banks in emerging countries.

The remainder of this chapter is structured as follows. In Section 3.2 we compare the state of market structure and profitability for both emerging and advanced banking systems, which reinforces the importance of our study. Section 3.3 specifies the model for estimation. Section 3.4 describes the variables used for this study. Section 3.5 describes the dataset and summarises the data descriptive statistics. The empirical results are reported in Section 3.6. Section 3.7 provides some robustness tests. Section 3.8 discusses the heterogeneity among emerging economies. Section 3.9 discusses the key findings. And finally, Section 3.10 concludes and provides a number of policy implications.

3.2. Market structure and profitability for emerging and advanced economies

In order to elaborate the level of profitability and market structure, we measure return on assets for 308 selected banks[3] located in emerging countries (Eastern Europe and Middle East) and 1621 selected banks in developed countries (Western Europe) over the sample period. Figure 3-1-a illustrates the trend of returns on average assets (ROAA) during the period1999-2008. Bank profitability in the emerging economies, which has an upward trend till 2007, is extremely high as compared to that observed for developed economies, where ROAA is relatively constant, being around 0.5. The main question one might want to address is what explains such differences in bank profitability between two different markets.

Figure 3-1-a: ROAA

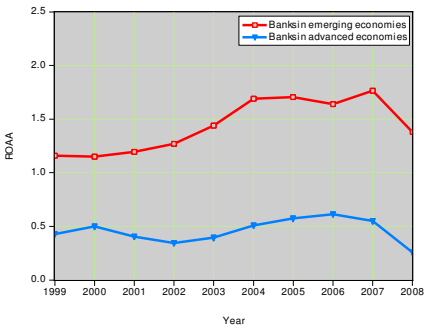
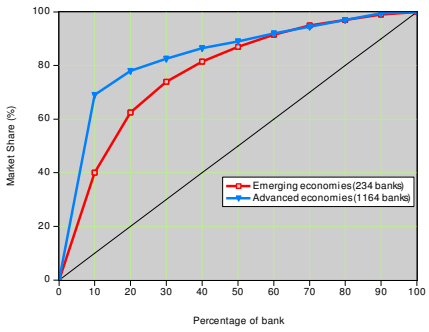


Figure 3-1-b: Lorenz Curve of market share



[3] See Section 3.5 for the bank selecting procedure.

Figure 3-1-c: Four-firm concentration

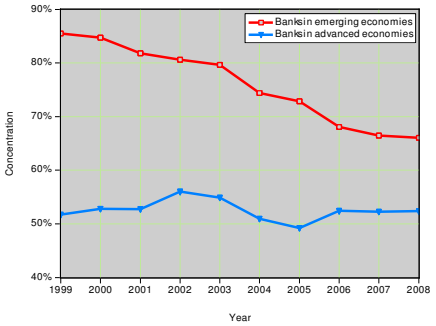
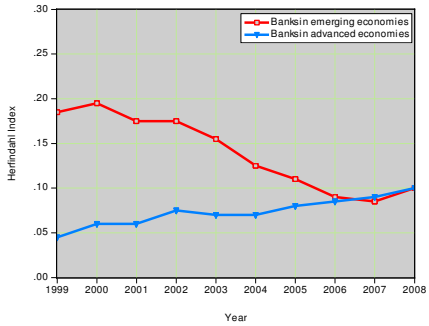


Figure 3-1-d: Herfindahl index



- **Figure 3-1**: Market structure and profitability for emerging and advanced banks. **Source**: Authors' calculations based on data from the BankScope.
- Sample 1999 to 2008
- ROAA (return on average assets): net income as a percentage of total assets, market share: a percentage of a bank's assets to total assets of banks in the country, concentration: a percentage of four-bank assets to total assets in the country, Herfindahl index: a square of total market shares of all banks operated in each country. For more detail, see Section 3.4 of this article.

One possible answer could be the market structure in these economies. We have computed a market share for each bank and market concentration for different countries where these banks are located. Figure 3-1-b displays the Lorenz Curve for market share[4]. The horizontal and vertical axes show the proportion of banks and market share respectively. It shows that 10% of emerging banks, accounting for 23 banks, holds nearly 40% of the market share[5], whereas the same 10% of advanced banks accounting for 116 banks holds as much as 70% of market share. Figures 3-1-c and d show the 4-firm concentration[6] (CR_4) and normalized Herfindahl-Hirschman index[7] ($NHHI$), respectively. It can be seen that the degree of CR_4 in emerging market banking systems declines dramatically over the sample period. Yet, even with the lowest CR_4 of around 67%, the structure is still highly concentrated, and banks may be very conducive to price collusion. Conversely, in the advanced banking system CR_4 is relatively stable at around 51%. In Figure 3-1-d, being consistent with CR_4, $NHHI$ shows a downward trend in emerging economies, and appears to converge to that in advanced economies. These comparative illustrations provide a powerful motivation to investigate the market structure nexus with bank performance for the two types of markets.

[4] In generating the Lorenz Curve, some banks were dropped due to missing observation.

[5] Market share is measured as a percentage of a bank's assets to total assets of banks in the country.

[6] CR_4 is calculated as the total assets of the four largest banks to the total assets of all banks in the country.

[7] If $\mathrm{MS_i}$ represents the market shares by firm i and N is the number of firms in the market, then $HHI=\sum(\mathrm{MS})_{\mathrm{i}}^2$ and $NHHI=\frac{(\mathrm{HHI}-\frac{1}{\mathrm{N}})}{(1-\frac{1}{\mathrm{N}})}$. $NHHI$ is normalized and deflated by 10,000 in Figure 3-1-d.

3.3. Model specification

We develop a panel data model by building upon the existing empirical models in bank performance through the potential influence of market structure. Following Berger (1995) and Smirlock (1985), the traditional hypothesis can be tested by estimating profit using the equation: $\Pi_{it} = f(Market\ Structure_{it})$, where i denotes i'th bank and t stands for time period, Π measures bank performance, and $market\ structure$ refers to either using market share (MS) at a firm level, or using the concentration ratio (CR) at the market level. The CR reflects the degree of collusive behaviour, where a firm's power to extract higher profits is due to oligopolistic behaviour. The specific version can be written as follows:

$$\Pi_{it} = \alpha_0 + \alpha_1 MS_{it} + \alpha_2 CR_{4,t} + \varepsilon_{it} \qquad (3\text{-}1)$$

where CR_4 is a measure of the 4-firm concentration ratio. This equation differentiates the two hypotheses of RMP and SCP. A coefficient combination of $\alpha_1 > 0$ and $\alpha_2 = 0$ implies that banks with a higher market share are more efficient than their rivals, and yield higher profit, supporting the RMP theory. Conversely, $\alpha_1 = 0$ and $\alpha_2 > 0$, suggest that the traditional SCP theory can be verified. This implies that firms' greater profitability is not affected by market share; rather rents arise from monopolistic operation due to market concentration.

As control variables, we consider the measures of X-efficiency and scale-efficiency (Claeys and Vander Vennet, 2008) together with other bank-specific variables. Moreover, the model is augmented with supplemented measures, which are particularly useful in providing a comprehensive understanding of the factors underlying a bank's net margins and risk. In cross-country comparisons, it is also necessary to allow for variation in country-level variables, in which performance determinants can vary systematically across countries. Thus, for empirical part we estimate an equation of the following form:

$$\Pi_{it} = \alpha_0 + \alpha_1 MS_{it} + \alpha_2 CR_{4,t} + \sum_{j=1}^{J} \beta_j X_{jit} + \sum_{m=1}^{M} \Upsilon_m X_{mit} + \varepsilon_{it}$$

$$\varepsilon_{it} = \mu_i + \nu_{it} \qquad (3-2)$$

where X_j is a vector of bank-specific variables and X_m is a vector of country-specific and overall financial structure factors. ε_{it} is the error term with μ_i being the unobserved individual specific effect and $\boldsymbol{\nu_{it}}$ being the normal stochastic disturbance, where $\mu_i \approx \text{IIN}(0,\sigma_\mu^2)$ and $\nu_{it} \approx \text{IIN}(0,\sigma_\nu^2)$.

For stability, we specify the analogous explanatory variables as in equation (3-2). Hence, the financial stability (*FS*) model is given by:

$$FS_{it} = \alpha_0 + \alpha_1 MS_{it} + \alpha_2 CR_{4,t} + \sum_{j=1}^{J} \beta_j X_{jit} + \sum_{m=1}^{M} \Upsilon_m X_{mit} + \varepsilon_{it}$$

$$\varepsilon_{it} = \mu_i + \nu_{it} \qquad (3-3)$$

This is suitable to study the impacts of banking market structure on banking stability. The specification of *CR* allows us to investigate the arguments of 'concentration-stability' and 'concentration-fragility'.

3.4. Variables description and determinants of bank performance

In this section, we describe the dependent variables and determinants of banking performance. The latter is classified into four groups of market structure, bank-specific factors, financial environment factors and macroeconomic environment.

Dependent variables

Following banking literature, the profitability measures are after-tax returns on average assets (ROAA) and after-tax returns on average equity (ROAE)[8], which indicates how effectively banks' assets and equity are being managed to generate revenues. The ROAA has emerged as the key indicator for the evaluation of bank profitability and has become the most common measure of bank profitability in the literature (Golin 2001). Our second measure of profitability the ROAE is also regularly has been used as an alternative indicator to ROAA by researchers. Thus, in

[8] In order to capture any differences that appear in assets during the fiscal year, averages are employed.

our analyses, we consider the ROAA and ROAE as the common measure of profitability and report the results for both[9].

The relationship between ROAA and ROAE could be expressed as $ROAA = \frac{Returns}{Assets} * \frac{Equity}{Equity} = \frac{Returns}{Equity} * \frac{Equity}{Assets} = ROAE * \frac{Equity}{Assets}$. So, ROAA equals ROAE times the capital equity ratio. The latter is often referred to as leverage. Since ROAE, compared to ROAA, disregards the risks associated with leverage which itself determined by regulation; ROAA emerges as the dominant indicator for the evaluation of profitability in the banking sector. However, in this study for robustness we employ both indicators.

Bank stability is measured by the distance to default or by the Z-score, defined as the standard deviation value that a bank's rate of returns on assets has to fall for the bank to become insolvent[10] and is computed as the ratio of the sum of ROAA and equity-to-asset (capital equity) ratio over the volatility of ROAA. A higher Z score indicates that the bank is more stable. An alternative measure of bank stability, the interest coverage ratio (or interest multiplier) is also employed, derived as profit plus interest expenses divided by interest expenses.

Following previous studies (e.g. Levy Yeyati and Micco, 2007 and Turk Ariss, 2010), we measure solvency risk. We define bank in solvency as $(\pi + Cap) \leq 0$, where π denotes profit and Cap as capital equity. Thus, an insolvency risk is measured as a probability of profit losses higher than the equity capital of a bank in a year, $P(-\pi \geq Cap)$, where π is assumed to be a normally distributed random variable such that $\pi \sim N(\mu_\pi, \sigma_\pi^2)$. Now, let us define $ROAA$ as an average return on assets of a bank over year and TA as total assets, we normalize and develop this probability as follows:

$$P(-ROAA_{it} \geq \frac{Cap_{it}}{TA_{it}})$$

Or

[9] For both emerging and advanced economies, both indicators show that that profitability was generally increasing over time. However, for the last year 2007-2008, profitability exhibited a significant decrease, mainly due to the recent financial crisis.

[10] Note that a more appropriate measure for bank risk is a non-performing loans ratio, however, due to data limitations, no homogeneous proxy could be constructed for all banks.

$$P\left(\frac{ROAA_{it}-\mu_{ROAA_{it}}}{\sigma_{ROAA_{it}}} \leq \frac{-\frac{Cap_{it}}{TA_{it}}-\mu_{ROAA_{it}}}{\sigma_{ROAA_{it}}}\right) = P\left(\frac{ROAA_{it}-\mu_{ROAA_{it}}}{\sigma_{ROAA_{it}}} \leq -Z\right)$$

$$= \emptyset(-Z)$$

where σ^2_{ROAA} and μ_{ROAA} are the variance and mean of the distribution of return on assets, and hence the Z-score for bank i at time t is defined as $Z_{it} \approx \frac{\frac{Cap_{it}}{TA_{it}}+\mu_{ROAA_{it}}}{\sigma_{ROAA_{it}}} \geq 0$ and $\emptyset(.)$ is the cumulative distribution function $N(0,1)$. Furthermore, Boyd et al. (1993) relaxed the normality assumption in related work and assume that if μ and σ^2 exist then a Chebisher inequality (see Roy, 1952 and De Nicolo, 2000 for more details) implies that:

$$P\left(-ROAA_{it} \geq \frac{Cap_{it}}{TA_{it}}\right) \leq \left(\frac{\sigma_{ROAA_{it}}}{\mu_{ROAA_{it}}+\frac{Cap_{it}}{TA_{it}}}\right)^2 \cong \frac{1}{Z^2_{it}} \qquad (3-4)$$

We estimate the Z-score based on the eq. (3-4). Again, the variable Z is a proxy of the probability of a negative shock to profits that forces the bank to default, which measures how many standard deviations of profits must fall below its mean to bankrupt the firm. This variable combines profitability, leverage, and returns volatility into a single measure, and is an inverse proxy for the firms' probability of failure and is an indicator of overall stability at the firm level. A smaller Z (a larger risk exposure), thus, can be associated with narrow returns, larger return volatility, or higher leverage. This is probably due to greater inefficiency, poorer diversification, and lower capitalization. Return volatility is measured based on a 3-year rolling window basis of volatility of the return on assets of the bank. Thus, for empirical work we measure the Z-score as the sum of profit return on the total assets plus the equity capital to total asset ratio and then divide by standard deviation of the return on assets.

Market structure

A market share is calculated as a ratio of the individual bank's assets to total bank assets of market. It is expected that market share and bank profitability has a positive relationship. The concentration ratio, which provides estimates of the extent to which the largest firms contribute to activity in an industry, is taken to investigate the SCP

hypothesis. Following Demirguc-Kunt et al. (2004), we measure bank-market concentration as the fraction of bank assets held by the four largest banks in a country. The degree of concentration of a market is expected to exert a negative influence on competition in the market; hence it is likely to raise the banks' profits.

Bank-specific variables

We consider eight bank-specific control variables that have been shown to be instrumental in explaining bank performance. Firstly, the interest rate spread (lending rate minus deposit rate) gauges the extent to which interest earning capacity of an entity exceeds or falls short of its interest cost obligations. We make on a priori forecast of the positive influence of this variable on risk and returns. The second variable is a bank size measured by the total assets of the bank, which captures the effect of scale efficiency[11]. Generally, the effect of a growing bank size on profitability has been proved to be positive. For example, Goddard et al. (2004) argue that a bank size can affect the profit positively through several channels; banks with higher assets benefit from economies of scale and also large banks may benefit from their market powers generating abnormal profits. However, it is also argued that for banks that become extremely large, this could turn negative due to bureaucratic and inflexible operations.

Thirdly, following many studies, the ratio of equity to total assets is employed as a measure of capital strength. In principle, all banks in our sample are subject to the Basel II capital adequacy regulations[12] where capitalization is seen as the main source to cover loan losses. Well-capitalized banks face lower costs of funding and lower risk of bankruptcy, and also have more capability to develop business and deal with risks. It is, therefore, expected that there will be a positive association with profitability and stability (Pasiouras and Kosmidou 2007)[13]. Note also that a bank can benefit from holding capital in excess of the regulatory minimum. For example, it can possibly increase its portfolio of highly profitable assets with the potential high risks being insulated by the capital.

[11] Due to a lack of data, we specify indirect measures of the efficiencies with the size of the bank as a proxy of scale-efficiency and overheads to total assets ratio as an overall measure of cost efficiency.
[12] Banks are required to hold at least 8% of capital against their risk weighted assets.
[13] As discussed previously, it would not be appropriate to include equity to assets in a profitability/stability equation, when ROAE and Z-score are the dependent variable. However, this does not violate our model as when we include one period lag of this variable or exclude it into the model the results are unchanged.

Fourthly, the ratio of overheads to total assets is considered to provide information on variation in bank costs, and this is a proxy for measuring the X-efficiency. A negative correlation between overhead expenses and profitability and stability is expected, provided that banks are efficiently operating with lower overheads[14]. Fifthly, off-balance-sheet activities to total assets ratio is specified in the model. This variable is relatively recent in being recognised for its importance in affecting bank performance. Casu and Girardone (2005) point out that the European Union banking sector increasingly developed non-traditional activities during the 1990s, therefore an empirical study would suffer from biased results without the role of off-balance sheet activities.

Moreover, loan growth is specified based on the argument that rapid growth is likely to yield relatively high profits. Finally, we examine the effects of bank age and foreign ownership status on bank risk and returns. The dummy variable is used for banks of foreign ownership. There is some evidence of difference in performance between foreign ownership and domestic ownership. For example, using 7900 bank observations from 80 countries over the period of 1988-1995, Claessens et al. (2001) report that domestic banks in industrialized countries are more profitable than their counterparts in developing countries, and the opposite is the case for foreign banks, indicating that the foreign banks are more profitable in emerging economies (see also Bonin et al., 2005).

Financial structure and macroeconomics

We specify three indicators of the financial structure of individual countries in the model. The first variable is domestic credit as % of GDP provided by the banking system to all economic sectors except to the government sector. A high ratio of bank credit to GDP, for instance, may reflect higher risk of default for banks. The second variable is the stock market turnover ratio, computed as the total value of shares traded during the period divided by the average market capitalization for the period. The high ratio indicates more efficiency of stock markets, and since efficient capital market discloses more information about companies, banks can benefit by reducing adverse selection and moral hazard risks, improving their profitability and also stability. The third variable is related to regulation of deposit insurance. The dummy

[14] Molyneux and Thornton (1992) among others, however, argue that high profits earned by firms may be attributed to high salaries paid to productive human capital.

variable takes a value of 1, if there is a deposit insurance scheme in place and 0 otherwise. In the traditional argument, generous deposit insurance may weaken the market discipline enforced by depositors, and encourage banks to take greater risk of moral hazard (For further discussion see Demirguc-Kunt and Detragiache, 2002).

In order to control the macroeconomic environment in which the banks operate, we include the inflation rate and real GDP growth as proxies for business cycle fluctuations. Demirguc-Kunt et al. (2004) have shown that banks in inflationary environments have wider margins and greater returns. Other studies (e.g. Bourke, 1989; Molyneux and Thornton, 1992, Demirguc-Kunt and Huizinga, 1999) have also demonstrated a positive relationship between nominal inflation rates and profitability. It is argued that the impact of inflation on profitability depends on whether future inflation is perfectly predicted or not. If bank managers fully anticipate inflation, then they increase lending rates more than deposit rates, maintaining the level of inflation-indexed real profits. According to Athanasoglou et al. (2008), GDP growth has also a positive effect on banks' profitability, possibly due to an increase in lending rates with less probability of a default rate. However, the level of economic activity also affects the supply of funds, i.e. deposits, and if deposit supply declines due to a rise in consumption in line with GDP growth, the sign on the coefficient may become negative.

3.5. Data sources and descriptive analyses

The source of data on the banks' specific variables is from the BankScope database[15]. The country level aggregate data are retrieved from the World Bank database. Table 3-1 summarises the dependent, explanatory variables and countries included.

[15] The database is produced by the Bureau van Dijk, which includes more than 12,000 banks around the world, accounting for about 90% of total assets in each country.

Table 3-1: Dependent and independent Variables

Variables	Units	Expected effect on returns	Expected effect on risk	Source
Bank profitability				
ROAA	Ratio	--	--	BankScope
ROAE	Ratio	--	--	BankScope
Bank stability				
Z-score	Ratio	--	--	BankScope
Interest coverage ratio	Ratio	--	--	BankScope
Bank structure				
Market share	Ratio	Positive	Positive	BankScope
4-firm concentration ratio	Ratio	Positive	Positive	BankScope
Herfindahl-Hirschman index (HHI)	Ratio	Positive	Positive	BankScope
Bank-specific Characteristics				
Interest rate spread	Percentage	Positive	Positive	BankScope
Bank size	Logarithm	?	?	BankScope
Equity to assets	Ratio	Positive	Positive	BankScope
Overheads to assets	Ratio	Negative	Negative	BankScope
Off-balance-sheet activity to assets	Ratio	?	?	BankScope
Loan growth	Ratio	?	?	BankScope
Bank age	Positive numb.	?	?	BankScope
Foreign ownership	Dummy	?	?	BankScope
Financial structure				
Domestic credit	Ratio	?	?	World Bank
Stock market turnover ratio	Ratio	Positive	Positive	World Bank
Regulation	Dummy	?	?	Demirguc-Kunt, Karacaovali and Laeven (2005)
Macroeconomics				
Inflation	Percentage	?	?	World Bank
GDP growth	Percentage	?	?	World Bank
Countries Included				
Emerging economies:				
Eastern Europe: Bulgaria, Czech –Rep, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia				
Middle East: Bahrain, Egypt, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi, Syria, Turkey, UAE				
Advanced economies:				
Western Europe: Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Spain, Sweden, UK				

Dependent variables:

ROAA: Profit before tax as a percentage of total assets of a bank.
ROAE: Profit before tax as a percentage of equity of a bank.
Z-score= (ROAA+CAR)/SROAA, where CAR represents capital assets ratio, and SROAA stands for standard deviation of return on assets.
Interest coverage ratio (or interest multiplier): Profit plus interest expenses divided by interest expenses.

Market structure determinants:
Market share: Share of a bank's assets to total assets in the market.
4-firm market concentration: Share of 4 largest bank assets to total assets in the market.
NHHI: Normalised Herfindahl-Hirschman index is the summation of each country's square of market share; If MS_i represents the market shares by firm i and N is the number of firm in the market then $HHI=\sum(MS)_i^2$ and $NHHI=\frac{(HHI-\frac{1}{N})}{(1-\frac{1}{N})}$ (NHHI is specified in the robustness test in Section 6.3).
Other determinants:
Interest rate spread: Difference between lending and deposit rates, Bank size: Log of total assets, Equity to total asset: Capital to asset ratio, Overheads to total assets: Total overhead costs as a share of total assets, Off-balance-sheet activities: Assets or debts that do not appear on a company's balance sheet as a percentage of total assets, Loan growth: Inflation-adjusted growth rate of bank total loans, Domestic credit: Domestic credit provided by banking sector as a percentage of GDP, Stock market turnover ratio: Total value of shares traded during the period divided by the average market capitalization for the period, Regulation: Value of 1 if the country has an explicit deposit insurance scheme and 0 otherwise, Inflation: Based on consumer prices and GDP growth: Inflation-adjusted growth rate of GDP.

Several criteria are used to filter bank data. Banks must be active; hence banks that went into bankruptcy are removed. In order to enhance the quality of data and comparability across countries, we selected banks that have total assets of more than a million USD. Certain outlier rules are also applied: the 1st and 99th percentiles of the distributions of main variables are eliminated. This helps alleviate the problems arising from extreme outliers that affect estimation. These data are only from depository and non-depository institutions involved in providing funds for

industry, excluding central banks and other non-banking financial institutions. In order to ensure that each bank is included only once in the dataset, we use unconsolidated statements when available and consolidated statements when the unconsolidated ones were not available. Merged banks are considered as separate entities before the merger and as one entity afterwards. The above procedure yielded an unbalanced panel data set of 1929 banks, including 308 banks from emerging economies (122 banks in 10 Eastern European countries and 186 banks in 13 Middle Eastern countries) and 1621 banks from 17 Western European countries[16] over the period 1999-2008. BankScope provides the standardized global accounting format in calculating the financial ratios capturing bank-specific characteristics, enabling comparability across countries.

Table 3-2 demonstrates the degree of correlation amongst dependent and independent variables. Within the independent variables, the maximum correlation is at 0.521 found between the variables of off-balance-sheet activities (11) and equity to total asset (9). In general, the degree of correlation among the determinants does not seem to be of much concern as to cause a potential multicollinearity problem.

The comparative study on mean values of the dependent and explanatory variables are shown in Tables 3-3-a, 3-3-b and 3-3-c in terms of region, country and the type of banks, respectively. Comparing the statistics across regions in Table 3-3-a, wider variations are observed. This particularly applies to the comparison between emerging banks versus advanced banks, whereas some of the mean values between Eastern Europe and Middle Eastern countries seem to be close to each other. It is observed that the returns in emerging market banks are almost three times in ROAA and twice in ROAE of those in West European banks. For instance: emerging market has 1.45 of ROAA while developed market has 0.43. The t-statistics for the mean equality for variables are mostly highly significant, confirming the wider degree of variations. Table 3-3-b shows sample means by country. The higher returns are mostly found in Middle Eastern countries, e.g. Qatar, Saudi Arabia and UAE, and the lower returns are found in many advanced countries.

[16] All banks included in the sample fall within the top 4500 banks in the world in 2010-2011, ranked by total assets. Furthermore, the sample covers approximately 65 % of the total assets for the whole of the EU banking system and 61 % of the total assets in all Middle Eastern countries.

Table 3-2: Correlation matrix for variables

	ROAA	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1)ROAE	0.816***																		
(2)Z-score	0.416***	0.303***																	
(3)Interest cov.ratio	0.725***	0.731***	0.328***																
(4)Market share	0.283***	0.244***	0.215***	0.298***															
(5)4-firm concentration	0.343***	0.209***	0.342***	0.326***	0.274***														
(6)HHI	0.2823***	0.1749***	0.3319***	0.2132***	0.3280***	0.7765***													
(7)Interest rate spread	0.117***	0.090***	-0.015	-0.095***	-0.008	-0.014	0.0364***												
(8)Bank size	0.110***	0.105***	0.049***	0.338***	0.235***	0.071***	0.0467***	-0.261***											
(9)Equity to assets	0.645***	0.234***	0.271***	0.373***	0.073***	0.309***	0.2812***	0.086***	0.033*										
(10)Overheads to assets	0.132***	-0.043**	0.025	-0.347***	-0.141***	-0.048***	0.0944***	0.446***	-0.526***	0.302***									
(11)Off-balance-sheet activities	0.538***	0.291***	0.380***	0.378***	0.147***	0.362***	0.2971***	-0.060***	0.116***	0.521***	0.093***								
(12)Loan growth	0.335***	0.302***	0.264***	0.351***	0.160***	0.236***	0.2133***	-0.122***	0.165***	0.186***	-0.112***	0.299***							
(13)Bank age	0.057***	0.027	0.067***	0.092***	0.035*	0.144***	0.1002***	-0.118***	0.265***	0.044**	-0.082***	0.077***	0.051***						
(14)Foreign ownership	0.059***	0.105***	0.029	0.185***	0.204***	0.039**	0.1302***	-0.145***	0.345***	-0.106***	-0.235***	0.039**	0.092***	0.111***					
(15)Domestic credit	-0.109***	-0.023	0.092***	0.027	-0.203***	-0.072***	-0.2397***	-0.065***	-0.081***	-0.166***	-0.067***	-0.019	0.083***	0.058***	0.01				
(16)Stock market turnover ratio	0.028	0.002	0.034*	0.090***	0.005	0.026	-0.0813***	-0.003	0.302***	0.060***	-0.168***	0.038**	0.016	0.072***	0.079***	-0.019			
(17)Regulation	-0.053***	-0.043**	-0.048***	-0.090***	-0.390***	-0.111***	-0.1665***	-0.036*	-0.042**	-0.023	0.044**	-0.002	-0.055***	0.014	0.005	0.062***	0.007		
(18)Inflation	0.261***	0.130***	-0.114***	0.274***	0.138***	0.351***	0.2630***	-0.077***	0.328***	0.269***	-0.123***	0.211***	0.170***	0.105***	0.135***	-0.137***	0.210***	-0.057***	
GDP growth	0.212***	0.205***	0.304***	0.232***	0.117***	0.335***	0.2509***	-0.013	0.083***	0.118***	-0.075***	0.168***	0.199***	0.011	0.076***	-0.065***	0.041**	0.029	0.157***

*, **, *** denote significance at 10%, 5% and 1% respectively.

Table 3-3-a: Descriptive statistics and tests of means by region average over 1999-2008

	ROAA	ROAE	Z-score	Interest cov. ratio	Market share	4-firms concen.	HHI	Interest rate spread	Log(size)	Equity to assets	Overh. to assets	Off. to assets	Loan growth	Domestic credit	Stock turnover ratio	Regulation	Inflation	GDP growth
Eastern European banks																		
Mean	1.29	13.13	1.64	82.31	11.2	77.79	1553	6.22	14.54	0.09	0.03	0.18	21.75	51.16	104.71	1	4.42	4.6
No. of observation	880	823	880	734	893	1076	1187	754	892	861	856	687	626	1017	1139	1220	1032	1178
Middle Eastern banks																		
Mean	1.55	13.36	2.13	123.42	8.66	74.4	1312	5.96	15.09	0.1	0.02	0.27	14.88	77.54	49.44	0.39	3.08	4.91
No. of observation	1350	1305	1350	678	1690	1792	1787	1056	1448	1241	1424	1302	1118	1662	1536	1860	865	1226
Total Emerging market banks																		
Mean	1.45	13.27	1.94	102.05	9.63	75.67	1408	6.22	14.88	0.09	0.02	0.24	17.35	67.53	72.97	0.63	3.81	4.76
No. of observation	2230	2128	2230	1412	2336	2868	2974	1813	2340	2102	2260	1989	1744	2679	2675	3080	1897	2404
West European banks																		
Mean	0.43	6.65	1.03	53.49	1.32	51.64	741	3.55	15.07	0.06	0.02	0.1	6.74	129.88	105.47	0.99	2.1	2.13
No. of observation	11540	11251	11540	10061	11648	14133	16125	10397	11502	11427	11440	9998	9530	15762	15344	16210	16206	16070
Tests of means (t-statistics)																		
Western vs. Eastern Europe	-36.59***	-27.32***	-25.95***	-12.16***	-45.35***	-56.78***	-63.02***	-17.72***	11.35***	-28.03***	-31.11***	-16.96***	-32.88***	108.01***	0.5	-3.49***	-69.98***	-48.23***
Western vs. Middle East Europe	-53.22***	-34.52***	-51.69***	-27.81***	-42.28***	-62.36***	-57.91***	-11.99***	-0.51	-39.00***	-3.90***	-42.56***	-22.97***	79.66***	40.28***	133.75***	-27.30***	-54.62***
Eastern Europe vs. Middle East	-4.81***	-0.61	-10.43***	-10.12***	4.89***	6.83***	27.38***	16.36***	-9.48***	-3.78***	18.83***	9.53***	9.34***	-19.22***	28.88***	43.44***	11.56***	-3.35***
Advanced vs. Emerging economies	-57.48***	-41.45***	-3.35***	-26.70***	-52.69***	-81.26***	-33.92***	-10.78***	6.20***	-45.27***	-20.31***	-41.44***	-35.31***	117.26***	29.41***	85.33***	-50.85***	-68.62***

*, **, *** denote significance at 10%, 5%, and 1%, respectively.

Table 3-3-b: Descriptive statistics of dataset by country average over 1999-2008

Country	No. of banks	Bank profitability		Bank stability		Bank structure			Bank-specific variables						Financial structure			Macroeconomics	
		ROAA	ROAE	Z-score	Interest cov. ratio	Market share	4-firms concen.	HHI	Interest spread	Log (size)	Equity to assets	Overh. to assets	Off. to assets	Loan growth	Domestic credit	Stock turnover ratio	Regulation	Inflation	GDP growth
East European countries																			
Bulgaria	11	1.87	15.63	1.97	113.65	11.63	80.08	1400	6.49	13.53	0.12	0.04	0.13	27.99	49.38	63.09	1.00	5.62	5.31
Czech–Rep	20	1.00	13.02	1.40	85.47	6.49	80.80	1500	4.77	14.84	0.07	0.02	0.18	17.81	48.83	63.53	1.00	2.91	3.91
Estonia	3	1.61	16.78	3.77	127.87	34.48	-	3200	5.21	14.79	0.09	0.03	0.18	24.23	60.49	82.51	1.00	4.01	7.39
Hungary	14	1.16	13.59	1.59	70.89	9.52	74.27	1300	4.41	15.09	0.08	0.03	0.33	23.09	60.92	107.64	1.00	6.35	3.59
Latvia	8	1.57	15.11	2.12	113.47	16.39	83.01	1300	6.27	15.09	0.09	0.03	0.12	27.80	67.83	99.37	1.00	3.98	7.22
Lithuania	4	1.00	11.65	2.72	62.63	25.64	-	2300	6.66	15.09	1.00	0.03	0.12	26.74	49.39	70.14	1.00	2.09	5.71
Poland	25	1.33	12.91	1.42	75.36	7.63	70.65	1700	7.23	15.03	0.09	0.03	0.17	20.96	40.69	114.18	1.00	3.22	4.20
Romania	13	1.65	11.66	1.68	77.62	10.20	82.13	1800	10.36	14.24	0.12	0.04	0.17	26.43	38.31	87.53	1.00	7.06	5.09
Slovakia	11	0.95	13.80	1.45	62.08	11.90	84.04	1700	6.07	14.65	0.08	0.03	0.18	14.21	51.50	92.66	1.00	5.16	4.54
Slovenia	13	1.09	10.59	1.25	77.63	9.43	74.09	1700	4.69	14.44	0.09	0.03	0.24	21.39	58.37	92.41	1.00	5.43	4.43
Middle Eastern countries																			
Bahrain	15	1.63	14.52	1.92	179.37	8.47	82.75	1600	6.83	15.06	0.11	0.02	0.17	15.46	60.27	29.82	1.00	1.81	5.99
Egypt	24	0.86	9.37	0.83	39.67	4.52	66.29	1000	7.75	14.53	0.08	0.02	0.18	9.35	99.94	131.30	0.00	4.64	4.88
Iran	15	1.57	13.79	1.27	122.05	8.77	77.68	1300	8.73	15.20	0.07	0.02	0.32	25.46	47.33	55.27	0.00	-	5.78
Israel	11	0.47	8.37	2.15	50.70	9.52	85.17	1300	5.13	16.04	0.05	0.02	0.31	6.26	80.28	31.76	0.00	2.19	3.79
Jordan	9	1.22	11.34	2.09	116.73	11.11	91.56	2500	6.36	14.88	0.10	0.02	0.27	12.88	97.29	35.88	1.00	2.78	6.02
Kuwait	14	2.28	16.12	3.47	159.23	11.11	80.00	1500	7.42	15.43	0.12	0.02	0.18	16.82	78.03	26.48	0.00	2.51	2.62
Lebanon	18	0.83	12.55	2.71	120.29	7.41	59.35	600	5.93	14.91	0.07	0.01	0.08	11.02	180.57	27.65	1.00	-	-
Oman	8	2.24	14.90	3.38	164.04	14.08	83.52	1500	4.47	14.21	0.13	0.02	0.35	13.76	39.02	18.59	1.00	1.55	3.72
Qatar	7	2.38	19.51	4.20	163.42	16.95	93.25	2300	6.97	14.86	0.13	0.01	0.41	18.97	41.48	29.64	0.00	3.35	5.60
Saudi Arabia	11	2.33	18.61	3.57	179.10	10.10	66.00	500	4.08	16.38	0.11	0.02	0.23	15.73	58.15	23.31	0.00	2.58	3.42
Syria	5	0.38	7.51	0.16	159.17	20.83	99.38	-	7.09	14.50	0.07	0.01	0.35	20.52	33.98	38.07	0.00	4.04	3.89
Turkey	23	1.79	16.16	1.29	92.85	8.69	79.48	2100	3.23	15.66	0.11	0.04	0.35	27.39	45.94	106.51	1.00	8.78	6.05
UAE	26	2.43	14.49	2.39	176.04	4.95	61.97	800	3.55	14.76	0.14	0.02	0.46	18.72	51.13	29.28	0.00	-	-
West European countries																			
Austria	78	0.42	7.92	0.99	72.97	1.79	65.82	1200	2.57	15.00	0.05	0.01	0.10	8.74	124.52	100.69	1.00	2.00	21.87
Belgium	35	0.57	7.96	0.74	69.40	4.33	65.90	1400	3.22	15.04	0.06	0.01	0.15	10.62	114.79	111.99	1.00	2.23	2.21
Cyprus	8	0.63	7.08	1.34	76.36	13.70	88.69	1800	3.32	15.13	0.06	0.01	0.12	15.31	-	97.64	1.00	2.91	3.82
Denmark	42	1.01	9.52	1.42	97.64	3.61	82.19	2100	3.03	14.91	0.10	0.02	0.27	16.70	148.88	86.79	1.00	2.22	1.69
Finland	8	0.60	7.91	0.94	89.40	14.71	-	2900	3.36	16.53	0.07	0.01	0.16	12.72	70.65	100.27	1.00	1.87	3.16
France	217	0.60	8.68	0.93	71.67	0.72	41.62	800	3.73	15.42	0.07	0.02	0.15	9.76	109.77	114.01	1.00	1.78	2.20
Germany	627	0.23	4.45	0.92	29.81	0.17	45.22	700	3.52	14.65	0.05	0.02	0.06	3.32	141.36	99.06	1.00	1.62	6.03
Greece	16	0.42	6.62	0.13	48.19	8.64	73.18	152	3.49	16.03	0.08	0.03	0.16	23.52	98.14	93.05	1.00	3.30	3.92
Ireland	37	0.47	9.60	1.25	141.43	5.49	71.58	1300	3.11	16.58	0.05	0.00	0.13	10.59	141.36	99.06	1.00	3.77	6.03
Italy	168	0.72	8.65	1.21	73.46	0.97	54.75	500	3.46	15.69	0.08	0.02	0.11	12.97	107.36	88.06	1.00	2.36	1.23
Luxembourg	64	0.58	11.84	1.09	132.79	2.04	39.23	400	7.93	15.32	0.05	0.01	0.18	8.11	125.17	105.36	1.00	2.40	4.12
Malta	6	0.99	11.77	6.66	146.96	28.57	88.54	1300	4.08	14.96	0.08	0.01	0.15	4.23	134.39	115.42	1.00	2.50	2.44
Netherlands	33	0.69	9.78	1.29	104.74	5.52	79.37	1600	2.99	15.58	0.06	0.01	0.13	13.35	164.03	101.76	1.00	2.22	2.42
Portugal	24	0.71	11.07	1.00	77.60	5.88	-	-	4.94	15.74	0.07	0.02	0.26	13.58	148.85	103.53	1.00	2.91	2.03
Spain	109	0.76	9.73	1.41	108.07	1.99	59.50	500	2.10	16.03	0.07	0.01	0.21	17.40	141.11	122.72	1.00	3.22	3.77
Sweden	22	0.81	10.42	1.26	97.05	6.80	82.80	800	1.95	15.74	0.07	0.02	0.20	12.92	108.22	97.15	1.00	1.60	2.95
UK	127	0.57	8.13	0.81	84.56	1.25	60.35	300	3.47	15.73	0.06	0.02	0.15	9.95	152.35	109.82	1.00	2.81	2.60

Table 3-3-c: Descriptive statistics of dataset by bank types and regions average over 1999-2008

	Emerging economies (No. of obs. 3080)				Advanced economies (No. of obs. 16210)				Total banks (No. of obs. 19290)			
	Commercial (2460)		Non-commercial (620)		Commercial (6350)		Non-commercial (9860)		Commercial (8810)		Non-commercial (10480)	
Variable	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Bank profitability												
ROAA	1.43	1.25	1.52	1.37	0.6	0.87	0.34	0.42	0.87	1.08	0.39	0.56
ROAE	13.38	8.17	12.78	8.78	9.16	8.62	5.43	4.57	10.52	8.71	5.78	5.1
Bank stability												
Z-score	1.91	1.28	2.06	1.32	1.09	1.19	0.99	0.29	1.32	1.27	1.06	0.49
Interest cov. ratio	99.17	77.94	119.74	83.1	77.82	81.3	43.26	47.57	84	80.91	45.34	50.43
Bank structure												
Market share	10.33	12.89	6.46	8.01	2.78	7.83	0.58	3.06	5.25	10.4	0.89	3.73
4-firms concentration	75.55	13.13	76.09	12.36	55.53	17.22	49.36	12.49	61.59	18.53	51.05	14.08
HHI	1755	584	1779	592	1133	675	885	500	1313	708	939	549
Bank-specific variables												
Interest rate spread	7.94	5.17	4.24	8.73	4.5	5.85	2.6	2.49	6.22	5.64	3.42	2.94
Log(size)	14.92	1.42	14.7	1.35	15.37	1.61	14.93	1.2	15.22	1.56	14.92	1.21
Equity to assets	0.09	0.04	0.1	0.05	0.06	0.04	0.06	0.03	0.07	0.04	0.06	0.03
Overheads to assets	0.02	0.01	0.03	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.01
Off-balance-sheet activities	0.245	0.19	0.21	0.222	0.161	0.169	0.076	0.08	0.191	0.18	0.082	0.096
Loan growth	16.92	15.15	19.65	14.68	10.82	13.78	5.15	8.81	13	14.58	5.7	9.51
Financial structure												
Domestic credit	69.32	39.6	60.24	20.15	127.6	28.26	131.3	18.79	112.35	40.69	127.64	24.56
Stock turnover ratio	75.41	55.99	62.89	55.22	100.08	47.59	109.02	54.65	93.63	51.08	106.57	55.65
Regulation	0.63	0.48	0.63	0.48	1	0	1	0	0.93	0.25	0.93	0.25
Macroeconomics												
Inflation	3.81	2.59	3.81	2.59	2.1	0.87	2.1	0.87	2.28	1.28	2.28	1.28
GDP Growth	4.75	2.34	4.81	2.32	2.47	1.87	1.9	1.45	3.01	2.21	2.03	1.62

Finally, Table 3-3-c compares the means and standard deviations (St.Dev.) of variables for the commercial and non-commercial banks. Non-commercial banks in emerging economies tend to exhibit higher values of St.Dev. than those in advanced economies, highlighting a volatile market. However, in the case of commercial banks, there is no significant difference between the two markets, for instance the St.Dev. of ROAE are close to each other. In the last column of 'Total banks', the commercial banks appear to yield much higher profitability measured by ROAA and ROAE than do the non-commercial banks.

3.6. Estimation Results

We, first, estimate Equation (3-2) to examine the impact of market concentration on bank profitability, and then we estimate Equation (3-3) to examine the impact of banking market structure on the stability. Note that the models are augmented with the interaction terms and the dummy variables for the different types of banks. The interaction terms investigate whether interest rate spread, bank age, ownership status and regulation have an independent effect on bank returns and risk or whether their effect is channelled through the market power possessed by banks[17]. Since the interaction terms are highly collinear with their respective components, we run regressions without the interaction terms in models (1), (3), (5) and (7) and with the interaction terms but without the relevant individual components in models (2), (4), (6) and (8). With the bank dummy variables, all bank types are in comparison with the counterpart of commercial banks, except for the Middle East which is compared with Eastern Europe.

In order to examine cross-section variation, the likelihood ratio and Hausman tests are conducted for fixed and random effects, respectively. The fixed effect models are run by the Least Square Dummy Variable (LSDV) procedure and the random effect models are by Generalized Least Squares (GLS) procedure. The justification for using the fixed effect, rather than the random effects model, is supported by the highly statistical significance of the likelihood ratios test. Furthermore, the Hausman test indicates that the coefficient between fixed and

[17] The selection of variables is based on empirical performance.

random effects is systematic, providing evidence in favour of a fixed effects model. The fixed effect is also supported by the absence of heteroscedasticity based on the Breusch-Pagan test in the residual from our estimated model, indicating that the variance of each model's residuals is equal across banks.

The panel regressions are, in general, subject to endogeneity problems. The endogeneity problem can be mitigated by applying Generalised Method of Moment (GMM) using instrument variables. A good instrument would be a variable which is highly correlated with regressors, but not with the error terms. One and two lagged values of regressors and dependent variables are conventionally used as instrument variables. However, the use of lagged variables implies loss of degree of freedom. This is particularly severe in our study when we already loose three years of observation for estimating the Z-score, given the fact that the data set is the unbalanced panel data and also the annual frequency. The loss of two degrees of freedom for each bank tends to generate poorer empirical performance. By using the LSDV procedure, we have obtained relatively well-performed coefficients with a satisfactory diagnostic of residuals; hence we present the LSDV estimates. To check the robustness, we conducted a wider range of robustness tests in Section 3.7.

The next issue we have to address is the stationary of the panel. This is because when using a relatively large years in a model of banks performance it may be criticized on grounds of non-stationary of the panel. Although in this study the time-dimension is relatively small, still we test for stationary of the main variables, using a unit root test for unbalanced panels. We apply the Fisher test which has the advantage over other tests as it does not require a balanced panel (Maddala and Wu, 1999). The null of non-stationary is rejected at the 5% level for all main variables but size. The relevant χ^2=values are 5004.64 (ROAA), 4545.11 (ROAE), 1056.49 (size), 4641.60 (market share), 5433.95 (interest rate spread), 3571.27 (equity to assets), 5108.02 (overheads to assets), 3979.35 (off-balance sheet to assets) and 5959.90 (loan growth). We do not, however, exclude size for the estimation of the model since the exclusion of the size variable does not violate the model's performance.

3.6.1. Bank profitability

Table 3-4 reports the empirical estimations for a bank's ROAA in panel A and a bank's ROAE in panel B for banking systems in both emerging and advanced economies separately. In order to avoid any direct accounting links between dependent variables and independent variables, we enter variables of total assets and overheads to total assets with one lag into the equation[18].

The result shows that in advanced markets, the market share coefficients are positive and statistically significant at the 5% level, whereas the coefficients of market concentration are not significant. This implies that market share seems to dominate market concentration, supporting the relative-market-power (RMP), rather than the traditional structure-conduct-performance (SCP) hypothesis. This accords with Goldberg and Rai (1996), who also fail to find a robust positive relationship between market concentration and profitability for a sample of large banks located in 11 European countries during the period 1988–199119.

In the emerging market banking systems, given an insignificant coefficient of market share, market power gained through market share does not seem to be the key factor in enabling banks to earn a relatively high rate of return. A negative significant coefficient of market concentration is unexpected but this reflects Figure 3-1, where profitability had an upward trend in contrast to the downward trend of market concentration. This outcome is, however, accordance with Berger (1995) and more recently Athanasoglou et al. (2008) that claim concentration usually affect profitability negatively when controlling other effects in the profitability equation. We leave discussion of the effects of market structure to Section 6.4. One possible explanation of why market share has an insignificant impact on bank profitability in emerging economies would be that emerging banking sectors are characterised as markets subject to state intervention since their larger banks may be taken over by

[18] Since $= \frac{net\ income}{assets}$, there is direct accounting link between ROAA and assets.

[19] Some existing literature is supportive to the SCP hypothesis. For example, Claeys and Vander Vennet (2008), for instance, argue that the SCP hypothesis holds well with Western European banks. In a major survey, Gilbert (1984) reported that 32 out of 44 studies on the US banking industry were found to support the traditional hypothesis of the existence of collusive profits.

Table 3-4: Determinants of the returns (ROAA and ROAE): emerging economies vs. advanced economies

	Panel A: ROAA				Panel B: ROAE			
	Emerging economies		Advanced economies		Emerging economies		Advanced economies	
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Structure								
Market share	0.0068		0.0148**		0.1253		0.2059**	
	(0.37)		(2.04)		(0.74)		(2.23)	
4-firms concentration	-0.0293***	-0.0293***	0.001	0.0005	-0.1417*	-0.1453*	0.0083	0.0017
	(-3.51)	(-3.30)	(1.23)	-0.54	(-1.81)	(-1.76)	(0.76)	(0.15)
Bank-Specific Variables								
Interest rate spread	0.0979***		0.0660***		0.7639***		0.5049***	
	(5.89)		(14.77)		(4.72)		(7.75)	
Log(total assets) (t-1)	-0.3488*	-0.2326	0.2309***	0.0438**	-6.0079***	-3.7804**	1.5681***	0.3084
	(-1.87)	(-1.44)	(8.04)	(2.17)	(-3.42)	(-2.51)	(4.19)	(1.23)
Equity to total assets	1.0125***	1.2702***	0.7297***	0.6809***	3.3359	6.6954***	3.6481***	3.0023***
	(4.86)	(6.22)	(19.15)	(17.60)	(1.64)	(3.42)	(6.94)	(5.87)
Overheads to total assets(t-1)	-0.4604*	-0.359	-0.2234***	-0.2411***	-4.8612**	-3.0891	-0.9763*	-0.8309
	(-1.85)	(-1.33)	(-5.43)	(-5.68)	(-2.00)	(-1.18)	(-1.80)	(-1.53)
Off-balanc. to total assets	0.0894	0.3716	-0.3100**	-0.6359***	0.5945	3.1297	-7.6776***	-9.4448***
	(0.27)	(1.07)	(-2.52)	(-5.01)	(0.19)	(0.97)	(-4.76)	(-5.85)
Loan growth	0.0068**	0.0061**	0.0020***	0.0013**	0.0506*	0.0455	0.0132*	0.0095
	(2.49)	(2.06)	(3.20)	(2.05)	(1.90)	(1.59)	(1.68)	(1.19)
Bank age	0.0624**		-0.0411***		0.8101***		-0.2769***	
	(2.33)		(-9.01)		(3.22)		(-4.65)	
Foreign ownership	0.0479***		-0.1521***		0.0485**		-0.1286***	
	(3.23)		(-3.95)		(2.04)		(-4.37)	
Overall Financial Structure								
Domestic credit provide by banking	-0.0136***	-0.0125***	0.0011**	0.0023***	-0.0942***	-0.0879***	0.0445***	0.0516***
	(-4.53)	(-3.71)	(1.97)	(4.12)	(-3.23)	(-2.72)	(5.98)	(7.13)
Stock turnover ratio	0.0024	0.0041**	0.0006**	-0.0004*	0.0344**	0.0559***	0.0007	-0.0054*
	(1.35)	(2.30)	(2.24)	(-1.68)	(2.08)	(3.41)	(0.20)	(-1.72)
Regulation	-0.2611*		0.1414		-0.3015		0.1211	
	(-1.81)		(0.77)		(-1.43)		(1.76)	
Macroeconomics								
Inflation	0.0007	0.0178	-0.0459***	-0.0668***	0.0055	0.1948	-0.6123***	-0.7473***
	(0.04)	(1.03)	(-3.72)	(-5.25)	(0.04)	(1.21)	(-3.89)	(-4.79)
GDP growth	0.0042	0.0076	0.0139***	0.0188***	0.1463	0.1727	0.3068***	0.3290***
	(0.31)	(0.52)	(3.33)	(4.34)	(1.13)	(1.25)	(5.75)	(6.14)
Vector Products								
Market share* interest rate spread		-0.0012***		0.0137***		-0.0008*		0.1288***
		(-3.95)		(6.51)		(-1.72)		(4.58)
Market share*bank age		0.0007		0.0000		0.0095*		0.0027*
		(1.20)		(0.34)		(1.78)		(1.71)
Market share*ownership		-0.0305		-0.0007		-0.0278		0.5693**
		(-0.99)		(-0.033)		(-0.10)		(2.22)
Market share*regulation		0.0069		-0.0211		0.0294		-0.4978***
		(0.25)		(-1.49)		(0.11)		(-2.79)
Bank Type and Regional Dummies								
Dummy investment	1.0429**	1.0365**	0.3089***	0.3236***	1.9427	0.0101	0.661	0.9938
	(2.45)	(2.22)	(3.26)	(3.33)	(0.42)	(0.00)	(0.53)	(0.79)
Dummy Islamic	0.3631	0.2638			3.8242*	3.2373		
	(1.30)	(0.86)			(1.73)	(1.35)		
Dummy real estate	1.2973*	0.586	-0.0855	-0.1506***	9.4551	4.5504	-3.0842***	-3.4622***
	(1.72)	(0.73)	(-1.58)	(-2.74)	(1.52)	(0.69)	(-4.52)	(-5.06)
Dummy savings	1.2929**	1.1935*	-0.2048***	-0.2600***	11.0146**	10.4600*	-3.8423***	-4.1703***
	(2.21)	(1.85)	(-6.56)	(-8.22)	(2.20)	(1.91)	(-9.72)	(-10.55)
Dummy cooperative	-0.75	-0.8482	-0.1532***	-0.2264***	-4.5876	-5.1311	-2.9335***	-3.4655***
	(-1.41)	(-1.45)	(-4.77)	(-7.06)	(-0.99)	(-1.02)	(-7.23)	(-8.66)
Dummy Middle East	0.2815*	0.3079*			1.2535	1.3655		
	(1.87)	(1.78)			(0.94)	(0.91)		
AR(1)	ρ=0.0589	ρ=0.0419	ρ=-0.0262	ρ=0.0023	ρ=0.0664	ρ=-0.3722***	ρ=0.0084	ρ=0.0093
	(0.88)	(0.64)	(-1.20)	(0.10)	(0.94)	(-5.37	(0.41)	(0.46)
Hausman test (χ^2)	67.70***	51.21***	213.89***	123.10***	58.83***	48.46***	18.19***	183.59***
Likelihood Ratio (χ^2)	475.24***	464.95***	3350.63***	3346.10***	431.46***	423.98***	3312.15***	3449.72***
F-statistic	15.38	12.94	13.2	11.87	7.34	6.24	9.71	9.55
R^2-adjusted	0.83	0.81	0.72	0.69	0.69	0.65	0.65	0.64
Standard error of regression	0.43	0.46	0.26	0.27	3.99	4.25	3.28	3.3
No. of countries	23	23	17	17	23	23	17	17
No. of observations	454	454	3711	3711	427	427	3614	3614
Bank dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering level	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank

- The dependent variable in panel A is return on average assets defined as profit before tax as a percentage of total assets of a ba
- The dependent variable in panel B is return on average equity defined as profit before tax as a percentage of equity of a bank.
- Market share*interest rate spread is an interaction term of market share and interest rate spread.
- Market share*age is an interaction term of market share and bank age. Market share*ownership is an interaction term of market share and foreign ownership. Market share*regulation is an interaction term of market share and regulation.
- We estimate all regressions using bank and time fixed effects and clustering at bank level. t-values are in parentheses.
- *, **, *** denote significance at 10%, 5%, and 1%, respectively. AR (1): Arellano-Bond test that average auto-covariance in residuals of order 1 is 0 (H0: no autocorrelation).

governments to serve political interests, such as financing major development projects at lower interest rates which can lower profitability.

With respect to bank-specific characteristics, all of the coefficients are significant in either with or without interaction term models, except for the off-balance-sheet activities in emerging markets. The variable of interest rate spread is well-determined in the profitability indicators with the correct positive sign for both emerging and advanced economies. The magnitude of the coefficients is higher in banks operating in emerging economies, indicating that these banks are likely to adjust interest rates more in order to raise profits. The interaction of interest rate spread with market share, however, enters with a negative coefficient in (2) and (4) in emerging economies. Possibly, an increasing market share allows banks to lower the spread which is already high at 6.22 (Table 3a), hence increasing their deposit funds and raising their profitability. The reverse situation occurs in the case of advanced economies, where the coefficients on the interaction term is positive, indicating that, as banks expand their market share, opportunities to raise the spreads are enhanced to increase their returns.

Bank size enters with a negative coefficient for emerging economies, but with a positive coefficient for advanced economies. This contrasting result suggests that larger banks have lower rates of return for the former, but have higher rates of return for the latter. The result may reflect the scale inefficiencies in emerging large banks, and explain the negative impact on profitability of market concentration constituted by the four largest banks. While the theory provides conflicting predictions about optimal bank asset structures, some empirical literature also tends to find a similar result to ours with economies of scale and scope for smaller banks, and diseconomies of scale for larger financial institutions.

For both economies, the relatively high and significant coefficients of pre-determined variables of equity to total assets and overheads to total assets are found, with the expected positive and negative signs, respectively. Capital strength and overhead expenses appear to be the robust determinants of bank profitability. A high capital adequacy increases ROAA and ROAE, and this is consistent with previous studies (e.g. Athanasoglou et al., 2008) in support of the argument that well capitalized banks face lower costs of external funding, resulting in higher

profitability. The negative estimate on the overheads is supportive to the X-efficiency hypothesis. Controlling for all other relevant factors, the coefficient on the off-balance-sheet activities is statistically significant only for the advanced markets' banking systems. With a negative sign, it is associated with lower returns, conflicting with Demirguc-Kunt and Huizinga (2010)[20]. Given an insignificant coefficient for emerging markets, there may be too little operation of the off-balance activities to determine its effect on profitability.

Market growth, measured as real growth of total loans, appears to be another important determinant for both types of economies; the fast-growing banking market tends to yield a market environment, which promotes higher returns. Bank age is highly significant, but the direction of the effect is opposite for emerging economies and advanced economies. Older banks in emerging countries are more profitable, compared to their counterparts in advanced economies. We also find that foreign banks in emerging economies seem to earn greater profits, whereas their counterparts in advanced economies earn lower profits. Foreign banks' entrance to emerging markets may not enhance competition, but with new technology and services they can be superior to domestic banks in terms of profitability. In contrast, foreign banks may face dampened profitability in the intensified competition stemming from mature domestic banks. The real impact of bank ownership status on returns may also depend on market power in advanced markets; in model (8), the variable of the interaction between ownership and market share yields a positive coefficient suggesting that foreign banks with a substantial market share are more profitable.

Turning to financial structure and macroeconomic variables, there are also different results between emerging and advanced economies. While there is a highly significant relationship between domestic credit and profitability, the coefficients have the opposite sign of negative and positive. One possible explanation of the negative relationship would be that, in emerging economies, providing credit to the private sector may be often influenced by government policies, and that banks may be obliged to provide credit even for unprofitable investment projects[21]. On the other

[20] Using data for 1,334 banks in 101 countries over the 1995-2007 periods, Demirguc-Kunt and Huizinga found that expansion into fee income (non-interest income) increases the rate of return on assets, and it could offer some risk diversification benefits.
[21] See, for example, Moore (2009) for the former Eastern European countries.

hand, in a competitive environment, credit is released for viable projects in advanced banking systems, consequently leading to the earning of higher profits. Stock market turnover ratio is positively related to bank profitability based on the 5% significance level. Since increasing efficiency in stock markets should contribute to more and better information and to making the process of selection and monitoring of borrowers easier for banks, a complementary relationship is founded between the development of banking systems and the stock markets. Regulation is statistically significant only for banks in emerging markets with a negative sign, implying that regulation through the deposit insurance scheme exerts a detrimental impact on returns.

The effects of inflation and GDP growth on bank profitability are negative and positive respectively for advanced economies: lower rates of inflation and high GDP growth are associated with higher returns in mature banks. GDP growth influences banks through raising demand for loans.

By looking at the types of bank, it is observed that investment banks generate higher ROAA than do commercial banks, for both types of economies. Islamic banks tend to be more profitable than commercial banks when the profitability is measured by ROAE. Moreover, banking systems operating in the Middle East appear to perform better than those in Eastern Europe.

3.6.2. Bank stability

We next explore how a bank's Z-score and interest coverage ratio are related to the market structure and other determinants of bank performance. Table 3-5 presents the regressions of the Z-score in panel A and the interest coverage ratio in panel B. All explanatory variables in both panel regressions are analogous to the rate of return regressions in Table 3-4, except for the fact that one period lag of equity to total assets is specified in order to avoid direct accounting relationships between capital and the Z-score[22]. The dependent variables are the inverse indicators of bank risk;

[22] $Z = \frac{ROAA+CAR}{\sigma ROAA}$, hence there is an accounting link between equity (CAR: capital asset ratio) and Z-score.

Table 3-5: Determinants of risk (Z-score and Interest Coverage Ratio): Emerging economies vs. advanced economies

	Panel A: Z-score				Panel B: Interest coverage ratio			
	Emerging economies		Advanced economies		Emerging economies		Advanced economies	
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Structure								
Market share	0.0396*		0.0063**		0.0225		0.0556***	
	(2.07)		(2.07)		(1.28)		(5.08)	
4-firms concentration	-0.0176	-0.0013	-0.0029***	-0.0028***	-0.0131	-0.0135	0.0008	0.0009
	(-1.58)	(-0.11)	(-5.65)	(-5.52)	(-1.33)	(-1.31)	(0.43)	(0.48)
Bank-Specific Variables								
Interest rate spread	0.0427**		0.0006***		0.0926***		0.0298***	
	(1.98)		(1.97)		(4.54)		(3.36)	
Log(total assets) (t-1)	-0.5314	-0.0021	0.0039	0.0015	-0.1951	-0.0205	0.0896	0.0632
	(-0.33)	(-0.01)	(0.22)	(0.13)	(-0.87)	(-0.11)	(1.30)	(1.39)
Equity to total assets (t-1)	0.5207**	0.4100**	0.2551**	0.1778*	1.1495***	1.4226***	0.8539***	0.8236***
	(2.15)	(2.25)	(2.15)	(1.89)	(4.24)	(5.38)	(9.65)	(9.80)
Overheads to total assets(t-1)	1.2460***	1.4169***	0.0815***	0.0726***	-0.5177*	-0.3659*	-0.3912***	-0.3645***
	(3.92)	(4.56)	(3.84)	(3.62)	(-1.71)	(-1.72)	(-4.76)	(-4.47)
Off-balanc. to total assets	0.1345	0.4788	0.2207***	0.2061***	0.7435*	1.0780**	0.5730**	0.6167**
	(0.28)	(1.08)	(3.15)	(3.05)	(1.75)	(2.46)	(2.01)	(2.16)
Loan geowth	0.0069*	0.0082**	0.0009**	0.0010***	0.0059*	0.0057	0.0029**	0.0021
	(1.81)	(2.14)	(2.37)	(2.72)	(1.72)	(1.58)	(2.12)	(1.59)
Bank age	0.2335***		-0.0023		0.0930***		-0.0058	
	(6.79)		(-0.85)		(2.71)		(-0.53)	
Foreign ownership	0.2762**		0.0303**		0.0953**		0.3205***	
	(2.05)		(1.97)		(2.23)		(3.72)	
Overall Financial Structure								
Domestic credit provide by banking	-0.0203***	-0.0253***	0.0012***	0.0016***	-0.0027	-0.0025	0.0073***	0.0073***
	(-4.72)	(-5.75)	(3.71)	(5.28)	(-0.69)	(-0.59)	(6.17)	(6.19)
Stock turnover ratio	0.0008	0.0061***	0.0003	0.0003*	0.003	0.0058***	-0.0004	-0.0005
	(0.31)	(2.61)	(1.51)	(1.65)	(1.28)	(2.49)	(-0.68)	(-0.88)
Regulation	-1.1503***		0.9381***		-0.2297**		0.0673	
	(-7.57)		(15.71)		(-2.53)		(0.20)	
Macroeconomics								
Inflation	-0.0304	-0.0591***	-0.1292***	-0.1293***	-0.0455**	-0.0211	-0.1070***	-0.1111***
	(-1.47)	(-2.88)	(-16.90)	(-17.39)	(-2.32)	(-1.01)	(-3.79)	(-3.98)
GDP growth	0.0623***	0.0812***	0.0400***	0.0411***	0.0460**	0.0474**	0.0667***	0.0669***
	(3.10)	(4.09)	(15.20)	(16.14)	(2.54)	(2.49)	(6.94)	(6.95)
Vector products								
Market share* interest rate spread		0.0021		0.0023**		0.0008		-0.0001
		(1.32)		(2.39)		(0.56)		(-0.03)
Market share*bank age		0.0021***		-0.0001		0.0007		-0.0004
		(2.91)		(-0.16)		(1.01)		(-1.41)
Market share*ownership		0.0896***		0.0049***		0.0121***		0.0073***
		(2.90)		(3.47)		(4.42)		(3.19)
Market share*regulation		0.0319**		-0.0005*		0.0107***		-0.0744***
		(2.50)		(-1.90)		(3.38)		(-3.96)
Bank Type and Regional Dummies								
Dummy investment	0.2437	0.304	0.0087	0.5649	0.5587	0.518	0.6243	0.5951
	(0.43)	(0.56)	(0.18)	(1.00)	(1.48)	(1.32)	(1.46)	(1.50)
Dummy Islamic	-0.0301*	-0.0454			0.1873	0.0917		
	(-1.85)	(-0.14)			(0.81)	(0.39)		
Dummy real estate	0.1822	0.0155	0.0523	0.0663	0.3086	-0.2512	0.2604	-0.3237
	(0.25)	(0.02)	(0.82)	(0.09)	(0.44)	(-0.35)	(0.37)	(-0.44)
Dummy savings	0.3957	0.4714	0.0079	0.7288	0.6066*	0.622	0.6407	0.6979
	(0.50)	(0.61)	(0.53)	(0.92)	(1.66)	(1.14)	(1.22)	(1.26)
Dummy cooperative	0.2002	-0.003	-0.0151	-0.1621	-0.3517	-0.4716	-0.3924	-0.5443
	(0.29)	(-0.01)	(-0.99)	(-0.23)	(-0.77)	(-0.99)	(-0.85)	(-1.12)
Dummy Middle East	0.8163***	0.7549***			0.2221**	0.3069**		
	(4.28)	(3.87)			(2.14)	(2.05)		
AR(1)	ρ=-0.0570	ρ=0.0709	ρ=0.0285	ρ=0.0110	ρ=0.0513	ρ=0.0280	ρ=0.1373***	ρ=0.1382***
	(-0.94)	(0.96)	(1.28)	(0.49)	(0.92)	(0.50)	(6.89)	(6.92)
Hausman test (χ^2)	120.95***	97.53***	132.30***	165.27***	50.72***	39.71***	161.01***	171.79***
Likelihood Ratio (χ^2)	349.03***	302.69***	2205.08***	2198.88***	301.19***	288.93***	3503.64***	3521.97***
F-statistic	3.68	3.28	5.9	5.93	8.77	7.74	14.4	14.31
R^2-adjusted	0.46	0.42	0.49	0.49	0.72	0.69	0.73	0.73
Standard error of regression	0.9	0.93	0.18	0.18	0.58	0.61	0.64	0.64
No. of countries	23	23	17	17	23	23	17	17
No. of observations	287	287	2656	2656	297	297	2716	2716
Bank dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering level	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank

- The dependent variable in panel A is the Z-score, which is defined as [(ROAA+CAR)/SROAA], where ROAA is return on averag CAR represents capital assets ratio, and SROAA stands for standard deviation of return on assets.
- The dependent variable in panel B is the Interest coverage ratio (interest multiplier) is defined as profit plus interest expenses divided by interest expenses.
- Market share*interest rate spread is an interaction term of market share and interest rate spread.
- Market share*age is an interaction term of market share and bank age. Market share*ownership is an interaction term of market share and foreign ownership. Market share*regulation is an interaction term of market share and regulation.
- We estimate all regressions using bank and time fixed effects and clustering at bank level. t-values are in parentheses.
- *, **, *** denote significance at 10%, 5%, and 1%, respectively. AR (1): Arellano-Bond test that average auto-covariance in residuals of order 1 is 0 (H0: no autocorrelation).

hence a *positive* (*negative*) sign on the coefficients implies an increase (decrease) in stability.

Both the Z-score and the interest coverage ratio are positively and significantly related to market share, suggesting that a greater market share increases bank stability. By contrast, the effect of market concentration on the Z-score is significantly negative in advanced economies at least at the 10% level, meaning that concentrated markets pose some risk; concentration may induce incentives for banks to take-on more risk, supporting the 'concentration-fragility' hypothesis. Our finding is in line with that of De Nicolo et al. (2004) who find that banks with more concentration are prone to be vulnerable to systemic failure for over 100 countries' banks, using an indicator of aggregated Z-index as stability. On the contrary, Beck et al (2006) using data on 69 countries during the period 1980-1997 provide strong evidence that in the concentrated banking system financial crises are less likely to occur.

Given many significant coefficients, the variables of the Z-score and the interest coverage ratio are closely related to bank-specific factors. With a positive sign on the coefficient of interest rate spread, banks operating in both types of economies seem to become stable as the spread widens. Bank size proxied by total assets does not appear to improve bank stability. A high capital ratio is found to contribute to bank stability, being consistent with theory. The overheads are positively related to the Z-score, yet negatively related to the interest coverage for both economies. It is interesting to find that banks with higher overheads are more stable when the stability is measured by the Z-score. Off-balance-sheet activities would seem to contribute to stability in advanced economies. Note that in Table 3-4, we find a negative impact of off-balance-sheet business on the returns, but this new finding for risk indicates a trade-off between risk and returns.

The loan growth appears to provide a preferable effect on the banks' stability for both economies. Bank age matters in emerging economies, where older banks seem to be more stable compared with younger banks, which is intuitively plausible for the less developed markets. Notably, model (2) suggests that the bank age effect is enhanced through market share. The increasing presence of foreign banks in an

economy exerts a positive impact on bank stability for both economies, which would be strengthened with the market power (see models (2), (4), (6) and (8)).

In terms of the effect of financial structure, the sign on the significant coefficients is the same as in the profitability regressions. An increase in releasing domestic credit leads to lower profitability and to increasing instability in emerging economies. The result emphasises the fact that immature banks tend to invest in risky investment projects or to release funds to low quality borrowers with a lack of adequate screening and monitoring systems in place. With a positive sign on the stock turnover ratio, stock market efficiency seems to be one of the factors for stability. Bank stability is positively associated with bank regulatory power for advanced economies, whereas it is negatively so for emerging economies. Given the fact that the negative coefficient is also found for bank profitability, deposit insurance regulation has little contribution to sound operations in emerging banks.

The macroeconomic variables seem to significantly impact on bank risk. The stability improves when a country enjoys high GDP growth in a deflationary period. Finally, the dummy variables for different types of banks are, in general, insignificant. The only noteworthy finding is that the Middle Eastern banking systems appear to be more stable than their counterparts in Eastern Europe.

3.7. Robustness tests

As a first step, we use a dynamic model for robustness of the results. Although we previously discussed that the fixed effects are more appropriate for our data still since bank profits show a tendency to persist over time and also since in each country-year, there are presumably shocks to the economy and the banking system to which both profitability and market share and concentration are reacting together, we adopt a dynamic specification of the model by including a lagged dependent variable among the regressors. Specifically, we apply a GMM technique to a panel of banks on Equation (1) that covers the period 1999-2008, clustering of errors at the bank level. We use one-step GMM estimator of Arellano and Bond (1991) by using all variable lagged values of the dependent variable plus lagged values of the exogenous regressors as instruments. Note that for GMM we have removed all interaction terms

Table 3-6: Determinants of the returns (ROAA and ROAE) over the period 2001-2010, using GMM: emerging economies vs. advanced economies

	Panel A: Dependent variable: ROAA						**Panel B:** Dependent variable: ROAE					
	Emerging economies			Advanced economies			Emerging economies			Advanced economies		
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lag dependent var.	0.234***	0.266***	0.211***	0.150*	0.144**	0.146*	0.282***	0.367***	0.282*	0.290***	0.141***	0.136***
	(3.99)	(3.79)	(4.38)	(1.79)	(2.31)	(1.89)	(4.11)	(2.99)	(1.77)	(2.62)	(3.69)	(3.64)
Market Structure												
Market share	0.010		0.051	0.012***		0.002*	0.128		0.323	0.005**		0.013**
	(0.22)		(0.11)	(3.11)		(1.71)	(1.46)		(0.68	(2.06)		(2.20)
4-firms concentration		-0.022***	-0.006*		-0.001	-0.001		-0.034*	-0.127**		0.041	0.041
		(-7.86)	(-1.72)		(-0.58)	(-0.52)		(-1.88)	(-2.35)		(0.21)	(0.11)
Bank-Specific Variables												
Interest rate spread	0.085***	0.072***	0.088***	0.019***	0.017***	0.017***	0.389***	0.420***	0.426***	0.366***	0.331***	0.334***
	(4.64)	(4.61)	(4.76)	(4.94)	(3.93)	(3.68)	(3.34)	(4.23)	(3.00)	(5.10)	(5.46)	(5.06)
Log(total assets)	-0.273**	-0.226***	-0.126	0.121**	0.209***	0.206***	-0.354	-0.202***	-0.857**	0.361	0.312	0.464*
	(-2.54)	(-3.89)	(-1.60)	(2.25)	(4.32)	(4.19)	(-0.39)	(-2.76)	(-2.14)	(1.56)	(1.57)	(1.75)
Equity to total assets	0.547***	0.707***	0.724***	0.929***	0.824***	0.813***	0.665**	0.861***	0.671***	0.696***	0.663***	0.641***
	(12.82)	(19.84)	(19.39)	(12.01)	(10.66)	(10.16)	(2.18)	(4.75)	(4.30)	(7.48)	(8.30)	(7.62)
Overheads to assets	-0.174**	-0.187***	-0.362***	-0.297***	-0.283***	-0.265***	-0.720***	-0.418	-0.850**	-0.726***	-0.822***	-0.814***
	(-2.19)	(-4.21)	(-4.38)	(-5.23)	(-5.13)	(-3.96)	(-2.70)	(-0.52)	(-2.06)	(-3.27)	(-5.63)	(-3.73)
Off-balanc. to assets	0.247***	0.071***	0.085**	-0.024***	-0.053***	-0.054***	0.380	0.756***	0.892***	0.564*	0.725**	0.758**
	(4.53)	(2.62)	(2.42)	(-2.95)	(-3.46)	(-3.48)	(1.56)	(4.73)	(5.41)	(1.79)	(2.50)	(2.19)
Loan growth	0.002**	0.001	0.001	-0.001	0.002**	0.002**	0.037***	0.042***	0.032***	0.019	0.007	0.004
	(2.26)	(1.20)	(0.44)	(-0.45)	(2.03)	(2.01)	(4.42)	(6.37)	(3.43)	(0.92)	(0.42)	(0.23)
Bank age	0.148***	0.105***	0.087***	0.004	0.023**	0.023***	0.145***	0.197***	0.199***	-0.026	-0.104	-0.088
	(6.56)	(6.33)	(4.86)	(0.36)	(2.55)	(2.58)	(4.63)	(6.12)	(4.77)	(-0.17)	(-0.72)	(-0.60)
Financial Structure												
Credit provided by banking	-0.004*	-0.005*	-0.005**	0.002***	0.003***	0.003***	-0.007	-0.054**	-0.093***	0.050***	0.046***	0.046***
	(-1.68)	(-1.67)	(-2.41)	(3.27)	(3.05)	(3.08)	(-0.33)	(-2.20)	(-3.60)	(3.63)	(3.04)	(2.98)
Stock turnover ratio	-0.003***	-0.002***	-0.002**	-0.001**	-0.002***	-0.002***	-0.034***	-0.043***	-0.039***	-0.028***	-0.016	-0.016
	(-6.22)	(-3.33)	(-2.37)	(-2.27)	(-3.81)	(-3.83)	(-4.46)	(-6.56)	(-3.85)	(-2.91)	(-1.56)	(-1.55)
Macroeconomics												
Inflation	-0.043***	-0.045***	-0.050***	-0.044***	-0.048***	-0.047***	-0.452***	-0.189**	-0.232***	-0.289	-0.051	-0.085
	(-5.09)	(-4.31)	(-3.51)	(-3.39)	(-3.88)	(-3.73)	(-7.88)	(-2.40)	(-2.82)	(-1.25)	(-0.24)	(-0.40)
GDP growth	0.027***	0.022***	0.019***	0.017***	0.020***	0.020***	0.337***	0.581***	0.515***	0.370***	0.375***	0.369***
	(3.01)	(5.02)	(3.64)	(4.14)	(5.10)	(5.14)	(5.05)	(8.10)	(4.09)	(5.61)	(6.10)	(5.90)
Sargan test (p-value)	0.29	0.50	0.60	0.21	0.30	0.28	0.54	0.44	0.52	0.81	0.63	0.60
AR(1)-coefficient	-0.037	-0.097	-0.107	-0.365	-0.393	-0.392	-0.119	-0.156	-0.151	-0.227	-0.220	-0.279
p-value	0.02	0.09	0.06	0.00	0.00	0.00	0.05	0.01	0.01	0.00	0.00	0.00
AR(2)-coefficient	-0.029	-0.014	-0.029	-0.080	-0.065	-0.066	-0.073	-0.067	-0.070	0.124	-0.099	-0.058
p-value	0.16	0.78	0.59	0.11	0.17	0.01	0.27	0.19	0.00	0.00	0.14	0.29
S.E of regression	0.67	0.65	0.66	0.36	0.36	0.36	3.63	5.55	5.65	4.51	4.40	4.41
No. of countries	23	23	23	17	17	17	23	23	23	17	17	17
No. of observations	312	312	312	3005	3005	3005	312	312	312	3005	3005	3005

- The dependent variable in panel A is return on average assets, which is defined as profit before tax as a percentage of total assets of a bank.
- The dependent variable in panel B is return on average equity, which is defined as profit before tax as a percentage of equity a bank.
- We estimate all regressions using using one-step GMM estimator of Arellano and Bond. t-values are in parentheses.
- *, **, *** denote significance at 10%, 5%, and 1%, respectively.
- AR(1) and AR(2): Arellano-Bond test that average auto-covariance in residuals of order 1 and 2, respectively, are 0 (H0: no autocorrelation).
- Sargan test: the test for over-identifying restrictions in GMM dynamic model estimation.

and dummy variables in order to not losing more observations. Other variables are analogous to Table 3-4. Also, we have run regressions only for profitability not risk as we have already loose three years observations for estimating Z-scores and again if this adds to the nature of GMM we will lose a substantial number of observations, especially for emerging economies that have limited number of banks.

The empirical results are presented in Table 3-6. The results are consistent with our previous findings which support the view that in advanced economies but not emerging economies, higher bank market share is associated with higher profitability being biased toward the RMP hypothesis; and that in emerging but not advanced economies; a higher industry concentration ratio is associated with lower profitability.

Table 3-7: Bank market structure, profitability and stability (Herfindahl Index)

Profitability model								
	Panel A: ROAA				Panel B: ROAE			
	Emerging economies		Advanced economies		Emerging economies		Advanced economies	
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Structure								
Market share	0.001		0.0068***		0.0336		0.2179***	
	(0.86)		(4.08)		(0.28)		(4.17)	
Normalised Herfindahl Index	-0.2715***	-0.3022***	0.1101	0.1244	-0.7792*	-1.1370**	0.9925	1.066
	(-3.60)	(-3.14)	(0.99)	(0.88)	(-1.78)	(-2.45)	(0.40)	(1.14)
Risk model								
	Panel A: Z-score				Panel B: Interest coverage ratio			
	Emerging economies		Advanced economies		Emerging economies		Advanced economies	
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Structure								
Market share	0.0403*		0.0027*		0.0185		0.0249***	
	(1.71)		(1.83)		(1.14)		(3.45)	
Normalised Herfindahl Index	-0.1012	-0.1426	-0.0519***	-0.1078***	-0.2752*	-0.1829	-0.2934***	-0.6167
	(-0.34)	(-1.16)	(-4.90)	(-13.49)	(-1.74)	(-1.07)	(-3.73)	(-1.58)

- We estimate all regressions using country and time fixed effects and clustering at bank level. t-values are in parentheses. *, **, *** denote significance at 10%, 5%, and 1%, respectively.
- The detailed results with other determinants are available from the authors upon request.
- Normalised Herfindahl Index is deflated by 10000.

We next verify the robustness of the empirical results by applying an alternative measure of market concentration, the normalised Herfindahl-Hirschman index ($NHHI$)[23]. Table 3-7 shows the results with the model specification being analogous to Tables 3-4 and 3-5. In order to save space, we only present the estimates of market share and *NHHI*[24]. The coefficients are mostly consistent in

[23] In general, the HHI in a market with N equal-size firms is $\frac{1}{N}$. Because of this property, the reciprocal of HHI is referred to as the number-equivalent of firms. The Herfindahl index ranges from $1/N$ to one. The normalized Herfindahl index ($NHHI$) ranges from 0 to 1, computed as $NHHI=\frac{(HHI-\frac{1}{N})}{(1-\frac{1}{N})}$. In the model specification, *NHHI* is deflated by 10000.

[24] The detailed results are available from the authors upon request. This also applies to Table 3-7.

terms of the statistical significance and the sign with those based on 'the 4-firm market concentration'. For other explanatory variables, the results are also broadly similar to those in Tables 3-4 and 3-5.

Our findings are also robust in a wider range of alternative regressions. Specifically, we tried i) adding more explanatory variables, namely, personnel expenses to size, square of bank size, cost to income ratio, and stock market capitalization, ii) decomposing non-commercial banks to investment, co-operative, savings, real estate and Islamic banks, and removing each type of non-commercial banks from the model one by one, which may have different objectives amongst themselves iii) including a one-period lag of explanatory variables, such as a capital adequacy lag, and interest rate spread lag, iv) using net interest margin and the Sharpe ratio[25] instead of ROAA and ROAE, and v) excluding year 2008 which is associated with a decline in returns on assets and equity. None of these alternative approaches yielded significantly different results. For brevity, the results are not presented here, but are available from the authors upon request.

3. 8. Emerging economies

While the Western European banks are relatively uniformed in terms of banking operations, regulations and structures, a heterogeneous banking system is often observed among emerging economies. We estimate the model by separating the emerging banks into two groups of the Eastern Europe and Middle East. See Table 3-8, where the models are estimated for risk (Panel A) and return (Panel B) using the same LSDV procedure. Note that Bank age is not specified for the Eastern Europe due to the fact that most of banks were established around the transition period of early 1990s.

A couple of distinctive features are mainly observed in the bank-specific significant variables between the two regions of emerging countries. The effect of off-balance to total assets on profitability is the opposite direction in the ROAA model. Eastern Europe gains with the off-balance sheet activities by generating

[25] The Sharp ratio is risk-adjusted returns on equity that is given by the mean value of the returns on equity divided by the standard deviation of the returns on equity. See, e.g. Kosmidou et al. (2005), Pasiouras and Kosmidou (2007), and Demirguc-Kunt and Huizinga (2010) for the use of these variables.

higher profitability, whereas Middle East poses a decline in returns by engaging in this. Although the inverse relationship is consistently observed for the effect of overheads to total assets on profitability for both regions, with respect to stability, it shows the opposite sign on the coefficient between Eastern Europe and Middle East. Overheads cost includes operating expenses as well as personnel expenses, and it is argued that the former differs across countries more than the latter does. Hence, the different result may be due to the diverse operating systems in their respective banking sector.

Table 3-8: Determinants of risk and returns in emerging economies (Eastern Europe vs. Middle East)

	Panel A: bank profitability: ROAA		Panel B: bank stability: Z-score	
	Eastern Europe	Middle East	Eastern Europe	Middle East
Variable	(5)	(1)	(7)	(3)
Market Structure				
Market share	0.0424	0.0042	0.0254**	0.0147*
	(1.16)	(0.20)	(2.12)	(1.76)
5-firms concentration	-0.0137	-0.0391***	-0.0024	-0.0412
	(-0.88)	(-2.72)	(-0.23)	(-1.47)
Bank-Specific Variables				
Interest rate spread	0.0543**	0.1895***	0.0069*	0.0670*
	(2.26)	(5.61)	(1.87)	(1.71)
Bank size: Log(total assets)	0.0224	0.3439	0.2937*	-1.4165*
	(0.10)	(0.82)	(1.68)	(-1.72)
Equity to total assets	0.4301*	2.2128***	0.3323*	0.6618**
	(1.79)	(6.20)	(1.70)	(2.91)
Overheads to total assets	-0.1172**	-0.7347*	-0.6535**	4.4631***
	(-2.32)	(-1.69)	(-2.31)	(5.07)
Off-balanc. to total assets	1.7960***	-1.2054**	0.5010*	0.6460
	(3.06)	(-2.27)	(1.81)	(0.62)
Market growth: Loan growth	0.0050**	0.0068*	-0.0003	-0.0120
	(2.02)	(1.70)	(-0.09)	(-1.50)
Bank age		0.0280***		0.1692**
		(3.69)		(2.14)
Foreign ownership	-0.1005	0.0364***	0.0943**	0.1453*
	(-0.79)	(3.80)	(2.07)	(1.69)
Overall Financial Structure				
Domestic credit provide by banking	0.0162*	-0.0152***	-0.0088	-0.0460***
	(1.71)	(3.30)	(-1.55)	(-5.14)
Stock turnover ratio	-0.0004	0.0025	0.0017	0.0078
	(-0.12)	(0.84)	(0.74)	(1.34)
Macroeconomics				
Inflation	0.0033	-0.0625*	0.0494***	-0.1191*
	(0.13)	(-1.82)	(2.49)	(-1.81)
GDP growth	0.0318	-0.0354*	0.0544*	-0.0511
	(0.78)	(-1.94)	(1.74)	(-1.43)
AR(1)	ρ=0.0662	ρ=-0.0381	ρ=-0.0504	ρ=-0.0059
	(0.79)	(-0.53)	(-0.70)	(-0.08)
Likelihood Ratio (χ^2)	219.82***	175.01***	106.28***	199.82***
F-statistic	5.26	13.25	1.68	4.12
R^2-adjusted	0.62	0.80	0.21	0.50
Standard error of regression	0.58	0.53	0.44	1.05
No. of countries	10	13	10	13

The dependent variable in panel A is return on average assets defined as profit before tax as a percentage of total assets of a bank. The dependent variable in panel B is the Z-score, which is defined as [(ROAA+CAR)/SROAA], where ROAA is return on average assets, CAR represents capital assets ratio, and SROAA stands for standard deviation of return on assets. We estimate all regressions using bank and time fixed effects and clustering at bank level. t-values are in parentheses. *, **, *** denote significance at 10%, 5%, and 1%, respectively. AR (1): Arellano-Bond test that average auto-covariance in residuals of order 1 is 0 (H0: no autocorrelation). In order to avoid any direct accounting links between dependent and independent variables, we enter variables of Total assets, equity to total assets and overheads to total assets with one lag into the equation

In terms of market structure, the results seem to be consistent with the original consolidated result, supporting the key findings: For profitability, market

share remains insignificant, and concentration continues to exerts an adverse influence. For the latter, a significant effect is found only for Middle East, and one may wonder that this may be due to a stronger state intervention on large banks in this region. With respect to Z-score models, it was found that market share acted to stabilise the banking sector in Table 5, and this effect is well-sustained in both types of emerging countries.

3.9. Discussion of the key findings

The empirical results support the view that greater market share leads to higher bank profit rates in advanced economies, however, it fails to explain the high bank returns among emerging markets. Also, we find that the effect of concentration on profit is negative on emerging markets, suggesting that the de-concentration improves returns. Overall, the empirical results are supportive to neither of the hypotheses of RMP and SCP on bank performance in emerging economies. There may be some other possible factors we should emphasise based on the data and empirical results.

Firstly, we find that as the number of banks in a market decreases (increases), profitability increases (decreases) significantly, irrespective of the efficiency of the banking system. High entry barriers and restrictions on new or foreign banks facilitate market collusion, with the consequence that even markets with low concentration may exhibit collusive behaviour, raising the profits of existing banks. In other words, market competitiveness may depend on the number of participants in a country.

In order to verify the negative relationship, we re-estimated equations (2) and (3) by replacing the market structure variables with the ratio of the number of banks to real GDP per capita,[26] whilst maintaining all control variables except for the interaction terms and bank dummies. Table 3-9 shows the coefficients of the number of banks. The estimates are negatively highly significant in emerging economies, supporting the argument. This is contrasted with the insignificant coefficients for the advanced economies. In the stability regressions, we also find significant negative coefficients at the 5% level for the emerging countries. These results imply that as

[26] The number of banks is based on individual countries. See the first column in Table 3b for the number of banks. The real GDP per head is the mean over the sample period.

the number of banks (per real GDP per capita) in an economy falls, both profitability and stability improve in emerging markets. In order to see the country-wise trend, we also plot the number of banks and the returns in Figure 3-2 and the risk in 3-3. It is evident that the trend-lines have a downward slope for emerging banks in both Figures 3-2 and 3-3, demonstrating the negative relationship between performance and the number of banks. Emerging economies tend to cluster around the trend-line except for Egypt. This can be compared with those of advanced banks with the very mild slopes.

Table 3-9: Bank market structure, profitability and stability (Number of banks)

	I-Bank profitability and market's number of bank			
	Panel A: ROAA		**Panel B:** ROAE	
	Emerging	Advanced	Emerging	Advanced
Variable	(1)	(2)	(3)	(4)
Market Structure				
No. of bank per real GDP per capita	-0.0319***	0.0001	-0.0205***	-0.0034
	(-4.11)	-0.78	(-3.92)	(-1.15)
	II-Bank stability and market's number of bank			
	Panel A: Z-score		**Panel B:** Interest coverage ratio	
	Emerging	Advanced	Emerging	Advanced
	(1)	(2)	(3)	(4)
Market Structure				
No. of bank per real GDP per capita	-0.1759***	0.0631	-0.1627**	-0.0801*
	(-3.83)	(1.49)	(-2.01)	(-1.69)
- We estimate all regressions using country and time fixed effects and clustering at bank level. t-values are in parentheses. *, **, *** denote significance at 10%, 5%, and 1%, respectively.				
- The detailed results with other determinants are available from the authors upon request.				

Figure 3-2-a: Number of banks per real GDP per capita and return on assets (emerging economies)

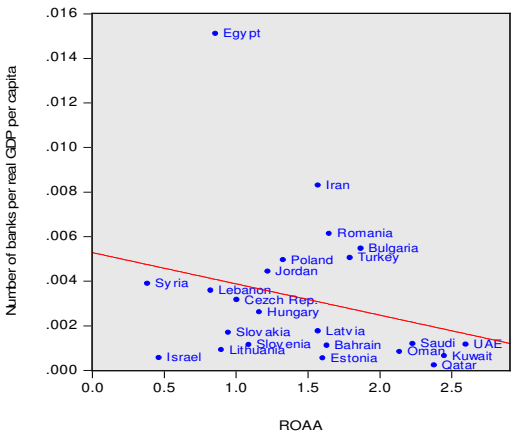


Figure 3-2-b: Number of banks per real GDP per capita and return on assets (advanced economies)

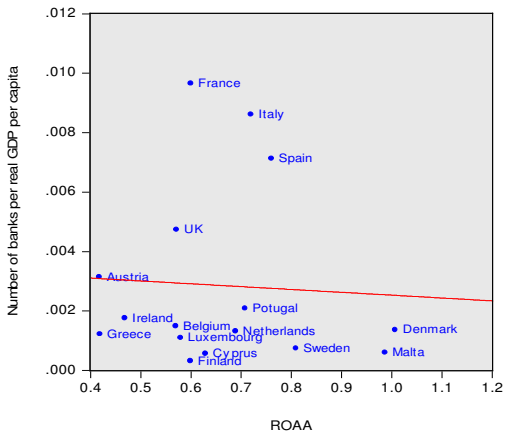


Figure 3-2-c: Number of banks per real GDP per capita and return on equi (emerging economies)

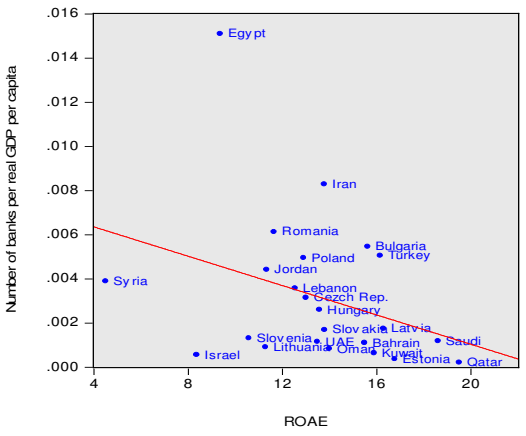


Figure 3-2-d: Number of banks per real GDP per capita and return on equity (advanced economies)

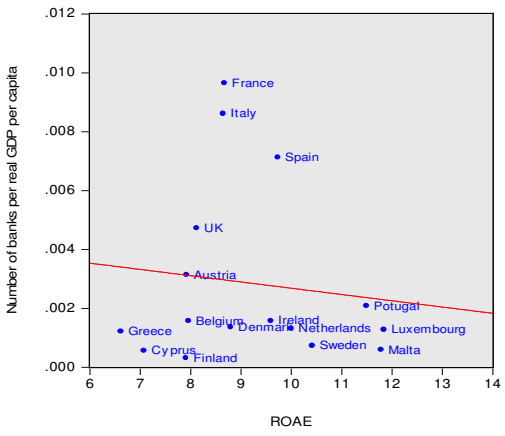


Figure 3-3-a: Number of banks per real GDP per capita and Z-score (emerging economies)

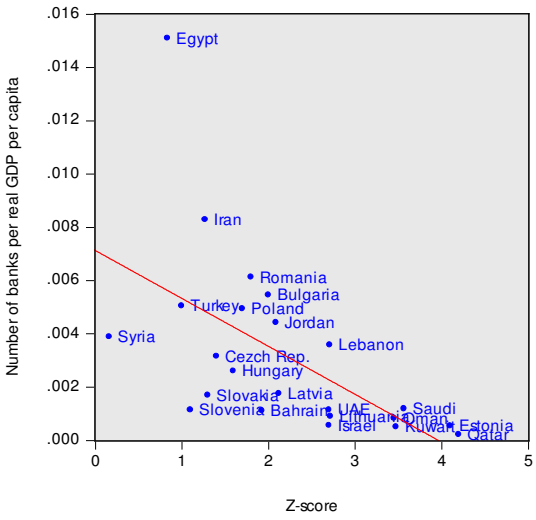


Figure 3-3-b: Number of banks per real GDP per capita and Z-score (advanced economies)

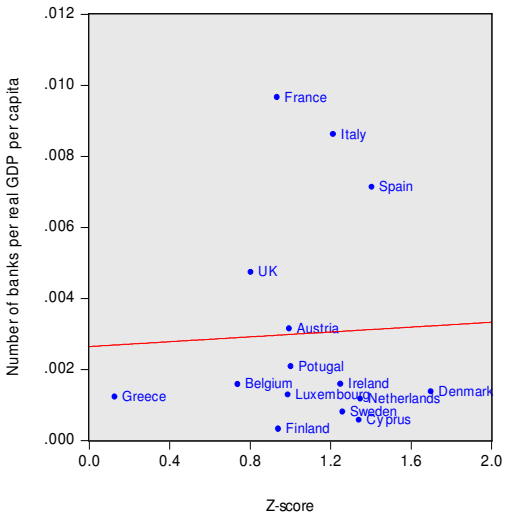


Figure 3-3-c: Number of banks per real GDP per capita and interest coverage ratio (emerging economies)

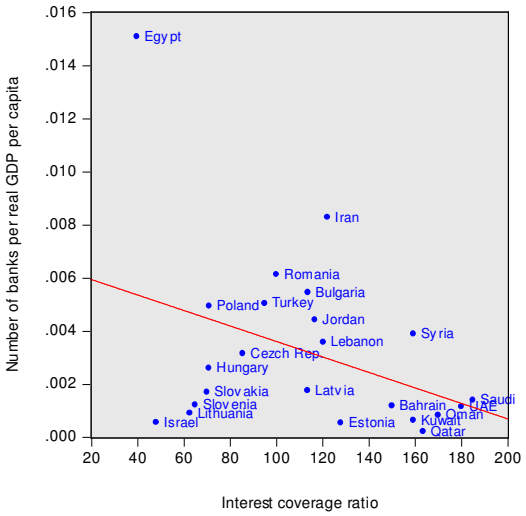
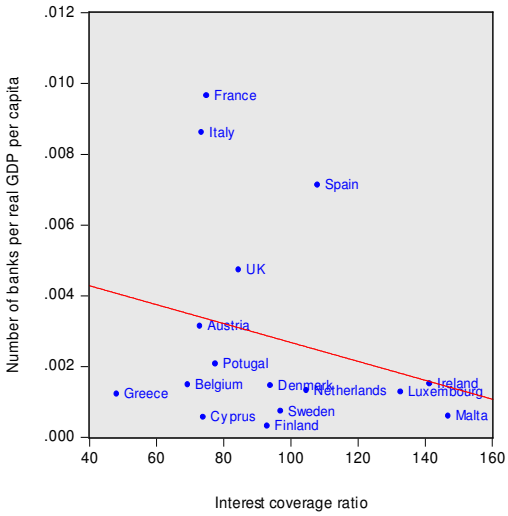


Figure 3-3-d: Number of banks per real GDP per capita and interest coverage ratio (advanced economies)



Another possible reason would be a high interest-rate margin between bank interest earnings and expenses, which remain substantially higher in emerging economies as compared with those in advanced economies. The emerging banks have a mean interest rate spread of 6.22%, compared with 3.55% for advanced economies (in Table 3-3-a). The spread is widely regarded as an indicator of the efficiency of financial intermediation. Hence the higher spreads are an impediment to financial intermediation, as they discourage potential savers due to a low return on savings, and increase financing costs for borrowers, reducing investment and growth opportunities. This is of a particular concern for countries in transition, where financial systems are largely bank-based. The robust effect of interest rate margins in emerging banking systems implies that banks can earn higher profits through increasing interest margin revenues in a less competitive financial market, signified by the number of banks, rather than by market share, or by market concentration.

3.10. Chapter summary

This chapter empirically investigates the effects of market structure, by controlling bank-specific characteristics and overall financial and macroeconomic environment, on the profitability and stability of banks in emerging and advanced economies during the period of the booming years, 1999-2008 when banks enjoyed good growth and profits. In particular, we assessed the extent to which the relatively high profitability in emerging banking systems can be attributed to less competitive market conditions.

We have shown that there are large differences in profitability among the banks in our sample, and that a significant amount of this variation can be explained by the factors included in our analysis. Market share has no significant impact on bank profitability in emerging markets, providing little evidence in support of the RMP hypothesis, whereas we find evidence in support of the hypothesis in advanced economy banking systems. The effect of market concentration on profitability is either insignificant on advanced banking market or the unexpected negative impact on emerging banks. Regarding bank stability, concentration is negatively associated with bank soundness in advanced economies and, to lesser degree, in emerging economies. These results suggest that concentrated markets may encourage risk-

taking behaviour in banks, and more concentrated banking systems are vulnerable to systemic failure. This is contrasted with the stabilising role of market share. In an extended model, we provided some evidence to show that in emerging economies the profitability and stability of banking systems have been negatively associated with the number of banks existing in the economy.

CHAPTER 4

Bank Performance II: Competition Assessment – Emerging vs. Advanced Economies

4.1. Introduction

Appropriately assessing the degree of competition in the financial markets remains an open issue. The literature contains several indicators of competition, which can be classified into two major categories: those that use traditional structural measures of competition and those that fall within the so-called 'New Empirical Industrial Organization (NEIO)' models (the non-structural approaches). The traditional measures use concentration indexes under the structure–conduct–performance or the efficient structure hypothesis (Berger, 1995). The non-structural indicators, including the estimation of the mark-up test of Bresnahan (Shaffer, 1989, 1993; Shaffer and Disalvo, 1994; Neven and Röller, 1999), the Panzar and Rosse test (Nathan and Neave, 1989; Molyneux et al., 1994; De Bandt and Davis, 2000; Bikker and Haaf, 2002b), or instruments derived from Monti–Klein-type banking competition models, such as the estimation of Lerner indexes (Prescott and McCall, 1975; Maudos and Fernández de Guevara, 2004 and 2007; Fernández de Guevara et al., 2005; Carbo et al., 2009). Although these methods have been applied individually to various markets, and hence, studies have relied on only one of the various competitiveness measures, researchers have not yet attempted to examine empirically whether or not different approaches yield similar results. In this chapter, we first assess the degree of competition in the banking sector by utilizing three NEIO non-structural approaches, the Panzar and Rosse, the Lerner index and the notion of efficiency competition, after which, by analysing the interrelationships between these measures, as well as with three structural indicators (return on assets, net interest margin and the HHI index), we examine the consistency of these six competition measures in ranking 49 emerging and advanced market banking environments. The dataset covers almost all emerging and advanced market banking systems worldwide, and hence, we systematically distinguish between these two markets.

Early studies on the measurement of banking competition are based on the structural approaches, in which there is an inverse relationship between market concentration and competition. In this context, there are three main hypotheses on

the structural approach of concentration and competition in the literature, namely the *SCP paradigm*, *efficient structure hypothesis*, and *contestable market hypothesis*.

Market structure studies during the 1940s and 1950s typically focused on traditional industrial organisation approach – *the Structure-Conduct-Performance (SCP) hypothesis*. This approach links the structural characteristics of a market to the conduct of firms within it, and thus to performance. In particular, the SCP hypothesis postulates that banks are able to extract monopolistic rents in concentrated markets, through their ability to offer lower deposit rates and charge higher loan rates. The literature based on the structural approaches has investigated how market concentration weakens competition by fostering collusive behaviour among firms. The SCP paradigm is empirically tested by examining the relationship between market concentration and profitability, with a positive association indicating non-competitive behaviour in concentrated markets. This hypothesis has been extensively examined with respect to both American and European banks. However, empirical studies on the SCP paradigm have yielded mixed results. Weiss (1989), for instance, reports that only 21 of 47 studies support the SCP model. Furthermore, various indicators have been devised in empirical work to measure the market structure. The most widely used measures include the n-firm concentration ratio and the Hirschman-Herfindahl index (HHI) (e.g., Angelini and Cetorelli, 2003; De Nicolo et al. 2004; and Beck et al. 2006). Each of these measures has its own advantages and disadvantages. The main drawback of the n-firm concentration ratio, for example, is that it neglects many small banks operating in the market. Firm performance is also measured using either profit or price indicators. In this context, increases in concentration ratios are usually interpreted as indications of decreased competition. Finally, the relative market hypothesis, which is a special case of the SCP, posits that only firms with large market shares and well differentiated product lines are able to exercise market power to raise profits through non-competitive price setting behaviour (Berger, 1995).

However, the SCP hypothesis is typically challenged by the efficient structure and market contestability hypotheses. *The efficient structure hypothesis* postulates that the relationship between market structure and the performance of any firm is defined by the efficiency, and that the competitive behaviour of efficient firms in the market leads to an increase in the market share of those firms. In

particular, the efficient structure hypothesis states that efficient firms increase in size and market share, because of their power to generate higher returns, which also usually leads to higher market concentration. Firms with superior management or production technologies have lower costs, enabling them to earn higher profits, thus further enhancing their market share, and resulting in a concentrated market. Therefore, higher profits could alternatively, in contrast to the SCP approach, be the result of greater efficiency in production and managerial organization (Smirlock, 1985; Evanoff and Fortier, 1988). In empirical investigations, while European banking studies tend to find more evidence that the traditional SCP hypothesis holds (Goddard et al., 2001), US banking studies tend to reject the SCP paradigm in favour of the efficiency hypothesis (see Gilbert, 1984; and Berger et al., 1999). Finally, some studies have attempted to examine both the SCP and efficient structure hypothesis simultaneously, by including proxies of efficiency measures into the models, in order to distinguish between these two hypotheses (e.g. Smirlock, 1985; Berger and Hannan, 1989; Jackson, 1997; Molyneux and Teppet, 1993; Lloyd-Williams et al., 1994; and Goldberg et al., 1996). Finally, the efficient structure hypothesis has usually been proposed in two different forms, those of scale efficiency and of x-efficiency.

An alternative theory, supporting the SCP hypothesis, is the theory of contestable *markets*, which assumes that ease of competitive entry and the existence of potential short-term entrants can restrain market power. It is claimed that in some banking markets, the traditional way of measuring competitive conditions has become less appropriate, because of the role of market contestability initially from Baumol (1982) and Baumol et al. (1982). The point is that the structural features of a market are irrelevant in determining the level of market competition, since entry and exit conditions determine competitive behaviour. The reason is that more concentrated markets, operating under conditions in which existing firms are actively competing with each other and with prospective new entrants, can still be competitive. Contrary to the predictions of the SCP paradigm, more concentrated market structures may still yield desirable outcomes. Thus, limited contestability and small numbers of firms result in collusive behaviour, control market output, resulting in uncompetitive behaviour. Claessens and Laeven (2004), for instance, investigate the effects of market structure and regulatory regimes on the competitiveness

measures for the banking sector in 50 countries. Their findings confirm that contestability determines effective competition.

According to the theory of industrial organization, however, the competitiveness of an industry cannot be measured by market-structure indicators alone. The shortcomings arising from the application of structural approaches as discussed before, and the developments in industrial organisation, have led many empirical studies to follow a new course within the New Empirical Industrial Organization (NEIG) approaches. Compared to the traditional approach of looking only at bank concentration figures, this approach provides a more comprehensive framework for examining competition in the banking sector. In this strand of literature, non-structural models are used for analysing competitive conditions, without referring to explicit information about market structure. Specifically, these new models determine the degree of market competition by analysing the actual behaviour of agents. The models of Lerner (1934), Iwata (1974), Bresnahan (1982) and Panzar and Rosse (1987) entail non-structural measures of competition. While both the Panzar and Rosse and Lerner models have been used extensively in the literature, empirical applications of other models (Iwata and Bresnahan) are scarce, due to the demanding information requirements.

Panzar and Rosse (1987) developed a method that uses firm-level data to determine the intensity of competition faced by market participants. The approach is based on competitive statistics properties of a reduced-form equation of a firm, and an *H-statistic* is defined as the sum of the elasticities of revenue with respect to input price factors. This statistics reveals information about the market in which firms operate. Shaffer (1982) and Nathan and Neave (1989) suggest different interpretations of H-statistic. In a perfectly competitive market the H-statistic is equal to unity, while in a monopolistic competition it ranges from zero to one. Under monopoly condition the H-statistic is less than or equal to zero. This approach is applicable in a banking market straightforward as it does not require any detailed information about output prices and output quantities. In contrast, all information needed to estimate the H-statistic can be extracted from the financial statements.

Furthermore, an alternative approach to the Panzar and Rosse methodology, which has recently attracted the attention of many European scholars, is the *Lerner*

model (Lerner 1934). This model focuses on measures of competition between oligopolists, such as those in Iwata (1974) and Berg and Kim (1994), and those that test for competitive behaviour in contestable markets (Bresnahan 1982, Lau 1982 and Panzar and Rosse 1987. These measures are developed from (static) theory of the firm models under equilibrium conditions and typically use some form of price mark-up over a competitive benchmark. The Lerner index uses the mark-up of price (average revenue) over marginal cost and the divergence of price from perceived marginal revenue for the Bresnahan measure. The higher the mark-up the greater the realized market power.

So far, almost all studies attempting to gauge the degree of competition in financial markets deduce competitive behaviour from basically just one of abovementioned models. However, recent work by Claessens and Laeven (2004) and Carbo et al. (2009), among others, suggest that firstly, concentration may not hamper competition and secondly, different indicators of competition yield conflicting predictions regarding the degree of competition across countries. Therefore, in order to revisit these recent findings, we assess the degree of competition among emerging and advanced market banking systems and examine whether different measures yield similar results. We adopt a two-stage approach in this study. In the first stage, we measure the degree of competition using three different non-structural NEIG approaches, i.e. the Panzar-Rosse, the Lerner index and our own concept of efficiency competition. Furthermore, in the second stage, by comparing the structural and non-structural indicators of competition, we rank banking competition across countries. The structural measures included bank profitability indicators (return on assets and net interest margin) and market concentration ratio (Hirschman-Herfindahl index).

We compute a novel measure of competition (efficiency competition) similar to the Boone indicator (Boone, 2008). The Boone indicator focuses on the effect of competition on the performance of efficient banks, and exploits the reallocation of profits to efficient banks from inefficient counterparts. The Industrial Organization approach stresses that industry performance is an endogenous factor of the growth of efficient firms. The empirical study of Hay and Liu (1997), for example, suggests that competition increases efficiency. Hence, under the Boone hypothesis, we expect that more efficient banks, i.e. banks with lower marginal costs, achieve higher profits

at the expense of their less efficient counterparts. However, in the empirical section, we regress market share rather than return on assets (which is used in the Boone indicator), on a firm's average overhead costs to the industry's average overhead costs, in order to obtain information on the extent to which firm growth varies with costs. The idea is that while a decrease in overheads increases market share in all markets, the same percentage decrease in a more competitive market leads to a greater increase in market share, because banks benefit more by being efficient. The Boone model just like other competition indicators has its own drawbacks. For instance, it ignores differences in bank product quality. Another problem is that the efficient firms may choose to translate some parts of lower costs into lower output prices and in this scenario the profitability may decline while market share will increase. The latter issue motivated us to use competition efficiency proposed by Hay and Liu (1997).

Our "efficiency competition" is different with the concept of "competition efficiency" proposed by Bolt and Humphrey. Specifically, Bolt and Humphrey (2010) employ a frontier efficiency analysis in order to devise an alternative indicator of bank competition. The frontier is determined by how lending rate spread and non-interest revenue are explained by payment and other costs. The authors show that productivity, costs, and competition are the main determinants of retail banking revenue. They include the productivity and input factor costs into a translog cost function, and, by borrowing the idea of cost efficiency, extract a degree of bank competition from the total residuals. They argue that unexplained portion of the revenue remaining after taking into account productivity and costs represent the effect of competition on revenues. By applying of this method for 11 European countries, they find that there is a little difference in competition for services generating traditional interest revenue as well as non-traditional revenue. They called this process of estimating bank competition as "competition efficiency" and it is different from our concept of efficiency competition in this study where it captures the reallocation of market share to more efficient banks from their inefficient counterparts.

To the best of our knowledge, the only study which assesses the relationships between different indicators of competitiveness is Carbo et al (2009). They assess the state of competition in 14 European countries by employing five indicators, i.e.

net interest margin, the Lerner index, return on assets, the H-statistics and the HHI, and find that different competitiveness measures do not yield similar predictions of the degree of competition. They further argue that such differences could be explained by cross-country differences in cost efficiency, fee income levels and macroeconomics. However, compared to Carbo et al., the contribution of our study is fourfold. Firstly, we refer to entire emerging and advanced economies. Secondly, we use a very recent dataset (2001-2010) while Carbo et al., used data for the years 1995-2001. This is because our data show that the banking markets of advanced economies became more concentrated during the period under consideration, while emerging economies show a downward trend in concentration. Thirdly, we propose a new method for gauging the degree of competition, which we refer to as efficiency competition. Finally, we systematically compare emerging and advanced economies, so as to avoid proposing a general pattern for all countries which in fact have different market structures.

In this chapter, we exploit a rich bank-level data base for 49 emerging and advanced countries in order to revisit the above issues. Of particular relevance, in our paper, the scale of analysis is extended to a panel database of about 60,000 bank-year observations for the last ten years of available data (2001-2010). This study therefore augments previous studies by considering the entire set of emerging countries covered by the Standard and Poor's as well as other OECD emerging economies, and using the entire set of OECD advanced economies. To do so, we adopt a two-stage approach in this study. In the first stage, we measure the degree of competition using three different non-structural NEIG approaches, i.e. the Panzar-Rosse, the Lerner index and our own concept of efficiency competition. Furthermore, in the second stage, by comparing the structural and non-structural indicators of competition, we rank banking competition across countries. The structural measures included bank profitability indicators (return on assets and net interest margin) and market concentration ratio (Hirschman-Herfindahl index).

The results reveal that bank revenue appears to be earned under conditions of monopolistic competition; there is a decline in the level of competition over time; and advanced banking systems are more competitive than their counterparts in emerging economies. Finally, there is no consistency among NEIO approaches, or among structural indicators, in ranking banking competition across countries.

A policy implication of our results is that, while policy makers tend to use more traditional indicators of market concentration in order to gauge the degree of competition, the new empirical approaches reveal that competition may not be measured by the traditional indicators alone. In fact, it seems that different competitiveness indicators capture different aspects of banking. For instance, the Boone indicator and our innovative measure of competition (efficiency competition) indicate that competition may be positively associated with profitability and market share. Also, net interest margins tend to be suitable for analysing the competitive behaviour of traditional deposit and loan markets, whereas return on assets and the Lerner index are more relevant when assessing the degree of competition with respect to the broader activities of banks, including fee income.

The remainder of this chapter is organized as follows. Section 4.2 develops the empirical models. Section 4.3 describes the data set and Section 4.4 presents an analysis of the data. Section 4.5 contains the estimation results in the first and second stages. By examining the interrelationships between the structural and non-structural indicators, the consistency of different indicators in ranking banking systems is discussed. Some conclusions are drawn in Section 4.6.

4.2. Models for competition assessment

In the academic sphere, there has been a significant development in measuring competition in which great interest is devoted to the new Industrial Organization indictors of competition including: Bresnanhan's mark-up test, conjectural variation parameter, Panzar and Rosse's model, and the Lerner model. In recent years, a substantial number of studies use such indicators to gauge competition in banking in different regions (see Berger et al., 2004 for a recent survey). We explain the development in the Panzar and Rosse's (1982, 1987) model, the Lerner and the efficiency competition approaches to assess the competitive nature of banking markets in emerging and advanced economies.

4.2.1. Development in Panzar and Rosse's Model

The Panzar and Rosse model (hereafter P&R) has been extensively used in the literature as a direct measure of competitive conduct of the banking sector (e.g. Molyneux et al., 1994; Bikker and Haaf, 2002b; Claessens and Laeven 2004). The P&R model for estimating the degree of competition relies on the premise that each bank will employ a different pricing strategy in response to a change in input costs, depending on the market structure in which this bank operates. Particularly, underlying this approach is the basic idea that profit-maximising firms in equilibrium will choose prices and quantities such that marginal cost equals their perceived marginal revenue. Thus, our starting point is to analyse P&R models theoretically (for precise discussion see Bikker and Haaf, 2002b). Generally, the P&R test can be derived from a general banking market model which determines equilibrium output and the equilibrium number of banks. Thus, maximizing profit function gives:

$$\frac{\partial \pi}{\partial q} = \frac{\partial TR}{\partial q} - \frac{\partial TC}{\partial q} = 0$$

where TR is total revenue, TC is total cost, q is output, and π is profit. As such:

$$MR_i(o_i, n, e_{1i}) - MC_i(o_i, z_i, e_{2i}) = 0$$

where MR refers to marginal revenue and MC to marginal cost bank i, o is output price, n is the number of banks, z is a vector of l factor input prices, e_1 and e_2 are a vector of exogenous variables that shift the bank's revenue and cost functions, respectively, and subscript i denotes bank i. At market equilibrium, zero profit constraint holds:

$$TR_i^*(o^*, n^*, e_1) - TC_i^*(o^*, z, e_2) = 0$$

where an asterisk $(*)$ represents equilibrium values. The Panzar and Rosse define a measure of competition, the H-statistics, which represents the percentage change of the equilibrium revenue resulting from a percent increase in the price of all factors used by the firm as follows:

$$H = \sum_{m=1}^{l} \frac{\partial TR_i^*}{\partial z_{mi}} \cdot \frac{z_{mi}}{TR_i^*}$$

where H is a measure of competition and computed as the sum of the elasticities of the reduced-form revenue function with respect to factor prices. In this context, the H-statistic discriminates between competitive, monopolistically competitive and monopolistic markets. Shaffer (1982) shows that $H = 1 - \varepsilon_{qp}$, where ε_{qp} is the absolute value of the price elasticity of demand facing a single firm. Writing the Lerner index for a single firm as $L = \frac{1}{\varepsilon_{qp}}$ allows us to drive a relation between the P&R H-statistics and the Lerner index as $H = 1 - \frac{1}{L}$. Furthermore, by applying the Lerner index in terms of conjectural elasticities, a conjectural variation version of the P&R H-statistic would be $H = 1 - \frac{\varepsilon_{qp}}{\alpha_i + (1-\alpha_i)s_i}$, where α_i is firm i's conjectural elasticity parameter, and s_i is its market share. Finally, in the case where monopolistic encounters a demand curve of constant price elasticity $\varepsilon > 1$ and where a constant return to scale Cobb-Douglas technology is employed, Panzar and Rosse show that H equals to $\varepsilon - 1$. This suggests that the magnitude, a part of the sign, of H may be of importance. This is further important when the Lerner index of monopoly power $L = \frac{\varepsilon - 1}{\varepsilon} = \frac{H}{H-1}$ is yielded from the H. This model has been extensively applied to the banking sector, both in individual or cross country studies as it is relatively simple and transparent (see e.g. De Bandt and Davis, 2000; Bikker and Haaf, 2002a; Claessens and Laeven, 2004; and Brissimis and Delis, 2011).

In general, Panzar and Rosse employed four models which compromise monopoly, monopolistic competition, conjectural variation oligopoly and perfect competition. They proved that under monopoly, an increase in input prices will increase marginal costs, reduce equilibrium output and subsequently reduce revenues; hence, H will be less than zero. When the assumption that the revenues of the banks are independent of the decisions made by their rivals is rejected, this does not support monopoly market. All other three models are assumed to be consistent with positive values for H, in which the revenue function of individual banks depends upon the decision made by its actual and potential rivals. It can be proved, when the long-run equilibrium exists, under monopolistic competition $H \leq 1$. Positive values of H indicate that the data are consistent with monopolistic competition but not with individual profit maximization as under monopoly conditions. Where the bank's products, in the case of monopolistic competition

model, are regarded as perfect substitutes of one another, the model produces the perfect competitive solution, as demand elasticity approaches infinity. In the perfect competition case, $H = 1$, where an increase in input prices raises both marginal and average costs without altering the optimal output of any individual firm. Finally, Panzar and Rosse analysed the conjectural variation oligopoly case and suggest that strategic interactions among a fixed number of banks may also be consistent with positive values of H. However, in the specific case of perfect collusion oligopoly or a perfect cartel, the value of H is negative, similar to the monopoly model.

In empirical studies, the H-statistic for each country is derived using the following specification of the reduced-form revenue equation. Our model is similar to that used extensively in the literature for banking industries (e.g. Nathan and Neave, 1989; Molyneux et al., 1996; Claessens and Laeven, 2004; Staikouras and Koutsomanoli-Fillipaki, 2006; and Goddard and Wilson, 2009):

$$Ln(P_{it}) = \beta_0 + \beta_1 Ln(w_{F,it}) + \beta_2 Ln(w_{L,it}) + \beta_3 Ln(w_{K,it}) + \beta_4 Ln(TA_{it)}) + \beta_5 Ln(NIITA_{it)}) + \beta_6 Ln(ETA_{it)}) + \beta_7 Ln(LTA_{it)}) + \varepsilon_{it} \qquad (A1)$$

where the Ln and subscripts i, and t denote natural logarithms, bank i and year t, respectively. P is the ratio of total income (or interest revenue) to total assets[27] (proxy output price of assets/loans). We employ real interest revenue to isolate competitive conditions in revenue generated by lending. The log specification is used to improve the regression's goodness of fit and to reduce possible simultaneity bias (De Bandt and Davis, 2000). Molyneux et al. (1996) also discovered that a log-linear revenue equation presents results similar to those of a more flexible translog equation. According to the P&R model, the core business of most banks is assumed to be the financial intermediation (Bikker and Haaf, 2002b), and hence we decide to also include the interest part of total revenue. However, Shaffer (1982) and Nathan and Neave (1989) employed total revenue as their dependent variable. Thus, we also include total revenue for robustness.

[27] We follow the specification of the dependent variable of Molyneux et al. (1994) as well as Bikker and Haaf (2002b).

Moreover, $w_F$is the ratio of interest expenses to total deposits (proxy for input price of deposits), w_L is the ratio of personnel expenses to total assets (proxy for input price of labour[28]), and w_K is the ratio of other operating and administrative expenses to total fixed asset (proxy for input price of equipment/fixed capital). Also β_0 is a constant, β_1 to β_7 be coefficients and ε is a stochastic error term. Finally, we include several exogenous factors (without explicit reference to their origin from the cost or revenue function) at the individual bank level to capture the potential effects of bank size, bank non-interest income, bank capital levels, and bank risk. Specifically, TA is total asset as a scaling factor, $NIITA$ is the ratio of non-interest income to total assets as a proxy of the bank's departure from the traditional source of revenue (loans), ETA is the ratio of equity to total assets as a proxy of equity capital levels, and LTA is the ratio of net loans to total assets as a proxy of risk. It would also be better to include non-performing loans to total loans as a proxy of bank risk, but due to lack of such information, we use LTA instead. We expect a positive effect of size (TA) for the purpose of economies of scale and a positive impact of non-interest income. Also, we expect a positive coefficient for ETA because more equity implies less leverage, and hence more interest income although it is also claimed that capital requirement increases loan portfolio risk. Finally, we expect a positive sign for LTA as more loans typically reflect more potential interest rate income

We use panel data for each of the 49 emerging and advanced countries over 2001-2010 to estimate a double log linear equation in order to derive H-statistics. The H-statictic is given by the sum of the elasticities of the total (interest) income with respect to the three input prices i.e $\beta_1 + \beta_2 + \beta_3$. The P&R H statistic ranges between $-\infty$ and 1, and is interpreted as follows: H<0 indicates a monopoly; H=1 indicates perfect competition or the monopolistic market which is perfectly contestable; and 0<H<1 indicates monopolistic competition. Thus, higher values of H indicate intensive competition. Furthermore, following the approach by Claessens and Laeven (2004) and Schaeck et al (2009), and in order to have a more comprehensive measure of the degree of competition across countries, we obtain the

[28] Due to lack of data on total employees, we do not express the unit cost of labour in terms of total employees but in terms of total assets. However, empirical studies reveal that results of these two variables are quite close to each other.

average H-statistic from two regression setups as follows. We run equation (A1) with first total revenue to total assets as the dependent variable, and second with the alternative dependent variable i.e. total interest income to total assets. As Schaeck et al (2009) point out, estimating the average H-statistic based on these two steps provides the approximate true value of market power for each jurisdiction. Note also that the estimation of Eq. (A1) is carried out for each banking system separately.

Finally, a critical feature of the P&R model is that the tests must be undertaken under the long-run equilibrium. In Particular, the correct calculation of the H-statistic basically relies on the assumption that the test is undertaken on observations that are in long-run equilibrium (Nathan and Neave, 1989). The idea that competitive capital markets will equalise the risk-adjusted rate of returns across banks in which rates of return (in equilibrium) should not be statistically correlated with input prices comes to the starting point of solving this problem. In disequilibrium, however, an increase (decrease) in factor price would be followed by a decline (increase) in the rate of return. Many studies (e.g. Nathan and Neave, 1989; Molyneux et al., 1996; Yildirim and Philippatos, 2007; Bikker and Haaf, 2002b; Drakos and Konstantinou, 2003) have used this point and test for equilibrium as follows. The equilibrium can be tested by computing Eq. (A1) using return on assets or return on equity as the dependent variable, and thus, the following representative equations for long-run equilibrium are estimated for each country:

$$\begin{aligned}\mathrm{Ln}(ROAA_{it}) = {} & \alpha_0 + \alpha_1 Ln\left(w_{F,it}\right) + \alpha_2 Ln\left(w_{L,it}\right) + \alpha_3 Ln\left(w_{K,it}\right) + \alpha_4 Ln\left(TA_{it)}\right) \\ & + \alpha_5 Ln\left(NIITA_{it)}\right) + \alpha_6 Ln\left(ETA_{it)}\right) + \alpha_7 Ln\left(LTA_{it)}\right) \\ & + \varepsilon_{it} \qquad\qquad (A2)\end{aligned}$$

where ROAA is before-tax return on average assets. The independent variables are as defined in Eq. (A1). We define the equilibrium E-statistic as $E = \alpha_1 + \alpha_2 + \alpha_3$. A value of $E < 0$ would show non-equilibrium, whereas $E = 0$ would prove equilibrium. However, if the 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 (Shaffer, 1985, 2004).We test whether $E = 0$, using an F-test. If not rejected, the market is assumed to be in equilibrium. When the market is in disequilibrium, returns are correlated to

input prices, and hence, the E-statistic is significantly different from zero (Molyneux et al., 1996).

4.2.2. Development in the Lerner Model

In our study, we also apply the Lerner model to analyse the competitive environment of emerging and advanced market banking sectors. The advantage of the Lerner index over other competitive indicators is that it is applied at the bank level which allows us to assess the evaluation of market power over time. We review the standard oligopoly version of the Monti-Klein model. In order to generalize this model to the n-banks case, we also focus on the duopoly case (see Frexias Rochet, 1997 for more discussion). The model explores the behaviour of a monopolistic bank that faces an upward sloping supply of deposit $D(r_D)$ and a downward sloping loan demand $L(r_L)$. We assume that the demand for loans and the supply of deposits are independent. The bank is assumed to be the price taker in the inter-bank market (r), so that the profit function of bank i takes the form

$$\pi = \pi(L, D) = [(r_L(L) - r)L + (r - r_D(D))D] - C(L, D)$$

where π is the net interest income or profit and $C(L, D)$ is the transformation costs which is usually interpreted as the administrative cost associated with the provision and management of loans L and deposits D. The first order conditions with respect to loans and deposits are as follows:

$$\frac{\partial \pi}{\partial L} = L\frac{\partial r_L}{\partial L} + r_L - r - \frac{\partial C}{\partial L} = 0$$
$$\frac{\partial \pi}{\partial D} = -D\frac{\partial r_D}{\partial D} + r - r_D - \frac{\partial C}{\partial L} = 0$$

By substituting the elasticities of loans and deposits $E_L = -\frac{\partial L}{\partial r_L}.\frac{r_L}{L}$ and $E_D = \frac{\partial D}{\partial r_D}.\frac{r_D}{D}$ into Eq. (i) and (ii) respectively, we obtain

$$\frac{r_L^* - r - \frac{\partial C}{\partial L}}{r_L^*} = \frac{1}{E_L}$$

$$\frac{r - r_D^* - \frac{\partial C}{\partial D}}{r_D^*} = \frac{1}{E_D}$$

According to Fernández De Guevara et al. (2005), for the case of an oligopoly with N banks the following expressions will be provided:

$$\frac{r_L^* - r - \frac{\partial C}{\partial L}}{r_L^*} = \frac{1}{NE_L}$$

$$\frac{r - r_D^* - \frac{\partial C}{\partial D}}{r_D^*} = \frac{1}{NE_D}$$

The above expressions indicate that market power depends both on the elasticity of demand and on the number of firms competing in the market, which is usually proxied by measures of market concentration. In our empirical part, we use a conventional Lerner index (Berger et al., 2009) as a proxy for market power. The Lerner index represents the mark-up of price over marginal costs. More details on the estimation of the Lerner index can be found in Fernández de Guevara et al.'s (2005) research. The Lerner index measures the disparity between price and marginal cost expressed as a percentage of price, which is defined as $L_{it} = \frac{P_{it} - MC_{it}}{P_{it}}$ in which P_{it} is the price of total assets computed as the ratio of total (interest and non-interest) income to total assets for bank i at time t. MC_{it} is the marginal cost of total assets for bank i at time t, computed from a standard translog function with a single output (total assets) and three input prices (deposits, labour and physical capital). Our definition of price is broader than the usual net interest margin measure since the numerator of the Lerner index includes both interest and non-interest income. The index should lie between 0 and one, where a perfect-competitive market $P = MC$ and, therefore, the Lerner index is 0, and as the index trends to distances from competitive conditions, it approaches the oligopoly one.

In our study, the marginal cost (MC) is estimated on the basis of the following translog cost function[29] for each country separately to reflect different technologies, while capturing bank specificities using bank fixed effects:

[29] Our choice of output/input variables are line with Coccorese and Pellecchia (2010)

$$ln(TC_{it}) = \alpha_0 + \alpha_1 lnTA_{it} + \frac{1}{2}\alpha_2 (lnTA_{it})^2$$
$$+ \sum_{j=1}^{3} \beta_j lnw_{j,it} + \frac{1}{2}\sum_{j=1}^{3}\sum_{k=1}^{3} \beta_{kj}\, lnw_{j,it} lnw_{k,it} + \sum_{j=1}^{3} \Upsilon_j lnTA lnw_{j,it}$$
$$+ \mu_1 Trend + \frac{1}{2}\mu_2 Trend^2 + \mu_q Trend.\, lnTA_{it}$$
$$+ \sum_{j=1}^{3} \mu_{zj} Trend.\, lnw_{j,it} + \varepsilon_{it} \qquad (B1)$$

where TC_{it} is the total cost (interest expenses and other operating costs) of bank i at time t, TA_{it} is bank output, measured by total assets, w_{it} are the vector of prices of inputs and ε_{it} is a stochastic disturbance. Three input prices (analogous to the Eq. A1 for estimating the H-statistics) are the price of funds $(w_{F,it})$ calculated as interest expenses to total external funding[30], the price of labour $(w_{L,it})$ which is measured by the ratio of personnel expenses to total assets, and the price of capital $(w_{K,it})$ measured by other operating and administrative expenses to total assets[31]. Finally, variable $Trend$ is a technical change.

Marginal cost is then computed as:

$$MC_{it} = \frac{\partial TC_{it}}{\partial TA_{it}} = \frac{TC_{it}}{TA_{it}}[\alpha_1 + \alpha_2 lnTA_{it} + \sum_{j=1}^{3} \gamma_j Lnw_{j,it} + \mu_q Trend] \qquad (B2)$$

And the Lerner index as

$$L_{it} = \frac{P_{it} - MC_{it}}{P_{it}} \qquad (B3)$$

where P_{it} again is the price charged by banks on their assets. Theoretically, the Lerner index can vary between 0 (in case of perfect competition) and 1. It should be noted that the constructed Lerner index does not capture risk permia in the prices of banks' products and services, breaking down its positive association with the size of monopoly rents. However, it is the only measure of competition that is computed

[30] Since BankScope does not include comprehensive information on bank staff members, we define the price of labour as total personnel expenses divided by total assets.
[31] The best proxy for the price of capital would be physical capital expenditure to total fixed assets. However, because of the shortcoming of such data, we use other operating and administrative expenses to total assets.

at the bank level. In a perfectly competitive environment, a larger Lerner index can be associated with firms taking on more risk for given marginal costs.

What explains the differences in concentration/competition measures? As discussed by Carbo et al. (2009), the various measures of competition lead to different results and cannot be used interchangeably. Carbo et al. attempted to show how the various measures are actually related, using an accounting relationship. They start at the point $\frac{TR-TC}{TA}$ where TR is total revenue, TC is total cost, and TA is total assets, and show how net interest margin to total assets ($NIMTA$), return on assets (ROA), the Lerner index, and the H-statistic measures can be derived from this point. Taking into account some assumptions, the relation between those indicators were given[32] by

$$\frac{TR-TC}{TA} = NIMTA + \frac{non\_interest\ revenue - operating\ cost}{TA}$$
$$= ROA + \frac{losses + taxes}{TA}$$
$$= Lerner\ index * \frac{TR}{TA}\ (assuming\ constant\ return\ to\ scale)$$
$$= a\ (stable\ H - statistic - 1) * \frac{TC}{TA}$$

Thus, these four measures can differ in their cross-country competition prediction when the share of fee and off balance sheet in total revenue are different, operating cost is falling at different rates, there are different scale economies, and finally there are cross differences in loan loss and taxes.

4.2.3. Efficiency Competition

Finally, to examine the degree of competition via the efficiency channels we express competition as a function of efficiency. We therefore use an innovation in the industrial organization literature and use a modified version of an indicator proposed by Boone (2008). Our approach is based on the efficiency structure hypothesis, which is developed by Hay and Liu (1997). To review the model proposed by Hay and Liu, consider an industry with an inverse demand curve given by $p = f(Q)$,

[32] For more detail see Carbo et al. (2009)

where $Q = \sum_i q_i$ the market output; is the sum of the outputs of the firms. The cost function of each firm has a fixed cost FC_i and a constant variable cost c_i. The profit function for firm i is given by:

$$\pi_i = pq_i - VC_i - FC_i$$

where $\pi_i$is profit and VC_i is variable cost. Expanding the above equation, we obtain:

$$\pi_i = f(Q)q_i - c_i q_i - FC_i$$
$$\pi_i = [f(Q) - c_i]q_i - FC_i \qquad (1)$$

Assuming profit-maximising behaviour, the first-order condition for a maximum is:

$$\frac{\partial \pi_i}{\partial q_i} = \frac{\partial f(Q)}{\partial q_i}.q_i + [f(Q) - c_i] = 0 \qquad (2)$$

Since $p = f(Q)$ therefore $\frac{\partial f(Q)}{\partial q_i} = \frac{\partial Q}{\partial q_i}.\frac{dp}{dQ}$. Now by substituting the latter formula into the Eq. (2)

$$\frac{\partial Q}{\partial q_i}.\frac{dp}{dQ}.q_i + [p - c_i] = 0$$
$$\frac{p - c_i}{p} = -\frac{q_i}{p}.\frac{\partial Q}{\partial q_i}.\frac{dp}{dQ}$$

The market elasticity for segment $i, \varepsilon_i^m,$ can be written as $\varepsilon_i^m = -\frac{dq}{dp}.\frac{p}{q}$ and since $\frac{\partial Q}{\partial q_i} = 1$Hence

$$\frac{p - c_i}{p} = \frac{1}{\varepsilon_i^m} \qquad (3)$$

However, according to Hay and Liu (1997) and by setting $\frac{\partial Q}{\partial q_i} = I + \lambda_i$**,** diversities of competitive behaviour can be presented, where λ_i is the expectation changes in the output of rivals by initiatives output of firm i. The authors argue that $\lambda_i > 0$ indicates the collusive behaviour. If all firms tend to increase outputs together $\lambda_i = \frac{I - s_i}{s_i}$, where s_i is the market share of firm i that indicates full collusion with all firms changing outputs so as to preserve market shares. The Nash-Cornet case has$\lambda_1 = 0$, while $\lambda_i < 0$ is competitive.

Equation (3) can be rearranged to give an expression for the price-cost margin

$$\frac{p - c_i}{p} = \frac{s_i}{\varepsilon_i^m}(I + \lambda_i) \qquad (4)$$

Or

$$s_i = \left(I - \frac{c_i}{p}\right).\frac{\varepsilon_i^m}{I + \lambda_i} \qquad (5)$$

From Eq. (5) we can interpret that higher market share is associated with a lower cost. To remove the price level, p, which is an endogenous variable, we sum Eq. (5) for all firms:

$$\sum\left(1 - \frac{c_i}{p}\right) = \sum \frac{s_i}{\varepsilon_i^m}.(I + \lambda_i)$$

$$N - \frac{\sum c_i}{p} = \frac{(I + \sum s_i\lambda_i)}{\varepsilon_i^m}$$

$$\frac{\sum c_i}{Np} = I - \frac{(I + \sum s_i\lambda_i)}{\varepsilon_i^m}$$

$$p = \frac{c^-}{I - \frac{(I + \sum s_i\lambda_i)}{\varepsilon_i^m}}$$

where $c^- = \frac{\sum c_i}{N}$ is the simple average of the costs of the different firms. Finally, for p back into Eq. (5) we obtain

$$s_i = \left(I - \frac{c_i}{\frac{c^-}{I - \frac{(I + \sum s_i\lambda_i)}{\varepsilon_i^m}}}\right).\frac{\varepsilon_i^m}{I + \lambda_i}$$

Or

$$s_i = \frac{\varepsilon_i^m}{I + \lambda_i} - \frac{\varepsilon_i^m}{I + \lambda_i}\left(I - \frac{(I + \sum s_i\lambda_i)}{N\varepsilon_i^m}\right).\frac{c_i}{c^-} \qquad (6)$$

The expression in parentheses determines the market-up of price over the average costs of the firms, and can therefore be interpreted as an index of the degree

of competition in the market. A smaller value indicates a less competitive market (For detailed discussion, see Hay and liu, 1997).

For the empirical implementation, we use the following model:

$$MS_{it} = \alpha + \beta \frac{(\frac{OV}{TA})_{it}}{\sum_i^n (\frac{OV}{TA})_{it}} + \varepsilon \qquad (C1)$$

The subscripts i and t denote bank i at time t in each country. MS is market share, OV is overhead cost and TA is total assets. The denominator expression in Eq. (7) is market average inefficiency. In a competitive market, we expect a negative coefficient (β). This is because, in any competitive market, firms with higher cost with respect to market average cost will lose their market share. However, it can be argued that some firms may incur higher costs if they enhance the quality of their services and hence exploit market share, and in this situation we observe a positive coefficient. For example, suppose that in a competitive market, one firm increases its product's quality and advertises it over the market; in this situation, although the cost of the firm with respect to market averages increases, it earn more market share. Therefore, we can interpret the state of competition in each market based on the size of absolute value of coefficient, i.e. $|\beta|$, regardless of its sign. Particularly, the following interpretation is hold:

$$\beta = \{^{>0 \rightarrow competition\ for\ service\ quality}_{<0 \rightarrow competition\ for\ efficiency}$$

Finally, in order to control other explanatory factors that may explain the variation of market share in banking, we include interest rate spread, SPE, and hence the final specification will be as follows:

$$MS_{it} = \alpha + \beta \frac{(\frac{OV}{TA})_{it}}{\sum_i^n (\frac{OV}{TA})_{it}} + \gamma SPE_{it} + \varepsilon_{it} \qquad (C2)$$

Again, we measure the state of competition in each banking sector based on the absolute value of β, i.e.|β|, in which the higher value indicates more competition. Finally, note that we measured cost efficiency using a stochastic frontier model in

order to use it instead of overhead costs, but we reach mixed or inconsistent results and hence we do not report such results.

4.3. Data

We select 19 emerging markets based on the Standard and Poor's classification. As of 31 December 2010, Standard and Poor's classified Brazil, Chile, China, Czech Republic, Egypt, Hungary, India, Indonesia, Malaysia, Mexico, Morocco, Peru, Philippines, Poland, Russia, South Africa, Taiwan, Thailand, and Turkey as emerging markets. However, we include other OECD emerging countries, Argentina, Estonia, Slovakia and Slovenia, as well as Colombia as this country has been nominated emerging economy by other companies such as Frontier Strategy Group. Furthermore, in order to compare competitive condition in emerging economies with that in advanced economies we select all 25 advanced OECD economies, i.e. Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States.

We use bank-level data from BankScope, a database containing bank financial statements used in a number of other cross-country studies. The BankScope database has comprehensive coverage in most countries, accounting for over 90 percent of all banking assets. We start driving our data for whole entire available years, i.e. 1996-2011, but by looking close at main variables we realized that for years 1996-2000 as wells as 2011 there are huge missing information. Thus, we have panel data for the years 2000-2010 and we include three bank types: commercial banks, savings banks, and cooperative banks to have a broad range of banking system. We have decided to restrict the analysis to such types of bank as to avoid comparing banks with different products, clientele and objectives. Still commercial, savings and cooperative banks may not be strictly viewed as firms producing a homogenous product. The impact of this heterogeneity along with assuming the same technology structure across the banks as well as the potential effect of networking can have important drawbacks in the econometric estimation of the P&R

model (Delis, 2010a). Moreover, we use data from consolidated accounts if available, and otherwise from unconsolidated accounts (to avoid double-counting).

We start with the complete sample of banks in BankScope for these 24 emerging economies and 25 advanced economies, resulting in a total number of banks of around 26,000 banks. The sample we end up using is smaller, however, as we apply some other selection criteria. First, we include those banks that are active, as indicated by the BankScope. Then, we apply a number of outlier rules to the main variables corresponding to the 1st and 99th percentiles of the distributions of the respective variables. Moreover, we exclude any banks with no information at least for total assets. We also delete banks for which data on total assets is less than USD 1 million in order to remove very small banks, as very small banks may operate more in local markets that are less competitive. Finally, there are around 14,223 US banks on BankScope. Of these, 11,669 are what would call extended banks – these tend to be state-wide only banks which do not publish the normal full set of accounts associated with most banks, as a result we exclude these banks for US country. These criteria reduce the sample considerably by around 20,000 banks. Finally[33], based on available data for total assets, the final sample consists of 5850 banks in which 1210 banks are from emerging economies and the reminder from advanced economies. In terms of number of banks, banks from Brazil and Russia dominate the emerging sample dataset, where these countries have more than 100 banks, while Germany, Japan and U.S. with each one having more than 500 banks dominate the advanced sample dataset (Table AP 4-0 in Appendix reports number of banks in the sample by country and year).

4.4. Summary statistics of variables

Table AP 4-1 in Appendix reports some descriptive statistics arising from our sample for individual countries. Again, our dataset includes only commercial, cooperative and savings banks, as a result the indicators presented here may differ from those reported in central bank website. However, since large banks are all included in the database, differences are small.

[33] For other criteria in cleaning data see Chapter 3-Dtat Section

Generally, banks in emerging economies are smaller than banks in advanced economies in terms of asset size. For emerging countries, the average ratio of loans to assets is the highest in Thailand (64%) and the lowest in Egypt (39%). On the other hand, for advanced countries, Norway has the highest average ratio (84%), while Luxembourg has the lowest (23%). Moreover, it is worth mentioning that for a third of emerging countries, the average level of this ratio stands below 50%, something that occurs only for a sixth of advanced countries. However, on average, the loan to assets ratio is higher in advanced market banking sector (59%) than in emerging market banking system (52%). Similarly, the average ratio of deposits to assets is the highest in Morocco (86%) and the lowest in Brazil (54%) for emerging economies, whereas for advanced economies Japan (92%) and Australia (65%) have the highest and lowest average ratio respectively. Interestingly, both emerging and advanced banking systems, on average, rely on deposits at the same level 75%. Also, the average ratio of equity to total assets in emerging countries ranges from 8% in India to 23% in Argentina, while, this ratio is much smaller for advanced countries; it ranges, on average, from 5% in New Zealand to 12% in Australia. Overall, capital ratios have remained at a relatively high level in emerging than in advanced economies (13% vs. 10%).

Table AP 4-1 also shows that on average banks in Brazil rely much more heavily on interest income (as presented by the interest income to total assets ratio) which stands at 6.8%, followed by Peru, while China is at the other end of the spectrum (at 3%). The average ratio for emerging banking sector as a whole is 5.6%. Regarding advanced countries, Canada has the highest and Japan the lowest interest margin ratio (8.7% and 1.5% respectively). On average, the examined ratio stand at 3.9% for advanced countries, and is much lower than that of emerging countries. This indicates that banks in emerging countries rely more on interest income than other sources of income, since capital markets are less developed in those countries compared with industrialized countries. The picture is similar when we examine the ratio of total revenue to assets.

Regarding the descriptive statistics for bank cost characteristics, Table AP 4-1 shows that while the average ratio of interest expenses to assets is higher for banks in advanced economies than emerging economies, the average of other types of costs such as personnel expenses, other operating costs, overheads and total costs, all as a

percentage of assets is significantly much higher for emerging market banking system. In particular, for emerging countries the average ratio of interest expenses to assets is the highest in Brazil (2.9%) and the lowest in Morocco (5.3%). On the other hand, for advanced economies, Canada has the highest average ratio (5.3%), while Japan has the lowest (0.3%). Overall, the average ratio of interest expenses to assets ratio is higher in advanced market banking sectors (1.7%) than in emerging market banking system (1.6%). By contrast, the average ratio of personnel expenses to assets (1.9%), other operating expenses to assets (3.3%), overheads to asset (4.8%) and total costs to asset ratio (6.1%) are much higher in emerging market banking sector than those observed in advanced market banking system (1.3%, 1.5%, 2.8%, and 4% respectively).

Finally, Table AP 4-1 reports the degree of market concentration among banking sectors. For emerging economies, the average ratio of 5-firm concentration is the highest in Estonia (96.8%) and the lowest in Taiwan (34.1%). On the other hand, for advanced economies, New Zealand has the highest ratio (93.7%), while US has the lowest (24.5%). Overall, 5-firm concentration ratio is relatively small in emerging economies (64.4%) than in advanced economies (66.4%). Furthermore, the picture is similar when we examine the Herfindahl-Hirschman index.

4.5. Empirical results

We adopt a two-step approach to assess the state of competition in the banking sectors of emerging and advanced economies. In the first step, we present results of our three models of measuring competition, the P&R *H*-statistics, the Lerner index and the efficiency competition in Section 4.5.1, and then in the second step, by comparing these competitiveness indicators with market structure indicators, we rank banking competition across countries in Section 4.5.2.

4.5.1. The estimation results

4.5.1.1. Estimating Panzar and Rosse H-statistics

We present the estimates obtained from applying the methodologies described in Section 4.2, and based on Eq. (A1) for both emerging and advanced economies respectively, as follows.

The estimation results of Eq. (A1) are reported in Appendix Tables AP 4-2 and AP 4-3. Table AP 4-2 shows the H-statistic for each emerging country. We present two regressions for each country, depending on the dependent variable, which is either total revenue or interest income. Most of the input prices and other explanatory variables are statistically significant at conventional levels, which imply a good fit of the revenue equations. Particularly worthy of note is that, the coefficient on fund price (w_F) is always positive and highly significant in all cases. This pattern is followed by the price of labour(w_L), with the exception that in 12 of 48 regressions, no significant result is found. Finally, in 21 of 48 regressions, the results indicate that the input price of capital (w_K) affects revenues significantly, although in one case, a negative relationship is found. These results correspond with those reported by Delis (2010a) for 22 Central and Eastern European banking systems. Furthermore, as far as the sign of the ratio of control variables is concerned, the results are mixed. While the impacts of bank size (TA) and non-interest income ($NIITA$) are negative in many cases (34 and 18 of 48 regressions respectively), the coefficients of equity to total assets (ETA) and loans to total assets (LTA) appear to be positive and significant in most countries. Finally, the average H-statistics (average of H for total income and interest income) calculated from each individual emerging country, indicate that the H varies between 0.129 (in Morocco) and 0.982 (in Taiwan). These results indicate that banks in emerging countries operate under conditions of monopolistic competition, although a closer look at individual countries reveals different patterns among them.

Similarly, Table AP 4-3 presents the H-statistics calculated from individual advanced countries. Overall, the input prices of deposits are significantly correlated with bank revenues in all countries at the 5% level. Most other input prices are also positively and significantly correlated with both total and interest revenues. Specifically, 37 of 50 regressions suggest a positive and statistically significant

relationship between labour price and revenue, while in the case of capital price; we observe that approximately half of 50 regressions appear to be significant. It is worth mentioning that in some regressions, the input price of capital seems to affect revenues negatively, but insignificantly. Furthermore, other control variables, to a large extent, also reveal positive coefficients, suggesting that during the study period, advanced banks with a greater asset base, non-interest income, equity capital and loans earned higher revenue, although in some countries, mixed results are observed. Finally, the average H-statistics calculated from individual advanced countries shows that, ignoring Israel, the H varies between 0.40 (in Spain) and 1.01 (in Netherlands). These results indicate that banks in advanced countries, just like their counterparts in emerging economies, operate under conditions of monopolistic competition, although a closer look at individual countries reveals different patterns for a few countries.

Compared to emerging economies, the same pattern has been observed for advanced economies, in which the input price of funds has the greatest impact on revenue, followed by the unit price of labour, and finally by the cost of physical capital. These results are consistent with previous studies (Molyneux et al., 1994; Bikker and Haaf, 2002b; Casu and Girardone, 2006; and Liu et al., 2012; among others) which argue that in explaining variations in revenue, the most important role is played by the unit price of deposits, while that of physical capital is the least important. As Liu et al. (2012) argue, these results suggest that banks may incur higher unit costs of labour and capital when they face greater funds, in order to intermediate such funds into earning assets, and hence raise revenue.

Figures 4-1-a and 4-1-b show the state of competition for individual countries, for both emerging and advanced economies, respectively. The H-statistic for each country is the average of H for total revenue and interest income. Regarding emerging economies, the average level of competition displays wide variation, ranging from a low of 0.13 in Morocco to a high of 0.98 in Taiwan. South Africa, Chile, China and Poland all yield relatively high levels of banking competition, while banking sectors in Thailand, Egypt, Russia and Brazil have the lowest figures. Similarly, the average competitiveness indicator for advanced economies ranges from 0.01 for Israel to 1.01 for the Netherlands. Countries like Belgium, New Zealand, Luxembourg and Italy are observed to have more competitive banking

systems, while the banking sectors in Spain, Denmark, US and Iceland seem to be less competitive.

Figure 4-1-a: The state of competition in banking sector by country- emerging economies

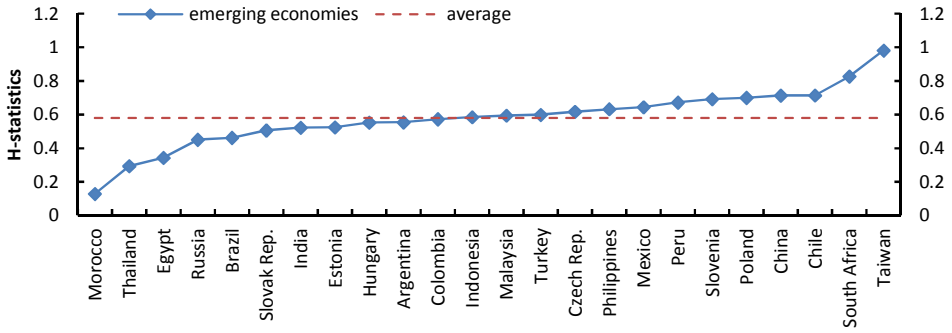
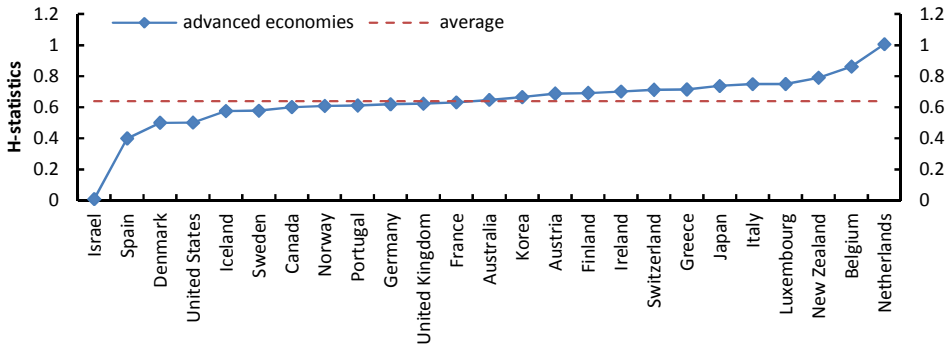


Figure 4-1-b: Tha state of competition in banking sector by country-advanced economies



A critical feature of the H-statistic, as noted before, is that the test must be undertaken on observations that are at a long-run equilibrium. An equilibrium test based on Eq. (A2) is provided, using the return on average assets as the dependent variable, in place of total revenue (or interest revenue) in the regression equation. A value of $R < 0$ would indicate non-equilibrium, whereas $R = 0$ would prove that there is an equilibrium. The results of equilibrium tests, based on performing the Wald test for all countries in both emerging and advanced economies, are shown in Appendix Table AP 4-4, which indicate that all 49 countries are at equilibrium. The calculation E-statistic is not significantly different from 0 at a conventional statistical level (95%), which means that our analysis is methodologically sound. More details are reported in Table AP 4-4.

Table 4-1: Some characteristics of banking competition and the *H*-statistics for the top three and bottom three competitive banking sectors in emerging and advanced economies over the period 2001-2010, based on Table AP5 in Appendix. This table provides some characteristics of banking competition including: (1) number of firms growth (FG), (2) increase in standard deviation of total cost (SDG_TC), (3) growth in loans (LG), (4) growth in sales (SG), (5) growth in interest spread (ISG), (6) growth of return on average assets (ROAG), and (7) the average *H*-statistic (H-stat.). The average *H*-statistic is taken from Table AP2 and AP3. All data are averages for 2001-2010. Arrows ↗ and ↘ indicate an increase or decrease respectively.

Rank	country	FG	SDG_TC	LG	SG	ISG	ROAG	H-stat.	P&R credibility
Emerging economies									
1	Taiwan	—	↘	↗	↘	↘	↘	0.982	✓
2	South Africa	↗	↘	↗	↗	↘	↘	0.825	✓
3	Chile	↗	↗	↗	↗	↘	↗	0.715	?
22	Egypt	↗	↗	↗	↗	↗	↗	0.343	✓
23	Thailand	↗	↗	↗	↗	↗	↗	0.294	✓
24	Morocco	↗	↗	↗	↗	↘	↗	0.129	?
Advanced economies									
1	Netherlands	↗	↘	↗	↗	↘	↘	1.006	✓
2	Belgium	↘	↘	↗	↘	↘	↘	0.862	✓
3	New Zealand	↗	↘	↗	↗	↘	↘	0.791	✓
23	Denmark	↗	↘	↗	↘	↗	↘	0.500	?
24	Spain	↘	↘	↗	↗	↘	↗	0.399	?
25	Israel	—	↗	↗	↘	↘	↗	0.009	?

To analyze whether the Panzar and Rosse H-statistics is a valid measure of competition in banking, we produce Table AP 4-5. In fact, we examine how the indicator lines up with other characteristics of competition. Table AP 4-5 shows growth in the number of firms and the average total cost to asset ratio, and the increase in standard deviation of costs, loan growth, sales growth, interest spread growth and return on assets (ROAA) growth. It is obvious that, as the standard deviation of costs converges during the period under consideration, or as interest spreads or return on assets decrease, we should observe more competition. In Table 4-1, we examine this hypothesis for the top three and three least competitive markets (based on average H-statistics) in each economy. It is evident that, in emerging economies, as the standard deviation, interest spread and ROAA for Taiwan and South Africa decrease, we observe high *H*-score for these countries (0.98 and 0.83 respectively).

However, while the competitive indicator for Chile (0.72) reveals relatively more competition among its banking sector, we observe that this is not supported by other competitive characteristics, evidenced by the increase in standard deviation and growth of ROAA in this country during 2001-2010. Also, while the P&R *H*-statistics for Egypt and Thailand, as less competitive markets, is supported by

increases in standard deviation, interest spread and ROAA, the data fail to support the least competitive banking sector in emerging economies, Morocco, as a decrease in standard deviation of cost is found during 2001-2010.

Similarly, for advanced economies, it seems that for the top three competitive markets (Netherlands, Belgium and New Zealand) the decreases in growth of standard deviation of cost, interest spread and ROAA correspond with a high H-score (1.01, 0.86 and 0.79 respectively) for these countries. However, for the least competitive banking sectors, we find mixed results. For instance, while the standard deviation of costs and return on assets in Denmark decreased during the period under study, we observe a low degree of competition (0.50) for its banking sector. Thus, these results raise concerns about the credibility of H-statistics as an accurate indicator of competition for each banking system. It seems that for the most competitive markets, the P&R H-statistics is more reliable and corresponds to other competitiveness characteristics than for other types of banking structure.

4.5.1.2. Estimating Lerner index

The calculation of marginal costs and the Lerner index is based on the specification $(B1)$, $(B2)$ and $(B3)$ in Section 4. The cost function estimation is conducted separately for each country, allowing the parameters of the cost function to vary from one area to another, so as to reflect different technologies.

Table 4-2 reports the average value for the period 2001-2010 of output price, absolute margin (price-marginal cost) and relative margin (Lerner index), for each banking sector in the sample and for the economy as a whole. Focusing on margins, the absolute margin (price-marginal cost) for emerging economies yields significant inter-country variation, ranging from 0.88% in Taiwan and China to 4.64% in Brazil. On the other hand, the margin for advanced economies ranges from 0.60% in Belgium to 3.06% for Iceland. Overall, the average margin (price-marginal cost) in emerging economies is 2.33%, which is approximately 1% more than that observed for advanced economies (1.25%).

Table 4-2: Prices, marginal cost and Lerner Index. Prices are calculated by estimating the average price of bank production (proxied by total assets), as a quotient between total revenue and total assets. Marginal cost is estimated on the basis of a translog cost function. The disparity between price and marginal cost, expressed as a percentage of prices, is defined as the Lerner Index of monopoly power. Source: BankScope (Bureau Van Dijk) and own calculation. All figures are averages over the period 2001-2010.

	Price (%)	Marginal cost (%)	Price-marginal cost (%)	Lerner (%
Emerging economies				
Argentina	*13.36*	*9.81*	*3.55*	*26.57*
Brazil	*13.95*	*9.32*	*4.64*	*33.23*
Chile	*8.50*	*6.40*	*2.10*	*24.71*
China	*3.36*	*2.48*	*0.88*	*26.23*
Colombia	*13.26*	*9.84*	*3.42*	*25.81*
Czech Rep.	*4.94*	*3.32*	*1.62*	*32.83*
Egypt	*4.95*	*2.65*	*2.30*	*46.41*
Estonia	*7.95*	*5.65*	*2.30*	*28.89*
Hungary	*7.48*	*4.99*	*2.49*	*33.33*
India	*6.54*	*4.37*	*2.17*	*33.15*
Indonesia	*8.71*	*6.22*	*2.49*	*28.61*
Malaysia	*3.72*	*2.68*	*1.05*	*28.11*
Mexico	*8.13*	*5.79*	*2.34*	*28.76*
Morocco	*4.57*	*2.07*	*2.50*	*54.81*
Peru	*10.46*	*7.65*	*2.82*	*26.93*
Philippines	*6.69*	*4.89*	*1.80*	*26.95*
Poland	*6.59*	*5.41*	*1.18*	*17.90*
Russia	*17.21*	*10.82*	*6.39*	*37.11*
Slovak Rep.	*4.50*	*3.15*	*1.35*	*30.06*
Slovenia	*5.35*	*4.08*	*1.27*	*23.72*
South Africa	*10.89*	*8.95*	*1.94*	*17.82*
Taiwan	*3.65*	*2.77*	*0.88*	*24.05*
Thailand	*4.65*	*3.23*	*1.42*	*30.64*
Turkey	*9.64*	*6.67*	*2.98*	*30.87*
Average	*7.88*	*5.55*	*2.33*	*29.56*
Advanced economies				
Australia	*6.61*	*5.01*	*1.60*	*24.25*
Austria	*3.90*	*2.74*	*1.16*	*29.63*
Belgium	*3.03*	*2.44*	*0.60*	*19.69*
Canada	*6.08*	*4.39*	*1.69*	*27.74*
Denmark	*5.40*	*4.12*	*1.27*	*23.58*
Finland	*3.64*	*2.86*	*0.78*	*21.46*
France	*4.93*	*3.60*	*1.34*	*27.09*
Germany	*5.00*	*3.96*	*1.04*	*20.80*
Greece	*5.09*	*4.12*	*0.98*	*19.15*
Iceland	*10.98*	*7.92*	*3.06*	*27.90*
Ireland	*3.96*	*2.98*	*0.98*	*24.81*
Israel	*5.40*	*3.50*	*1.89*	*35.06*
Italy	*4.67*	*3.37*	*1.29*	*27.75*
Japan	*2.63*	*1.97*	*0.66*	*25.16*
Korea	*5.59*	*4.30*	*1.29*	*23.04*
Luxembourg	*4.89*	*4.06*	*0.83*	*16.92*
Netherlands	*4.17*	*3.34*	*0.82*	*19.74*
New Zealand	*5.57*	*4.93*	*0.64*	*11.48*
Norway	*5.06*	*3.78*	*1.28*	*25.33*
Portugal	*5.34*	*3.96*	*1.38*	*25.87*
Spain	*4.16*	*2.98*	*1.18*	*28.42*
Sweden	*5.10*	*3.64*	*1.46*	*28.61*
Switzerland	*4.86*	*3.64*	*1.22*	*25.08*
United Kingdom	*4.61*	*3.57*	*1.04*	*22.49*
United States	*5.13*	*3.46*	*1.67*	*32.46*
Average	*5.03*	*3.79*	*1.25*	*24.76*

Regarding market power, important differences among emerging economies can again be found. The last column of Table 4-2 shows that market power (Lerner index) for emerging economies ranges from the highest in Morocco (54.81%) to the lowest in South Africa (17.82%). Similarly, for advanced economies, it ranges from 35.06% in Israel to 11.48% in New Zealand. Overall, the market power of banking systems in emerging economies (29.5%) is higher than in advanced economies

(24.7%). Furthermore, Table AP 4-6 in Appendix shows the evolution of the Lerner index by country, for both emerging and advanced economies during 2001-2010.

Figure 4-2-a: Evolution of price

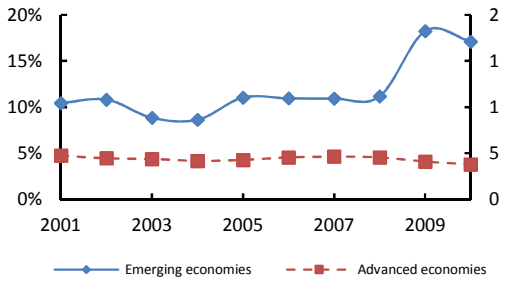


Figure 4-2-b: Evolution of marginal cost

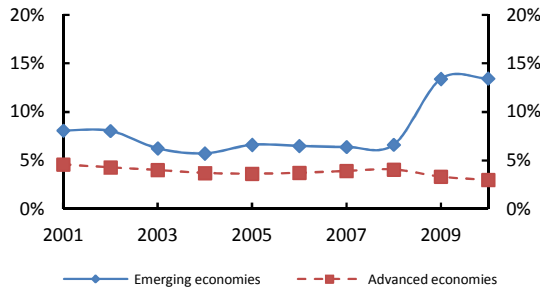


Figure 4-2-c: Evolution of the Lerner index

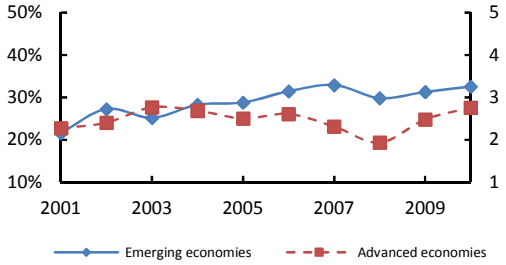


Figure 4-2-d: Evoultion of st. dev.of the Lerner index

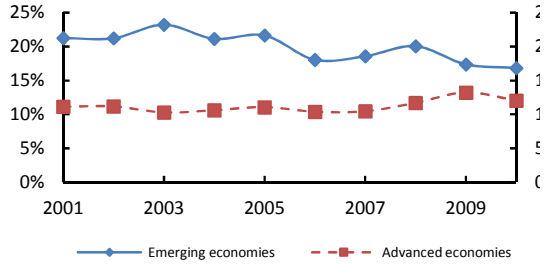


Figure 4-2: Evolution of Prices, Marginal Cost and Lerner Index over 2001-2010. Prices are calculated by estimating the average price of bank production (proxied by total assets) as a ratio of total revenue to total assets. Marginal cost is estimated on the basis of a translog cost function. The disparity between price and marginal cost, expressed as a percent of price, is defined as the Lerner Index of monopoly power. Source: BankScope (Bureau Van Dijk) and own calculations.

Figure 4-2 also shows the evolution of prices, marginal costs and the Lerner index for both emerging and advanced economies over the period 2001-2010. For emerging economies, there was a dramatic increase in output price, marginal cost and the Lerner index between 2001 and 2010, although the standard deviation of Lerner declines. In contrast, for advanced economies, while we find a slight decrease in both output price and marginal cost over time, there is a gradual increase in the Lerner index and its standard deviation. Note, however, that the net effect of the reduction (increase) in marginal costs and prices is not always a reduction (increase) of the absolute margin, depending on which one decreases (increases) faster.

Finally, Figures 4-3a and 4-3b show the state of competition for each country, according to the Lerner index, over the period 2001-2010. The Lerner indexes reveal substantial differences across countries. Figure 4-3-a shows that in

emerging economies, the banking sector in Morocco enjoys the greatest relative margin in price setting, followed by Egypt and Russia. At the opposite extreme, South Africa, followed by Poland and Slovenia has the most competitive banking sectors. Similarly, Figure 4-3-b shows Israel has the least competitive banking system in the advanced economies, followed by the United States and Austria. By contrast, New Zealand has the most competitive banking system, followed by Luxembourg and Greece.

Figure 4-3-a: The state of competition in banking sector by country - emerging economies

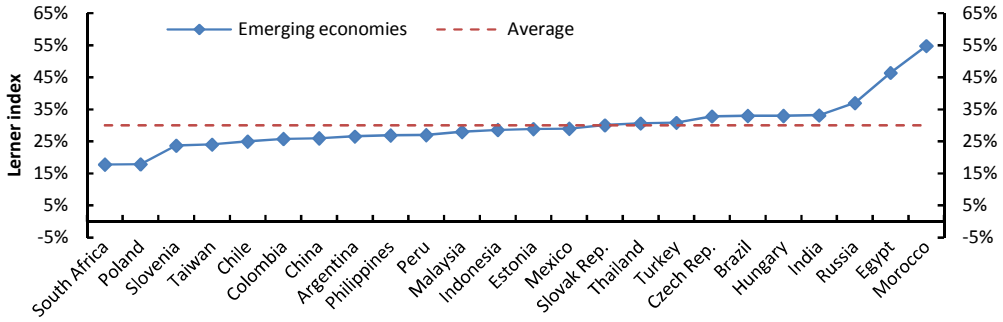
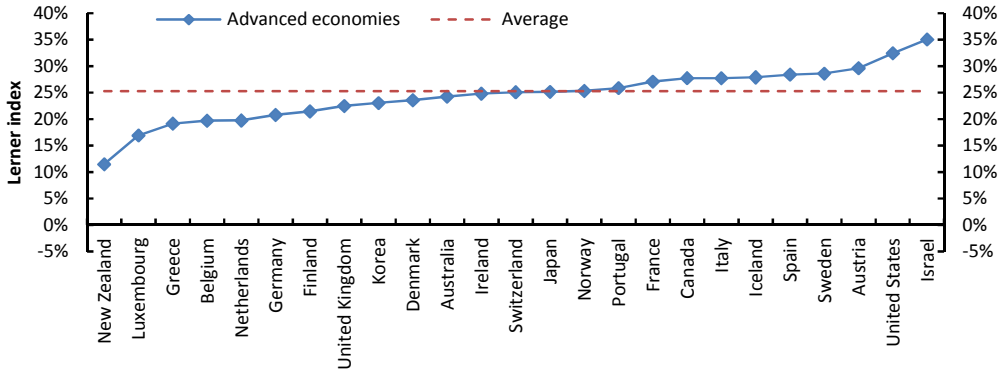


Figure 4-3-b: The state of competition in banking sector by country - advanced economies



4.5.1.3 Estimating efficiency competition

In order to measure efficiency competition, we estimate the relationship between market share and average overhead cost and the market average, based on Eq. (C2), using a GMM-style estimator, whereby we use one year lagged values of the explanatory variables as instruments. Our choice of a GMM-style estimator is motivated by concerns that market share and cost may be determined jointly, as banks with a large market share might benefit from low overhead costs. Nonetheless, for a few countries, we use a fixed effect estimator; because of having either too few

observations or obtaining mixed results. In our estimation, the coefficients for the efficiency competition indicator are mostly negative (20 of 24 for emerging, and 20 of 25 for advanced economies). More details are presented in Appendix Table AP 4-7.

Table 4-3: Efficiency competition. The table reports the results from the regression model estimation Eq. (C2): $MS_{it} = \alpha + \beta \frac{(\frac{OV}{TA})_{it}}{\sum_i^n (\frac{OV}{TA})_{it}} + \gamma SPE_{it} + \varepsilon_{it}$ presented in Table AP7 in Appendix. The level of efficiency competition is equal to the absolute value of β. The higher value of β indicates a more competitive market.

Emerging economies		*Advanced economies*	
Country	Efficiency competition |β|	Country	Efficiency competition |β|
Argentina	2.7%	Australia	4.5%
Brazil	0.3%	Austria	1.9%
Chile	6.6%	Belgium	6%
China	1.7%	Canada	0.4%
Colombia	1.7%	Denmark	2%
Czech Rep.	1.6%	Finland	11.3%
Egypt	1.3%	France	1.8%
Estonia	1.5%	Germany	3.3%
Hungary	1.2%	Greece	2.3%
India	1.1%	Iceland	10.9%
Indonesia	1.8%	Ireland	1.8%
Malaysia	1.5%	Israel	2.5%
Mexico	1.5%	Italy	1.9%
Morocco	0.4%	Japan	4.9%
Peru	1.8%	Korea	7.4%
Philippines	4.5%	Luxembourg	12.7%
Poland	6.0%	Netherlands	14.0%
Russia	0.6%	New Zealand	15.8%
Slovak Rep.	1.8%	Norway	2.7%
Slovenia	4.9%	Portugal	1.4%
South Africa	19.7%	Spain	1.8%
Taiwan	7.1%	Sweden	3.3%
Thailand	1.5%	Switzerland	3.2%
Turkey	2.1%	UK	4.7%
Average	3.1%	US	0.2%
		Average	4.91%

Table 4-3 presents the degree of efficiency competition obtained from the estimation results for both emerging and advanced economies. It is evident that, there is a substantial difference regarding the degree of banking competition across countries. For emerging economies, it ranges from 0.3% in Brazil to 19.7% in South Africa. Similarly, for advanced economies, the efficiency competition indicator ranges from 0.2% in US to 15.8% in New Zealand. Overall, the efficiency competition indicates that the banking sector in emerging countries (3.1%) is less competitive than in advanced economies (4.9%).

Finally, Figures 4-4-a and 4-4-b show the state of competition for each country, according to the efficiency competition index, over the period 2001-2010.

Figure 4a indicates that in emerging economies, the banking sector in the South Africa seems to be more competitive than in other countries, followed by Taiwan and Chile. At the opposite extreme, Brazil, followed by Morocco and Russia have the least competitive banking systems. Similarly, for advanced economies, New Zealand's banking system is the most competitive, followed by the Netherlands and Luxembourg. On the other hand, the US followed by Canada and Portugal have the least competitive market.

Figure 4-4-a: The state of competition in banking sector by country -emerging economies

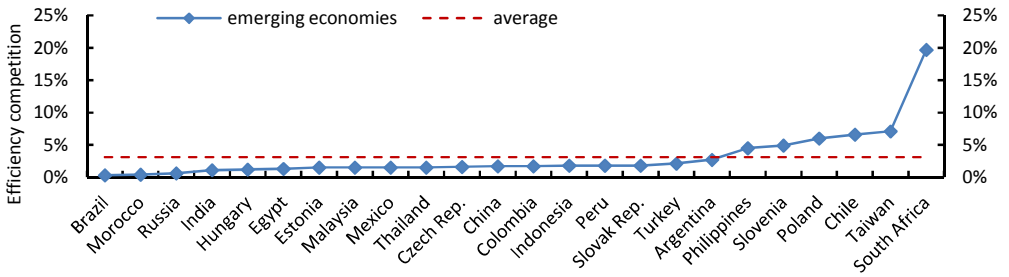
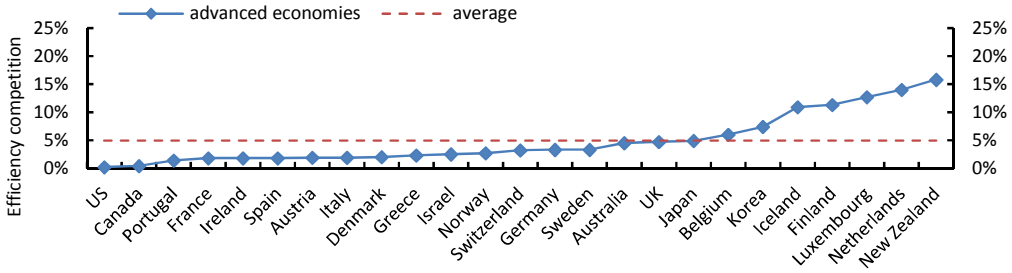


Figure 4-4-b: The state of competition in banking sector by country-advanced economies



4.5.2. Non-structural vs. structural indicators and ranking countries

In the second stage, we first analyse the interrelationships between the above non-structural competition measures in relation to each other, as well as to three structural indicators, i.e. return on average assets (ROAA), net interest margin (NIM), and market concentration (HHI index). We then rank countries and assess the consistency of these six indicators in the ranking countries.

a) To what extent is the variation in one competition indicator explained by other indicators?

To verify the validity of our measures of competition and examine how they line up with other indicators, we first examine correlations between these competitiveness indicators and between other market structure (structural) indicators, i.e. return on average asset (ROAA), net interest margin (NIM) and HHI index. We then regress each indicator on other indicators to investigate whether these measures can be substituted for one another.

Table 4-4: Cross-country correlations among competition measures over 2001-2010 - emerging vs. advanced economi

	H-statistics	Lerner index	EC	ROAA	NIM
	Panel A: Emerging economies				
Lerner index	*-0.215****				
	(0.046)				
Efficiency competition (EC)	*0.696****	*-0.193****			
	(0.484)	*(0.037)*			
Return on average assets (ROAA)	*-0.142****	*0.504****	*-0.104****		
	(0.020)	*(0.254)*	*(0.011)*		
Net interest margin (NIM)	*-0.341****	*0.189****	*-0.260****	*0.290****	
	(0.116)	*(0.036)*	*(0.068)*	*(0.084)*	
HHI	*0.140****	*-0.024***	*0.221****	*-0.057****	*-0.073****
	(0.020)	*(0.001)*	*(0.049)*	*(0.003)*	*(0.005)*
	Panel B: Advanced economies				
Lerner index	*-0.019****				
	(0.000)				
Efficiency competition (EC)	*0.310****	*-0.156****			
	(0.096)	*(0.024)*			
Return on average assets (ROAA)	*0.063****	*0.431****	*0.066****		
	(0.004)	*(0.186)*	*(0.004)*		
Net interest margin (NIM)	*-0.171****	*0.219****	*-0.250****	*0.096****	
	(0.029)	*(0.048)*	*(0.063)*	*(0.009)*	
HHI	*0.178****	*0.109****	*-0.011**	*0.153****	*-0.159****
	(0.032)	*(0.012)*	*(0.000)*	*(0.023)*	*(0.025)*

Table 4-4 shows the cross-country correlation among competition measures for both emerging and advanced economies. The R^2 values in parenthesis in Table 4-4 directly indicate the degree of consistency among our three banking competition measures and other banking structure indicators. If any of these pair-wise values were to equal 1.0, then the paired indicators would be a perfect substitute for each other. Specifically, when R^2 is equal to 1.0, we can interfere that each measure contains the same information and hence could be used interchangeably. As discussed by Carbo et al. (2009), if R^2 were equal to 0.5 then one competition indicator can only explain 50% of the variation of another indicator, and hence we could to some extent (although not strongly) use one measure instead of another. Finally, when paired competition measures contain completely different information (or are uncorrelated), the indicators only randomly yield similar information.

The relationships between the six competition measures in Table 4-4 are weak for both emerging and advanced economies, although relatively more correlations can be found for pair-wise indicators for emerging economies. For emerging economies, at most only 48% of the information in one competition measure (efficiency competition) is also contained in another (H-statistics). Similarly, for advanced economies, at most only 19% of the variation in one competition indicator (ROAA) can be explained by another (Lerner index). All the other R^2s for both economies are significantly less than these values and are close to zero. For instance, all three market structure variables, i.e. ROAA, NIM and HHI appear not to explain each other's variation.

Table 4-5: Explained variation (R-squared) among competition indicators ($CI_i = f(CI_j)\ i \neq j, j = 1,2,\dots,5$).

	Emerging economies	Advanced economies	All
H-statistics	51%	13%	39%
Lerner index	28	24	31
Efficiency competition (EC)	50	17	32
Return on assets (ROAA)	30	22	34
Net interest margin (NIM)	18	14	35
HHI	5	9	5
Sample size	7464	26519	33983

In order to examine the R^2 regressing any one of our competition indicators (CI_i) on the other five remaining measures ($CI_i = f(CI_j)\ i \neq j, j = 1,2,\dots,5$)), Table 4-5 shows the R^2 from such regressions for both emerging and advanced economies, as well as for all countries. As Carbo et al. (2009) explain, if R^2 were reasonably large, a weighted average or factor analysis of these indicators could then be a better way to analyse the degree of competition among banking sectors than relying on only one indicator. However, as shown in Table 4-5, this does not appear to be the case. Particularly for emerging economies, the greatest similarity among the six competition measures seem to be the H-statistics and the efficiency competition indicator with the other five indicators, where only 51% and 50% of their variations, respectively, is explained by the other measures. This similarity even weakens when we analyse advanced market banking systems, where at most only 24% of the variation of the Lerner index is explained by the other five competitiveness indicator. When the sample of both emerging and advanced is merged, at most only 30% of the variation of the H-statistic can be explained by other measures. These results

confirm, from a different perspective, the lack of consistency among competition measures.

b) Ranking banking competition across countries

Table 4-6 shows the means of the six indicators of banking market competition: our three non-structural indicators (the *H*-statistics, the Lerner index and the efficiency competition) and three traditional structural measures of market structure (return on average assets (ROAA), net interest margin (NIM) and HHI index) across our 24 emerging and 25 advanced economies over 2001-2010. We already ranked the countries based on our first three competitiveness measures when we reported the results of each measure. However, our focus here is to compare the consistency of our indicators in the ranked countries, and to rank countries based on traditional (structural) indicators that we have not so far investigated.

Focusing first on our three measures of competition, in terms of rankings, it can be seen that the three competitiveness measures appear relatively consistent in identifying the most and least competitive banking markets. The most competitive markets in emerging economies seem to be South Africa and Taiwan. Particularly South Africa is ranked number two for the first competitiveness measure and number one for the other two measures. Taiwan is also ranked one for the first competition measure and four for the second indicator and two for the third. The rankings also suggest that the least competitive banking systems are those of Morocco and Egypt. Similarly, for advanced economies, the most competitive markets appear to be New Zealand, the Netherlands and Luxembourg, while the least competitive are Israel, Spain and the US. Furthermore, as part of these extreme points, Table 4-6 shows a degree of consistency in ranking such countries as Brazil, Chile, India, Peru, Philippine and Slovenia for the emerging economies and Australia and Norway for advanced economies. Thus, there is some evidence, although not strong, that these three competition measures may yield consistent rankings of competition across countries, and hence, they may be used interchangeably.

Turning to the market structure indicators, we first focus on return on average assets (ROAA), a broad measure of banking profitability, the most profitable banking systems (or potentially least competitive) for emerging economies can be

Table 4-6: Mean values and ranks of competition measures by country over 2001-2010, emerging vs. advanced economies. This table shows the rankings of banking competition, based on three New Empirical Industrial Organisation (NEIO) approaches, i.e. the *H*-statistic (H-stat.), the Lerner index, efficiency competition (EC), and based on three traditional structural indicators i.e. return on average assets (ROAA), net interest margin (NIM), and HHI index. The former three competitiveness indicators from Section 4.5.1, and the latter indicators are taken from accounting data. Source: BankScope and own calculations.

	Three NEIO competition indicators						Three traditional structural indicators					
	H-stat.	Rank	Lerner (%)	Rank	EC (%)	Rank	ROAA (%)	Rank	NIM (%)	Rank	HHI	Rank
Emerging economies												
Argentina	0.554	15	26.57	8	2.7	7	1.00	11	4.69	15	898	2
Brazil	0.463	20	33.23	20	0.3	24	2.18	24	7.41	24	999	5
Chile	0.715	3	24.71	5	6.6	3	1.06	13	3.51	10	5542	23
China	0.714	4	26.23	7	1.7	12	0.79	4	2.75	4	1500	10
Colombia	0.573	14	25.81	6	1.7	13	1.63	20	5.52	20	1416	9
Czech Rep.	0.618	10	32.83	18	1.6	14	0.82	8	2.41	3	1632	14
Egypt	0.343	22	46.41	23	1.3	19	0.80	5	2.16	2	1634	15
Estonia	0.525	17	28.89	14	1.5	15	1.09	15	3.68	13	5968	24
Hungary	0.553	16	33.33	21	1.2	20	0.95	9	4.40	14	1585	12
India	0.523	18	33.15	19	1.1	21	0.96	10	3.33	9	1032	7
Indonesia	0.585	13	28.61	12	1.8	9	1.71	22	5.30	19	1069	8
Malaysia	0.595	12	28.11	11	1.5	16	1.15	17	3.20	8	990	3
Mexico	0.645	8	28.76	13	1.5	17	1.01	12	5.14	17	1594	13
Morocco	0.129	24	54.81	24	0.4	23	0.81	6	3.52	12	2553	19
Peru	0.672	7	26.93	9	1.8	10	1.33	18	6.22	22	3078	21
Philippines	0.633	9	26.95	10	4.5	6	1.14	16	4.88	16	2814	20
Poland	0.701	5	17.90	2	6.0	4	1.08	14	3.52	11	1019	6
Russia	0.451	21	37.11	22	0.6	22	1.68	21	6.79	23	1575	11
Slovak Rep.	0.507	19	30.06	15	1.8	11	0.59	2	3.14	7	1738	16
Slovenia	0.692	6	23.72	3	4.9	5	0.82	7	2.78	5	2071	18
South Africa	0.828	2	17.82	1	19.7	1	1.53	19	5.25	18	3682	22
Taiwan	0.982	1	24.05	4	7.1	2	-0.05	1	1.87	1	728	1
Thailand	0.294	23	30.64	16	1.5	18	0.61	3	3.10	6	997	4
Turkey	0.599	11	30.87	17	2.1	8	1.81	23	5.90	21	1932	17
Average	0.579		29.90		3.1		1.10		4.19		2002	
Advanced economies												
Australia	0.648	13	24.25	11	4.5	10	0.83	22	1.95	7	3381	20
Austria	0.688	11	29.63	23	1.9	18	0.47	7	2.38	15	1321	7
Belgium	0.862	2	19.69	4	6.0	7	0.66	17	2.19	8	1748	11
Canada	0.601	19	27.74	18	0.4	24	0.62	13	2.37	13	1416	8
Denmark	0.500	23	23.58	10	2.0	17	0.81	21	3.80	25	2627	15
Finland	0.692	10	21.46	7	11.3	4	0.32	5	1.52	3	5297	24
France	0.632	14	27.09	17	1.8	20	0.66	16	2.34	12	1033	5
Germany	0.620	16	20.80	6	3.3	11	0.27	4	2.66	17	539	2
Greece	0.715	7	19.15	3	2.3	16	0.17	3	2.86	19	2629	16
Iceland	0.576	21	27.90	20	10.9	5	2.17	25	3.74	24	3688	21
Ireland	0.702	9	24.81	12	1.8	21	0.17	2	1.30	2	2767	17
Israel	0.009	25	35.06	25	2.5	15	0.42	6	2.74	18	2124	13
Italy	0.749	5	27.75	19	1.9	19	0.56	9	3.04	20	1222	6
Japan	0.737	6	25.16	14	4.9	8	-0.01	1	1.85	6	591	4
Korea	0.666	12	23.04	9	7.4	6	0.79	20	3.27	21	1977	12
Luxembourg	0.750	4	16.92	2	12.7	3	0.68	18	1.00	1	541	3
Netherlands	1.006	1	19.74	5	14.0	2	0.50	8	1.57	4	2154	14
New Zealand	0.791	3	11.48	1	15.8	1	0.65	14	2.27	11	5508	25
Norway	0.609	18	25.33	15	2.7	14	0.70	19	2.38	14	3059	19
Portugal	0.612	17	25.87	16	1.4	23	0.66	15	2.60	16	2954	18
Spain	0.399	24	28.42	21	1.8	22	0.58	10	2.23	9	1659	10
Sweden	0.578	20	28.61	22	3.3	12	1.05	24	3.37	22	4271	23
Switzerland	0.713	8	25.08	13	3.2	13	0.58	11	1.68	5	4072	22
UK	0.623	15	22.49	8	4.7	9	0.60	12	2.23	10	1623	9
US	0.501	22	32.46	24	0.2	25	0.91	23	3.63	23	464	1
Average	0.639		24.54		4.91		0.63		2.44		2347	

found in Brazil (218 basis points) and Turkey (181 basis points), while the least profitable are Taiwan and the Slovak Republic. Similarly for advanced economies, the ROAA ranges from -1basis point in Japan and 17 in Ireland, to 105 in Sweden

and 217 in Iceland. Overall, banks in emerging economies (110 basis points) are more profitable than banks in advanced economies (63 basis points).

Regarding the net interest margin (NIM), for emerging economies, Brazil and Russia have the highest margins (at 7.41% and 6.79%, respectively), while Egypt and Taiwan have the lowest (at 2.16% and 1.87%). Similarly, for advanced economies, Iceland (3.7%) and Denmark (3.80%) have the highest margins, whereas Ireland (1.3%) and Luxembourg (1%) have the lowest. Overall, banks in emerging economies seem benefit more in earning interest margins through imposing their market power in setting lending prices well above deposit prices, than banks in developed countries (4.19% vs. 2.44%).

Finally, the Hirschman-Herfindahl index (HHI) is an indicator of market concentration, where low values reflect more (potential) competition. For emerging economies, the highest level of banking concentration is found in Estonia (5968) and in Chile (5542), while the lowest is indicated for Taiwan (728) and Argentina (898). Similarly, the highest level of market concentration within advanced economies is observed in New Zealand (5508) and Finland (5279), while the lowest is indicated for the US (464) and Germany (539). Interestingly, in contrast to the previous results, the HHI index indicates that emerging markets (2002) are less concentrated than advanced economies (2347).

In terms of rankings based on these three structural indicators, there is no consistency among these indicators for ranking countries. The only country for which these measures tend to predict similar results is Taiwan, where all indicators seem to rank this country number one for emerging economies. For advanced countries, at best the only country that these indicators rank consistently is Sweden, where it is ranked between 24 (ROAA), 22 (NIM) and 23 (HHI).

Overall, although there is some consistency between some of these six indicators in predicting the degree of competition (for example, between the H-statistic and efficiency competition or between ROAA and NIM), we support the study by Carbo et al. (2009) in which existing competition indicators measure different things and give conflicting predictions. For instance, while the HHI index ranks the US as number one in having a more competitive banking system, the other

five indicators predict the opposite result, in which US banks are a less competitive market in relation to other advanced economies.

Next we pool all emerging and advanced economies to rank bank competition in 49 countries over the world. Specifically, we have constructed a number of summary indexes of competition based on the first component of principal component analysis (PCA). While overall the competitiveness indicators are, to some extent, related to each other in a statistical cense (recall Tables 4-4 and 4-5), there are sufficient differences among them to impact the rankings of the individual countries.

Table 4-7 presents four competition indexes. Index 1 ranks bank competition based on two pricing power-based competition measures (i.e. H-statistics and Lerner index), using PCA. Index 2 just ranks countries' banking sector based on the competitive-process-based approach (i.e. efficiency competition). Index 3 ranks countries based on two traditional market structure approach of competition (i.e. 5-firm concentration and HH index, excluding ROAA and NIM), using PCA. And finally, Index 4 is an overall index based on the averages of ranks obtained by Indexes 1, 2 and 3.

As it can be seen, Indexes 1 and 2 which are all based on the new empirical industrial organisation (NEIO) approaches are overall consistent in ranking countries. On the other hand, Index 3 indicates that traditional measure of competition (i.e. concentration indexes) is not consistent with NEIO approaches in ranking countries. Furthermore, the simple overall ranking index (Index 4) that we have created summarizes the information content of all the five competition indexes. As researchers found different competition indicators may yield different things, this overall index could be used as an overall ranking index of competition in banking sector across countries. Finally, according to this index, the country with the most competitive banking sector across these 49 countries is Luxembourg, followed by Taiwan, Poland, Germany and Japan. In contrast, the least competitive banking sector belongs to Morocco, followed by Estonia, Russia, Egypt and Israel.

Table 4-7: Summary of the 5 competitiveness indexes in ranking banking sectors across 49 countries over the period 2001-2010, using principal component analysis for indexes 1 and 3 and mean ranks for indexes. Note that, in all indexes 1=more competitive and 49=least competitive banking sector)

Country	Number of banks	The pricing-power-based rank: H-statistics and Lerner index Index 1	The competitive-process-based approach (efficiency competition) Index 2	The market structure approach: 5-firm concentration and HH index Index 3	Overall competition index Index 4
Argentina	60	32	21	9	15
Australia	15	20	15	41	22
Austria	226	26	27	14	18
Belgium	41	5	10	33	10
Brazil	105	44	48	8	39
Canada	57	30	46	24	40
Chile	8	12	9	46	19
China	81	18	35	25	25
Colombia	17	27	34	20	27
Czech Rep.	20	38	36	28	42
Denmark	83	29	25	34	32
Egypt	22	47	42	21	46
Estonia	5	37	40	49	48
Finland	7	9	5	47	14
France	197	25	30	10	16
Germany	1551	10	18	4	4
Greece	14	8	23	35	17
Hungary	23	40	43	23	44
Iceland	10	33	6	45	29
India	58	41	44	7	33
Indonesia	49	34	33	17	30
Ireland	10	16	29	26	20
Israel	11	48	22	37	45
Italy	377	19	26	13	13
Japan	631	15	12	5	5
Korea	12	13	7	18	7
Luxembourg	77	6	4	3	1
Malaysia	26	31	39	6	23
Mexico	30	28	38	15	28
Morocco	7	49	47	38	49
Netherlands	24	1	3	31	6
New Zealand	5	2	2	48	11
Norway	85	22	20	36	26
Peru	14	21	32	42	37
Philippines	23	24	16	32	21
Poland	30	7	11	12	3
Portugal	18	23	41	39	43
Russia	522	46	45	19	47
Slovak Rep.	13	39	31	30	41
Slovenia	14	11	13	29	12
South Africa	12	3	1	40	8
Spain	108	43	28	22	35
Sweden	82	35	17	44	38
Switzerland	341	14	19	43	24
Taiwan	33	4	8	2	2
Thailand	19	45	37	11	36
Turkey	19	36	24	27	31
UK	104	17	14	16	9
US	555	42	49	1	34

4.6. Chapter summary

While many studies have attempted to determine the degree of competition in banking markets by relying upon only one of the (non) structural indicators, this paper has applied three non-structural NEIO techniques (H-statistics, the Lerner index and efficiency competition) to assess, in the first stage, the degree of competition and, in the second stage, the consistency between these competitiveness indicators and three structural competition measures (return on average assets, net interest margin and HHI index) in ranking banking competition across countries. Efficiency competition is our innovative measure of competition, which is based on the notion of analysing the cost elasticity of performance (market share) by capturing the link between competition and efficiency. The measures were computed for 49 emerging and advanced economies, using a panel of 5850 banks over the period 2001-2010.

The findings of the first stage are as follows: i) the Panzar and Rosse H-statistic indicates that the competitive conduct of banks can be characterized as monopolistic competition, ii) an evaluation of the Lerner index indicated deterioration in competitive conditions in banking sectors during 2001-2010, and iii) the efficiency competition analyses suggests that the degree of banking competition varies considerably across countries. Furthermore, all three competitiveness measures provide evidence that emerging banking systems are less competitive than their counterparts in advanced economies.

The findings of the second stage can be summarized as follows: i) the coefficient of determination (R^2) between our six indicators of completion show weak relationships. For example, for emerging economies, where at most only 48% of the variation in the efficiency competition indicator can be explained by the H-statistic, and for advanced economies, at most only 19% of information in ROAA is contained in the Lerner index. Other relationships are even weaker and mostly close to zero. ii) the R^2s of regressing any one of our competition indicators on the other five remaining measures show that for emerging economies, at most only 51% of the variation in the H-statistic can be explained by the other five indicators, and for advanced economies, at most only 24% of information in the Lerner index is contained in the other five indicators, and finally iii) with the exception of few

countries such as Taiwan, the six indicators fail to rank banking competition consistently across countries.

The six indicators used in this paper have been treated more or less as substitutes for each other. However, our results suggest that policy makers should be aware that different indicators do not necessarily yield similar predictions of the degree of competition, because they measure different things. For example, the net interest margin effectively captures the degree of competition among traditional deposit and loan markets, whereas for broader bank activities such as fee income, the Lerner index or ROAA, seem to be more appropriate indicators. Finally, the competitiveness measures based on elasticities, such as of revenue with respect to factor input costs (the H-statistic) or the elasticity of performance with respect to efficiency (efficiency competition) tend, to some extent, produce similar results in predicting the degree of competition.

4.7. Appendix

Table AP4-0: Number of banks in the sample (emerging vs. advanced economies)

Panel A: by country-averages over 2001-2010

Emerging economies			*Advanced economies*		
	No. of banks	%		No. of banks	%
Argentina	60	4.92	Australia	15	0.32
Brazil	105	8.67	Austria	226	4.86
Chile	8	0.69	Belgium	41	0.89
China	81	6.69	Canada	57	1.23
Colombia	17	1.39	Denmark	83	1.78
Czech Rep.	20	1.67	Finland	7	0.16
Egypt	22	1.81	France	197	4.24
Estonia	5	0.43	Germany	1551	33.42
Hungary	23	1.86	Greece	14	0.29
India	58	4.80	Iceland	10	0.22
Indonesia	49	4.06	Ireland	10	0.21
Malaysia	26	2.12	Israel	11	0.24
Mexico	30	2.50	Italy	377	8.11
Morocco	7	0.54	Japan	631	13.59
Peru	14	1.12	Korea	12	0.26
Philippines	23	1.87	Luxembourg	77	1.66
Poland	30	2.50	Netherlands	24	0.53
Russia	522	43.15	New Zealand	5	0.11
Slovak Rep.	13	1.11	Norway	85	1.83
Slovenia	14	1.18	Portugal	18	0.39
South Africa	12	1.02	Spain	108	2.33
Taiwan	33	2.73	Sweden	82	1.78
Thailand	19	1.59	Switzerland	341	7.36
Turkey	19	1.60	United Kingdom	104	2.25
			United States	555	11.97
all emerging	*1210*	*100*	*all advanced*	*4640*	*100*

Panel B: by year

Emerging economies			*Advanced economies*		
	No. of banks	%		No. of banks	%
2001	665	54.96	2001	4332	9.34
2002	696	57.52	2002	4131	8.90
2003	702	58.02	2003	3970	8.56
2004	753	62.23	2004	4037	8.70
2005	1195	98.76	2005	5217	11.24
2006	1434	118.51	2006	5217	11.24
2007	1679	138.76	2007	5122	11.04
2008	1732	143.14	2008	5024	10.83
2009	1676	138.51	2009	4907	10.58
2010	1568	129.59	2010	4443	9.58
total	*12100*	100	*total*	*46400*	100

Table AP4-1: Descriptive statistics.
This table provides descriptive statistics on: (1) total assets (TA) (expressed in millions of dollars), (2) loans to assets (L/A), (3) deposits to assets, (4) equity to assets (E/A), (5) interest revenue to assets (IR/A), (6) total revenue to assets (TR/A), (7) interest expenses to assets (IE/A), (8) personnel expenses to assets (PE/A), (9) other expenses to assets (OE/A), (10) total cost to assets (TC/A), (11) overheads to assets (OV/A), (12) 5-firm concentration ratio (Conc5), and (13) Herfindahl-Hirschman index (HHI) for each of the 24 emerging and 25 advanced economies for the period 2001 to 2010. All variables except TA are in %. Standard errors are also reported. Further descriptive statistics can be provided upon requested. Source: BankScope database and own estimations.

	TA		***L/A***		***D/A***		***E/A***		***IR/A***		***TR/A***	
Emerging economies												
	Mean	*Std. Dev.*	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*
Argentina	*1,441*	*3,195*	*39.72*	*19.13*	*67.94*	*22.61*	*23.32*	*23.27*	*8.28*	*10.69*	*13.62*	*12.70*
Brazil	*9,075*	*38,695*	*41.08*	*25.02*	*54.09*	*22.80*	*21.38*	*19.16*	*11.61*	*10.69*	*14.13*	*12.85*
Chile	*7,051*	*11,409*	*51.77*	*26.79*	*68.60*	*15.30*	*13.49*	*10.17*	*6.25*	*5.07*	*8.50*	*5.15*
China	*62,948*	*213,000*	*53.62*	*12.21*	*85.90*	*14.58*	*8.94*	*11.00*	*2.98*	*1.19*	*3.36*	*1.23*
Colombia	*3,599*	*5,779*	*58.43*	*14.04*	*77.17*	*14.67*	*13.22*	*9.38*	*8.01*	*2.89*	*13.26*	*5.19*
Czech Rep.	*7,033*	*11,328*	*46.66*	*20.67*	*76.56*	*21.43*	*11.17*	*14.12*	*3.39*	*2.19*	*4.94*	*3.66*
Egypt	*4,728*	*8,081*	*39.55*	*12.10*	*85.50*	*6.29*	*9.36*	*4.98*	*3.58*	*1.77*	*4.95*	*2.05*
Estonia	*2,961*	*7,428*	*58.87*	*23.01*	*71.24*	*20.03*	*14.82*	*10.84*	*5.81*	*5.66*	*7.95*	*6.15*
Hungary	*4,298*	*8,105*	*59.32*	*23.79*	*78.78*	*11.90*	*13.21*	*12.80*	*5.29*	*1.04*	*7.48*	*1.35*
India	*10,897*	*27,003*	*50.20*	*12.73*	*83.06*	*13.18*	*7.63*	*9.30*	*4.87*	*1.53*	*6.54*	*1.95*
Indonesia	*3,150*	*6,716*	*52.06*	*17.63*	*76.54*	*15.23*	*13.73*	*10.18*	*7.14*	*3.26*	*8.71*	*3.63*
Malaysia	*11,496*	*16,205*	*51.37*	*20.73*	*80.12*	*9.71*	*10.55*	*6.27*	*2.72*	*1.27*	*3.72*	*1.23*
Mexico	*8,210*	*16,607*	*44.86*	*25.21*	*62.28*	*26.81*	*20.45*	*20.87*	*5.75*	*7.11*	*9.37*	*12.15*
Morocco	*10,913*	*9,076*	*53.73*	*18.27*	*86.19*	*6.24*	*8.05*	*3.31*	*3.57*	*1.38*	*4.57*	*1.51*
Peru	*4,590*	*9,383*	*58.88*	*14.29*	*77.83*	*10.60*	*13.15*	*8.63*	*8.62*	*6.85*	*10.46*	*7.04*
Philippines	*2,901*	*4,427*	*41.58*	*15.44*	*75.08*	*15.45*	*15.61*	*12.87*	*4.77*	*3.71*	*6.69*	*4.34*
Poland	*5,755*	*9,610*	*56.93*	*24.20*	*78.60*	*13.76*	*12.47*	*9.69*	*4.58*	*3.96*	*6.59*	*3.95*
Russia	*903*	*8,329*	*53.44*	*19.85*	*57.49*	*19.86*	*22.11*	*15.99*	*8.41*	*4.29*	*25.22*	*30.59*
Slovak Rep.	*3,564*	*4,398*	*49.30*	*16.74*	*82.63*	*8.10*	*9.78*	*6.93*	*3.32*	*0.88*	*4.50*	*0.97*
Slovenia	*3,186*	*4,829*	*63.07*	*13.62*	*77.17*	*11.65*	*8.87*	*4.03*	*3.97*	*1.16*	*5.35*	*1.58*
South Africa	*15,861*	*31,931*	*58.50*	*23.44*	*69.83*	*25.95*	*14.87*	*12.07*	*7.22*	*4.94*	*11.67*	*9.58*
Taiwan	*25,890*	*30,480*	*58.88*	*17.20*	*84.64*	*14.77*	*8.13*	*9.33*	*3.07*	*1.54*	*3.65*	*1.66*
Thailand	*13,137*	*13,732*	*64.55*	*14.79*	*80.14*	*11.62*	*12.68*	*12.97*	*3.58*	*1.27*	*4.65*	*1.77*
Turkey	*14,518*	*23,049*	*46.81*	*20.54*	*67.13*	*20.86*	*17.89*	*16.35*	*7.10*	*2.70*	*9.64*	*3.68*
Average	***9,921***	***21,783***	***52.22***	***18.81***	***75.19***	***15.56***	***13.54***	***11.44***	***5.58***	***3.63***	***8.31***	***5.67***
Advanced economies												
Australia	*74,590*	*154,000*	*72.20*	*20.63*	*65.23*	*21.01*	*12.06*	*19.41*	*5.32*	*1.81*	*6.61*	*2.15*
Austria	*3,666*	*18,536*	*55.26*	*21.33*	*81.29*	*17.37*	*10.55*	*13.69*	*2.96*	*1.54*	*3.90*	*1.75*
Belgium	*29,193*	*116,000*	*43.03*	*26.93*	*79.48*	*18.48*	*10.91*	*15.89*	*2.30*	*0.97*	*3.03*	*1.57*
Canada	*36,340*	*103,000*	*64.48*	*24.55*	*79.10*	*20.01*	*12.17*	*17.01*	*8.72*	*68.65*	*13.65*	*91.92*
Denmark	*8,820*	*54,699*	*59.61*	*16.47*	*76.92*	*13.66*	*13.64*	*7.16*	*4.16*	*1.29*	*5.40*	*1.95*
Finland	*40,765*	*75,856*	*54.92*	*28.50*	*63.81*	*18.24*	*14.12*	*21.95*	*1.99*	*1.24*	*3.64*	*1.94*
France	*55,160*	*251,000*	*57.73*	*24.65*	*76.63*	*19.91*	*11.03*	*11.61*	*3.15*	*2.03*	*4.93*	*3.65*
Germany	*3,213*	*29,514*	*57.84*	*15.32*	*87.28*	*9.51*	*6.86*	*7.15*	*3.93*	*1.12*	*5.21*	*4.82*
Greece	*24,953*	*36,678*	*64.96*	*14.72*	*83.19*	*8.93*	*9.01*	*7.57*	*3.94*	*1.33*	*5.09*	*1.61*
Iceland	*3,801*	*12,256*	*63.50*	*16.15*	*65.60*	*19.88*	*7.58*	*39.90*	*7.71*	*2.18*	*10.58*	*6.50*
Ireland	*54,669*	*75,714*	*49.86*	*26.36*	*67.51*	*23.39*	*7.48*	*5.59*	*3.19*	*1.49*	*3.96*	*1.90*
Israel	*21,725*	*25,782*	*65.47*	*16.50*	*84.75*	*4.63*	*6.47*	*2.98*	*3.84*	*1.72*	*5.20*	*1.70*
Italy	*7,965*	*63,502*	*65.72*	*17.01*	*56.64*	*13.07*	*12.05*	*7.93*	*3.63*	*1.14*	*4.67*	*1.59*
Japan	*17,885*	*112,000*	*52.94*	*14.48*	*92.34*	*9.56*	*5.59*	*6.50*	*1.52*	*0.77*	*1.62*	*1.34*
Korea	*56,248*	*69,116*	*61.97*	*18.83*	*76.66*	*11.62*	*6.13*	*3.73*	*4.48*	*1.67*	*5.59*	*1.88*
Luxembourg	*8,532*	*15,896*	*23.27*	*20.05*	*82.49*	*18.09*	*7.18*	*9.42*	*3.37*	*2.45*	*4.89*	*2.93*
Netherlands	*118,000*	*306,000*	*50.92*	*24.33*	*72.95*	*21.68*	*9.10*	*11.55*	*2.97*	*1.63*	*4.17*	*2.26*
New Zealand	*26,237*	*24,498*	*68.82*	*26.61*	*66.82*	*24.17*	*5.00*	*3.05*	*4.90*	*2.32*	*5.57*	*2.64*
Norway	*3,499*	*19,907*	*84.36*	*8.58*	*71.31*	*13.54*	*9.78*	*5.28*	*4.50*	*1.25*	*5.06*	*1.51*
Portugal	*16,888*	*36,921*	*58.03*	*25.55*	*65.64*	*23.40*	*15.28*	*21.51*	*4.06*	*3.16*	*5.34*	*3.33*
Spain	*29,326*	*124,000*	*67.75*	*19.76*	*76.20*	*15.86*	*10.81*	*12.96*	*3.23*	*1.01*	*4.16*	*1.25*
Sweden	*4,722*	*32,893*	*75.15*	*12.99*	*81.92*	*9.38*	*13.65*	*4.82*	*3.90*	*1.46*	*5.10*	*2.15*
Switzerland	*7,984*	*94,214*	*72.53*	*27.67*	*76.55*	*14.38*	*9.40*	*12.49*	*2.75*	*1.05*	*4.88*	*4.41*
United Kingdon	*57,501*	*230,000*	*37.37*	*27.84*	*72.18*	*23.63*	*17.86*	*21.61*	*3.18*	*3.12*	*4.94*	*6.74*
United States	*16,441*	*87,780*	*62.72*	*20.79*	*77.67*	*16.32*	*11.77*	*10.37*	*3.65*	*1.73*	*5.58*	*10.45*
Average	***29,125***	***86,790***	***59.62***	***20.66***	***75.21***	***16.39***	***10.22***	***12.04***	***3.89***	***4.33***	***5.31***	***6.56***

IE/A		PE/A		OE/A		OV/A		TC/A		Conc5		HHI	
continoued - emerging economies													
Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
1.95	4.09	5.20	6.76	6.29	7.26	9.94	11.00	12.02	12.88	51.16	3.82	898	103
2.21	7.97	2.38	2.34	5.21	6.68	7.56	7.69	9.71	11.24	49.76	5.30	999	182
2.88	2.08	2.11	1.77	2.00	1.67	4.11	3.27	6.31	3.84	89.66	11.19	5542	3188
0.72	0.86	0.53	0.26	0.97	0.54	1.19	0.49	1.90	0.96	70.26	6.69	1500	688
2.32	2.74	2.49	1.17	4.86	3.66	7.33	4.16	9.05	5.19	61.65	6.81	1416	337
1.11	1.53	0.94	1.04	1.39	1.32	2.30	2.28	3.53	3.21	75.58	5.03	1632	193
1.35	1.57	1.01	0.27	1.68	1.03	1.83	1.01	3.01	1.68	62.59	3.97	1634	82
1.69	1.78	1.72	0.91	1.93	1.30	3.65	2.12	5.49	3.39	96.81	3.36	5968	528
1.91	0.92	2.02	1.83	5.85	18.63	7.53	19.21	5.33	1.34	64.45	6.95	1585	127
2.24	2.10	1.18	0.53	1.08	1.01	2.25	1.20	4.50	2.22	43.14	5.01	1032	331
2.15	2.24	1.44	0.79	1.80	1.25	3.22	1.63	5.61	3.18	60.66	5.46	1069	184
0.73	0.81	0.63	0.27	0.65	0.34	1.27	0.57	1.96	0.97	38.75	3.35	990	44
0.99	2.83	4.52	3.89	8.37	13.34	8.47	13.29	8.79	12.53	52.97	4.59	1594	240
0.61	1.15	1.11	0.38	1.25	0.70	1.94	0.69	2.60	1.31	85.17	14.56	2553	892
1.71	1.60	2.51	1.20	3.15	2.12	5.65	3.17	7.27	3.83	83.75	3.67	3078	211
0.67	2.25	1.64	1.61	2.83	2.74	4.47	4.14	5.16	5.63	66.42	16.87	2814	3098
1.26	1.72	1.65	1.31	2.33	2.09	3.75	2.82	4.76	3.19	56.91	7.95	1019	361
2.68	2.91	3.81	3.17	15.36	29.87	19.08	30.42	22.10	30.94	57.13	7.39	1575	679
0.72	0.98	1.05	0.33	2.17	6.03	3.22	5.99	3.20	0.99	76.81	3.70	1738	204
1.63	1.23	1.15	0.40	1.15	0.60	2.22	0.83	3.80	1.52	71.29	6.71	2071	286
2.79	3.10	2.57	1.69	3.42	5.02	5.86	6.44	8.36	6.59	72.73	15.85	3682	1454
1.24	1.14	0.66	0.26	0.90	0.82	1.42	0.85	2.73	1.44	34.10	5.84	728	141
0.91	1.04	0.94	0.63	1.42	0.80	2.36	1.24	3.28	1.51	57.18	2.35	997	57
2.36	2.16	1.99	0.96	3.00	3.19	4.74	3.61	6.62	3.09	67.31	9.82	1932	1018
1.62	**2.12**	**1.89**	**1.41**	**3.29**	**4.67**	**4.81**	**5.34**	**6.13**	**5.11**	**64.43**	**6.93**	**2002**	**610**
continoued - advanced economies													
3.58	1.64	1.09	1.65	1.44	5.87	2.42	6.17	5.42	1.77	77.59	8.26	3381	2469
1.40	1.21	1.62	2.46	1.49	3.97	3.03	5.67	2.93	1.48	55.98	8.25	1321	573
1.01	0.77	1.10	1.63	1.06	1.37	2.09	2.58	2.30	1.03	80.84	3.67	1748	942
5.34	55.55	1.68	6.86	2.47	8.04	4.06	14.12	9.95	71.12	68.41	5.35	1416	31
1.13	0.95	2.07	2.86	1.63	1.64	3.61	4.28	4.30	1.63	75.54	4.92	2627	1744
0.76	0.99	2.62	6.35	2.17	4.14	4.79	10.45	3.12	1.90	92.95	6.70	5297	2586
1.17	1.56	1.47	1.46	1.70	4.24	3.04	4.67	3.78	3.02	52.33	8.97	1033	431
1.44	0.95	1.59	2.17	1.24	3.41	2.81	5.07	4.19	4.64	38.99	3.66	539	127
1.47	1.08	1.29	0.51	1.16	0.70	2.45	1.09	3.96	1.56	80.94	5.89	2629	2149
4.18	3.23	1.63	0.79	1.76	0.74	3.37	1.42	7.58	3.46	91.88	7.08	3688	1004
1.80	1.22	0.41	0.34	0.46	0.51	0.84	0.81	2.82	1.25	56.37	10.64	2767	1472
1.50	1.61	1.46	0.40	1.08	0.43	2.51	0.71	4.01	1.56	89.69	3.78	2124	59
0.86	0.87	1.60	2.52	1.32	1.84	2.92	3.95	3.49	1.38	55.66	8.34	1222	382
0.26	0.37	0.91	0.46	0.80	1.69	1.52	1.76	1.17	1.25	38.94	1.37	591	95
2.02	0.92	0.72	0.25	2.44	3.23	3.00	3.07	4.11	2.16	49.39	3.37	1977	281
2.41	2.44	0.78	0.90	0.72	0.80	1.49	1.61	3.88	2.63	38.81	3.06	541	80
1.63	1.45	1.25	3.38	1.28	4.03	2.44	7.17	3.31	1.77	72.44	12.19	2154	422
3.05	2.15	0.55	0.25	0.69	0.62	1.22	0.69	4.25	2.42	93.70	4.92	5508	3725
2.30	1.14	0.82	0.51	0.96	1.52	1.77	1.90	3.95	1.40	75.77	9.25	3059	1526
1.83	2.54	1.05	0.70	1.09	0.96	2.11	1.57	4.03	2.85	80.97	13.65	2954	1327
1.48	0.91	1.00	0.76	0.80	0.91	1.78	1.55	3.08	1.21	62.95	6.86	1659	920
0.74	0.87	1.36	0.68	1.39	1.19	2.74	1.66	3.49	1.83	77.04	6.94	4271	1247
1.20	0.85	1.45	2.30	1.24	2.35	2.69	4.33	3.84	4.00	76.42	3.83	4072	1023
1.11	2.47	2.09	4.99	5.80	114.54	7.55	114.62	3.92	5.76	52.79	7.69	1623	772
0.59	0.97	1.74	5.18	2.39	10.08	4.12	14.40	4.22	9.73	24.46	4.82	464	144
1.77	**3.55**	**1.33**	**2.01**	**1.54**	**7.15**	**2.82**	**8.61**	**4.04**	**5.31**	**66.43**	**6.54**	**2347**	**1021**

Table AP4-2: The estimation results for H-statistics for emerging economies.

The table reports the results arising from the estimation of the regression model: $\mathrm{Ln}(P_{it}) = \beta_0 + \beta_1 Ln(w_{F,it}) + \beta_2 Ln(w_{L,it}) + \beta_3 Ln(w_{K,it}) + \beta_4 Ln(TA_{it}) + \beta_5 Ln(NIITA_{it}) + \beta_6 Ln(ETA_{it}) + \beta_7 Ln(LTA_{it}) + \varepsilon_{it}$ where it is the subscript indicating bank i at time t and ln is the natural logarithm. The dependent variable (P) is total (interest) revenue scaled by total assets. Variables w_F, w_L and w_K are the unit prices of three inputs: (w_F) interest expenses to total funds, (w_L) the ratio of personnel expenses to total assets, and (w_K) the ratio of other expenses (operating costs minus those expenses related to funds and labour) to fixed assets. Bank specific factors included in the model are asset size (TA), the ratio of non-interest income to total assets $(NIITA)$, the ratio of equity to total assets (E/A), the ratio of loans to total assets (L/A). The model is estimated by running regressions on individual countries for 24 emerging economies. The present results estimated using bank effects (fixed or random effects depending on the results of the Husman test). In each country's regressions two results are reported depending on the dependent variable (total or interest revenue). The t-values are in parentheses. ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively. The H-statistic is equal to the sum of the elasticities of total (interest) revenue with respect to three input prices: $H = \beta_1 + \beta_2 + \beta_3$. The Wald test is used to test the $H = 0$ and $H = 1$ hypotheses and follows an F-distribution.

	Argentina		Brazil		Chile		China		Colombia	
Independent vars.	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue
ln w(F)	0.122 (8.26)***	0.259 (8.77)***	0.287 (14.19)***	0.257 (9.87)***	0.345 (7.77)***	0.436 (10.66)***	0.212 (12.85)***	0.223 (12.19)***	0.079 (2.61)**	0.148 (3.49)***
ln w(L)	0.169 (5.71)***	0.449 (7.61)***	0.138 (4.64)***	0.137 (4.02)***	0.481 (2.45)**	0.301 (2.04)**	0.332 (7.29)***	0.395 (7.83)***	0.129 (0.83)	0.211 (0.96)
ln w(K)	0.083 (3.23)***	0.026 (0.50)	0.055 (3.79)***	0.051 (2.89)***	-0.064 (-1.02)	-0.070 (-1.11)	0.122 (4.19)***	0.143 (4.43)***	0.199 (2.64)**	0.380 (3.59)***
ln(total assets)	0.017 (0.56)	0.123 (2.02)**	-0.023 (-1.21)	-0.037 (-1.97)**	-0.127 (-1.07)	-0.195 (-2.74)***	-0.103 (-4.88)***	-0.125 (-5.30)***	-0.041 (-0.61)	-0.114 (-1.23)
ln (non-int. inco./assets)	0.402 (16.07)***	-0.065 (-1.31)	0.083 (5.93)***	-0.049 (-2.67)***	0.035 (0.46)	0.001 (0.10)	0.072 (3.77)***	-0.006 (-0.30)	0.316 (4.01)***	-0.244 (-2.21)**
ln(equity/assets)	0.247 (5.84)***	0.354 (4.21)***	0.237 (5.83)***	0.258 (5.06)***	-0.289 (-1.64)	0.287 (1.77)*	0.047 (1.40)	0.056 (1.49)	-0.425 (-3.56)***	-0.382 (-2.28)**
ln(loans/assets)	0.325 (8.28)***	0.787 (10.11)***	0.179 (5.95)***	0.452 (12.37)***	0.039 (0.43)	1.170 (14.28)***	0.025 (0.23)	0.018 (0.15)	-0.053 (-0.27)	-0.259 (-0.93)
constant	0.635 (1.61)	-0.883 (-1.12)	0.759 (3.34)***	0.323 (1.30)	2.26 (1.69)	1.855 (2.06)**	1.82 (3.79)***	1.985 (3.74)***	-0.653 (-0.83)	-1.253 (-1.13)
No. of obs.	275	275	503	502	57	57	272	272	50	50
R-squar.	0.93	0.89	0.91	0.49	0.97	0.93	0.88	0.89	0.93	0.85
Husman test (χ2)	16.90***	14.31**	18.99***	10.81	21.47***	5.79	91.05***	128.53***	16.42**	13.35*
P&R H-statistic	**0.374**	**0.734**	**0.480**	**0.445**	**0.762**	**0.667**	**0.666**	**0.761**	**0.407**	**0.739**
Monopoly H=0	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject**	Reject***
Perf. Com. H=1	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Fail to reject
	Czech Rep.		Egypt		Estonia		Hungary		India	
Independent vars.	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue
ln w(F)	0.333 (7.41)***	0.378 (7.90)***	0.148 (3.60)**	0.168 (3.64)**	0.267 (5.73)***	0.373 (5.53)***	0.118 (2.72)***	0.154 (3.43)***	0.258 (19.85)***	0.305 (21.30)***
ln w(L)	0.103 (0.04)	0.154 (0.56)	0.147 (1.61)	0.117 (1.14)	0.289 (1.62)	0.097 (0.37)	0.319 (6.39)***	0.445 (6.25)***	0.225 (5.79)***	0.231 (5.01)***
ln w(K)	0.151 (1.27)	0.116 (0.31)	0.027 (2.10)*	0.079 (1.09)	0.038 (0.99)	-0.014 (-0.25)	0.028 (1.33)	0.042 (1.37)	0.008 (0.68)	0.018 (1.21)
ln(total assets)	-0.067 (-1.39)	-0.047 (-0.77)	0.764 (2.07)*	0.679 (2.75)**	-0.079 (-1.29)	-0.209 (-2.36)**	0.091 (6.61)***	0.127 (7.13)***	0.046 (3.63)***	0.036 (2.29)**
ln (non-int. inco./assets)	0.116 (3.00)***	-0.094 (-1.94)	-0.476 (-2.46)*	-0.700 (-5.41)***	0.185 (2.56)**	-0.087 (-0.83)	0.235 (8.97)***	-0.048 (-0.80)	0.214 (18.79)***	0.028 (2.03)**
ln(equity/assets)	0.381 (6.18)***	0.447 (5.78)***	1.030 (2.57)*	1.186 (4.41)***	0.068 (0.74)	-0.063 (-0.48)	0.036 (0.65)	0.042 (0.63)	0.045 (2.19)**	0.048 (1.92)*
ln(loans/assets)	0.135 (2.52)**	0.127 (1.89)*	-0.600 (-1.66)	0.166 (0.68)	0.260 (2.18)**	0.858 (4.97)***	0.251 (3.24)***	0.35 (2.05)*	0.019 (0.44)	0.153 (2.85)***
constant	0.074 (0.15)	-1.422 (-2.26)**	-12.304 (-2.33)*	-12.36 (-3.50)**	1.701 (3.31)***	1.594 (2.14)**	-1.11 (-2.99)***	-2.392 (-5.53)***	-1.176 (-5.64)***	-1.780 (-7.04)***
No. of obs.	134	134	23	23	42	42	62	62	525	525
R-squar.	0.92	0.87	0.99	0.99	0.97	0.97	0.87	0.79	0.87	0.82
Husman test (χ2)	23.50***	16.39**	49.62***	93.33***	-	-	20.77***	19.46***	61.39***	32.83***
P&R H-statistic	**0.587**	**0.648**	**0.322**	**0.364**	**0.594**	**0.456**	**0.465**	**0.641**	**0.491**	**0.554**
Monopoly H=0	Reject**	Fail to reject	Reject*	Fail to reject	Reject***	Reject*	Reject***	Reject***	Reject***	Reject***
Perf. Com. H=1	Reject***	Reject***	Fail to reject	Reject**	Reject**	Reject*	Reject***	Reject***	Reject***	Reject***
	Indonesia		Malaysia		Mexico		Morocco		Peru	
Independent vars.	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue
ln w(F)	0.161 (9.50)***	0.216 (11.04)***	0.197 (11.66)***	0.404 (13.47)***	0.179 (4.48)***	0.287 (5.32)***	0.050 (2.73)**	0.085 (19.25)***	0.155 (5.87)***	0.188 (6.53)***
ln w(L)	0.111 (1.81)*	0.127 (1.80)*	0.389 (5.24)***	0.287 (2.19)**	0.352 (3.90)***	0.389 (4.73)***	0.233 (1.00)	0.300 (1.84)*	0.292 (3.28)***	0.326 (3.34)***
ln w(K)	0.269 (2.03)**	0.286 (2.20)**	-0.015 (-0.40)	-0.073 (-1.13)	0.025 (0.75)	0.057 (1.28)	-0.128 (-8.59)***	-0.282 (-1.03)	0.193 (3.08)***	0.190 (2.76)***
ln(total assets)	-0.049 (-2.00)**	-0.072 (-2.54)**	-0.108 (-3.16)***	0.063 (1.04)	-0.051 (-1.33)	-0.029 (-0.55)	-0.035 (-0.26)	-0.111 (-0.94)	-0.002 (-0.06)	0.001 (0.01)
ln (non-int. inco./assets)	0.124 (5.69)***	0.009 (0.37)	0.158 (3.99)***	-0.083 (-1.18)	0.311 (9.00)***	0.056 (1.20)	0.059 (2.23)**	-0.026 (-1.02)	0.105 (4.09)***	0.004 (0.13)
ln(equity/assets)	0.143 (2.76)***	0.139 (2.33)**	0.140 (1.78)*	0.127 (0.91)	0.103 (1.54)	0.151 (1.68)	0.043 (5.67)***	-0.017 (-1.96)*	0.287 (3.32)***	0.282 (2.97)***
ln(loans/assets)	0.138 (1.98)*	0.117 (1.46)	0.200 (3.25)***	-0.095 (-0.88)	0.320 (4.72)***	0.95 (4.33)***	0.434 (4.84)***	0.197 (0.53)	0.252 (2.16)**	0.254 (1.98)*
constant	0.251 (0.68)	0.121 (0.28)	2.757 (4.31)***	-1.230 (-1.08)	0.625 (1.25)	-0.520 (-0.77)	-0.693 (-0.60)	0.227 (0.27)	0.632 (1.30)	0.186 (0.35)
No. of obs.	134	134	80	80	73	73	23	23	110	110
R-squar.	0.97	0.96	0.98	0.97	0.96	0.92	0.91	0.95	0.95	0.95
Husman test (χ2)	18.18**	22.28**	28.92***	31.09***	12.34*	14.63**	-	-	52.97***	63.35***
P&R H-statistic	**0.541**	**0.629**	**0.571**	**0.618**	**0.556**	**0.733**	**0.155**	**0.103**	**0.640**	**0.704**
Monopoly H=0	Reject***	Reject***	Reject***	Reject***	Reject**	Reject***	Fail to reject	Fail to reject	Reject***	Reject***
Perf. Com. H=1	Reject***	Reject***	Reject***	Reject**	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***

continoued Table AP4-2

	Philippine		Poland		Russia		Slovak Rep.		Slovenia	
Independent vars.	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue
ln *w(F)*	0.072 (6.11)***	0.099 (6.54)***	0.125 (8.05)***	0.180 (8.34)***	0.134 (25.10)***	0.208 (34.39)***	0.169 (6.43)***	0.215 (6.74)***	0.371 (14.29)***	0.369 (15.81)***
ln *w(L)*	0.415 (7.96)***	0.518 (7.78)***	0.462 (8.31)***	0.510 (6.64)***	0.178 (19.37)***	0.245 (23.43)***	0.212 (1.57)	0.308 (1.88)*	0.314 (2.41)**	0.343 (2.23)**
ln *w(K)*	0.076 (2.69)***	0.085 (2.37)**	0.045 (1.03)	0.079 (1.31)	0.096 (20.32)***	0.041 (7.58)***	0.055 (0.70)	0.054 (0.57)	-0.013 (-0.35)	-0.005 (-0.10)
ln(total assets)	-0.042 (-1.48)	-0.076 (-2.12)**	0.005 (0.14)	-0.021 (-0.44)	-0.010 (-1.64)	-0.065 (-9.24)***	-0.122 (-1.36)	-0.091 (-0.83)	-0.016 (-0.40)	-0.033 (-0.66)
ln (non-int. inco./assets)	0.268 (12.52)***	0.079 (2.91)***	0.223 (6.07)***	-0.006 (-0.12)	0.440 (77.06)***	-0.001 (-0.07)	0.125 (2.38)**	-0.059 (-0.92)	0.131 (4.24)***	-0.127 (-3.33)***
ln(equity/assets)	-0.002 (-0.04)	-0.043 (-0.80)	-0.017 (-0.24)	-0.178 (-1.80)*	0.072 (6.63)***	0.097 (7.88)***	0.033 (0.88)	0.044 (0.95)	0.329 (5.26)***	0.415 (5.39)***
ln(loans/assets)	0.058 (0.92)	0.143 (1.76)*	0.100 (1.44)	0.293 (3.07)***	0.046 (4.35)***	0.237 (19.75)***	-0.044 (-0.46)	-0.025 (-0.22)	0.022 (0.29)	0.041 (0.44)
constant	1.137 (2.72)***	1.045 (1.96)*	0.618 (1.53)	-0.188 (-0.34)	0.761 (11.40)***	0.136 (1.79)*	1.079 (1.04)	0.209 (0.17)	0.811 (2.32)**	0.387 (0.90)
No. of obs.	135	135	172	172	4387	4387	67	67	110	110
R-squar.	0.97	0.96	0.94	0.93	0.94	0.86	0.83	0.79	0.96	0.94
Husman test ($\chi 2$)	19.29***	36.11***	37.26***	22.75***	94.84***	193.27***	25.57***	15.57**	48.80***	50.05***
P&R H-statistic	**0.563**	**0.702**	**0.632**	**0.769**	**0.408**	**0.494**	**0.436**	**0.577**	**0.672**	**0.712**
Monopoly H=0	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***
Perf. Com. H=1	Reject***	Reject***	Reject***	Reject**	Reject***	Reject***	Reject***	Reject**	Reject***	Reject***

	South Africa		Taiwan		Thailand		Turkey	
Independent vars.	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue
ln *w(F)*	0.328 (8.29)***	0.373 (7.10)***	0.312 (12.76)***	0.412 (14.10)***	0.114 (5.89)***	0.148 (6.48)***	0.184 (9.19)***	0.164 (6.72)***
ln *w(L)*	0.239 (2.41)**	0.206 (1.56)	0.490 (9.25)***	0.532 (8.38)***	0.093 (1.61)	0.189 (2.79)***	0.376 (4.49)***	0.376 (3.84)***
ln *w(K)*	0.242 (3.03)***	0.267 (3.96)***	0.100 (3.82)***	0.117 (3.83)***	0.028 (0.70)	0.016 (0.34)	0.041 (1.06)	0.057 (1.18)
ln(total assets)	-0.129 (-1.83)*	-0.234 (-2.51)**	0.010 (0.40)	-0.004 (-0.14)	0.017 (0.49)	0.027 (0.64)	-0.112 (-2.99)***	-0.149 (-1.91)*
ln (non-int. inco./assets)	0.054 (0.88)	-0.112 (-1.38)	0.094 (2.81)***	-0.098 (-2.46)**	0.181 (7.39)***	0.006 (0.21)	0.073 (2.04)**	-0.112 (-2.59)**
ln(equity/assets)	0.035 (0.48)	0.114 (1.16)	0.053 (1.05)	0.053 (0.88)	0.060 (1.33)	0.068 (1.28)	0.137 (1.79)*	0.091 (0.97)
ln(loans/assets)	0.315 (2.06)**	0.410 (2.02)**	-0.180 (-1.74)*	-0.084 (-0.67)	0.829 (10.37)***	1.037 (10.98)***	-0.094 (-1.15)	0.181 (1.93)*
constant	2.111 (2.20)**	2.989 (2.35)**	1.004 (2.44)**	0.766 (1.54)	-0.979 (-1.62)	-1.486 (-2.08)**	2.102 (3.94)***	1.669 (1.56)
No. of obs.	71	71	122	122	165	165	124	124
R-squar.	0.96	0.92	0.88	0.83	0.88	0.83	0.89	0.88
Husman test ($\chi 2$)	20.73***	16.76**	8.14	9.02	14.86**	15.91**	34.19***	38.07***
P&R H-statistic	**0.809**	**0.846**	**0.902**	**1.061**	**0.235**	**0.353**	**0.601**	**0.597**
Monopoly H=0	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***
Perf. Com. H=1	Reject***	Reject***	Reject*	Fail to reject	Reject***	Reject***	Reject***	Reject***

Table AP4-3: The estimation results for H-statistics for advanced economies.

The table reports the results arising from the estimation of the regression model: $\mathrm{Ln}(P_{it}) = \beta_0 + \beta_1 Ln(w_{F,it}) + \beta_2 Ln(w_{L,it}) + \beta_3 Ln(w_{K,it}) + \beta_4 Ln(TA_{it}) + \beta_5 Ln(NIITA_{it}) + \beta_6 Ln(ETA_{it}) + \beta_7 Ln(LTA_{it}) + \varepsilon_{it}$ where it is the subscript indicating bank i at time t and ln is the natural logarithm. The dependent variable (P) is total (interest) revenue scaled by total assets. Variables w_F, w_L and w_K are the unit prices of three inputs: (w_F) interest expenses to total funds, (w_L) the ratio of personnel expenses to total assets, and (w_K) the ratio of other expenses (operating costs minus those expenses related to funds and labour) to fixed assets. Bank specific factors included in the model are asset size (TA), the ratio of non-interest income to total assets $(NIITA)$, the ratio of equity to total assets (E/A), the ratio of loans to total assets (L/A). The model is estimated by running regressions on individual countries for 25 advanced economies. The present results estimated using bank effects (fixed or random effects depending on the results of the Husman test). In each country's regressions two results are reported depending on the dependent variable (total or interest revenue). The t-values are in parentheses. ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively. The H-statistic is equal to the sum of the elasticities of total (interest) revenue with respect to three input prices: $H = \beta_1 + \beta_2 + \beta_3$. The Wald test is used to test the $H = 0$ and $H = 1$ hypotheses and follows an F-distribution.

	Australia		Austria		Belgium		Canada		Denmark	
Independent vars.	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue
ln *w(F)*	0.393 (7.30)***	0.446 (8.55)***	0.297 (15.74)***	0.380 (19.83)***	0.081 (3.51)***	0.079 (3.18)***	0.190 (11.30)***	0.237 (13.98)***	0.146 (12.64)***	0.205 (14.13)***
ln *w(L)*	0.182 (2.61)**	0.183 (2.71)***	0.291 (7.42)***	0.373 (9.20)***	0.622 (5.03)***	0.430 (1.49)	0.261 (8.01)***	0.232 (5.86)***	0.350 (5.34)***	0.304 (3.67)***
ln *w(K)*	0.024 (0.60)	0.067 (1.69)*	0.044 (1.73)*	-0.009 (-0.31)	0.260 (3.72)***	0.251(2.80)***	0.102 (9.15)***	0.180 (2.07)**	0.011 (0.75)	-0.016 (-0.85)
ln(total assets)	-0.030 (-0.69)	-0.001 (-0.01)	0.010 (0.65)	-0.006 (-0.31)	0.93 (1.02)	-5.06 (-1.67)	0.004 (0.48)	0.019 (1.80)*	0.069 (1.83)*	0.141 (2.95)***
ln (non-int. inco./assets)	0.202 (5.42)***	-0.022 (-0.61)	0.112 (3.54)***	-0.051 (-1.59)	0.011 (1.01)	0.072 (0.99)	0.240 (11.95)***	0.004 (0.17)	0.098 (9.44)***	-0.016 (-1.23)
ln(equity/assets)	0.155 (2.38)**	0.101 (1.59)	0.093 (1.89)*	0.063 (1.20)	-0.18 (-1.39)	-0.18 (-1.23)	0.227 (6.27)***	0.177 (4.17)***	0.246 (5.65)***	0.122 (2.21)**
ln(loans/assets)	-0.679 (-4.47)***	-0.371 (-2.52)**	-0.027 (-0.64)	-0.035 (-0.75)	0.10 (1.57)	0.04 (0.28)	0.272 (7.61)***	0.684 (16.34)***	-0.072 (-1.03)	0.144 (1.65)
constant	1.216 (1.98)*	-0.565 (-0.95)	0.160 (0.58)	0.028 (0.09)	0.93 (1.02)	-5.06 (-1.67)	0.686 (4.65)***	-0.815 (-4.44)***	-0.721 (-1.48)	-2.625 (-4.26)***
No. of obs.	94	94	127	127	44	44	329	329	284	284
R-squar.	0.93	0.95	0.86	0.85	0.57	0.96	0.85	0.76	0.95	0.94
Husman test (χ2)	54.78***	67.51***	10.56	9.68	8.35	43.21***	33.15***	8.52	16.47**	50.46***
P&R H-statistic	**0.599**	**0.696**	**0.632**	**0.744**	**0.963**	**0.76**	**0.553**	**0.649**	**0.507**	**0.493**
Monopoly H=0	Reject***	Reject***	Reject***	Reject***	Reject***	Reject**	Reject***	Reject***	Reject***	Reject***
Perf. Com. H=1	Reject***	Reject***	Reject***	Reject***	Fail to reject	Fail to reject	Reject***	Reject***	Reject***	Reject***
	Finland		France		Germany		Greece		Iceland	
Independent vars.	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue
ln *w(F)*	0.205 (6.10)***	0.289 (5.85)***	0.252 (30.20)***	0.271 (7.54)***	0.237 (83.25)***	0.375 (91.68)***	0.243 (9.82)***	0.306 (10.01)***	0.164 (2.64)**	0.348 (8.21)***
ln *w(L)*	0.284 (1.44)	0.332 (1.14)	0.350 (19.44)***	0.276 (3.33)***	0.319 (34.77)***	0.291 (26.29)***	0.186 (2.16)**	0.488 (4.58)***	0.191 (2.41)**	0.403 (7.47)***
ln *w(K)*	0.113 (0.82)	0.161 (0.79)	0.075 (11.67)***	0.039 (1.36)	0.005 (2.16)**	0.012 (4.59)***	0.190 (4.58)***	0.017 (0.33)	0.050 (0.71)	-0.005 (-0.11)
ln(total assets)	0.173 (1.13)	0.091 (0.41)	-0.028 (-6.13)***	-0.036 (-2.03)**	-0.093 (-33.16)**	-0.096 (-29.54)***	-0.099 (-1.91)*	0.071 (1.11)	-0.038 (-0.64)	-0.000 (-0.00)
ln (non-int. inco./assets)	0.183 (1.92)*	-0.119 (-0.85)	0.142 (11.73)***	-0.079 (-2.50)**	0.150 (56.63)***	-0.027 (-8.95)***	0.210 (5.71)***	-0.076 (-1.67)*	0.232 (5.56)***	-0.117 (-4.12)***
ln(equity/assets)	0.041 (0.34)	-0.015 (-0.09)	0.067 (5.87)***	0.030 (0.86)	-0.071 (-13.21)**	-0.109 (-17.54)***	0.095 (2.29)**	0.044 (0.86)	-0.084 (-0.70)	-0.032 (-0.40)
ln(loans/assets)	0.718 (1.81)*	1.237 (2.12)*	0.037 (2.39)**	0.460 (6.73)***	0.171 (30.87)***	0.284 (44.13)***	0.085 (0.73)	0.515 (3.56)***	-0.053 (-0.25)	0.303 (2.17)**
constant	-2.537 (-1.26)	-2.274 (-0.77)	0.845 (11.04)***	-0.485 (-1.74)*	0.366 (9.32)***	-0.658 (-14.44)***	1.77 (3.06)***	-0.96 (-1.34)	0.209 (0.30)	-0.147 (-0.31)
No. of obs.	41	41	1128	1127	14297	14295	95	95	86	86
R-squar.	0.94	0.93	0.96	0.94	0.92	0.89	0.92	0.93	0.90	0.94
Husman test (χ2)	17.80***	13.99*	91.44***	59.03***	2124.87***	899.81***	21.77***	22.02***	14.71**	35.17***
P&R H-statistic	**0.602**	**0.782**	**0.677**	**0.586**	**0.561**	**0.678**	**0.619**	**0.811**	**0.405**	**0.746**
Monopoly H=0	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***
Perf. Com. H=1	Reject**	Fail to reject	Reject***	Reject***	Reject***	Reject***	Reject***	Reject*	Reject***	Reject***
	Ireland		Israel		Italy		Japan		Korea	
Independent vars.	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue
ln *w(F)*	0.559 (12.57)***	0.613 (12.64)***	0.201 (13.56)***	0.276 (14.88)***	0.230 (50.86)***	0.313 (48.98)***	0.021 (2.72)***	0.025 (3.19)***	0.271 (9.05)***	0.209 (8.49)***
ln *w(L)*	0.191 (1.70)	0.156 (1.28)	-0.075 (-0.72)	-0.168 (-1.27)	0.379 (14.22)***	0.435 (11.54)***	0.585 (15.61)***	0.486 (12.92)***	0.191 (3.26)***	0.231 (3.44)***
ln *w(K)*	-0.085 (-1.46)	-0.031 (-0.49)	-0.108 (-1.05)	-0.109 (-0.85)	0.063 (7.79)***	0.078 (6.82)***	0.150 (7.28)***	0.207 (10.04)***	0.195 (5.25)***	0.234 (5.51)***
ln(total assets)	0.043 (0.42)	0.045 (0.41)	-0.107 (-1.45)	-0.182 (-1.97)*	-0.127 (-8.65)***	-0.137 (-6.58)***	0.095 (3.18)***	0.082 (2.72)***	-0.102 (-2.71)***	-0.087 (-2.03)**
ln (non-int. inco./assets)	0.129 (4.65)***	0.058 (1.91)*	0.172 (4.95)***	-0.031 (-0.70)	0.073 (9.85)***	-0.084 (-7.99)***	0.029 (3.22)***	-0.012 (-1.30)	0.104 (4.37)***	-0.042 (-1.56)
ln(equity/assets)	0.184 (2.11)**	0.229 (2.41)**	0.085 (1.19)	0.082 (0.92)	0.166 (7.26)***	0.119 (3.68)***	0.066 (2.54)**	-0.021 (-0.81)	-0.050 (-0.82)	-0.056 (-0.80)
ln(loans/assets)	0.002 (0.02)	0.071 (0.62)	-0.194 (-1.04)	-0.230 (-0.99)	-0.057 (-1.77)*	-0.057 (-1.25)	0.151 (3.78)***	0.954 (23.75)***	0.174 (2.89)***	0.159 (2.31)**
constant	0.654 (0.41)	0.187 (0.11)	0.247 (0.21)	0.169 (0.11)	2.133 (11.82)***	1.807 (7.09)***	-1.559 (-3.93)***	-2.031 (-5.10)***	1.325 (1.88)*	0.435 (0.54)
No. of obs.	44	44	91	91	2669	2669	372	372	82	82
R-squar.	0.98	0.98	0.91	0.92	0.84	0.85	0.97	0.98	0.94	0.92
Husman test (χ2)	15.76**	19.63***	20.23***	23.88***	316.96***	367.12***	121.01***	140.89***	24.86***	24.21***
P&R H-statistic	**0.665**	**0.738**	**0.018**	**-0.001**	**0.672**	**0.826**	**0.756**	**0.718**	**0.657**	**0.674**
Monopoly H=0	Reject***	Reject***	Fail to reject	Fail to reject	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***
Perf. Com. H=1	Reject***	Reject**	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***

continoued Table AP 4-3

	Luxembourg		Netherlands		New Zealand		Norway		Portugal	
Independent vars.	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue
ln *w(F)*	0.578 (25.51)***	0.575 (41.10)***	0.217 (6.57)***	0.333 (10.13)***	0.517 (7.42)***	0.550 (15.62)***	0.383 (45.38)***	0.435 (51.60)***	0.364 (16.81)***	0.462 (15.93)***
ln *w(L)*	0.199 (2.13)**	0.101 (0.02)	0.612 (5.33)***	0.729 (6.37)***	0.317 (4.94)***	0.141 (1.15)	0.160 (6.69)***	0.176 (7.40)***	0.288 (4.10)***	0.280 (2.98)***
ln *w(K)*	0.020 (1.03)	0.027 (1.48)	0.078 (1.44)	0.043 (0.81)	0.036 (2.30)**	0.020 (1.00)	0.038 (4.71)***	0.025 (3.03)***	-0.082 (-1.70)*	-0.089 (-1.37)
ln(total assets)	-0.017 (-0.60)	-0.008 (-0.30)	-0.019 (-0.31)	0.021 (0.35)	-0.076 (-1.61)	-0.031 (-0.52)	-0.147 (-9.36)***	-0.158 (-10.03)***	0.045 (0.93)	0.055 (0.84)
ln (non-int. inco./assets)	0.116 (5.74)***	0.003 (0.18)	0.220 (4.34)***	0.033 (0.66)	0.024 (1.50)	0.002 (0.128)	0.029 (4.52)***	-0.036 (-5.60)***	0.150 (4.78)***	-0.069 (-1.63)
ln(equity/assets)	0.128 (3.90)***	0.156 (5.05)***	-0.025 (-0.27)	-0.003 (-0.04)	0.001 (0.01)	0.000 (0.00)	0.035 (0.86)	0.011 (0.27)	-0.032 (-0.51)	-0.029 (-0.34)
ln(loans/assets)	0.006 (0.31)	-0.009 (-0.46)	0.064 (0.54)	0.126 (1.07)	0.019 (0.11)	0.118 (0.78)	-0.166 (-2.22)**	-0.074 (-0.99)	-0.085 (-1.35)	0.001 (0.01)
constant	0.100 (0.35)	-0.658 (-2.41)**	2.073 (1.65)	1.358 (1.09)	1.951 (2.31)**	0.219 (0.33)	1.4172 (7.82)***	1.312 (7.25)***	-0.236 (-0.36)	-1.282 (-1.45)
No. of obs.	520	520	86	86	34	34	722	722	113	113
R-squar.	0.85	0.88	0.94	0.96	0.97	0.97	0.90	0.91	0.96	0.95
Husman test (χ2)	12.25*	24.65***	18.09**	29.80***	-	-	68.51***	93.25***	15.57**	14.60**
P&R H-statistic	**0.797**	**0.703**	**0.907**	**1.105**	**0.870**	**0.711**	**0.581**	**0.636**	**0.570**	**0.653**
Monopoly H=0	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***
Perf. Com. H=1	Reject***	Reject***	Fail to reject	Fail to reject	Fail to reject	Reject**	Reject***	Reject***	Reject***	Reject***
	Spain		Sweden		Switzerland		United Kingdom		United States	
Independent vars.	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue	Total revenue	Interest revenue
ln *w(F)*	0.320 (28.04)***	0.389 (30.11)***	0.291 (17.77)***	0.223 (18.83)***	0.508 (44.46)***	0.403 (75.52)***	0.367 (16.58)***	0.348 (16.71)***	0.037 (4.09)***	0.086 (7.79)***
ln *w(L)*	-0.038 (-0.90)	0.011 (0.22)	0.350 (5.96)***	0.301 (7.00)***	0.284 (18.87)***	0.217 (6.61)***	0.259 (4.70)***	0.240 (1.96)*	0.388 (7.87)***	0.395 (6.60)***
ln *w(K)*	0.062 (2.54)**	0.054 (1.96)*	-0.005 (-0.43)	-0.004 (-0.28)	0.002 (0.40)	0.011 (1.95)*	0.031 (1.58)	0.000 (0.01)	0.045 (1.92)*	0.051 (1.80)*
ln(total assets)	-0.054 (-1.87)*	-0.005 (-0.14)	-0.273 (-18.74)**	-0.330 (-17.74)***	-0.151 (-24.89)**	-0.103 (-14.48)***	0.023 (0.46)	0.020 (0.311)	0.016 (0.31)	0.216 (3.51)***
ln (non-int. inco./assets)	0.132 (5.59)***	-0.084 (-3.13)***	0.045 (3.63)***	-0.082 (-5.11)***	0.152 (20.44)***	0.031 (3.52)***	0.123 (4.14)***	-0.075 (-1.95)*	0.076 (6.36)***	-0.042 (-2.95)***
ln(equity/assets)	0.077 (2.66)***	0.122 (3.74)***	-0.014 (-0.36)	-0.040 (-0.77)	0.019 (1.33)	0.067 (4.09)***	0.094 (1.50)	0.195 (2.39)**	-0.054 (-1.27)	-0.125 (-2.43)**
ln(loans/assets)	0.169 (3.36)***	0.212 (3.72)***	0.171 (2.96)***	0.241 (3.26)***	0.060 (5.57)***	0.055 (4.39)***	0.056 (1.03)	0.069 (0.99)	0.223 (3.08)***	0.681 (7.75)***
constant	-0.109 (-0.27)	-1.590 (-3.53)***	1.907 (12.96)***	2.307 (12.27)***	1.867 (22.82)***	0.488 (5.10)***	-0.211 (-0.29)	-1.414 (-1.50)	-0.974 (-1.37)	-4.500 (-5.21)***
No. of obs.	464	464	627	627	2941	2941	187	187	580	580
R-squar.	0.89	0.89	0.90	0.85	0.96	0.88	0.97	0.96	0.97	0.96
Husman test (χ2)	24.70***	21.43***	355.30***	420.05***	274.50***	245.11***	32.57***	47.03***	82.36***	49.52***
P&R H-statistic	**0.344**	**0.454**	**0.636**	**0.520**	**0.794**	**0.631**	**0.657**	**0.588**	**0.470**	**0.532**
Monopoly H=0	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***
Perf. Com. H=1	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***	Reject***

Table AP4-4: Equilibrium tests

The table reports the estimated regression mode: :$\text{Ln}(ROAA_{it}) = \alpha_0 + \alpha_1 Ln(w_{F,it}) + \alpha_2 Ln(w_{L,it}) + \alpha_3 Ln(w_{K,it}) + \alpha_4 Ln(TA_{it)}) + \alpha_5 Ln(NIITA_{it)}) + \alpha_6 Ln(ETA_{it)}) + \alpha_7 Ln(LTA_{it)}) + \varepsilon_{it}$, where it is the subscript indicating bank i at time t and ln is the natural logarithm. The dependent variable is the logarithm of return on average assets (ROAA). Variables w_F, w_L and w_K are the unit prices of three inputs: (w_F) interest expenses to total funds, (w_L) the ratio of personnel expenses to total assets, and (w_K) the ratio of other expenses (operating costs minus those expenses related to funds and labour) to fixed assets. Bank specific factors included in the model are asset size (TA), the ratio of non-interest income to total assets ($NIITA$), the ratio of equity to total assets (E/A), the ratio of loans to total assets (L/A). The model is estimated by running regressions on individual countries for 24 emerging and 25 advanced economies. The present results estimated using bank dummies (and time dummies when needed). However, in two cases we have to estimate the model through random effects or OLS, which indicated by (a) and (b) respectively. Furthermore, for some countries we find their markets to be in equilibrium if and only if the above model is estimated when excluding bank specific variables, i.e. TA, $NIITA$, ETA, and LTA. Such countries are identified by (*). The standard errors were calculated using White's (1980) correction for heteroscedasticity. The R-statistic is equal to the sum of the elasticities of ROAA with respect to three input prices: $R = \alpha_1 + \alpha_2 + \alpha_3$. The Wald test is used to test the $R = 0$ hypothesis and follows an F-distribution. Test for all countries are failed to reject at 10% significance level, except some countries at 5% which is identified by (1). R is not significantly different from zero, indicating equilibrium in all cases.

	ROAA				ROAA		
country	E-statist	St. Err.	Wald F-test for	country	E-statist	St. Err.	Wald F-test for
Emerging economies				*Advanced economies*			
Argentina	-0.17	0.14	Fail to reject	Australia	-0.03	0.07	Fail to reject
Brazil	-0.13	0.08	Fail to reject (1)	Austria (*)	-0.08	0.02	Fail to reject
Chile	0.08	0.16	Fail to reject	Belgium	-0.23	0.24	Fail to reject
China	0.00	0.02	Fail to reject	Canada	0.00	0.02	Fail to reject
Colombia	-0.19	0.14	Fail to reject	Denmark (*)	-0.92	0.47	Fail to reject (1)
Czech Rep.	-0.07	0.03	Fail to reject (1)	Finland	-0.03	0.05	Fail to reject
Egypt	-0.23	0.18	Fail to reject	France (*)	-0.04	0.05	Fail to reject
Estonia	-0.16	0.36	Fail to reject	Germany (*)	-0.05	0.02	Fail to reject (1)
Hungary	-0.02	0.11	Fail to reject	Greece	-0.22	0.25	Fail to reject
India (b)	-0.02	0.01	Fail to reject (1)	Iceland	0.06	0.06	Fail to reject
Indonesia (a)	-0.04	0.03	Fail to reject (1)	Ireland	-0.36	0.33	Fail to reject
Malaysia	-0.01	0.05	Fail to reject	Israel	-0.37	0.25	Fail to reject
Mexico	0.08	0.06	Fail to reject	Italy	-0.19	0.09	Fail to reject (1)
Morocco	0.15	1.48	Fail to reject	Japan	-0.11	0.08	Fail to reject
Peru	-0.11	0.07	Fail to reject	Korea	0.01	0.05	Fail to reject
Philippines	-0.09	0.05	Fail to reject	Luxembourg	-0.04	0.02	Fail to reject (1)
Poland	-0.05	0.05	Fail to reject	Netherlands	-0.22	0.17	Fail to reject
Russia (*)	-0.02	0.01	Fail to reject	New Zealand	-0.02	0.12	Fail to reject
Slovak Rep.	-0.51	0.40	Fail to reject	Norway	-0.01	0.01	Fail to reject
Slovenia	-0.04	0.09	Fail to reject	Portugal (*)	-0.15	0.12	Fail to reject
South Africa	-0.28	0.25	Fail to reject	Spain	0.00	0.03	Fail to reject
Taiwan	0.01	0.05	Fail to reject	Sweden (*)	-0.01	0.02	Fail to reject
Thailand	-0.28	0.15	Fail to reject (1)	Switzerland	-0.01	0.03	Fail to reject
Turkey	-0.07	0.04	Fail to reject	United Kingdom	-0.03	0.06	Fail to reject
				United States (*)	-0.88	0.52	Fail to reject

Table AP4-5: Some characteristic of banking competition and the *H*-statistics.

This table provides some characteristic of banking competition includes: (1) number of firm growth (FG), (2) growth of standard deviation of total cost (SDG_TC), (3) average total cost to total assets (CTA), (4) growth of total cost to total assets (CTAG), (5) growth of loans (LG), (6) growth of sales (SG), (7) growth of interest spread (ISG), (8) growth of return on average assets (ROAG), and (9) the average *H*-statistic (H-stat.). Average *H*-statistic is taken from Table AP2 and AP3. All data are average for 2001-2010.

			CTA		CTAG		LG		SG		ISG		ROAG		
	FG	SDG_TC	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	H-sta.
Emerging economies															
Argentina	-8	-19.54	12.02	12.88	0.14	23.91	10.50	22.51	10.92	23.32	-4.06	29.55	-2.49	27.28	0.554
Brazil	-12	-19.21	9.71	11.24	-3.54	22.43	9.17	27.59	9.09	25.79	-7.04	24.37	-4.09	25.23	0.463
Chile	950	4.84	6.31	3.84	-4.58	23.31	9.03	17.00	0.43	24.36	-5.26	18.83	11.98	26.38	0.715
China	12	-10.62	1.90	0.96	-2.97	20.20	22.81	15.62	21.03	20.76	2.69	19.46	3.21	22.96	0.714
Colombia	33	-21.01	9.05	5.19	-7.95	21.35	10.86	20.54	8.39	20.46	-2.63	21.23	-4.40	22.59	0.573
Czech Rep.	-9	-16.37	3.53	3.21	-8.36	17.50	17.53	18.75	9.97	20.27	-9.03	23.06	-0.99	22.59	0.618
Egypt	10	10.23	3.01	1.68	-5.72	21.39	2.94	18.64	6.22	24.26	16.01	20.01	35.58	23.39	0.343
Estonia	0	29.47	5.49	3.39	-7.99	20.52	10.43	25.04	2.97	21.28	-8.11	21.55	-5.64	23.63	0.525
Hungary	-15	32.86	5.33	1.34	-1.44	18.34	11.75	23.88	9.82	23.66	0.67	15.84	-4.49	24.75	0.553
India	3	-21.29	4.50	2.22	1.74	18.39	20.23	17.47	14.52	17.72	-4.14	13.59	1.32	21.93	0.523
Indonesia	-8	24.00	5.61	3.18	-0.55	19.01	18.25	17.29	15.66	16.84	-2.41	20.41	-2.65	22.51	0.585
Malaysia	8	-24.77	1.96	0.97	-7.70	15.94	9.79	16.19	8.62	16.93	-1.56	12.91	0.46	20.73	0.595
Mexico	3	18.19	8.79	12.53	-9.59	21.53	8.63	22.24	0.95	19.50	-7.06	19.68	-6.19	25.19	0.645
Morocco	120	9.24	2.60	1.31	0.89	14.08	17.03	15.22	14.18	12.36	-3.57	9.01	59.08	24.69	0.129
Peru	15	8.06	7.27	3.83	-3.94	19.22	12.80	19.37	11.87	20.31	0.58	18.36	1.01	23.27	0.672
Philippines	-23	-10.75	5.16	5.63	-4.93	15.89	14.28	16.91	11.76	20.06	-0.60	18.26	0.88	25.18	0.633
Poland	30	-3.99	4.76	3.19	-5.20	16.34	10.86	20.71	6.61	21.42	-5.30	21.09	-1.58	25.23	0.701
Russia	30	-2.58	22.10	30.94	-0.36	22.61	6.40	24.74	18.33	21.44	-5.97	27.88	-6.16	26.30	0.451
Slovak Rep.	8	-15.86	3.20	0.99	-6.32	19.40	14.65	19.65	2.91	22.56	-10.49	21.71	-4.56	21.68	0.507
Slovenia	13	-47.99	3.80	1.52	-5.84	19.41	17.60	18.88	7.33	21.00	-4.38	17.47	-7.44	24.54	0.692
South Africa	6	-1.70	8.36	6.59	-2.07	16.49	12.60	20.95	9.56	17.23	-4.28	17.63	-3.20	22.90	0.828
Taiwan	0	-19.53	2.73	1.44	-7.72	21.45	6.33	12.73	-1.73	19.98	-4.59	18.14	-8.10	23.14	0.982
Thailand	11	0.94	3.28	1.51	-6.89	18.76	14.58	14.21	9.50	18.10	1.18	18.74	1.98	23.12	0.294
Turkey	8	-10.57	6.62	3.09	-6.24	20.77	13.28	20.11	4.40	21.00	-9.32	21.03	-3.50	25.19	0.599
Average	17	-4.50	6.13	5.11	-4.46	19.51	12.60	19.43	8.89	20.44	-3.28	19.58	2.08	23.93	0.579
Advanced economies															
Australia	-17	-27.56	5.42	1.77	-1.44	18.31	13.29	19.90	15.71	21.81	-4.73	22.96	-1.65	23.09	0.648
Austria	-12	-11.79	2.93	1.48	-6.20	21.76	9.15	14.70	3.42	25.19	-7.48	17.94	-3.63	23.54	0.688
Belgium	-16	-30.15	2.30	1.03	-4.00	16.91	8.89	19.26	-0.42	22.08	-5.84	21.74	-27.79	25.71	0.862
Canada	5	-13.41	9.95	71.12	-6.77	17.87	10.74	18.25	5.80	21.42	-2.27	19.59	-2.20	22.98	0.601
Denmark	22	-7.94	4.30	1.63	-6.13	17.31	12.36	18.96	-0.08	21.71	0.49	16.39	-4.57	25.37	0.500
Finland	86	8.63	3.12	1.90	-7.05	23.03	10.24	14.94	-0.44	24.21	-7.63	18.90	0.03	24.27	0.692
France	-5	-25.23	3.78	3.02	-3.12	14.68	11.36	16.46	6.47	18.34	-3.92	14.15	-0.73	21.75	0.632
Germany	-6	-6.00	4.19	4.64	-4.12	11.48	6.76	12.62	4.79	14.63	-0.54	8.69	-1.12	19.80	0.620
Greece	0	-1.94	3.96	1.56	-4.07	18.07	12.79	18.71	2.88	21.79	-4.51	15.50	-2.25	26.64	0.715
Iceland	-63	72.17	7.58	3.46	-0.55	18.56	11.90	26.26	19.81	21.05	-11.79	23.78	0.82	29.48	0.576
Ireland	-20	16.36	2.82	1.25	4.68	25.76	5.04	25.04	4.75	29.83	-6.71	21.98	-2.83	20.31	0.702
Israel	0	11.14	4.01	1.56	-5.63	24.02	4.33	9.95	-1.39	23.32	-1.22	15.76	0.48	25.90	0.009
Italy	-4	-28.45	3.49	1.38	-2.55	16.94	13.39	13.59	4.17	21.25	-7.39	19.14	-6.23	25.19	0.749
Japan	-5	-18.58	1.17	1.25	-2.34	12.95	3.68	10.99	1.71	15.75	-0.78	9.05	-3.83	25.39	0.737
Korea	-47	-16.94	4.11	2.16	0.95	17.37	12.51	19.24	11.10	18.19	-2.46	16.00	-4.36	24.04	0.666
Luxembourg	5	13.34	3.88	2.63	-4.82	24.03	2.36	24.56	0.89	23.36	-10.41	28.58	-1.24	23.73	0.750
Netherlands	11	-13.34	3.31	1.77	-9.95	19.19	8.10	21.10	2.91	22.03	-13.88	28.88	-1.79	22.95	1.006
New Zealand	29	-46.46	4.25	2.42	-5.76	14.82	6.88	22.64	0.75	20.23	-6.03	18.59	-0.72	22.33	0.791
Norway	13	-28.92	3.95	1.40	-0.09	25.42	13.36	18.15	3.89	17.18	-5.72	18.71	-2.74	23.04	0.609
Portugal	12	33.64	4.03	2.85	-4.81	20.86	10.55	17.63	2.66	25.21	-8.50	22.31	-4.50	28.28	0.612
Spain	-2	-0.75	3.08	1.21	1.51	22.54	12.14	17.27	4.55	23.52	-7.15	20.51	24.49	21.25	0.399
Sweden	-12	0.62	3.49	1.83	-2.70	18.34	16.54	16.33	10.20	20.15	-5.65	11.09	-9.96	24.49	0.578
Switzerland	-10	-2.55	3.84	4.00	-4.20	13.78	10.23	14.66	6.87	14.67	-2.98	16.87	-1.37	16.19	0.713
United Kingdo	2	-13.80	3.92	5.76	-3.85	23.83	3.81	22.71	-4.36	26.55	-5.37	25.08	-3.09	23.70	0.623
United States	-17	-0.10	4.22	9.73	-5.86	15.86	6.42	14.56	-2.63	14.82	6.50	15.47	-2.94	20.43	0.501
Average	-6	-6.93	4.04	5.31	-3.55	18.95	9.47	17.94	4.16	21.13	-5.04	18.71	-2.55	23.59	0.639

Table AP4-6: Evaluation of the Lerner index by country – emerging vs. advanced economies

This table shows the evaluation of the Lerner index according to the Equations (B3): $L_{it} = \frac{P_{it} - MC_{it}}{P_{it}}$, where L is the Lerner index, P is the price charged by banks on their assets, and MC is the marginal cost based on the translog cost function, Equations (B1) and (B2).

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Emerging economies										
Argentina	25.28	27.66	10.45	17.33	23.60	32.18	29.64	29.56	32.06	30.68
Brazil	21.92	29.77	34.59	30.47	31.39	37.94	39.82	30.25	39.15	39.85
Chile	NA	NA	NA	NA	NA	NA	NA	19.36	27.33	27.31
China	20.55	23.52	24.11	25.83	26.59	28.23	27.18	26.89	24.92	26.52
Colombia	-4.91	6.15	-25.84	0.38	26.26	21.36	29.02	35.29	34.37	34.70
Czech Rep.	22.25	28.64	27.56	28.51	37.90	38.92	38.04	33.95	41.64	28.69
Egypt	NA	NA	NA	NA	NA	NA	57.96	55.13	41.82	47.65
Estonia	15.46	21.50	24.80	30.37	23.17	46.19	40.30	32.18	17.82	26.30
Hungary	-12.38	19.07	25.78	28.96	39.16	41.54	38.00	19.16	33.01	54.76
India	27.53	34.31	36.65	43.85	35.46	34.76	32.36	29.31	29.35	28.60
Indonesia	NA	46.03	43.75	39.78	28.80	28.08	29.43	25.17	28.11	31.11
Malaysia	NA	NA	NA	NA	31.26	29.60	26.80	28.45	27.67	28.15
Mexico	27.99	25.75	29.48	38.28	26.31	34.09	28.49	26.96	31.30	29.69
Morocco	56.35	43.92	39.22	52.04	37.28	47.33	60.57	66.22	65.19	58.61
Peru	23.25	18.41	19.17	26.04	31.24	32.33	33.21	24.71	29.09	30.63
Philippines	NA	NA	NA	17.75	17.21	29.39	25.76	17.74	39.06	47.09
Poland	17.14	20.34	8.92	20.15	14.41	18.85	19.28	16.65	17.95	20.21
Russia	42.49	41.78	44.28	40.22	46.61	46.70	46.15	45.46	23.46	18.91
Slovak Rep.	NA	NA	30.80	25.62	27.35	30.93	32.45	36.00	23.88	26.67
Slovenia	18.69	19.49	19.21	24.55	24.77	20.85	25.26	19.11	26.19	32.34
South Africa	NA	NA	NA	8.91	14.33	18.97	20.83	20.32	18.53	17.52
Taiwan	22.90	25.72	25.91	24.52	26.22	21.79	23.25	21.88	23.27	26.98
Thailand	21.02	31.18	34.51	40.87	29.38	23.14	24.13	28.96	37.57	38.06
Turkey	NA	NA	NA	28.67	34.93	28.53	29.02	27.42	38.20	30.51
Average	21.60	27.25	25.19	28.24	28.80	31.44	32.91	29.84	31.29	32.56
Advanced economies										
Australia	NA	NA	NA	19.16	26.15	18.95	21.22	24.00	28.84	30.54
Austria	22.83	22.37	25.03	23.48	29.81	29.63	28.10	25.68	33.33	37.50
Belgium	NA	NA	NA	NA	22.72	24.18	23.68	13.41	18.29	20.25
Canada	23.57	26.72	26.85	30.86	26.52	30.31	26.03	20.52	30.65	35.01
Denmark	NA	NA	39.64	22.97	24.85	20.17	16.58	12.19	30.71	30.95
Finland	NA	NA	22.53	19.60	13.55	25.28	18.54	12.54	26.93	39.13
France	26.08	26.39	27.03	29.62	28.45	28.95	24.48	21.20	28.96	30.57
Germany	16.33	18.88	20.64	21.62	20.86	24.49	18.97	17.93	22.55	27.08
Greece	NA	NA	NA	13.02	22.20	23.43	21.11	14.63	22.54	16.70
Iceland	10.52	17.16	25.52	31.57	34.70	35.09	25.26	26.19	-0.10	33.53
Ireland	NA	NA	NA	44.13	23.23	25.49	22.73	19.82	26.44	26.56
Israel	31.28	32.77	41.49	42.08	32.96	44.45	42.03	17.50	35.90	34.65
Italy	22.65	20.82	24.90	24.28	29.59	31.65	30.48	26.58	26.41	25.26
Japan	24.01	19.27	22.59	28.63	26.88	31.45	34.82	28.29	24.43	26.78
Korea	25.76	26.83	29.18	29.73	16.62	17.76	24.66	21.08	22.31	25.59
Luxembourg	11.66	13.42	15.46	18.07	18.91	18.47	16.36	16.77	21.82	28.73
Netherlands	NA	NA	NA	21.83	23.55	20.26	20.24	13.94	17.80	25.51
New Zealand	NA	NA	NA	NA	9.36	10.47	11.42	11.19	12.32	12.64
Norway	19.66	18.21	25.49	34.21	31.82	29.28	22.58	14.90	25.46	28.93
Portugal	28.67	44.08	43.30	21.97	31.47	30.60	19.14	15.21	28.79	18.71
Spain	23.96	NA	NA	33.21	29.56	28.33	27.47	23.64	29.94	29.62
Sweden	30.76	27.45	27.83	30.00	27.55	34.64	30.58	21.63	28.78	26.90
Switzerland	24.08	22.14	25.38	26.49	28.28	28.28	27.16	22.20	22.46	22.26
United Kingdom	NA	NA	NA	25.00	24.06	21.80	21.75	21.66	23.84	21.40
United States	NA	NA	NA	NA	22.73	18.93	3.05	21.20	31.28	34.56
Average	22.79	24.04	27.68	26.89	25.06	26.09	23.14	19.36	24.83	27.57

Table AP4-7: Efficiency competition

The table reports the results arising from the estimation of the regression model: $MS_{it} = \alpha + \beta\frac{(\frac{ov}{TA})_{it}}{\sum_i^n(\frac{ov}{TA})_{it}} + \gamma SPE_{it} + \varepsilon_{it}$ where it is the subscript indicating bank i at time t. The dependent variable (MS) is market share in terms of total assets. $\frac{(\frac{ov}{TA})_{it}}{\sum_i^n(\frac{ov}{TA})_{it}}$ is inefficiency where variables ov and TA are the overhead costs and total assets respectively, and SPE is interest rate spread,. The model is estimated by running regressions on individual countries for 49 emerging and advanced economies. The present results estimated using a GMM technique (or fixed effects (FE) when appropriated). The t-values are in parentheses. ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively. The efficiency competition is equal to the absolute value of β. The higher value of β indicates the more competitive market.

Emerging economies

Country	Spe.	Inefficiency	Interest spread	Market share (t-1)	Obs.
Argentina	GMM	-0.027(-175.53)***	0.003(2.89)***	0.518(332.39)***	255
Brazil	GMM	-0.003(-4.96)***	-0.019(0.002)***	0.257(186.15)***	337
Chile	FE	-0.066(-2.60)**	0.049(0.50)		34
China	GMM	0.017(69.27)***	-0.121(-22.13)***	0.383(617.97)***	330
Colombia	FE	-0.017(-1.75)*	0.023(0.04)		45
Czech Rep.	GMM	0.016(3.55)***	0.042(0.735)	0.486(7.45)***	77
Egypt	GMM	-0.013(-8.64)***	-0.025(-12.26)***	0.585(420.76)***	40
Estonia	FE	-0.015(-3.42)***	-2.084(-5.04)***		38
Hungary	FE	-0.012(-2.16)**	0.206(2.60)**	0.977(47.67)***	59
India	GMM	-0.011(-40.10)***	0.083(14.95)***	0.328(104.84)***	364
Indonesia	GMM	-0.018(-17.49)***	-0.046(-14.44)***	0.695(39.22)***	82
Malaysia	GMM	-0.015(-3.63)***	-0.020(-0.41)	0.808(8.52)***	57
Mexico	GMM	-0.015(-11.19)***	-0.011(-17.55)***	0.324(21.07)***	37
Morocco	FE	0.004(2.33)**	0.632(3.28)		43
Peru	GMM	-0.018(-1.39)	0.045(0.22)	0.193(4.89)***	77
Philippines	GMM	-0.045(-1.85)*	-0.087(-2.31)**	-0.210(-7.63)***	71
Poland	GMM	-0.060(-7.65)***	0.617(6.71)***	-0.008(-0.36)	104
Russia	GMM	-0.006(-11.28)***	-0.021(-7.53)***	0.734(519.88)***	2264
Slovak Rep.	GMM	-0.018(-17.55)***	-0.025(-2.75)***	-0.000(-0.02)	50
Slovenia	GMM	-0.049(-5.25)***	0.581(6.00)***	0.549(9.08)***	88
South Africa	GMM	0.197(3.32)**	-0.990(-5.75)***	0.079(1.46)	46
Taiwan	GMM	-0.071(-3.92)***	0.101(6.38)***	0.160(11.33)***	95
Thailand	GMM	-0.015(-22.82)***	-0.185(-7.55)***	0.738(18.16)***	124
Turkey	GMM	-0.021(-2.22)**	-0.160(-5.88)***	0.392(64.18)***	86

Advanced economies

Country	Spe.	Inefficiency	Interest spread	Market share (t-1)	Obs.
Australia	GMM	-0.045(-1.83)*	-0.035(-1.11)	-0.012(-0.89)	50
Austria	GMM	-0.019(-11.05)***	-0.023(-0.96)	0.370(15.42)***	93
Belgium	FE	-0.060(-3.03)***	0.095(0.17)		35
Canada	GMM	-0.004(-36.99)***	-0.037(-12.21)***	0.537(565.29)***	241
Denmark	FE	-0.020(-3.27)***	-0.032(-0.80)		277
Finland	FE	-0.113(-1.70)*	-0.952(-0.89)		32
France	GMM	0.018(4.51)***	0.491(7.38)***	-0.076(-9.35)***	756
Germany	FE	-0.033(-10.77)***	-0.015(-5.13)***		12222
Greece	GMM	0.023(5.17)***	0.826(1.79)*	0.076(0.44)	68
Iceland	GMM	-0.109(-2.83)***	0.641(2.40)**	-0.136(-3.74)***	42
Ireland	FE	-0.018(-3.55)**	0.019(0.72)		41
Israel	GMM	-0.025(-2.53)**	-0.129(-1.58)	0.919(5.10)***	66
Italy	GMM	-0.019(-5.60)***	0.643(6.53)***	-0.009(-1.96)**	1680
Japan	GMM	-0.049(-14.86)***	0.107(200.29)***	0.624(543.60)***	491
Korea	GMM	-0.074(-69.92)***	-1.280(-14.05)***	0.493(21.64)***	60
Luxembourg	GMM	-0.127(-31.51)***	0.093(15.10)***	0.618(81.08)***	241
Netherlands	GMM	-0.140(-21.71)***	-1.290(-2.39)**	0.727(11.95)***	47
New Zealand	FE	-0.158(-1.75)*	-1.001(-1.62)		26
Norway	GMM	-0.027(-16.48)***	0.035(0.77)	-0.074(-18.658)***	507
Portugal	GMM	0.014(4.38)***	-1.251(-7.48)***	0.017(0.65)	61
Spain	GMM	0.018(10.24)***	1.050(3.79)***	0.619(4.60)***	283
Sweden	GMM	0.033(49.43)***	0.122(32.09)***	-0.037(-25.48)***	470
Switzerland	GMM	-0.032(-47.50)***	-0.016(-1.81)*	0.894(1156.39)***	2072
UK	GMM	-0.047(-6.44)***	-0.161(-2.25)**	-0.017(-0.73)	588
US	GMM	-0.002(-2.88)***	0.051(13.74)***	-0.009(-0.06)	248

CHAPTER 5

Bank Performance III: Its Externalities to the Industry and Economy

5.1. Introduction

The performance of banks shall be at not only on the basis of its growth but also grow at what costs or benefits to uses of bank services. This is because the externalities of bank performance to non-financial industries and so the economy in particularly important and significant. In existing literature, there is substantial evidence of a positive effect of a banking sector development on the long-run output growth of an economy. However, arguments from previous studies are unclear about whether the competition and risk associated with banking sector activities create positive or negative externalities to the rest of an economy. Against this background, this chapter attempts to add its argument to the studies of the issue by investigating how banking competition and stability affect the growth and market structure of the manufacturing sectors.

This chapter contributes a new dimension of analysis that investigates the impact of bank market competition and stability on the growth and structure of nonfinancial industries. One important policy objective which has received much attention in recent years is competition in the financial sector. It is argued that competition improves overall economic performance (Claessens and Laeven, 2005; Cetorelli and Strahan, 2006; Maudos and Fernandez de Guevara, 2006; and Bertrand et al, 2007). However, the existing empirical studies usually use market structural indicators, such as concentration ratios, to gauge a degree of competition, and as a result, the structural measures have failed in identifying the bank competition (Carbo et al. 2009). This motives the study to take a different approach to estimate the relationship between bank competition and economic growth.

Current literature prevalently argues that services providing by a financial sector have a positive influence on economic growth (e.g. Schumpter, 1991). The argument is basically that financial development facilitates the allocation of capital

to less risky projects through revealing more information, and hence the risk of loss through moral hazard and adverse selection decreases substantially.

However, the development can only be sustainable through a competitive process. This leads us to explore an issue on bank competition and its role in stimulating economic growth. On one hand, as we know, bank service efficiency, products quality, and business innovation are all affected by competition. Furthermore, according to both theoretical and empirical studies, there is a significant impact of a banking market structure on the process of capital accumulation, and in turn, on growth. Competition in the banking sector can also affect the access of firms to external financing (see Vives 2001 for a review). On the other hand, it is argued that a stable banking system is a prerequisite for sustainable economic growth. An unstable banking system is prone to booms and busts which can destabilize the real economy. Although the link between competition and stability has been well recognized in theoretical and empirical research (see Allen and Gale 2004 for a review), to the best of our knowledge, a few of studies analyse the impact of bank competition and stability on economic growth. In addition, the ongoing financial crisis at the time of writing motivates us to examine how bank stability affects the growth and competition of nonfinancial industries.

From an empirical perspective, studies on bank competition in relation to economic growth are very limited. As a result, there are some contraventions about the role of bank competition in stimulating growth of an economy. On one hand, more market power (less competition) may relax external financing constraints on firms, as banks with more market power have more incentive to invest in relationship lending with borrowers, facilitating the availability of credit, and hence promoting economic growth (Mayer, 1988 and 1990; Peterson and Rajan 1995; Dell'Ariccia and Marquez, 2004). Boot (2000), for instance, argues that in an uncompetitive banking system, firms have greater access to credit in the long-term, although they may run the risk of paying more interest. On the other hand, when banking systems are less competitive, borrowers are less inclined to use bank service due to high costs, and hence demand for external finance will be lowered. It is expected that services provided by uncompetitive systems can be more costly and low quality, which lowers the effective demand and thus dampens economic growth. Difficulties for firms to access to bank finance can slow down their business development and so

economic growth. Welfare theory also suggests that inefficiencies, arising from a departure from perfect competition, increase credit constraints on firms, thus hindering growth (Pagano, 1993). To summarize, the influence of banking competition (or concentration) on the access of firms to external finance is unclear, receiving lack of support of empirical evidence.

Despite the abundant literature devoted to both sides of this debate, there are hardly any a few studies that offer convincing empirical evidence from broad-scope cross-country empirical work on the relationship between banking competition and economic growth. Among these few studies, Claessens and Laeven (2005) and Maudos and Fernandez de Guevara (2006) attempted to investigate directly the effect of bank competition on industry growth. Particularly Claessens and Laeven (2005) examine the influence of banking competition on economic growth, using the well-known Panzar and Rosse H-statistic as an indicator of market power. They find that sectors heavily dependent on bank financing grow faster in countries where there is rigid banking competition. This result conflicts with the theory that market power facilitates access to finance. By contrast, Maudos and Fernandez de Guevara (2006) analyse the effect of banking competition on economic growth using the H-statistics, Lerner index and concentration ratio as proxies for the intensity of competition. With a sample of data from 53 sectors in 21 countries over the period of 1993-2003, they find that the exercise of market power enhances economic growth. This result confirms the relationship lending theory, implying that bank competition may have no impact on the availability of finance for firms. The views from these two widely-cited studies are opposite about bank competition for growth. This calls for further study on the issue.

In attempt to find further empirical evidence on how bank competition is related to growth, this chapter has two distinctions from the existing studies. Firstly, in order to assess the effect of banking competition and stability on industrial growth, we take a new approach to measure a degree of competition in addition to the pricing-based approach such as the H-statistics and concentration ratios. Claessens and Laeven (2005) emphasize that the competitiveness of an industry cannot be measured by traditional indicators such as concentration ratios, regulation or ownership status. Hence, we extend the existing approach by including a competitive-process-based approach, called efficiency competition developed by

Hay and Liu (1997), which captures the reallocation of market share to more efficient banks from their inefficient counterparts, to gauge the state of degree of bank competition. This new competitive-process-based approach is a good alternative to the pricing-power-based approach to measure competition such as to the H-statistic, Lerner index and traditional measures of concentration that are prevalently employed by existing studies in assessing competition impact. Secondly, we use the Z-score as a measure of overall bank stability and assess whether stable banking systems can contribute to economic growth.

Regarding the importance of financial system stability for sectoral growth, we discuss at least two channels through which more stable banking systems do indeed enhance economic growth. The first channel is the amount of credit available for externally dependent firms during the financial crisis. It is obvious that financial markets, in general, and banking systems specifically, have greater incentives to finance more nonfinancial firms during a period of financial stability than in a crisis. The second and more important channel is that firms have fewer incentives to enter into lending relationships with banks if they suspect that banks are unstable. This is because firms are then afraid that their banks may be about to go bankrupt and hence, finding alternative banks becomes more difficult, or at least takes time. Thus, during the period in which banking systems are more stable, more financially dependent firms establish lending relationships with banks, enhancing their access to external finance, and consequently increasing economic growth. One might, however, argue that individual banks facing more risk are under greater pressure to finance profitable projects (especially older firms) than risky ones (especially young and unknown firms) to recover, and this helps the older projects grow faster and leads to concentrated markets. Similarly, risky projects are likely to be financed during a stable period, in which banks compete intensely with one another and are under pressure to finance more firms. Thus, in this study, we explore empirically how the growth of nonfinancial firms responds to banking stability.

Apart from economic growth, we also test the effect of bank competition and stability on the market structure of nonfinancial sectors. This is also an important issue, because the recent wave of merger and acquisitions, especially in developed countries, has reduced the number of banks. This process may affect the structure of manufacturing sectors. In this study, we test whether competition in the banking

sector fosters the entry of new firms and hence maintains an unconcentrated industrial market structure, or instead, competition directs the lending relationship towards older and larger firms, and hence causes the manufacturing sectors to be more concentrated. The theory offers two opposing views. One the one hand, a more concentrated banking system may limit the access of financially dependent firms or entry incumbent to external financing, such as bank credit, and if concentration means more favourable relationships for older firms, then more concentration in the banking sector contributes to the growth of average firm size. One the other hand, as Peterson and Rajan (1995) argue, if banks have more market power, young and unknown firms have easier access to credit. In this scenario, a more concentrated banking system reduces average firm size. Thus, the effect of bank competition on industry market structure is theoretically ambiguous.

The only empirical study investigating the role of banking market concentration in affecting the market structure of nonfinancial industries is Cetorelli (2004). Using data for 29 OECD countries, Cetorelli finds that more concentration in the banking system is positively associated with average firm size. Borrowing from his work, we contribute to this strand of literature by testing the effect of competition and stability in the banking sector on the structure of nonfinancial industries. This is important because firstly, recent studies (e.g. Carbo et al, 2009) have emphasized that the traditional measures of market concentration are not a good indicator of the degree of competition, and secondly, the real effect of financial instability on the market structure of industrial sectors has not received much attention by researchers. Furthermore, having a rich dataset that covers all developed and emerging economies over the recent years also enables us to further examine the robustness of findings derived by Cetorelli.

One method of clarifying the theoretically unclear relationship between banking performance (competition and stability) and its externalities to bank services users is to examine how the state of competition and degree of stability influence the rate of growth and market structure of firms that vary in their dependence on external financing. This is an important characteristic of nonfinancial industries that may be affected by the degree of banking performance, and hence establishes the channel through which banking system influences economic growth. By using the empirical method developed by Rajan and Zingales (1998), we test the importance of banking

market competition and stability for growth. Rajan and Zingales make an innovative contribution to the field by investigating the relationship between financial development and growth in value added of industry sectors that vary in external financial dependence. They develop a new method by introducing an interaction term between the degree of dependence of each industrial sector on external finance and the degree of financial development. To construct a measure of the dependence on external finance, they assess the differences between industrial sectors in terms of technology-specific factors. For example, chemical products that need more R&D investment seem to depend more on external finance than Tobacco. This method has been adopted in a number of ways to test the impact on industrial growth of banking system concentration (Cetorelli and Gambera, 2001), the strength of property rights (Claessens and Laeven, 2003), the development of trade finance (Fisman and Love, 2004), the degree of competition or market power (Cetorelli, 2004; Claessens and Laeven, 2005) and banking regulation (Utrero-Gonzalez, 2007). This chapter adopts this methodology to explore the effect of competition and bank soundness on the growth and structure of nonfinancial industries.

Using data for some 5850 banks and 23 industrial sectors in 48 emerging and advanced economies, we find robust empirical evidence that a more vigorously competitive and thus efficient banking sector allows financially dependent industries not only to grow faster but also to disconcentrate their market structure. Furthermore, the stability of the banking system is an essential for economic growth. When splitting the sample into emerging and advance economies, however, we find that such effects are noticeably different. Finally, the results are remarkably sensitive to alternative measure of bank competition, suggesting that a good measure of bank competition matters for implication of economic growth.

The reminder of this chapter is organized as follows. Section 5.2 contains the models used for hypothesis testing. In Section 5.3, we describe the data set and data descriptive statistics. The main empirical results regarding banking system competition and stability, and the impact on growth and market structure of manufacturing sectors are reported in Section 5.4. Section 5.5 contains some robustness tests, and finally, Section 5.6 concludes.

5.2. Methodology

This section discusses our empirical models to analyse the influence of bank competition and stability on the growth and market structure of nonfinancial industries. Particularly, we develop two similar models to test i) the effect of bank competition and stability on manufacturing industry growth, and ii) the effect of such competition and stability on the market structure of an industry.

Our reference model for analysing the effect of banking performance on industry growth is based on Cetorelli and Gamberra (2001), Claessens and Laeven (2005) and Cetorelli and Strahan (2006), who in turn adapt the framework from Rajan and Zingales (1998). In their specification, Rajan and Zingales (1998) focus on analysing the effect of financial development on growth, and test whether the sectors which rely more on external finance yield higher growth in economies with a higher level of financial development. In order to avoid some problems of identification that arise in the cross-country regressions which are observed in the literature on economic growth, Rajan and Zingales invented an innovative specification by introducing the interaction between an industry characteristic (external financial dependence) and a country characteristic (financial development). As noted by Maudos and Fernandez de Guevara (2006), this test allows us to examine whether ex-ante financial development facilitates firms' access to finance, and thus intensifies ex-post growth in the heavily financial-dependent sectors.

The introduction of the financial dependence variable interacting with the indicator of banking competition and/or stability allows us to examine whether the sectors with more demand to external finance grow faster in a country where more competition and/or stability appears in its banking system, or whether, on the contrary, a higher market power assists firms to have an easier access to finance. Thus, our baseline model for estimation is as follows:

$$\begin{aligned} Growt_{i,c} = {} & Constant + \beta_1 Sector\ Dummies_i + \beta_2 Country\ Dummies_c \\ & + \beta_3 Share\ in\ value\ added_{i,c} \\ & + \beta_4 External\ Dependence_i \times Banking\ Development_{\ c} \\ & + \beta_5 External\ Dependence_i \times Banking\ Competition_c \\ & + \beta_6 External\ Dependence_i \times Banking\ Stability_c + \varepsilon_{i,c} \end{aligned} \quad (1)$$

where subscripts i and c refer to industry i in country c, respectively. $Growth$ is the average (compounded) annual growth rate of value added of industry i in country c. $Banking\ Development$ is an indicator of development of the banking system in country c such as credit provided to private sector, $Banking\ Competition$ is a degree of banking competition in country c (i.e. an efficiency competition index or H-statistic or Lerner index), and $Banking\ Stability$ is the overall degree of banking stability (measured by the Z-index or non-performing loans) in country c. Our measure of growth is similar to one used by Rajan and Zingales (1998) and Cetorelli and Gambera (2001).

Also, $External\ Dependence$ is the external-financing dependence of an industry, which taken from Rajan and Zingales (1998), at two digit level by the classification of ISIC Rev.2. Rajan and Zingales calculated sector dependence for U.S. manufacturing industries in the 1980s, using data of publicly traded, relatively large firm in Standard and Poor's Compustat database. A firm's dependence on external finance is defined as capital expenditures minus cash flow from operations divided by capital expenditures. Rajan and Zingales assume that external financing ratio for each industry in the U.S constitutes a global benchmark of each sector's need for external financing. The point is that if bank performance has any impact on firm growth, this impact should be prominent in those sectors that heavily depend on external finance.

Finally, since sectors with large initial shares in the industry usually grow at a slower rate, we introduce the beginning-of-period sector share in value added ($Share\ in\ value\ added$) in order to capture the possible "convergence" effect at a sectoral level, and hence a negative β_3 could be expected. Guiso et al. (2004) argue that the inclusion of the initial share in total value added avoids the bias derived from the possible correlation between financial development and sector specialisation. The argument is that financial development can affect both the growth of a sector and the pattern of specialisation, so it incentivises the less financially developed countries to specialise in sectors that are less dependent on external finance. Moreover, by including the share of total manufacturing value added, we predict that sectors, which have grown considerably in their life cycle in the past, are unlikely to continue to grow at a high rate in the future (see also Rajan and Zingales, 1998; Cetorelli and

Gambera, 2001; and Cetorelli, 2004). The fixed effects ($Sector\ Dummies$ and $Country\ Dummies$) control any unobserved industry- or country-specific heterogeneity, and finally ε is the error term with normal distribution. We run several cross-section regressions on the basis of this baseline model.

Similarly, the second empirical model used to identify the effect of bank competition and stability on firm size (market structure) is as follows:

$$\begin{aligned} Average\ Firm\ Size_{i,c} &= Constant + \beta_1 Sector\ Dummies_i + \beta_2 Country\ Dummies_c \\ &+ \beta_3 Share\ in\ value\ added_{i,c} \\ &+ \beta_4 External\ Dependence_i \times Banking\ Development_{\ c} \\ &+ \beta_5 External\ Dependence_i \times Banking\ Competition_c \\ &+ \beta_6 External\ Dependence_i \times Banking\ Stability_c + \varepsilon_{i,c} \end{aligned} \quad (2)$$

The explained variable here is the average firm size which is calculated either as the ratio of value added to the number of firms in sector i of country c, or as the ratio of total employment to the number of firms in sector i of country c. We take the natural logarithm of these variables. Our measures of average firm size are similar to those used by Cetorelli (2004). Table 5-1 presents an overview of the main variables used in our empirical analysis together with their sources.

Measurement of bank efficiency competition and bank stability

Previous studies on the importance of banking competition to economic growth take market structure as a measurement of banking competition. However, in recent literature, it shows the limitation of such measure in indicating the intensity of banking competition. In this study, as discussed in Chapter 4, we measure a degree of competition on the basis of Hay and Liu (1997)'s approach as alternative measure of competition developed by Panzar and Rosse. The basic idea of Hay and Liu is that a firm with high efficiency grows more than those with less efficiency if market is competitive or market has a competitive process in selecting efficient firms to grow. In line with this idea, we simplify Hay and Liu's model in the context of bank business to measure efficiency competition. Our empirical estimation of bank

Table 5-1: Descriptive and definition of variables

Variable	Definition and source
Dependent variables	
Growth	Average (compounded) annual growth rate of value added in a particular sector in each country over 1993-2010. Source: UNIDO database, and own calculation.
Industry market structure	Average natural logarithm of ratio either value added or total employment and total number of establishments over 1993-2010. Source: UNIDO database, and own calculation.
Explanatory variables	
Share in value added	The value added of each sector as a percentage of the total value added of an economy at the initial year (1993). Source: UNIDO database, and own calculation.
Financial dependence	External financial dependence of U.S. firms by ISIC sector over the period 1980 to 1989. Source: Rajan and Zingales (1998).
Overall financial development	
Bank development	Credit provided to private sectors as a fraction of GDP. Source: IMF-IFC.
Market capitalization	Stock market capitalization to GDP. Source: World Bank-WDI.
Market activity	Stock market turnover ratio calculated as the total value of shares traded during the period divided by the average market capitalization for the period, as an indicator of market activity. Source: World Bank-WDI.
Competitiveness indicators	
5-firm concentration	A country-level indicator of bank concentration, measured by total of the 5 largest banks' share of assets in total assets of all banks in a country as concentration ratio Index. Source: BankScope and own calculation.
HHI index	A country-level indicator of bank concentration, measured by the Herfindahl–Hirschman Index of total assets, which is defined as the sum of the square of the market shares of all the banks. Source: BankScope and own calculation.
H-statistics	A country-lever indicator of bank competition based on model proposed by Panzar and Rosse. Specifically, we calculate the H-statistics as the sum of the elasticities of revenue with respect to input prices. Higher values indicating more competition in the banking sector. Source: own estimation using BankScope data.
Lerner Index	An indicator of bank competition, calculated as the mark-up of price over marginal costs, with higher values indicating less competition in the banking sector. Source: BankScope and own calculation.
Efficiency competition	A degree of bank-sector competition measured by the responsiveness of growth of bank market share to change of bank cost efficiency. Source: BankScope and own estimation on the basis of Hay and Liu (1997).
Banking stability	
Z-score	A measure of bank soundness calculated as return on assets plus capital ratio divided by volatility of return on assets. Source: BankScope and own calculation.
Non-performing loans	The ratio of non-performing loans to gross loans. Source: BankScope.
Regulatory variables	
Property rights	Measure of property rights, and ranges from 2 to 9. A higher score denotes greater protection of property. Source: Heritage Foundation.

Note: This table describes the variables collected for our study. The first column gives the name of variable as we use it; the second column describes and provides the source from which it was collected.

competition for each country using the simplified model of Hay and Liu are reported in Chapter 4. Furthermore, in order to test the robustness of previous studies' results that identify the intensity of bank competition, this chapter compares the relation of manufacturing industry growth to measure of bank competition from different theories, such as the H-statistics, Lerner index, and HHI. One expectation is that a

good or effective measure of bank competition shall contain information that can affect users of bank services.

Furthermore, in order to measure bank stability, we use the Z-score as discussed in Chapter 3. Thus, for empirical work we measure the Z-score as the sum of return on assets plus capital to asset ratio and then divide by standard deviation of return on assets. We calculate the volatility on a 3-year rolling window basis. As a result we will have a changing pattern of volatility which allows us to have σ_{ROAA} for each individual bank from 2003 to 2010. This procedure, however, affects the number of observation, i.e. we lose data from 2000 to 2002. It might be argued that a rolling window of three years may not be enough to capture deviation and that we could use more years in the calculations. However, to avoid losing further observations from early years which is important for our study we select just three years.

5.3. Data

In order to look at how bank competition and stability affect industrial development as a major objective of the study, we combine different sources of statistical information on variables related to banking market, bank business and nonfinancial industries. For bank-related variables, we need information to proxy the overall financial development of economies, as well as a level of competition, concentration and stability in the bank market of each country. And, for industry-related variables, it is necessary to acquire information on the growth and market structure of nonfinancial sectors as well as their financial dependence at a sectoral level for countries analysed.

The information on overall financial development is proxied through the variables most commonly used such as the private credit/GDP ratio, stock market capitalisation/GDP, and stock market turnover ratio (as a proxy of market activity). These variables are obtained directly from the *World Development Indicators* database published by the United Nations.

In the case of the measurement of banking competition, the information necessary for estimating the *H*-statistic, the Lerner index, the efficiency competition

and the indices of concentration of the banking markets are all from Chapter 4. To recapitulate, data taken from the *BankScope* database of the *Bureau van Dijk*. In total, the sample is formed by 23 emerging and 25 advanced countries, consisting of around 5850 banks over 2001-2010 of commercial, cooperative and savings banks[34]. In Chapter 4 we had 24 emerging countries but since the industry data for Taiwan is limited, we omit this country from the analysis. The ways of calculating the efficiency competition, the *H*-statistic and the Lerner index are discussed in a Chapter 4. Also, banking regulatory and institutional variables (such as activity restriction, fraction of entry denied, banking freedom, and property rights) are taken from Barth et al. (2001), Demirguc-Kunt et al. (2004) and the Heritage Foundation database.

Finally, the information needed to measure nonfinancial industry economic growth (our dependent variables) and a share of an industrial sector in total manufacturing output measured by value added is taken from *the UNIDO Database* (United Nations Database on Industrial Statistics) for 23 sectors (classified in ISIC rev.3) in each of 48 countries, and provides broad and homogeneous disaggregation of information for a large number of countries. The database contains information on value added, number of establishments, number of the employed, fixed capital formation, output, etc. for the period 1993-2007. The variable to be explained will be the average annual (or compounded) growth rate of real value added, and the natural log of ratio between either value added or number of employments and number of establishments for each sector in each country from 1993 to 2007. Finally, each country's degree of financial dependence is taken from Rajan and Zingales (1998) at three digit level by the classification of ISIC Rev.3, and converted into two digit levels.

Before proceeding, we should point out that our measures of bank performance (competition, concentration, stability, etc) are estimated over the period 2001-2010, a period for which more individual bank data are available from our database of BankScope. This period does not, however, overlap fully with the period for which we estimate the industry growth, 1993-2007. This ex post determination

[34] Our dataset includes only banks in BankScope and contain related information, so that the data set may not represent banking system as a whole in each country. However, since almost all large banks are included, the difference should be small.

does not constitute, however, an important issue. Firstly, the market structure of a banking sector, at a country level, does not vary noticeably over such a short period. For instance, by analysing the pattern of variability of the 5-firm concentration ratio over the period 2001-2010, we observed that the average change in concentration for countries under study over this period was less than 1% (0.97%). Or similarly, with the Herfindahl index (HHI), the average change was only -1.8%. Secondly, we use a robustness test and computed the industry variables for the period 2001-2007, the period which is corresponding to the period covered by our banking data, and we find consistent results. Finally, previous researchers also use different time span. For example, Cetorelli and Gambera (2001) use bank data for 1989-1996, while their industry data are for 1980-1990. Similarly, Cetorelli (2004) use bank data for 1990-1997, whereas their industry data are for 1980-1997. And, finally, Claessens and Laeven (2005) use bank-level data for 1994-2001, while their industry data are for 1980-1990 (for more discussion see Cetorelli and Gambera, 2001).

5.4. Descriptive Statistics of Data

Table 5-2 presents the summary statistics of the country-specific variables. The average (compounded) real growth rate of value added is 2.8%. The average firm size measured by natural log of respective ratio either values added or number of employments to number of establishments are approximately 14.1 and 3.7, (in antilog 1,329,083 and 40) respectively. The average sector requires some 36% of external financing for investment, while the figures for only young or old firms are 3.8% and 73.4%, respectively. Overall bank development measured as the ratio of domestic credit in private sector to GDP is on average some 89% but with large variations across countries, from a low of 14% to a high of 190%.

Furthermore, in Appendix, Table AP 5-1 presents banking market structure variables including concentration, competition and stability by individual country (taken from Chapter 4) and Table AP 5-2 reports a correlation among the main variables.

Table 5-2: Summary statistics

	Mean	Median	Max.	Min.	Sta. Dev.	Obs.
Industry variables						
Industry growth (avaerage compounded)	0.028	0.025	0.248	-0.154	0.060	928
Firm's size (log of value added to no. of establishment)	14.064	13.924	19.894	9.129	1.589	1046
Firm's size (log no. of employment to no. of establishment)	3.747	3.686	7.245	-0.420	1.219	1044
Industry's share in total industryvalue added	0.045	0.033	0.447	0.000	0.047	928
External finance dependence (all firms)	0.358	0.240	1.490	-0.450	0.414	23
External finance dependence (mature firms)	0.038	0.100	0.390	-0.950	0.270	23
External finance dependence (young firms)	0.734	0.715	2.060	-0.440	0.506	23
Financial development variables						
Domestic credit to private sector/GDP	89.359	87.906	190.433	13.797	52.347	48
Bank credit/GDP	106.220	104.205	308.514	19.421	58.169	48
Stock market capitalization/GDP	75.007	63.514	250.058	6.871	49.162	48
Stock market turnover ratio	73.346	64.077	240.705	0.754	53.602	48
Banking variables						
Concentration (5-firm) ratio (%)	66.526	68.684	96.929	21.629	18.246	48
Concentration (HHI) ratio (%)	2387	1827	7311	387	1633	48
Competition (H-statistics)	0.610	0.620	1.006	0.009	0.175	48
Competition (Lerner index)(%)	26.948	25.973	49.424	7.489	7.548	48
Efficiency competition (%)	4.033	2.000	19.700	0.200	4.273	48
Non-performing loans to total Loans (%)	5.760	4.786	25.936	0.245	5.006	48
Z-index	6.461	5.642	16.806	2.437	2.598	48
Institutional variable						
Property rights	6.708	7.000	9.000	2.857	2.106	48

Note: This table reports the summary statistics of the main regression variables. Definitions and data sources of the variables are in Table 1. Source: BankScope (Bureau Van Dijk), UNIDO Database, World Bank Database, Barth et al. (2001), Demirguc-Kunt et al. Heritage Foundation, and estimation by this study.

Finally, as a first step of analysing the effect of bank competition and stability on growth and market structure of nonfinancial industries, we plot the estimates of bank competition and stability on industry growth and average firm size. We present four graphs. Figures 5-1 plot each county's bank competition and stability to its industry growth measured by the average (compounded) growth rate of value added. Although it seems not all countries that fit the pattern, the figure reveals a clearly positive association between the financial system competition (left-hand graph) and stability (right-hand graph) and the growth rate of industrial sectors. Furthermore, Figures 5-2 plot the intensity of bank competition and stability to average firm size measured by the natural log of ratio of number of employment to number of establishments. Again, although there are few countries that do not fit the pattern, we find a strong and a moderate negative association between banking competition (left-hand graph) and stability (right-hand graph) and the average firm size respectively. Next section explores these relationships in more details.

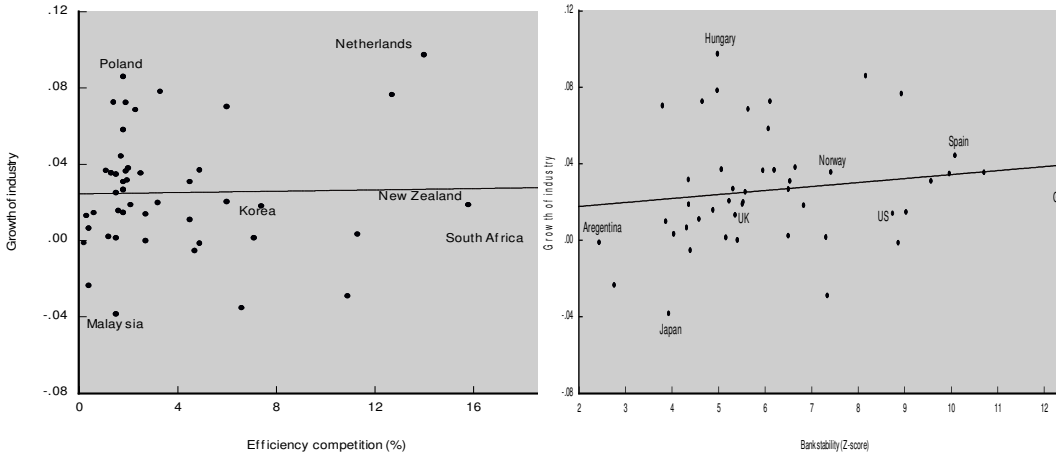


Figure 5-1: Bank competition and stability versus industry growth. The figures plot country-specific estimate of the competition (left-hand side graph) and soundness (right-hand side graph) of banking sector for 48 emerging and advanced countries over 2001-2010 with the data on the average (compounded) growth rate of value added over 1993-2007. Bank competition (efficiency competition) captures the reallocation of market share to more efficient banks from their inefficient counterparts. Bank soundness is measured on a 3-year window of Z-score.

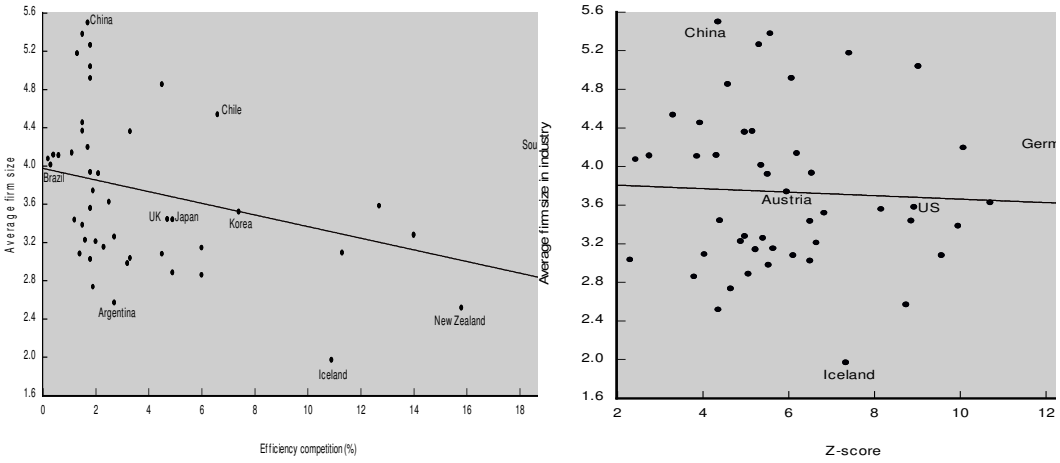


Figure 5-2: Bank competition and stability versus average firm size. The figures plot our estimation of intensity of banking competition (left-hand side graph) and soundness (right-hand side graph) in each of 48 emerging and advanced countries over 2001-2010 versus the average firm size of industrial sectors over 1993-2007. Bank competition (efficiency competition) captures the reallocation of market share to more efficient banks from their inefficient counterparts. Bank soundness is measured on a 3-year window of Z-score. Average firm size is measured as the natural log of ratio of employment to establishments, averages over both sector and country.

5.5. Empirical results

This chapter tests the importance of banking competition and stability for the growth and market structure of nonfinancial industries, by control of the need of external finance, as proposed by Rajan and Zingales (1998). This is similar to the approach of King and Levine (1993a), Levine and Zervos (1998), Cetorelli and Gambera (2001) and Cetorelli and (2004). Specifically, we test i) whether more competition or a more stable banking sector can lead nonfinancial industries to grow more or less, and ii) whether competition or stability in the banking sector can affect the market structure of an industry.

Before reporting the results, we shall discuss two issues. The first is that in most of existing studies that analyse the effect of banking market structure on economic growth, the researchers include both a proxy for overall financial development and a proxy for banking market concentration as a measure of competition at a given time (Cetorelli and Gambera, 2001; Claessens and Laeven, 2005; Maudos and Fernandez de Gambera, 2006; among others). On this basis, we include one financial development indicator in our model. Specifically, we select the $Banking\ development$ variable which was found in the basic regressions (not reported), as an important indicator explaining industry growth. It is measured by the ratio of domestic credit in the private sector to GDP and is expected to have a positive effect on growth and a negative effect on industrial sectors market structure. This estimation also allows us to check whether our findings regarding the impact of bank competition and stability on economic growth also apply in the presence of an indicator of overall financial development. If the coefficients of the variables of interest (competition and stability) become insignificant, we can interpret it as evidence that the level of overall financial development is dominant factor underlying the level of bank competition and stability.

The second issue is that although we control country specific effect by using country dummies, there may still be factors other than financial sector development that drive growth. For example, some institutional variables may correlate with our competitiveness and stability measures and consequently, the regression results may lead to the incorrect conclusion. Existing studies control for all forms of such (institutional) development that might correlate with competition through introducing two important variables into the model. The first variable is the quality of financial information and the second is the level of protection of property rights in the country. As Claessens and Laeven (2005) argue, these two factors have been shown to be closely correlated with developments in finance and growth. However, in our dataset, we do not have a proxy for the quality of accounting standards and hence, we only include an indicator of property rights. It has been reported by some studies (e.g. Back et al. 2003) that the degree to which property rights are perceived to be enforced in the country matter for financial sector development and growth.

We categorise our empirical results into two sections. The first tests whether competition and stability in the banking sector promote industry growth. In the

second section, we test the effect of banking sector competition and stability on the market structure of industrial sectors.

5.5.1. Bank competition, stability and industry growth

In this sub-section, we test the effect of bank competition and stability on the growth of nonfinancial industries. The effect is expected differently with different theories. On one hand, the expectation is that firms heavily dependent on external finance grow faster in countries where the banking sector is less competitive and riskier and in favour of more lending. On the other hand, growth should be faster in countries where the bank sector is more competitive and stable if market power lowers the credit availability for firms. We report the estimation of equation (1), where the dependent variable is the average (compounded) real growth rate over the period 1993-2007 of the value added of each sector in each country (as in Cetorelli and Gambera, 2001), with one observation per sector in each country. In the Appendix, Tables AP 5-3 and AP 5-4 show the pattern of growth across countries and across industrial sectors, respectively. Since it is cross-sectoral data, we use the ordinary least squares with industry and country dummies, as well as the initial share in value added as one of the explanatory variables. Also, all examined explanatory variables (except share in value added) are interacted with external financial dependence (FD). Furthermore, in order to harmonize all variables (except FD), we take the natural log of variables.

The main regression results are presented in Table 5-3. Again, we use OLS with industry dummies and country dummies (not reported) in all regressions. As expected, the industry's market share of total manufacturing in a specific country (*Share in value added*) has a negative sign in all regressions, suggesting a convergence trend in growth across countries if others remain unchanged.

Table 5-3: The effect of bank competition and stability on industry growth

	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	**-0.031*** **	**-0.033*** **	**-0.034*** **	**-0.031*** **	**-0.037** **	**-0.035*** **
	(-3.03)	**(-3.27)**	**(-3.36)**	**(-3.01)**	**(-2.03)**	**(-3.43)**
Financial development						
Bank development*FD	**0.046***	0.032	**0.058** **	**0.050***	-0.010	0.008
	(1.80)	(1.22)	**(2.15)**	**(1.83)**	(-0.34)	(0.23)
Bank concentration						
5-firm ratio*FD	**0.133** **			0.085		
	(2.07)			(1.28)		
Bank competition						
Efficiency competition*FD		**0.060*** **		**0.048** **		**0.048** **
		(2.97)		**(2.23)**		**(2.29)**
Bank stability						
Z-score*FD			**0.453** **	**0.358***		**0.353***
			(2.14)	**(1.67)**		**(1.65)**
Regulation						
Property rights*FD					**0.164***	0.121
					(1.94)	(1.63)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48
Observations	928	928	928	928	928	928
R-squared	0.45	0.45	0.45	0.46	0.45	0.46
S.E of regression	0.21	0.21	0.21	0.21	0.21	0.21
F-statistics	9.71***	9.82***	9.72***	9.65***	9.73***	9.67***

Notes: Dependent variable is the average (compounded) real growth of value added over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 1. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

We find that the industrial sectors relying on more external finance tend to develop faster in countries where there is more financial development, since the coefficient of the variable of financial dependence, interacted with banking development, is statistically positive in three out of six regressions (Columns 1, 3 and 4). A similar result is also observed by Cetorelli and Gambera (2001). Furthermore, the concentration effect on growth (Column 1) appears significant but the significance is not robust when efficiency competition is added into the model (Column 4), for given financial development ($Bank\ development$). This result supports the view that a more concentrated banking market promotes economic growth by facilitating sound lending relationships. However, the results contrast with the conventional view that a concentrated banking industry imposes a deadweight loss and reduces the supply of credit and hence obstructs economic growth. Cetorelli and Gambera (2001) find a negative effect of banking concentration on economic growth.

We also find that efficiency competition in banking sectors (Columns 2 and 4) is significantly affecting industrial growth. In particular, this effect is evident strongly from those industrial sectors relying more on external finance. So, why do we find a positive impact of both concentration and competition on industry growth? The market share of top 5 banks in each country indicates the concentration of

banking market structure. A process to develop such concentration can be through either rival competition or monopolistic competition. If the process is non-rivalry, then we can expect a negative relationship of bank-market concentration with industrial growth, otherwise if the process is rivalry a positive impact of the concentration should be expected. In our regressions, efficiency competition measures how rivalry banks are in taking their cost or quality advantages to compete market. The combination of both rivalry efficiency competition and the market concentration variables in the model shows how the concentration is evolved: a rivalry process that brings industries with a better access to bank finance and so stimulate their growth. Furthermore, financially dependent industries tend to grow faster in countries with more stable banking systems (Columns 3 and 4). This suggests that having a sound banking system is essential for promoting economic growth.

To address the abovementioned second issue, we look at the models with a proxy for property rights for given external financial dependence (Columns 5 and 6). In Column 5, we only include property rights without having a proxy for banking competition and stability, and find that by given financial dependence industries grow faster in countries with more clearly defined property rights. In Column 6, we extend our estimation with competition and stability, and we find that although the interactions of the property rights index with financial dependence itself is still positive but statistically insignificant. In contrast, the bank competition and stability remain statistically significant and positive. This result indicates that greater competition and/or more stable banking system dominates the bank effect on the growth of industries for given financial dependence. In line with this result, Claessens and Laeven (2005) also find the positive effect of banking competition on industry growth, and no evidence in supporting of a better quality of financial information or improved property rights that could affect growth.

5.5.2. Bank competition and stability, and market structure of industrial sectors

We next investigate whether a competitive and stable state of banking sector affects the market structure of nonfinancial industries. Specifically, we test whether competition and stability in banking systems can lower the average firm size by

facilitating industry entry. Bank competition and stability that means better access of industries to finance (especially for young firms) should be expected to facilitate entry. On the basis of this expectation, the easier entry shall help reduce average, in logarithm, size of firms in an industry. To test this hypothesis empirically, we estimate equation (2). The explained variable here is the average firm size, which implies a market structure of an industry – the lower average size of a firm the less concentrated market structure. Tables AP 5-5 and AP 5-6 in the Appendix show a pattern of an average firm size across countries and across industrial sectors, respectively.

The impact of bank competition and stability on the market structure of nonfinancial industrial sectors is identified by the term of interaction between a measure of competition (or stability) and a measure of industrial dependence on the external sources of finance. As Rajan and Zingales (1998) and Cetorelli (2004) argue, if banking market structure has any impact on firm size, this impact must be prominent on those sectors that are relatively more dependent on external finance. These estimations were obtained to verify the degree of consistency with those in Cetorelli (2001) and Cetorelli (2004). However, Cetorelli (2004) used a dataset with a time series dimension.

Table 5-4 presents the results of our estimation where in Panel A the dependent variable is the natural log of ratio of value added to number of establishment and in Panel B the dependent variable is the natural log of ratio of number of employment to number of establishment. The results indicate that the share of the value added variable is consistently positive and statistically significant in all regressions. This finding is not surprising, as expected by both theory and empirical observation from existing studies (e.g. Cetorelli, 2004). We also find that the overall bank development variable (*Financial development*) is consistently negative and statistically significant in most of twelve regressions. This is because the development will provide more credit is available to the private sector, facilitating new entrants to enter markets.

Table 5-4: The effect of bank competition and stability on average size of a firm in an industry

	Panel A: Average firm size measured in terms of value added					
	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	**0.392*** (17.45)**	**0.402*** (18.19)**	**0.403*** (18.23)**	**0.394*** (17.57)**	**0.422*** (19.10)**	**0.420*** (18.96)**
Financial development						
Bank development*FD	**-0.128* (-1.84)**	-0.075 (-1.07)	**-0.137* (-1.92)**	-0.110 (-1.50)	**-0.251*** (-2.63)**	**-0.234** (-2.37)**
Bank concentration						
5-firm ratio*FD	**-0.453*** (-2.68)**			**-0.312* (-1.73)**		
Bank competition						
Efficiency competition*FD		**-0.153*** (-2.92)**		**-0.110* (-1.94)**		**-0.086* (-1.79)**
Bank stability						
Z-score*FD			-0.884 (-1.50)	-0.526 (-0.88)		-0.267 (-0.45)
Regulation						
Property rights*FD					**-1.085*** (-5.48)**	**-0.993*** (-4.84)**
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48
Observations	1046	1046	1046	1046	1046	1046
R-squared	0.84	0.84	0.84	0.84	0.85	0.85
S.E of regression	0.65	0.65	0.65	0.65	0.65	0.65
F-statistics	72.42***	72.53***	71.98***	70.77***	74.41***	72.52***
	Panel B: Average firm size measured in terms of employment					
	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	**0.279*** (12.50)**	**0.289*** (13.11)**	**0.291*** (13.13)**	**0.281*** (12.61)**	**0.308*** (13.99)**	**0.307*** (13.91)**
Financial development						
Bank development*FD	-0.060 (-0.99)	-0.013 (-0.21)	-0.066 (-1.03)	-0.056 (-0.84)	**-0.291* (-1.69)**	-0.272 (-0.98)
Bank concentration						
5-firm ratio*FD	**-0.475*** (-3.21)**			**-0.376** (-2.38)**		
Bank competition						
Efficiency competition*FD		**-0.125*** (-2.73)**		**-0.077* (-1.76)**		**-0.061* (-1.71)**
Bank stability						
Z-score*FD			-0.756 (-1.45)	-0.553 (-1.06)		-0.301 (-0.58)
Regulation						
Property rights*FD					**-0.990*** (-5.71)**	**-0.918*** (-5.09)**
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48
Observations	1044	1044	1044	1044	1044	1044
R-squared	0.79	0.79	0.79	0.79	0.79	0.79
S.E of regression	0.57	0.57	0.58	0.57	0.57	0.57
F-statistics	50.13***	49.94***	49.59***	48.93***	51.57***	50.22***

Notes: Dependent variable is the natural logarithm of average either value added or employment per firm in each sector and in each country over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 1. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

The negative sign of the bank concentration in relation to the firm size is inconsistent with Cetorelli (2004), who finds a positive impact of bank concentration on average firm size. As we have explained, if the market has a competitive-process to have the industry evolving to a more concentrated structure, the negative sign implies this process, which is estimated which is consistent with the negative sign of the efficiency competition. Moreover, Cetorelli uses an interaction term between a

banking concentration indicator and the need for external finance of older firms only, rather than all firms as we do in this study. Thus, to compare our results with Cetorelli, we also use a term interacting competitiveness indicator and older firm external finance, and find that the results remain unchanged. We report this robustness test in the robustness section. Also, bank competition appears to have a negative and statistically significant effect on industry market structure (Columns 2, 4 and 6). This effect is irrespective of the choice of dependent variable, which suggests that for given external finance dependence, bank competition does matter for the average firm size of manufacturing industries and so their market structure.

Columns 3-4 present the estimation results where the interaction terms with proxies for bank market stability were included. We find that have a negative but statistically insignificant impact on industry market structure. This provides consistent and some evidence of bank stability affecting the market structure. Finally, the last two columns report additional regression results where we include a proxy for property rights. We find although the estimated coefficient for this variable is consistently negative and statistically significant across all specifications, the impact of bank competition and stability remains unchanged.

5.6. Robustness tests

In order to test the sensitivity of our results, we conduct a number of robustness tests in this section. We divide the robustness tests into two sub-sections. The first sub-section presents the robustness tests for the effect of bank competition and stability on industry growth (findings of Section 5.5.1), and the second sub-section reports the robustness tests for the effect of bank competition and stability on market structure of industries (findings of Section 5.5.2).

Robustness tests for industry growth

Instrumental variables

The first issue concerns the potential endogeneity of the market structure of the banking sector, although Claessens and Laeven (2005) state that by using the Rajan

and Zingales methodology the endogeneity or omitted variables concerns should not exist. Following previous studies, however, we resolve this potential problem by using instrumental variables (IV) estimation. We use three variables as instruments. The first variable determining a country's institutional characteristic is an indicator of the legal origin of a country. The next two variables, which proxy for market size, are total population and total GDP (measured in UD dollars) of the country. These types of instrumental variables are already used by a number of studies (e.g. Cetorelli and Gambera, 2001). In order to check the overidentifying restriction for each of the IV regression, we perform a Durbin-Wu-Hausman (DWH) F-test. The test verifies the null hypothesis that the introduction of IVs has no impact on the estimates of the regression's coefficients. If the null hypothesis is rejected, then the IVs are justified for estimation.

Table 5-5: Instrumental variables

	(1)	(2)	(3)	(4)
Share in value added	**-0.029*** **	**-0.031*** **	**-0.032*** **	**-0.035*** **
	(-2.73)	**(-3.03)**	**(-3.08)**	**(-3.38)**
Financial development				
Bank development*FD	0.042	0.030	**0.053***	-0.012
	(1.59)	(1.13)	**(1.93)**	(-0.35)
Bank concentration				
5-firm ratio*FD	**0.142****			
	(2.15)			
Bank competition				
Efficiency competition*FD		**0.060*****		
		(2.87)		
Bank stability				
Z-score*FD			**0.470****	
			(2.19)	
Regulation				
Property rights*FD				**0.161****
				(2.15)
Industry dummies	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes
Number of countries	46	46	46	46
Observations	893	893	893	893
R-squared	0.45	0.45	0.45	0.45
S.E of regression	0.22	0.22	0.22	0.22
Wald chi-square	678.37***	684.95***	452.15***	678.38***
Durbin-Wu-Hausman	6.07	5.45	19.61***	18.03***

Notes: Dependent variable is the average (compounded) real growth in sectoral value added over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 1. Regressions are estimated using instrumental variables and include industry and country dummies (not reported). As instrument for bank development, concentration, competition and stability we use the legal origin dummy, population and GDP indicator of the country. The Durbin-Wu-Hausman statistic tests the null hypothesis that the use of instrumental variables does not change the estimation outcome. Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

The results of this robustness test are reported in Table 5-5 (Columns 1-4). The instrumental variables regression results show evidence that industries grow faster for given development of financial systems (see Column 3). In the case of bank concentration the result (Column 1) confirms once again the positive effect of concentration. Focusing next on the competition and stability variables, we find

again that for given dependence on external finance industries grow faster in countries where their bank sector is more competitive and stable. These results are consistent with our previous findings, not affected by possible endogeneity problems, although the test on bank stability and regulation refutes the null hypothesis.

Sensitivity to initial financial development

It is argued that the influence of financial development and bank competition and stability on economic growth is not concurrent but future growth. Hence, we investigate the effect of initial financial development and banking performance on the growth of value added for the period under study. More specifically, the overall financial development indicator (*Bank development*) is obtained for year 1993; the variable of property right is taken from the related database for year 1995 as this is the earliest year that the data is available. In the case of bank efficiency competition, however, the value taken as reference is 2001-2005 because we need to estimate the efficiency competition over several years (we choose a period of 5 years) to have enough observation for each country, so it is impossible to estimate the model for only one year (initial year). Since we compute the Z-score based on a 3-year rolling window, the initial z-score is also available for 2003.

Table 5-6: Effect of bank competition and stability on industry growth (using initial financial development indicators)

	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	**-0.037*** (-3.18)**	**-0.028*** (-2.79)**	**-0.041* (-1.95)**	**-0.026** (-2.53)**	**-0.044*** (-3.72)**	**-0.027*** (-2.69)**
Financial development						
Bank development(1993)*FD	0.006 (0.20)	-0.003 (-0.13)	-0.025 (-0.84)	0.012 (0.45)	-0.051 (-1.55)	-0.019 (-0.62)
Bank concentration						
5-firm ratio(2001)*FD	**0.211*** (3.03)**			**0.145** (2.35)**		**0.147** (2.28)**
Bank competition						
Efficiency competition(2001-05)*FD		**0.016*** (3.91)**		**0.023** (2.60)**		**0.012* (1.79)**
Bank stability						
Z-score(2003)*FD			**0.144*** (2.91)**	**0.012** (2.36)**		0.003 (0.03)
Regulation						
Property rights(1995)*FD					**0.217*** (2.68)**	**0.201*** (2.88)**
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48
Observations	928	928	928	928	928	928
R-squared	0.40	0.45	0.40	0.45	0.40	0.46
S.E of regression	0.25	0.21	0.25	0.21	0.25	0.21
F-statistics	8.00***	9.63***	7.83***	9.63***	7.85***	9.55***

Notes: Dependent variable is the average (compounded) real growth in sectoral value added over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 1. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

For this objective, Table 5-6 shows the results. The results are similar to the main tests presented in Table 3; more competition and stability in banks facilitates growth of industry. The level of bank development measured by credit provided to private sector, however, becomes insignificant in all specifications.

Sensitivity to different sample period

As a subsequent robustness test, we use a different sample period. So far, the data from which we have estimated the dependent variable (growth in value added) covered the period 1993-2007 do not exactly coincide with the period 2001-2010 that we have estimated the banking system concentration, competition and stability measures. In the current test, we calculate the dependent variable for the period 2001-2007, and the share in value added for the initial year 2001. This provides for a large overlap with the period for which we estimate the performance of banking sector. Using the same regressions as before, the results are reported in Table 5-7. The results, again, confirm that competition and stability in the bank system matter for improved access to external financing. Also, it is evident that the coefficients of bank market concentration remain positive and significant.

Table 5-7: Effect of bank competition and stability on industry growth over the period 2001-2007

	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	**-0.036*** (-2.78)**	**-0.040*** (-3.06)**	**-0.041*** (-3.15)**	**-0.036*** (-2.76)**	**-0.044*** (-3.38)**	**-0.041*** (-3.18)**
Financial development						
Bank development*FD	0.050 (1.52)	0.030 (0.92)	**0.064* (1.86)**	0.055 (1.58)	-0.012 (-0.28)	0.009 (0.20)
Bank concentration						
5-firm ratio*FD	**0.187** (2.28)**			0.127 (1.49)		
Bank competition						
Efficiency competition*FD		**0.078*** (2.99)**		**0.060** (2.19)**		**0.064** (2.38)**
Bank stability						
Z-score*FD			**0.590** (2.17)**	**0.466* (1.70)**		**0.477* (1.74)**
Regulation						
Property rights*FD					**0.171* (1.87)**	0.127 (1.38)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48
Observations	928	928	928	928	928	928
R-squared	0.42	0.40	0.42	0.43	0.42	0.43
S.E of regression	0.27	0.27	0.27	0.27	0.27	0.27
F-statistics	8.68***	8.77***	8.67***	8.64***	8.64***	8.63***

Notes: Dependent variable is the average (compounded) real growth in sectoral value added over the period 2001-2007. Share in value added is the fraction of value added of each sector in each country in year 2001. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 1. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Sensitivity to different measures of financial sector development

As a subsequent robustness test, we investigate whether other measures of financial sector development affect the results. So far, we have used the credit provided to private sector (*Bank development*) as a measure of overall financial development. We now use its alternatives. Specifically, we use three other indicators of development in finance, which have already been reported by researchers (e.g. Claessens and Laeven, 2005) as important factors in determining economic growth. These variables are: i) credit provided by banking sector as a percentage of GDP; ii) stock market capitalization; and iii) stock market activity measured by stock turnover ratio. In addition, we also use the values of these three variables for initial year (1993). This practice allows us to test whether the orientation of the country's financial sector toward banking intermediation or capital markets influence results and whether the averages over the period, or rather initial development, is more important.

Table 5-8: Bank performance vs. overall financial development, and industry growth

	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	**-0.030*** (-3.01)**	**-0.028*** (-2.77)**	**-0.030*** (-3.03)**	**-0.027*** (-2.63)**	**-0.032*** (-3.13)**	**-0.034*** (-3.35)**
Average financial development						
Bank credit*FD	0.022 (0.67)					
Market capitalization*FD		-0.033 (-1.10)				
Market activity*FD			0.016 (0.79)			
Initial financial development						
Bank credit-1993*FD				-0.018 (-0.63)		
Market capitalization-1993*FD					0.008 (0.68)	
Market activity-1993*FD						**0.080*** (3.11)**
Bank competition						
Efficiency competition*FD	**0.059*** (2.89)**	**0.066*** (3.16)**	**0.061*** (3.00)**	**0.058*** (2.80)**	**0.070*** (3.36)**	**0.085*** (4.10)**
Bank stability						
Z-score*FD	0.281 (1.35)	0.212 (1.02)	0.297 (1.40)	0.234 (1.17)	**0.354* (1.72)**	**0.376* (1.86)**
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	47	42	41
Observations	928	928	928	914	818	800
R-squared	0.45	0.45	0.45	0.45	0.48	0.49
S.E of regression	0.21	0.21	0.21	0.21	0.21	0.20
F-statistics	9.69***	9.71***	9.69***	9.77***	10.36***	10.47***

Notes: Dependent variable is the average (compounded) real growth in sectoral value added over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 1. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Table 5-8 (Columns 1-6) presents these results. We find that the interaction between financial dependence and nearly all indicators of financial development

(averages or initial bank credit, stock market capitalization, or market activity – Columns 1-6) are all statistically insignificant, the exception is when the interaction between initial market activity (Column 6) and external financial dependence is positive and statistically significant. We emphasize that the interaction between our competitiveness measures and external financial dependence remain positive and statistically significant in all six regressions. Further, we observe a positive impact of bank stability on growth, although statistically significant for two out of six regressions (Columns 5 and 6). Overall, these results confirm that competition and stability in the banking sector indeed matter for economic growth through credit channel, regardless of whether we control for the development of the banking sectors or stock markets.

Sensitivity to different alternative measures of competition and stability

In order to check the sensitivity of our results on alternative measures of competition and stability, we consider various measures of bank competition and classify them into three groups. The first group is the variable that captures the structure of banking system i.e. the Herfindahl-Hirschman index. The second group is those indicators that show the pricing power on the bank market i.e. Panzar and Rosse H-statistics and the Lerner index. We estimate the Lerner index as price-marginal cost spread as percentage of price, where price marginal cost is estimated from a translog cost function. We obtain the H-statistic based on the estimation of a revenue function and calculate the sum of elasticities of revenue with respect to input prices. And, the third group is those variables that capture the effect of banking regulatory regimes i.e. banking freedom and activity restriction (according to the contestability theory). Finally, we use an alternative indicator of financial sector stability, i.e. non-performing loans to total loans as well.

Table 5-9 presents these results. We find that the interaction between an alternative indicators of competition (and stability) and external financial dependence is not statistically significant. The exception, however, is the HHI index that its effect on industry growth is positively and statistically significantly, which is consistent with what we have found of a positive relationship between market concentration measured by 5-firm concentration ratio and growth. Interestingly, the

estimated results show that the measure of competition from the pricing-power perspective does not contain much information that can affect users of bank sciences.

Table 5-9: Bank competition and growth: using alternative indicators of bank competition and stability

	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	**-0.035*** (-3.37)**	**-0.038*** (-3.72)**	**-0.037*** (-3.67)**	**-0.037*** (-3.63)**	**-0.035** (-2.27)**	**-0.037*** (-3.66)**
Financial development						
Bank development*FD	-0.005 (-0.15)	-0.010 (-0.28)	-0.011 (-0.32)	-0.009 (-0.26)	-0.012 (-0.24)	-0.008 (-0.24)
Different indicators of competition						
HHI index*FD	**0.051* (1.75)**					
Lerner index*FD		0.086 (1.32)				
H-statistics*FD			-0.016 (-0.55)			
Banking freedom*FD				0.011 (0.14)		
Bank activity restriction*FD					0.083 (1.09)	
Different indicator of stability						
Non-performing loans*FD						0.028 (1.05)
Regulation						
Property rights*FD	**0.144* (1.95)**	**0.170** (2.32)**	**0.168** (2.29)**	**0.159* (1.69)**	**0.183** (1.96)**	**0.203** (2.47)**
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	47	48
Observations	928	928	928	928	909	928
R-squared	0.45	0.45	0.45	0.45	0.45	0.45
S.E of regression	0.21	0.21	0.21	0.21	0.21	0.21
F-statistics	9.66***	9.63***	9.59***	9.58***	9.48***	9.61***

Notes: Dependent variable is the average (compounded) real growth in sectoral value added over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 1. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Sensitivity to different sub-sample countries (emerging vs. advanced economies)

The final test of robustness refers to the subsample analysed. In this subsection, we divide our dataset into two subsamples for emerging and advance economics separately. Here we investigate whether the previous results can be affected by the subsamples. It could be that the particular combination of greater financial development, more competition and more stable banking systems is more likely in countries with well economic development. Table 5-10 presents the estimation results with a subsample of countries. In Pane A, we include only our 23 emerging countries, while in Panel B we include only 25 advanced countries. We find overall that splitting sample indeed affects the results. More specifically, we observe that the concentration remains statistically significant and positive for emerging economies, but insignificant for advanced economies.

In terms of the effect of banking competition, consistently we find statistically significant effect for both emerging and advanced economies. Furthermore, the banking stability effect on growth appears to be positive only in advanced economies (Columns 3).

Table 5-10: The effect of bank competition and stability on growth: emerging versus advanced economies

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: emerging economies					
Share in value added	**-0.049*** (-2.79)**	**-0.052*** (-2.97)**	**-0.056*** (-3.21)**	**-0.047* (-1.93)**	**-0.057*** (-3.29)**	**-0.053*** (-3.02)**
Financial development						
Bank development*FD	0.006 (0.131)	0.004 (0.08)	0.008 (0.15)	-0.025 (-0.55)	-0.003 (-0.07)	-0.051 (-0.94)
Bank concentration						
5-firm ratio*FD	**0.276** (2.10)**			**0.220* (1.68)**		
Bank competition						
Efficiency competition*FD		**0.064* (1.78)**		**0.056* (1.67)**		**0.064* (1.74)**
Bank stability						
Z-score*FD			-0.243 (-0.69)	0.098 (1.02)		0.154 (1.46)
Regulation						
Property rights*FD					**0.193* (1.75)**	**0.201* (1.77)**
Number of countries	23	23	23	23	23	23
Observations	434	434	434	434	434	434
R-squared	0.44	0.43	0.43	0.44	0.43	0.44
S.E of regression	0.24	0.24	0.24	0.24	0.24	0.24
F-statistics	6.35***	6.31***	6.21***	6.16***	6.30***	6.18***
	Panel B: advanced economies					
Share in value added	**-0.026* (-1.88)**	**-0.030** (-2.26)**	**-0.024* (-1.81)**	**-0.026* (-1.90)**	**-0.030** (-2.21)**	**-0.029** (-2.17)**
Financial development						
Bank development*FD	0.106 (1.32)	**0.135* (1.76)**	0.086 (1.21)	**0.163** (1.99)**	0.036 (0.49)	0.107 (1.32)
Bank concentration						
5-firm ratio*FD	0.105 (1.39)			0.034 (0.44)		
Bank competition						
Efficiency competition*FD		**0.070*** (2.73)**		**0.055** (2.12)**		**0.045* (1.68)**
Bank stability						
Z-score*FD			**0.985*** (3.85)**	**0.193*** (3.22)**		**0.228*** (3.67)**
Regulation						
Property rights*FD					0.142 (0.92)	0.249 (1.51)
Number of countries	25	25	25	25	25	25
Observations	494	494	494	494	494	494
R-squared	0.49	0.50	0.51	0.51	0.49	0.51
S.E of regression	0.19	0.19	0.19	0.19	0.19	0.19
F-statistics	8.76***	8.99***	9.28***	9.04***	8.72***	9.13***
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variable is the average (compounded) real growth in sectoral value added over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 1. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Robustness tests for industry market structure

Sensitive to alternative indicators of competition and stability

In this section we test the impact of alternative indicators of bank competition and stability on market structure of industrial sectors. Specifically, we include three competitiveness indicators: i.e. HHI index, Lerner index, H-statistics and non-performing loans. Table 5-11 presents the estimation results, which is consistent with our claim that bank competition affects the structure of other industries. Furthermore, we find that non-performing loans has a positive impact on industry market structure. The non-performing loans are regarded as an alternative measure of bank stability, because the more non-performing loans the more risky banks are. This provides consistent and strong evidence of bank stability affecting the market structure.

Table 5-11: The effect of alternative indicators of bank competition and stability on average size of a firm in an industry

	Average firm size measured in terms of							
	Panel A: value added				**Panel B:** employment			
	(1)	(2)	(3)	(4)	(I)	(II)	(III)	(IV)
Share in value added	**0.398*** (17.81)**	**0.404*** (18.43)**	**0.403*** (18.29)**	**0.408*** (18.53)**	**0.285*** (12.81)**	**0.288*** (13.12)**	**0.288*** (13.07)**	**0.292*** (13.27)**
Financial development								
Bank development*FD	-0.106 (-1.52)	-0.086 (-1.24)	-0.100 (-1.45)	0.033 (0.42)	-0.036 (-0.57)	-0.020 (-0.32)	-0.031 (-0.50)	0.073 (1.04)
Bank concentration								
HHI index*FD	**-0.135* (-1.74)**				**-0.129* (-1.92)**			
Bank competition								
Lerner index*FD		**0.819*** (4.84)**				**0.557*** (3.75)**		
*H-statistic*FD*			**-0.280*** (-3.30)**				**-0.214*** (-2.86)**	
Bank stability								
*Non-performing loans*FD*				**0.259*** (4.10)**				**0.189*** (3.62)**
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48	48	48
Observations	1046	1046	1046	1046	1044	1044	1044	1044
R-squared	0.84	0.85	0.84	0.84	0.79	0.79	0.79	0.79
S.E of regression	0.65	0.65	0.65	0.65	0.58	0.57	0.58	0.57
F-statistics	72.05***	73.84***	72.74***	73.26***	49.70***	50.37***	49.99***	50.31***

Notes: Dependent variable is the natural logarithm of either value added or total employment by the total number of establishments in each sector in each country over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 1. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Sensitivity to old firm external dependence

One may argue that if more competition means more favourable lending conditions for older firms as these firms are more profitable, then we should expect that average

firm size in sectors where old firms still depend on external financing will be disproportionally larger, all else equal, in countries with more competition and/or stability in banking sectors. The opposite would be also true if instead bank competition originates better lending relationships with young firms. Cetorelli (2004) addresses this issue well in his study by interacting proxies of bank concentration and old firm external finance. Borrowing Cetorelli idea and taking the old firm external finance from Rajan and Zingales (1998), we attempt to test the effect of bank competition on average firm size of sectors where old firms are still in need of external finance.

Table 5-12: Effect of bank competition and stability on average size of old firms in an industry

	Average firm size measured in terms of					
	Panel A: value added			**Panel B:** employment		
	(1)	(2)	(3)	(I)	(II)	(III)
Share in value added	**0.406*** (18.47)**	**0.408*** (18.63)**	**0.408*** (18.58)**	**0.290*** (13.18)**	**0.293*** (13.31)**	**0.291*** (13.21)**
Financial development						
Bank development*FD(old firms)	**-0.351*** (-3.29)**	**-0.298*** (-2.77)**	**-0.375*** (-3.44)**	-0.123 (-1.27)	-0.073 (-0.76)	-0.123 (-1.24)
Bank concentration						
5-firm ratio*FD(old firms)	**-0.366* (-1.70)**			**-0.448* (-1.93)**		
Bank competition						
Efficiency competition*FD(old firms)		**-0.177** (-2.17)**			**-0.145** (-1.99)**	
Bank stability						
Z-score*FD(old firms)			-1.44 (-1.61)			-0.792 (-0.99)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48
Observations	1046	1046	1046	1044	1044	1044
R-squared	0.84	0.84	0.84	0.79	0.79	0.79
S.E of regression	0.65	0.65	0.65	0.58	0.58	0.58
F-statistics	72.60***	72.85***	72.66***	49.74***	49.76***	49.56***

Notes: Dependent variable is the natural logarithm of either value added or total employment by the total number of establishments in each sector in each country over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD (old firms) is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 1. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

The results in Table 5-12 are consistent with the argument suggesting that bank competition have no propensity to preserve relationships with their older clients, which creates a market in favour of growth of potential new incumbents or young firms.

Sensitivity to different sub-sample countries (emerging vs. advanced economies)

Is bank competition impact on other industrial structure persistent across different economies in the world? Table 5-13 presents the results of regression for developed

and emerging markets separately. The results overall indicate that our previous findings of the structural impact are hold only in emerging economies; i.e. average firm size is smaller in countries where the banking sector is more competitive and stable. While for advanced economies, we observe no effect of bank competition on industry market structure, and more surprisingly average firm size is larger when financial sectors are more stable.

Table 5-13: Effect of bank competition and stability on average firms size (emerging vs. advanced economies)

	Average firm size in terms of					
	value added			employment		
	(1)	(2)	(3)	(I)	(II)	(III)
	***Panel A** : emerging economies*					
Share in value added	**0.328*** (9.72)**	**0.371*** (10.91)**	**0.386*** (11.21)**	**0.209*** (6.08)**	**0.207*** (7.20)**	**0.218*** (7.54)**
Financial development						
Bank development*FD	**0.441*** (3.63)**	**0.452*** (3.57)**	**0.231* (1.70)**	**0.467*** (4.58)**	**0.474*** (4.48)**	**0.309*** (2.73)**
Bank concentration						
5-firm ratio*FD	**-2.131*** (-6.79)**			**-1.562*** (-5.89)**		
Bank competition						
Efficiency ompetition*FD		**-0.339*** (-3.83)**			**-0.252*** (-3.89)**	
Bank stability						
Z-score*FD			**-2.440*** (-2.61)**			**-1.821** (-2.32)**
Number of countries	23	23	23	23	23	23
Observations	501	501	501	500	500	500
R-squared	0.84	0.83	0.83	0.79	0.78	0.78
S.E of regression	0.68	0.70	0.70	0.57	0.58	0.59
F-statistics	51.12***	47.29***	46.34***	36.27***	34.07***	33.50***
	***Panel B:** advanced economies*					
Share in value added	**0.519*** (17.10)**	**0.506*** (16.98)**	**0.516*** (17.33)**	**0.401*** (14.15)**	**0.401*** (14.21)**	**0.403*** (14.35)**
Financial development						
Bank development*FD	0.042 (0.22)	-0.103 (-0.55)	-0.065 (-0.36)	0.014 (0.07)	-0.026 (-0.14)	0.031 (0.18)
Bank concentration						
5-firm ratio*FD	**0.380** (2.06)**			0.049 (0.29)		
Bank competition						
Efficiency competition*FD		0.004 (0.07)			-0.016 (-0.29)	
Bank stability						
Z-score*FD			**1.913*** (2.75)**			**1.210* (1.96)**
Number of countries	25	25	25	25	25	25
Observations	54	54	545	544	544	544
R-squared	0.88	0.88	0.88	0.81	0.81	0.81
S.E of regression	0.55	0.55	0.54	0.49	0.49	0.49
F-statistics	74.87***	74.14***	75.43***	42.91***	42.91***	43.31***
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variable is the natural logarithm of either value added or total employment by the total number of establishments in each sector in each country over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 1. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

5.7. Chapter summary

Using a large cross- countries data, we investigate the economic role of bank competition and stability. We find that external-financially dependent industries

grow faster in countries where there are more competitive and stable banking sectors. This relationship appears when the effects of overall banking sector development and the institutional aspect of property rights are also presented in estimation. This finding is robust to the possibility of an endogeneity problem, the initial level of financial development, and different sample periods. Apparently, our identified evidence does not support the view that market power facilitates access of industry to financing. Rather, it suggests that bank competition is an important element in promoting economic growth.

Furthermore, we find that sectors in which firms are in need of more external finance are disproportionately smaller if they are in countries with more competitive and stable banking sectors. This suggests that banks with market power may have incentives favouring lending relationships with older firms, which consequently lead industrial sectors become more concentrated, while competition in the banking sector facilitate access to finance for younger and entry firms, thus reducing the average firm size. The results are robust when controlling for older firms.

The impact of bank competition on industry growth is clearly evidenced in both developed and emerging economies. The competition creates favourable financial support in facilitating both new entrants to business and the growth of small firms for an economy. This explains why bank competition can affect the growth of an economy because bank competition favours small firms and business. From this aspect, the policy implication of this chapter is clear for small business and economic growth.

5.8 Appendix

Table AP 5-1: Mean values of bank concentration, competition and stability measures by country over 2001-2010 (emerging vs. advanced economies).

	Banking market structure and competition					Banking stability	
	5-firm conc.	HHI Index	H-statistic	Lerner index (%)	Efficiency compet. (%)	Non-perf. Loans (%)	Z-index
Emerging economies							
Argentina	52.20	870	0.554	26.57	2.70	14.01	2.44
Brazil	46.45	886	0.463	33.23	0.30	10.62	4.40
Chile	96.93	7311	0.715	24.71	6.60	1.04	5.53
China	73.81	1737	0.714	26.23	1.70	8.53	7.22
Colombia	59.94	1412	0.573	25.81	1.70	5.39	6.51
Czech Rep.	75.33	1699	0.618	32.83	1.60	6.65	6.11
Egypt	63.19	1637	0.343	46.41	1.30	25.94	5.41
Estonia	95.61	5654	0.525	28.89	1.50	3.23	4.36
Hungary	61.93	1536	0.553	33.33	1.20	3.90	4.99
India	44.57	1111	0.523	33.15	1.10	9.49	8.93
Indonesia	61.41	1127	0.585	28.61	1.80	6.96	6.84
Malaysia	36.97	971	0.595	28.11	1.50	10.04	8.87
Mexico	54.08	1687	0.645	28.76	1.50	4.62	4.65
Morocco	92.81	2982	0.129	54.81	0.40	6.93	10.71
Peru	85.20	3106	0.672	26.93	1.80	5.07	6.54
Philippines	70.40	3595	0.633	26.95	4.50	8.16	7.34
Poland	59.43	1119	0.701	17.90	6.00	21.61	5.64
Russia	58.55	1822	0.451	37.11	0.60	2.63	4.98
Slovak Rep.	77.46	1827	0.507	30.06	1.80	8.67	8.16
Slovenia	74.40	2206	0.692	23.72	4.90	7.15	4.04
South Africa	78.79	4228	0.828	17.82	19.70	9.01	6.65
Thailand	56.98	1028	0.294	30.64	1.50	11.99	5.23
Turkey	71.36	2312	0.599	30.87	2.10	8.50	5.96
Average	67.30	2255	0.561	30.15	2.95	8.70	6.15
Advanced economies							
Australia	79.28	4043	0.648	24.25	4.50	1.92	9.57
Austria	58.77	1516	0.688	29.63	1.90	1.92	5.52
Belgium	80.63	1585	0.862	19.69	6.00	3.29	5.16
Canada	68.68	1418	0.601	27.74	0.40	2.86	7.31
Denmark	77.43	2484	0.500	23.58	2.00	2.22	3.87
Finland	95.89	6019	0.692	21.46	11.30	0.60	5.06
France	53.12	1145	0.632	27.09	1.80	4.82	9.03
Germany	38.91	556	0.620	20.80	3.30	5.08	12.82
Greece	82.60	3114	0.715	19.15	2.30	7.39	3.80
Iceland	92.69	3942	0.576	27.90	10.90	3.53	4.59
Ireland	51.91	3121	0.702	24.81	1.80	0.89	6.08
Israel	89.19	2153	0.009	35.06	2.50	7.20	4.32
Italy	57.28	1259	0.749	27.75	1.90	4.70	5.58
Japan	38.90	591	0.737	25.16	4.90	9.83	3.93
Korea	50.51	2030	0.666	23.04	7.40	1.85	5.31
Luxembourg	38.72	571	0.750	16.92	12.70	2.35	6.20
Netherlands	70.63	2269	1.006	19.74	14.00	1.82	6.50
New Zealand	95.33	6940	0.791	11.48	15.80	0.24	9.96
Norway	78.39	3296	0.609	25.33	2.70	1.39	7.42
Portugal	84.40	3349	0.612	25.87	1.40	2.38	4.89
Spain	63.49	1879	0.399	28.42	1.80	1.08	10.09
Sweden	75.89	4371	0.578	28.61	3.30	1.34	4.36
Switzerland	77.72	4423	0.713	25.08	3.20	2.54	16.81
UK	54.73	1856	0.623	22.49	4.70	5.21	5.36
US	21.63	387	0.501	32.46	0.20	0.84	8.75
Average	67.07	2573	0.639	24.54	4.91	3.09	6.89

Table AP 5-2: Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)Industry growth									
(2)Average firm sizeI	-0.035								
(3)Average firm sizeII	0.092***	0.713***							
(4)Share in value added	-0.009	0.209***	0.178***						
(5)Financial dependence	0.082**	-0.078**	-0.074**	-0.159***					
(6)Bank development	-0.172***	0.208***	-0.168***	0.017	0.012				
(7)Concentration	0.060*	-0.182***	-0.135***	0.031	0.013	-0.153***			
(8)Competition	0.065**	-0.006	-0.168***	0.034	-0.006	0.267***	0.242***		
(9)Z-score	0.084***	-0.114***	-0.212***	-0.025	0.017	-0.180***	0.059*	-0.021	
(10)Property rights	-0.160***	0.174***	-0.329***	-0.006	0.042	0.657***	0.049	0.277***	-0.135***

Notes: This table reports the correlation matrix of the main regression variables. Industry growth is the average (compounded) real growth in sectoral value added. Average firm size I and II are the natural logarithm of either value added or total employment by the total number of establishments in each sector in each country. Share in value added is the fraction of value added of each sector in each country in year 1993. Financial dependence is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of other variables are in Table 1. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Table AP 5-3: Average (compunded) growth of value added across countries (emerging vs. advanced economies).

	Growth		Growth
Emerging economies		*Advanced economies*	
Argentina	-0.0015	Australia	0.0307
Brazil	-0.0056	Austria	0.0186
Chile	0.0197	Belgium	0.0011
China	0.1603	Canada	0.0012
Colombia	0.0264	Denmark	0.0096
Czech Rep.	0.0723	Finland	0.0368
Egypt	-0.0003	France	0.0144
Estonia	0.0185	Germany	0.0144
Hungary	0.0972	Greece	0.0700
India	0.0764	Iceland	0.0108
Indonesia	0.0179	Ireland	0.0580
Malaysia	0.0081	Israel	0.0063
Mexico	0.0723	Italy	0.0250
Morocco	0.0352	Japan	-0.0387
Peru	0.0307	Korea	0.0266
Philippines	-0.0294	Luxembourg	0.0365
Poland	0.0683	Netherlands	0.0019
Russia	0.0780	New Zealand	0.0345
Slovak Rep.	0.0858	Norway	0.0353
Slovenia	0.0031	Portugal	0.0155
South Africa	0.0378	Spain	0.0441
Thailand	0.0202	Sweden	0.0314
Turkey	0.0362	Switzerland	-0.0355
Average	0.0403	UK	0.0128
		US	0.0137
		Average	0.0190

Notes: The figures for firm growth are calculated as simple averages for each country across all industries over 1993-2007.

Table AP 5-4: Average (compounded) growth of value added across industries (emerging vs. advanced economies)

Isic	Sector	emerging	advanced
15	Basic metals	0.0361	0.0239
16	Chemicals and chemical products	0.0159	-0.0028
17	Coke,refined petroleum products	0.0024	-0.0194
18	Electrical machinery and apparatus	0.0141	-0.0364
19	Fabricated metal products	-0.0001	-0.0262
20	Food and beverages	0.0529	0.0310
21	Furniture; manufacturing n.e.c.	0.0217	-0.0085
22	Leather, leather products and foot.	0.0362	0.0273
23	Machinery and equipment n.e.c.	0.0552	0.0588
24	Medical, precision and optical inst.	0.0388	0.0335
25	Motor vehicles, trailers, etc.	0.0453	0.0250
26	Non-metallic mineral products	0.0347	0.0254
27	Office, accounting and computing	0.0593	0.0205
28	Other transport equipment	0.0461	0.0420
29	Paper and paper products	0.0311	0.0258
30	Printing and publishing	0.0205	-0.0187
31	Radio,television and commun.	0.0178	0.0048
32	Recycling	0.0437	0.0294
33	Rubber and plastics products	0.0575	0.0593
34	Textiles	0.0415	0.0216
35	Tobacco products	0.0623	0.0329
36	Wearing apparel, fur	0.0652	0.0183
37	Wood products (excl. furniture)	0.0854	0.1114

Notes: The figures for firm growth are calculated as simple averages for each industry across all countries over 1993-2007.

Table AP 5-5: Average firm size across countries (emerging vs. advanced economies).

	ln(value added/ establisments)	ln(employment/ establisments)		ln(value added/ establisments)	ln(employment/ establisments)
Emerging economies			*Advanced economies*		
Argentina	13.0926	2.5649	Australia	13.8673	3.0748
Brazil	14.2997	4.0095	Austria	14.9068	3.7365
Chile	15.2133	4.5320	Belgium	14.4031	3.1381
China	14.3366	5.4955	Canada	15.3005	4.1100
Colombia	14.3206	4.1917	Denmark	14.2034	3.2051
Czech Rep.	12.3088	3.2204	Finland	14.1501	3.0860
Egypt	13.6256	5.1729	France	14.5447	3.5541
Estonia	12.7212	3.3806	Germany	15.1114	4.3555
Hungary	13.1038	3.4316	Greece	13.7871	3.1473
India	12.6239	4.1333	Iceland	12.6335	1.9650
Indonesia	14.1383	5.2593	Ireland	15.1298	3.9298
Malaysia	14.2651	4.4493	Israel	14.2278	3.6215
Mexico	15.6091	5.3758	Italy	13.6479	2.7297
Morocco	13.6435	4.1123	Japan	15.0237	3.4334
Peru	14.2768	4.9127	Korea	14.6598	3.5156
Philippines	14.2991	4.8483	Luxembourg	14.6073	3.5774
Poland	12.6314	2.8544	Netherlands	14.4978	3.2731
Russia	12.8178	4.1066	New Zealand	13.5543	2.5117
Slovak Rep.	14.0370	5.0359	Norway	14.6348	3.2547
Slovenia	13.1901	2.8816	Portugal	13.3098	3.0764
South Africa	13.6554	4.1059	Spain	13.8169	3.0201
Thailand	13.7794	4.3622	Sweden	14.1252	3.0312
Turkey	14.3480	3.9177	Switzerland	14.1766	2.9758
Average	13.7538	4.1893	UK	14.4581	3.4369
			US	15.8941	4.0708
			Average	14.3469	3.3132

Notes: The figures for firm size are calculated as simple averages for each country across all industries over 1993-2007.

Table AP 5-6: Average firm size across industries (emerging vs. advanced economies)

Isic	Sector	ln(value added/ establisments)		ln(employment/ establisments)	
		emerging	advanced	emerging	advanced
15	Basic metals	13.6571	14.2212	4.0762	3.2552
16	Chemicals and chemical products	16.4653	17.7101	5.6752	5.2336
17	Coke,refined petroleum products	13.3371	13.6278	4.4012	2.9523
18	Electrical machinery and apparatus	12.5968	12.6933	3.9360	2.2974
19	Fabricated metal products	12.6838	13.0958	3.9945	2.7494
20	Food and beverages	12.3521	13.0941	3.3873	2.3365
21	Furniture; manufacturing n.e.c.	14.1989	15.2075	4.3692	4.0063
22	Leather, leather products and foot.	12.9886	13.5260	3.3889	2.6130
23	Machinery and equipment n.e.c.	16.7050	16.9162	5.3815	4.4898
24	Medical, precision and optical inst.	14.7125	15.7191	4.5065	4.0845
25	Motor vehicles, trailers, etc.	13.3845	14.3646	3.9281	3.4325
26	Non-metallic mineral products	13.6353	14.0763	3.9666	3.0253
27	Office, accounting and computing	14.9723	15.4979	4.9419	4.3097
28	Other transport equipment	12.7606	13.3862	3.4705	2.5725
29	Paper and paper products	13.3930	14.0770	4.0075	3.2050
30	Printing and publishing	14.0410	14.2856	4.2008	3.2553
31	Radio,television and commun.	13.9088	14.3519	4.3892	3.4835
32	Recycling	14.3654	15.2370	4.5892	4.0851
33	Rubber and plastics products	13.2087	13.9566	3.9528	2.9253
34	Textiles	14.7252	15.0444	4.8284	4.0148
35	Tobacco products	13.9249	14.7947	4.4442	3.7953
36	Wearing apparel, fur	12.5031	12.8944	3.5616	2.2888
37	Wood products (excl. furniture)	11.9982	13.3798	3.1121	2.3024

Notes: The figures for firm size are calculated as simple averages for each sector across all countries over 1993-2007.

CHAPTER 6

Conclusion

6.1. Summary of findings

A lot of concerns have been raised after the recent global financial crisis. One major concern is the sustainability of financial markets and their externalities to an economy and industry. It is argued that a sustainable banking sector requires a profitable and competitive banking system. Furthermore, a sustainable banking system can contribute to economic growth by financing non-financial industries. The banking sector can play a crucial role in promoting sustainable development. Hence, the thesis assessed bank performance from two aspects: growth sustainability and the externality of fostering the growth of non-financial industries. With regard to sustainability, the study considered two issues. One is financial performance with a focus on understanding what determines profitability and stability, particularly the role of market structure in generating profits. The second aspect is that of exploring what drives bank growth. Do banks grow through a competitive process or a non-competitive one? In the context of externality, the thesis investigated whether and how bank competition and stability contribute to the growth of non-financial industries. The main findings are as follow.

This thesis started with empirically investigating the effects of market structure, by controlling bank-specific characteristics, overall financial structure and macroeconomic environment, on the profitability and stability of banks using sample data of 1929 banks from 40 emerging and advanced economies over time period 1999-2008. By incorporating the traditional SCP and the RMP hypotheses, we assessed the extent to which the relatively high bank returns in emerging banking systems can be attributed to non-competitive market conditions and/or pricing behaviour. Our results show clearly that there are large differences in profitability among the banks in our sample and that a significant amount of this variation can be explained by the factors included in our analysis. We analysed the market structure of emerging economies in considerable detail and thus contributed to the existing literature. The question was that shall we encourage our banks to operate in a more

concentrated market or not? This question was particularly investigated in our study. Our results indicate that banking systems in developed countries are generally biased toward the RMP hypothesis, whereas we find evidence to support the hypothesis in advanced economy banking systems. The effect of market concentration on profitability is either insignificant on advanced banking market or the unexpected negative impact on emerging banks. Regarding bank stability, concentration is negatively associated with bank soundness in advanced economies and, to lesser degree, in emerging economies. These results suggest that banks operated in a concentrated market tend to be less profitable and more vulnerable to financial instability, suggesting the benefits of an unconcentrated market for both bank's stakeholders and society. Finally, other interesting results of this chapter are that we observe that higher interest rate spreads increase bank returns, but for banks with market power operated in emerging economies this effect significantly weakens or can even be reversed. Off-balance-sheet activities appear to present banks in advanced economies with a trade-off between risk and returns. The effects of bank age, bank ownership status, and regulation on risk and returns depend on market power. Finally, more concentrated banking systems in advanced economies may be more vulnerable to financial instability.

The thesis then continued by applying three non-structural NEIO techniques (H-statistics, the Lerner index and efficiency competition) to assess, in the first stage, the degree of competition and, in the second stage, the consistency between these competitiveness indicators and three structural competition measures (return on average assets, net interest margin and HHI index) in ranking banking competition across countries. The findings of the first stage are as follows: i) the Panzar and Rosse H-statistic indicates that the competitive conduct of banks can be characterized as monopolistic competition, ii) an evaluation of the Lerner index indicated deterioration in competitive conditions in banking sectors during 2001-2010, and iii) the efficiency competition analyses suggests that the degree of banking competition varies considerably across countries. Furthermore, all three competitiveness measures provide evidence that emerging banking systems are less competitive than their counterparts in advanced economies. Furthermore, the findings of the second stage which checked the consistency of competition

assessment between non-structural approaches and structural ones show a difference and inconsistency of such competition measures in ranking across countries.

Finally, the thesis investigated the economic role of bank competition and stability. The study explored whether recent changes in bank performance (especially in terms of competition and stability) affect the growth and formation of nonfinancial industries. Empirical evidence was found from around 6000 banks and 23 industrial sectors in 48 emerging and advanced economies. The study provided robust evidence that a more vigorously competitive and thus efficient banking sector allows financially dependent industries to grow faster, and to maintain an unconcentrated market structure. Furthermore, the stability of the banking system is an essential catalyst of economic growth. When splitting the sample into emerging and advance economies, however, we find that such effects are noticeably different. This indicates that firstly, the state of competition in the banking system is an important factor in promoting economic growth only in emerging economies, while the degree of financial stability is an important factor in advance economics. Secondly, while in emerging economies, a more stable banking system contributes to the formation of unconcentrated industrial sectors, average firm size become larger in more financially stable periods in advanced economies. Furthermore, the results are remarkably sensitive to alternative indicators of bank competition, suggesting that a good measure of bank competition matters for implication of economic growth.

6.2. Contributions

The followings are the main contributions of this thesis:

1- Does high profitability mean high stability of a bank? How is important the market structure of banking sector? These questions are hardly studies in existing literature. On the one hand, a profitable banking system is likely to absorb negative shocks, thus maintaining the stability of the financial system. On the other hand, an inadequate regulatory bank environment with a greater information asymmetry, may lead to high profitability, but is associated with high risk premia, which can cause financial instability. The investigation of

such a joint effect on both the profitability and stability with respect to market structure was pursued to address the question. The policy implication of understanding the question is clear: at which profitability circumstance can be conductive to bank stability. In this context, we find that market concentration negatively affect profitability in emerging banks. Furthermore, concentration is negatively associated with bank soundness in advanced economies. These results indicate that more concentrated market increase bank risk-taking behaviour, suggesting that more concentrated banking systems are more vulnerable to systemic failure in advanced economies.

2- Do banks grow through a competitive process? Bank business cannot sustain if its business growth is not made through competition. This gives importance to evaluate the question. Evaluation of competition in a banking sector is controversial in existing studies. Some define banking sector with competition while others does not. Empirical studies are not clear because different theories are applied. To challenge the controversially in the literature, the thesis combined all of theories in related to competition evaluation to look at the issue comparatively and correlatively between economic theories and methods, making a distinctive approach of the thesis from existing studies. Our results suggest that policy makers should be aware that different indicators do not necessarily yield similar predictions of the degree of competition, because they measure different things. Furthermore, they are inconsistent in ranking countries

3- Another distinction in assessing the degree of competition is to directly look at how competition selects efficient banks to growth by applying the theory of competition and efficiency developed by Hay and Liu (1997). This alternative but powerful measure of competition seems to be used hardly in banking studies. The notion is simple: a firm with high cost efficiency grows more than those with less efficiency if market is competitive. The thesis applies this idea to estimate bank competition across 49 countries in the world. This is the first attempt, to our best knowledge, to apply this approach to evaluate bank competition.

4- Does a banking sector create positive externality or an impact on stimulating growth of other industries and so the whole economy? Little attention has been paid for the issue on economic growth with bank performance. This thesis fills the gap by investigating how banking competition and stability affect the growth and market structure of manufacturing sectors. This is the first attempt to assess the effect of bank stability on nonfinancial industry empirically. In this context, the study provides some evidence that a more vigorously competitive and thus efficient banking sector allows financially dependent industries not only to grow faster but also to disconcentrate their market structure. The results are remarkably, however, sensitive to alternative indicators of bank competition, suggesting that a good measure of bank competition matters for implication of economic growth.

5- How do banks in emerging markets perform differently from banks in developed economies? We systematically compared the two groups in terms of profitability, stability and competition. The comparison has provided us with good understanding on policy issues needed to be addressed by governments at different stages of economic development.

6.3. Policy implications

The results of this thesis are of great interest to academics, bankers, and policy makers, with particularly important for central banks and supervisors. One of the major concerns of central banks is to have a sound and solvent banks that contribute to financial stability. A prerequisite for such a stable banking sector is well-functioning banking markets and analysing all angels of the market, as the way this study done. Furthermore, the results of this study provide valuable information about the structure and performance of the banking industry, and hence they are useful for supervisors' needs about the financial institutions under their responsibility and about the markets they operate in. In this context, the policy implications of this thesis are as follows:

The findings of first empirical chapter (Chapter 3) have several implications for policy makers. Firstly, given the overall robust impact of bank-specific variables

that are specified as control variables, the conventional wisdom of bank prudential regulations continues to be implemented, e.g. bank managers should undertake the necessary measures to enhance the role of capitalization, and to create efficient cost-control. Secondly, although during the period under study, there was a significant decrease in the market concentration of emerging market banks (recall Figure 3-1-c), there is scope for further reduction without jeopardising the level of profitability. This should also be encouraged for advanced economy banks, given the destabilising effect of concentration. A fall in banking concentration ratios could be promoted through a variety of ways. Antitrust enforcement or anti-collusion regulatory action may indeed be stressed, also policies that penalise or impair mergers and acquisitions may be considered. Thirdly, in emerging economies, profits seem to be derived at a cost to the remainder of the economy where higher prices are imposed on borrowers and lenders in a less competitive environment. However, evidence also indicates that the less competitive market, measured by the number of banks, is contributory to bank stability. Thus, when implementing measures to boost competition, such as the removal of unnecessary restrictions and entry-barriers in establishing new private or foreign banks, there is need for a careful approach, otherwise excessive anti-competitive measures may threaten bank stability. Another important implication drawn from our empirical results is that although the RMP hypothesis dominates in the advanced-market banking system, the power of market share has an effect of stability, which policy makers should bear in mind when they regulate their anti-monopolistic provisions. Overall, these results suggest that although measures to promote competition may dampen economic rent, excessive implementation may yield an undesired destabilising effect on banks.

The findings of second empirical chapter (Chapter 4) have also several implications for policy makers. One policy implication of the results is that, while in the literature, different competitiveness indicators are being used more or less as substitutes for each other; our results suggest that policy makers should be aware that different indicators do not necessarily yield similar predictions of the degree of competition, because they measure different things. For example, the net interest margin effectively captures the degree of competition among traditional deposit and loan markets, whereas for broader bank activities such as fee income, the Lerner index or ROAA, seem to be more appropriate indicators. Finally, the

competitiveness measures based on elasticities, such as of revenue with respect to factor input costs (the H-statistic) or the elasticity of performance with respect to efficiency (efficiency competition) tend, to some extent, produce similar results in predicting the degree of competition.

Finally, the policy implication of third chapter (Chapter 5) are that firstly, the link between banking performance and the conduct of nonfinancial firms can assistant policy makers in monitoring firm behaviour with respect to setting prices for their products. Secondly, depending on the level of bank competition and stability, and citrus paribus, individual industrial sectors will growth at different speeds. This helps setting appropriate policies in shaping the cross-industry size distribution within a country. Thirdly, central banks can draw on lesson from the past and promote further competition in banking by encouraging more foreign banks, liberalizing the state-owned banks, reforming legal and regulatory regimes, and by keeping banking market open, stable and contestable. Finally, policy makers should be aware that finding a good measure of bank competition matters for implication of economic growth.

6.4. Limitations of the research

One of the limitations of this research is that it would be more methodologically sound if, in the light of the recent global financial crisis, we had included market-based information. In this study, we used accounting-based information, which constitutes a backward looking approach. However, including market-based information, that is a forward looking approach, would also be productive. Given the importance of profitability for the stability of the banking sector and the significant impact of banking industry on the real economy, combining these complementary sources of information would be of considerable importance.

Another limitation of the study is that we have not investigated cost efficiency in this study. The present work does not benefit from directly including efficiency variables such as x-efficiency, to distinguish precisely between the market power and efficient-structure hypotheses. The recent wave of mergers and acquisitions in the banking industry has changed its structures, and may have

significant implications for efficiency levels in the industry. While the literature on banking efficiency is vast, few studies have investigated the impact of bank market structure on efficient delivery of financial services, especially in the context of the recent financial crisis. It is important to identify the factors explaining the potential efficiency differences between emerging and advanced economies. Specifically, analysing the market power – inefficiency relationship, known as the "quiet life" effect, could contribute usefully to our study.

Finally, this study has not analysed the impact of bank governance on bank performance. Since emerging countries have recently hosted many foreign banks and state ownership in the banking industry has declined significantly, such processes may affect banking sector performance. Hence, it would be desirable to contribute to the debate on the three main views of state-owned enterprises – social, agency and political.

6.5. Future research

Future research could extend the datasets provided throughout the thesis, by collecting ownership and governance data, in order to analyse the performance of banks from different perspectives. Furthermore, the effect of the recent financial crisis on bank performance could be studied. Finally, this study focused on emerging and advanced economies, and hence, replicating the analysis for underdeveloped countries would also constitute a meaningful extension to work in the field.

References

Albertazzi, U. & Gambacorta, L. 2009, "Bank profitability and the business cycle", *Journal of Financial Stability*, vol. 5, no. 4, pp. 393-409.

Allen, F. & Gale, D. 2000, "Financial contagion", *Journal of Political Economy*, vol. 108, pp. 1–33.

Allen, F. & Gale, D. 2004, "Competition and Financial Stability", *Journal of Money, Credit, and Banking*, Vol. 36, No. 3

Amidu, M. & Wolfe, S. 2009, "Bank Competition, Diversification and Financial Stability (February 12, 2009)", *22nd Australasian Finance and Banking Conference 2009*. Available at SSRN: http://ssrn.com/abstract=1341863

Angbazo, L. 1997, "Commercial bank net interest margins, default risk, interest-rate risk, and off-balance sheet banking", *Journal of Banking and Finance*, vol. 21, pp. 55-87.

Angelini, P. & Cetorelli, N. 2003, "The effects of regulatory reform on competition in the banking industry", *Journal of Money, Credit and Banking,* vol. 35, pp. 663-684.

Angelini, P., Disalvo, R. & Ferri, G. 1998, "Availability and cost of credit for small businesses: customer relationships and credit cooperatives", *Journal of Banking and Finance,* vol. 22, pp. 925-54.

Athanasoglou, P.P., Brissimis, S.N. & Delis, M.D. 2008, "Bank-specific industry-specific and macroeconomics determinants of bank profitability", *Journal of International Financial Markets, Institutions and Money*, vol, 18, no 2, pp. 121-136.

Athanasoglou, P.P., Delis, M.D. & Staikouras, C. 2006, "Determinants of Bank Profitability in the South Eastern European Region", *Journal of Financial Decision Making*, vol. 2, pp. 1-17.

Barro, R. 1991, “Economic Growth in a Cross Section of Countries”, *Quarterly Journal of Economics*, vol. 106, no. 2, pp. 407-43.

Barro, R. J., & Lee, J. W. 1993. “International comparisons of educational attainment”, *Journal of Monetary Economics*, vol. 32, pp. 363-394.

Barth, J.R, Gerard C.J. & Ross L. 2001, “The Regulation and Supervision of Banks Around the World: A New Database (February 2001)”, *University of Minnesota Financial Studies Working Paper* No. 0006; World Bank Policy Research Working Paper No. 2588. Available at SSRN: http://ssrn.com/abstract=262317

Barth, J.R., Gerard C.J. & Ross L. 2003, "Bank Regulation and Supervision: What Works Best?”, *Journal of Financial Intermediation*, vol. 13, no. 2, pp. 205-248.

Baumol, W. J. 1982, “Contestable markets: An uprising in the theory of industry structure”, *American Economic Review*, Vol. 72, pp. 1–15.

Baumol, W. J., John C. Panzar and Robert D. Willig. 1982, “Contestable Markets and the Theory of Industry Structure”, San Diego: Harcourt Brace Jovanovich.

Baumol, W. J., Panzar, J. C. & Willig, R. D. 1982, “Contestable markets and the theory of industry structure”, *Working Paper* (San Diego: Harcourt Brace Jovanovich, 1982).

Beck, T. & Levine, R. 2005, “Legal institutions and financial development”, in ME´ NARD C. and SHIRLEY M. (Eds) Handbook of New Institutional Economics, pp. 251–278.

Beck, T., De Jonghe, O. & Schepens, G. 2011, “Bank Competition and Stability: Cross-Country Heterogeneity (July 18, 2011)”, *European Banking Center Discussion Paper,* no. 2011- 019; CentER Working Paper Series No. 2011-080. Available at SSRN: http://ssrn.com/abstract=1890674

Beck, T., Demirguc-Kunt, A. & Levine, R. 2006, “Bank concentration, competition, and crises: first results”, *Journal of Banking and Finance*, vol. 30, pp. 1581–603.

Beck, T., Demirguc-Kunt, A. & Maksimovic, V. 2004, “Bank competition and access to finance: International evidence”, *Journal of Money, Credit and Banking,* vol. 36, pp. 627–648.

Beck, T., Demirguc-Kunt, A. & Ross, L. 2003. "Law, Endowments, and Finance", *Journal of Financial Economics*, vol. 70, pp. 137-181.

Beck, T., Demirguc-Kunt, A., & Ross, L. 2007, “Bank Concentration and Fragility: Impacts and Mechanics”, In The Risks of Financial Institutions, edited by M. Carey and R. Stulz, pp. 193–231. Cambridge, MA: National Bureau of Economic Research.

Beck, T., Ross, L. & Norman, L. 2000, "Finance and the Sources of Growth", *Journal of Financial Economics*, vol. 58, pp. 261-300.

Berg, S.A. & Kim, M. 1994, “Oligopolistic interdependence and the structure of production in banking: an empirical evaluation”, *Journal of Money, Credit and Banking*, vol. 26, no. 2, pp. 309e332.

Berger, A. & Hannan, T. 1989, “The price-concentration relationship in banking”, *The Review of Economics and Statistics*, vol. 71, pp. 291–99.

Berger, A. N., Demirguc-Kunt, A., Levine, R. & Haubrich, J. 2004, “Bank concentration and competition: an evolution in the making”, *Journal of Money, Credit and Banking*, vol. 36, pp. 433–51.

Berger, A. N., DeYoung, R., Flannery, M. J., Lee, D. & Oztekin, O. 2008, “How do large banking organizations manage their capital ratios?”, *Journal of Financial Service and Research,* vol. 34, pp. 123–149

Berger, A. N., Klapper, L. F. & Turk-Ariss, R. 2009, "Bank competition and financial stability", *Journal of Financial Services Research*, issue. 2, vol. 35, pp. 99-118.

Berger, A., Demsetz, R. & Strahan, P. 1999, "The consolidation of the financial services industry: causes, consequences, and implications for the future", *Journal of Banking and Finance,* vol. 23, no. 2–4, pp. 135–194.

Berger, A., Hanweck, D. & Humphrey, D. 1987, "Competitive viability in banking: scale, scope, and product mix economies", *Journal of Monetary Economics,* vol. 20, no. 3, pp. 501–520.

Berger, A.N. 1995, "The Profit-Structure Relationship in Banking--Tests of Market-Power and Efficient-Structure Hypotheses", *Journal of Money, Credit and Banking*, vol. 27, no. 2, pp. 404-431.

Berlin, M. & Mester, L.J. 1999, "Deposits and relationship lending", *The Review of Financial Studies,* vol. 12, pp. 579-607.

Bertrand, M., Schoar, A. & Thesmar, D. 2007, "Banking Deregulation and Industry Structure: Evidence from the French Banking Reforms of 1985", *Journal of Finance*, vol. 62, no. 2, pp. 597-628.

Besanko, T., Besanko, D. & Thakor, A. 1993, "Relationship banking, deposit insurance and bank portfolio choice, C. Mayer, X. Vives, Editors , Capital Markets and Financial Intermediation", Cambridge University Press, Cambridge (1993).

Bikker, J. A. & Groeneveld, J. M. 2000, "Competition and concentration in the EU banking industry", *Kredit and Kapital*, vol. 33, pp. 62–98.

Bikker, J. A. & Haaf, K. 2002a, "Measures of competition and concentration in the banking industry: a review of the literature", *Economic and Financial Modelling*, vol. 9, pp. 53–98.

Bikker, J. A. & Haaf, K. 2002b, “Competition, concentration and their relationship: An empirical analysis of the banking industry”, *Journal of Banking and Finance,* vol. 26, pp. 2191–2214.

Bikker, J. A. 2004, “Competition and Efficiency in a Unified European Banking Market”, (Cheltenham: Edward Elgar, 2004).

Bikker, J. A. & van Leuvensteijn, M. 2008, “Competition and efficiency in the Dutch life insurance industry”, *Applied Economics*, vol. 40. Pp. 2063–84.

Bolt, W. & Humphrey, D. 2010, "Bank competition efficiency in Europe: A frontier approach," *Journal of Banking & Finance*, vol. 34, no.8, pp. 1808-1817.

Bonin, J.P., Hasan, I. & Wachtel, P. 2005, "Bank performance, efficiency and ownership in transition countries", *Journal of Banking and Finance*, vol. 29, pp. 31-53.

Boone, J. 2001, “Intensity of competition and the incentive to innovate”, *International Journal of Industrial Organization*, vol. 19, pp. 705–726.

Boone, J. 2008, “A new way to measure competition”, *Economic Journal*, vol. 118, pp. 1245-1261.

Boone, J., Griffith, R. & Harrison, R. 2005, “Measuring competition”, *AIM Research Working Paper* 022-August-2005

Boot, A. & Anjan V. 2000, "Can Relationship Banking Survive Competition?", *Journal of Finance*, vol. 55, pp. 679-713.

Boot, A.W. & Greenbaum, S. 1993, “Bank regulation, reputation, and rents: Theory and policy implications”, In: Mayer, C., and Vives, X. (eds), Capital markets and financial intermediation. Cambridge, UK: Cambridge University Press, 292-318.

Boot, W. 2000, “Relationship banking: what do we know?”, *Journal of Financial Intermediation*, vol. 9, pp. 7-25.

Bourke, P. 1989, "Concentration and Other Determinants of Bank Profitability in Europe, North America, and Australia", *Journal of Banking and Finance*, vol. 13, no. 1, pp. 65-79.

Boutillier, M., Gaudin, J. & Grandperrin, S. 2004, "La situation concurrentielle des principaux secteurs bancaires Europeens entre 1993 et 2000: Quels enseignements pour la future structure des marches financiers issue de l' uem?", (http://www.banque-France.fr/gb/fondatio/ papers, 2004).

Boyd, J. H. & De Nicolo, G. 2005, "The Theory of Bank Risk Taking and Competition Revisited", *Journal of Finance*, vol. 60, Issue 3, pp. 1329-1343.

Boyd, J. H., De Nicola. G. & Jalal, A. M. 2009, "Bank Competition, Risk and Asset Allocations", *IMF Working Papers,* 09/143, International Monetary Fund.

Boyd, J. H., De Nicolo, G. & Jalal, A. M. 2006, "Bank risk-taking and competition revisited: new theory and new evidence", *Working Paper No*. WP/06/297, IMF.

Boyd, J. H., Graham, S. L. & Hewitt, R. S. 1993, "Bank holding company mergers with nonbank financial firms: effects on the risk of failure", *Journal of Banking & Finance*, vol. 17, pp. 43–63.

Boyd, J.H. & Prescott, E.C. 1986, "Financial intermediary-coalitions", *Journal of Economic Theory,* vol. 38, pp. 211–232.

Boyd, J.H., De Nicolo, G. & Smith, B.D. 2004, "Crises in competitive versus monopolistic banking systems", *Journal of Money, Credit and Banking*, vol. 36, pp. 487–506.

Bresnahan, T. F. 1982, "The oligopoly solution concept is identified", *Economic Letters*, vol. 10, pp. 87–92.

Bresnahan, T. F. 1989, “Empirical studies of industries with market power”, in: R. Schmalensee and R. D. Willig (eds), Handbook of Industrial Organisation, vol. II, pp. 1011–57.

Bretschger, L. & Kappel, V. 2010, “Market concentration and the likelihood of financial crises”, *CER-ETH Economics working paper series*, no 10/138, CER-ETH - Center of Economic Research (CER-ETH) at ETH Zurich.

Brissimis, S.N. & Delis, M.D. 2011, "Bank-level estimates of market power", *European Journal of Operational Research*, vol. 212, no. 3, pp. 508-517.

Caminal, R. & Matutes, C. 2002, “Market power and bank failures”, *International Journal of Industrial Organisation*, vol. 20, pp. 1341–1361.

Canhoto, A. 2004, “Portuguese banking: a structural model of competition in the deposits market”, *Review of Financial Economics*, vol. 13, pp. 41–63.

Capie, F. 1995, “Prudent and Stable (but inefficient?): Commercial Banks in Britain, 1890–1940”, in Anglo-American Financial Systems: Institutions and Markets in the Twentieth Century, ed. by Michael Bordo and Richard Sylla (New York: Irvin).

Carbo, L. R. & Rodiguez, F. 2007, “Financial innovations in banking: impact on regional growth”, *Regional Studies*, vol. 41, pp. 311–323.

Carbó, S., Humphrey, D. & Rodríguez, F. 2003, “Deregulation, Bank Competition and Regional Growth”, *Regional Studies*, vol. 37, pp. 227–237.

Carbo, S., Humphrey, D., Maudos, J. & Molyneux, P. 2009, “Cross-country comparisons of competition and pricing power in European banking”, *Journal of International Money and Finance*, vol. 28, pp. 115–34.

Carbó, S., Rodriguez, F. & Udell, G. 2006, “Bank Market Power and SME Financing Constraints“, Proceedings of The 42nd Annual Conference on Bank Structure & Competition, Federal Reserve Bank of Chicago, 17-19 May, Chicago.

Carbo´, S. & Rodrıguez, F. 2007, “The determinants of bank margins in European banking”, *Journal of Banking and Finance,* vol. 31, no. 7, pp. 2043–2063.

Carletti, E. & Hartmann, P. 2003, “Competition and financial stability: what’s special about banking?”, in Monetary History, Exchange Rates and Financial Markets: Essays in Honour of Charles Goodhart, vol. 2 (Ed.) P. Mizen, Edward Elgar, Cheltenham, pp. 202–29.

Carletti, E. & Vives, X. 2008, “Regulation and competition policy in the banking sector”, Occasional Paper 159, IESE, Public-Private Sector Research Center.

Casu, B. & Girardone, C. 2005, "An analysis of the relevance of off-balance sheet items in explaining productivity change in European banking", *Applied Financial Economics*, vol. 15, no. 15, pp. 1053-1061.

Casu, B. and Girardone, C. 2006, “Bank competition, concentration and efficiency in the single European market”, *The Manchester School*, vol. 74, pp. 441–68.

Cestone, G. & White, L. 2003, “Anticompetitive Financial Contracting: The Design of Financial Claims”, *Journal of Finance*, nol. 58, no. 5, pp. 2109-2142.

Cetorelli, N. & Gamberra, M. 2001, “Banking market structure, financial dependence and growth: international evidence from industry data”, *Journal of Finance,* vol. 56, pp. 617-648.

Cetorelli, N. & Strahan, P. E. 2006,”Finance as a Barrier to Entry: Bank Competition and Industry Structure in Local U.S. Markets”, *Journal of Finance*, vol. 61, no. 1, pp. 437-461.

Cetorelli, N. 2001, "Does Bank Concentration Lead to Concentration in Industrial Sectors?" Federal Reserve Bank of Chicago Working Paper No. 2001-01.

Cetorelli, N. 2003, "Life-Cycle Dynamics in Industrial Sectors. The Role of Banking Market Structure", Federal Reserve Bank of St. Louis Quarterly Review 85, 135-148.

Cetorelli, N. 2004, “Real Effects of Bank Competition”, *Journal of Money, Credit and Banking*, vol. 36, no. 3, pp. 543-58.

Cetorelli, N., Hirtle, B., Morgan, D., Peristiani, S. & Santos, J. 2007, “Trends in financial market concentration and their implications for market stability”, Federal Reserve Bank of New York Policy Review, pp. 33–51.

Chakrabortt, A. & Hu, C. X. 2006, "Lending relationships in line-of-credit and non line-of-credit loans: Evidence from collateral use in small business", *Journal of Financial Intermediation*, vol. 15, no. 1, pp. 86-107.

Chan-Lau, J. A. & Sy, A. N. R. 2006, “Distance-to-Default: A Bridge Too Far?”, IMF Working Paper No. 06/215 (Washington: International Monetary Fund).

Chen, B., & Feng, Y. 1996, “Some political determinants of economic growth”, *European Journal of Political Economy*, vol. 12, pp. 609-627.

Chen, X. 2007, “Banking Deregulation and Credit Risk: Evidence from the EU”, *Journal of Financial Stability*, vol. 2, no. 4, pp. 356-390.

Claessens, S. & Laeven, L. 2004, “What drives bank competition? Some international evidence”, *Journal of Money, Credit and Banking,* vol. 36, no. 3, pp. 563-583.

Claessens, S. & Laeven, L. 2005, “Financial dependence, banking sector competition, and economic growth”, *Journal of the European Economic Association,* vol. 3, no. 1, pp. 179-207.

Claessens, S. & Luc, L. 2003. "Financial Development, Property Rights and Growth", *Journal of Finance*, vol. 58, pp. 24-36.

Claessens, S., Demirguc-Kunt, A. & Huizinga, H. 2001, "How does foreign entry affect domestic banking markets?", *Journal of Banking & Finance*, vol. 25, no.5, pp. 891-911.

Claeys, S. & Vander Vennet, R. 2008, "Determinants of bank interest margins in Central and Eastern Europe: A comparison with the West", *Economic Systems*, vol. 32, no. 2, pp. 197-216.

Coccorese, P. 2002, "Competition among dominant firms in concentrated markets: evidence from the Italian banking industry", *Working Paper No. 89* (Centro Studi in Economia e Finanza, Universita degli Studi di Salerno, 2002).

Coccorese, P. 2004, "Banking competition and macroeconomic conditions: a disaggregate analysis", *Journal of Financial Markets, Institutions and Money*, vol. 14, pp. 203–219.

Coccorese, P., & Pellecchia, A. 2010, "Testing the Quiet Life Hypothesis in the Italian Banking Industry", *Economic Notes*, Vol. 39, Issue 3, pp. 173-202, 2010.

Cole, R.A. 1998, "The importance of relationships to the availability of credit", *Journal of Banking and Finance,* vol. 22, pp. 959-977.

Collender, R. N., & Shaffer, S. 2002, "Local bank office ownership, deposit control, market structure, and economic growth", *Journal of Banking and Finance*, vol. 26, no. 12, pp. 21–51.

Cordella, T. & Levy Yeyati, E. 2002, "Financial Opening, Deposit Insurance and Risk in a Model of Banking Competition", *European Economic Review,* vol. 46, pp. 471-85.

D'Auria, C., Foglia, A. & Reedtz, P. 1999, "Bank interest rates and credit relationships in Italy", *Journal of Banking and Finance*, vol. 23, no. 7, pp. 1067-93.

De Bandt, O. & Davis, P. 2000, "Competition, contestability and market structure in European banking sectors on the eve of EMU", *Journal of Banking and Finance*, vol. 24, pp. 1045–66.

De Nicolo, G. & Loukoianova, E. 2006, “Bank ownership, market structure, and risk”, Unpublished Working Paper, IMF.

De Nicolo, G. 2000, “Size, charter value and risk in banking: an international perspective”, *International Finance Discussion*, No. 689, Board of Governors of the Federal Reserve System.

De Nicolo, G., Bartholomew, P., Zaman, J. & Zephirin, M. 2004, “Bank consolidation, internationalization and conglomeration: trends and implications for financial risk”, *Financial Markets, Institutions and Instruments*, vol. 13, pp. 173–217.

Degryse, H. & Van Cayseele, P. 2000, “Relationship lending within a Bank-based system: evidence from European small business data”, *Journal of Financial Intermediation*, vol. 9, pp. 90-109.

Deidda, L. & Bassam, F. 2002, "Concentration in Banking Industry and Economic Growth", *Macroeconomic Dynamics*, vol. 9, pp. 198–219.

Delis, M. D. 2010a, “Competitive conditions in the Central and Eastern European banking systems”, *Omega*, vol. 38, pp. 268–74.

Delis, M. D. 2010b, “Bank competition, financial reform and institutions: The importance of being developed”, MPRA working paper.

Delis, M. D. 2012, ‘Bank competition, financial reform, and institutions: the importance of being developed’, *Journal of Development Economics*, 97, 450-465

Demirguc-Kunt, A & Maksimovic, V. 1996, "Financial Constraints, Uses of Funds and Firm Growth: An International Comparison", *World Bank Working paper*, 1996.

Demirguc-Kunt, A, Laeven, L. & Levine, R. 2004, “Regulations, market structure, institutions, and the cost of financial intermediation”, *Journal of Money, Credit and Banking*, vol. 36, pp. 593-622.

Demirguc-Kunt, A. & Detragiache, E. 2002, "Does deposit insurance increase banking system stability? An empirical investigation", *Journal of Monetary Economics*, vol. 49, no. 7, pp. 1373-1406.

Demirguc-Kunt, A. & Huizinga, H. 1999, "Determinants of commercial bank interest margins and profitability: some international evidence", *World Bank Economic Review*, vol. 13, pp. 379-408.

Demirguc-Kunt, A. & Huizinga, H. 2000, "Financial structure and bank profitability", *Policy Research Working Paper Series*, 2430. The World Bank.

Demirguc-Kunt, A. & Huizinga, H. 2010, "Bank activity and funding strategies: The impact on risk and returns", *Journal of Financial Economics*, vol. 98, no. 3, pp. 626-650.

Demirguc-Kunt, A. & Vojislav, M. 1998, "Law, Finance, and Firm Growth", *Journal of Finance*, vol. 56, pp. 2107-2137.

Demirguc-Kunt, A., Martinez, P. & Maria, S. 2010, "A Framework for Analyzing Competition in the Banking Sector: An Application to the Case of Jordan (December 1, 2010)", *World Bank Policy Research Working Paper Series*, Vol., pp. -, 2010. Available at SSRN: http://ssrn.com/abstract=1726248

Demsetz, R., Saidenberg, M. R. & Strahan, P. E. 1996, "Banks with something to lose: the disciplinary role of franchise value", *Federal Reserve Bank of New York Economic Policy Review*, 2, 1–14.

Dick, A. A. 2006, "Nationwide branching and its impact on market structure, quality and bank performance", *Journal of Business*, vol. 79, pp. 567–92.

Dietrich, A. & Wanzenried, G. 2011, "Determinants of bank profitability before and during the crisis: Evidence from Switzerland", *Journal of International Financial Markets, Institutions and Money,* vol. 21, no. 3, pp. 307-327.

Drakos, K. & Konstantinou, P. 2003, “Competition and contestability in transition banking: an empirical analysis”, (EEFS Conference, Heraklion, Crete, 2003).

Edwards, F.R. & Mishkin, F.S. 1995, “The decline of traditional banking: implications for financial stability and regulatory policy”, *Federal Reserve Bank of New York Economic Policy Review*, Vol. 1, No.2, PP. 27-45

Elsas, R. & Krahnen, J.P. 1998, “Is relationship lending special? Evidence from credit-file data in Germany”, *Journal of Banking and Finance*, vol. 22, pp. 1283-1316.

Emilia, B. P. & Dell’Ariccia, G. 2004. "Bank Competition and Firm Creation", *Journal of Money, Credit and Banking*, vol. 3, no. 6, pp. 225-252.

Evanoff, D. & Fortier, D. 1988, “Re-evaluation of the structure-conduct-performance paradigm in banking”, *Journal of Financial Service Research*, vol. 1, pp. 277–94.

Feng, Y. 1997, “Democracy, political stability and economic growth”, *British Journal of Political Science*, vol. 27, pp. 391-418.

Fernández de Guevara, J. & Maudos, J. 2004, “Measuring welfare loss of market power: an application to European banks”, *Applied Economics Letters*, vol. 11, no. 13, pp. 833-836.

Fernandez de Guevara, J. & Maudos, J. 2009, "Regional Financial Development and Bank Competition: Effects on Firms' Growth", *Regional Studies*, vol. 43, no. 2, PP. 211-228.

Fernández de Guevara, J., Maudos, J. & Pérez, F. 2005, “Market power in European banking”, *Journal of Financial Services Research*, vol. 27, no. 2, pp. 109-137.

Fernández de Guevara, J., Maudos, J. & Pérez, F. 2007, "Integration and competition in the European financial markets", *Journal of International Money and Finance*, vol. 26, no. 1, pp. 26-45.

Fernández de Guevara, J., Maudos, J. 2007, "Explanatory factors of market power in the banking ", *The Manchester School, vol*. 75, no. 3, pp. 275-296.

Fisman, R. & Inessa L. 2004, "Financial Development and Inter-sectoral Allocation: A New Approach", *Journal of Finance*, vol. 59, pp. 3785-3807.

Freixas, X. & Rochet, J. C. 1997, "Microeconomics of Banking", MIT Press, Cambridge, MA.

Fungacova, Z. & Weill, L. 2010, "How Market Power Influences Bank Failures Evidence from Russia", *Working Papers of LaRGE Research Center*, No. 2010-08

García-Herrero, A., Gavilá, S. & Santabárbara, D., 2009. "What explains the low profitability of Chinese banks?", *Journal of Banking and Finance*, vol. 33, no. 11, pp. 2080–2092.

Gelos, R. G. & Roldos, J. 2004, "Consolidation and market structure in emerging market banking systems", *Emerging Markets Review*, vol. 5, pp. 39–59.

Gilbert, A. 1984, "Studies of Bank Marke Structure and Competition: A Review and Evaluation", *Journal of Money, Credit, and Banking*, vol. 16, pp. 617-44.

Grier, K. & Tullock, G. 1989, "An empirical analysis of cross-national economic growth, 1951-1980", *Journal of Monetary Economics*, vol. 24, no. 1, pp. 259-276.

Goddard, J. & Wilson, J. O. S. 2009, "Competition in banking: a disequilibrium approach", *Journal of Banking and Finance*, vol. 32, pp. 2282–92.

Goddard, J., Liu, H., Molyneux, P. & Wilson, J. 2009. "Do bank profits converge?", *Working Paper*. Available at SSRN: http://ssrn.com/abstract=1509868 or http://dx.doi.org/10.2139/ssrn.1509868

Goddard, J., Molyneux, P. & Wilson, J.O.S. 2004, "The profitability of European banks: a cross-sectional and dynamic panel analysis", *Manchester School*, vol. 72, no. 3, pp. 363-381.

Goddard, J., Wilson, J. & Molyneux, P. 2001, “European Banking: Efficiency”, Technology and Growth. John Wiley, London.

Goldberg, L.G. & Rai, A. 1996, "The structure-performance relationship for European banking", *Journal of Banking & Finance*, vol. 20, no. 4, pp. 745-771.

Goldsmith, R. W. 1969, “Financial structure and development”, New Haven, CT: Yale University Press, 1969.

Golin, J. 2001, “The Bank Credit Analysis Handbook: A Guide for Analysts, Bankers and Investors”, John Wiley & Sons, Asia.

Gorton, G. & Winton, A. 2003, “Financial intermediation”, In: Constantinides, G., Harris, M., Stulz, R. (Eds.), Handbook of the Economics of Finance, Corporate Finance. Amsterdam, North Holland.

Greenwood, J. & Jovanovic, B. 1990, "Financial Development, Growth, and the Distribution of Income", *Journal of Political Economy*, vol. 98, no. 5, pp. 1076- 107.

Gruben, W. C. & Robert P. M. 2003, "Privatization, Competition and Super-competition in the Mexican Commercial Banking System", *Journal of Banking and Finance*, vol. 27, pp. 229-249.

Guiso, L., Jappelli, T., Padula, M. & Pagano, M. 2004, “Financial market integration and economic growth in the UE”, *Economic Policy*, pp. 523-577.

Gurley, J. G. & Edward S. S. 1967, “Financial structure and economic development”, *Economic Development and Cultural Change*, vol. 15, pp. 257-278.

Gurley, J. G., & Edward S. S. 1955, "Financial Aspects of Economic Development", *American Economic Review*, vol. 45, pp. 515-538.

Haan, J. D. & Poghosyan, T. 2011, "Bank Size, Market Concentration, and Bank Earnings Volatility in the US", (January 16, 2011). Available at SSRN: http://ssrn.com/abstract=1742082

Harhoff, D. & Körting, T. 1989, "Lending relationships in Germany – Empirical evidence from survey data", *Journal of Banking and Finance*, vol. 22, pp. 1317-1353.

Hay, D. A. & Liu, G. S. 1997, "The Efficiency of Firms: What Difference Does Competition Make?", *Economic Journal*, Royal Economic Society, vol. 107, no. 442, pp. 597-617.

Hellmann, T.F., Murdock, K.C. & Stiglitz, J.E. 2000, "Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough?", *The American Economic Review*, vol. 90, no. 1, pp. 147-165.

Hempell, H. S. 2002, "Testing for competition among German banks", *Discussion Paper*, 04/02 (Economic Research Centre, Deutsche Bundesbank, 2002).

Hondroyiannis, G., Lolos, S. & Papapetrou, E. 1999, "Assessing competitive conditions in the Greek banking system", J*ournal of International Financial Markets, Institutions and Money*, vol. 9, pp. 377–91.

Hughes, J.P., Lang, W.W., Mester, L.J. & Moon, C.G. 1999, "The dollars and sense of bank consolidation", *Journal of Banking & Finance*, vol. 23, no. 2–4, pp. 291–324.

Hussein, K. 2009, "Does Bank Concentration Increase Credit Risk-Taking Behaviour? Evidence from SADC", (March 14, 2009), *The IFM Working Paper,* No. 2/2009. Available at SSRN: http://ssrn.com/abstract=1607706

Iannotta, G., Nocera, G. & Sironi, A. 2007, “Ownership structure, risk and performance in the European banking industry”, *Journal of Banking and Finance*, vol. 31, no. 7, pp. 2127–2149.

Illing, M. & Liu, Y. 2006, “Measuring Financial Stress in a Developed Country: An Application to Canada”, *Journal of Financial Stability*, vol. 2, no. 3, pp. 243–65.

International Monetary Fund. 2009, Global Financial Stability Report, April.

Iwata, G. 1974, “Measurement of conjectural variations in oligopoly”, *Econometrica*, vol. 42, pp. 947–66.

Jackson, W. 1997, ‘Market Structure and the Speed of Adjustment: Evidence of Non-monotonicity’, *Review of Industrial Organization*, vol. 12, pp. 37–57.

Jayaratne, J. & Strahan, P. E. 1996, "The Finance-Growth Nexus: Evidence from Bank Branch Deregulation", *Quarterly Journal of Economics*, vol. 111, no. 3, pp. 639-70.

Jensen, M. C. & Meckling, W. R. 1976, "Theory of the Firm: Managerial Behavior, Agency Costs and Capital Structure", *Journal of Financial Economics*, vol. 3, no. 4, pp. 305-60.

Jime´nez, G., Lopez, J. & Saurina, J. 2007, “How does competition impact bank risk taking?”, *Banco de Espana Working Paper*, No. 2007-23, Federal Reserve Bank, San Francisco.

Keeley, M. C. 1990, “Deposit insurance, risk and market power in banking”, *The American Economic Review*, vol. 80, pp. 1183–200.

King, R. G. & Levine, R. 1993a, "Finance and Growth: Schumpeter Might Be Right", *Quarterly Journal of Economics*, vol. 108, no. 3, pp. 713-37.

King, R. G. & Levine, R. 1993b, "Finance, Entrepreneurship, and Growth", *Journal of Monetary Economics*, vol. 32, no. 3, pp. 513-42.

Koetter, M. & Poghosyan, T. 2009, “The identification of technology regimes in banking: implications for the market power-fragility nexus”, *Journal of Banking and Finance*, vol. 33, pp. 1413–22.

Kormendi R. & Meguire, P. 1985, “Macroeconomic determinants of growth: cross-country evidence”, *Journal of Monetary Economics*, vol. 16, no. 4, pp. 141-63.

Koskela, E. & Stenbacka, R. 2000, “Is there a tradeoff between bank competition and financial fragility?”, *Journal of Banking and Finance*, vol. 24, no. 12, pp. 1853–1873

Kosmidou, K., Tanna, S. & Pasiouras, F. 2005, "Determinants of profitability of UK domestic banks: panel evidence from the period 1995–2002", In: Proceedings of the 37th Annual Conference of the Money Macro and Finance (MMF) Research Group, Rethymno, Greece, September 1–3.

La Porta, R., Florencio, L. & Andrei, S. 2002, “Government ownership of banks”, *Journal of Finance*, vol. 57, pp. 265–301.

La Porta, R., Florencio, L., Andrei, S. & Robert W. V. 1998, "Law and Finance", *Journal of Political Economy*, vol. 106, pp. 1113-1 155.

Lau, L. 1982, “On identifying the degree of competitiveness from industry price and output data”, *Economic Letters*, vol. 10, pp. 93–99.

Lerner, A. 1934, “The concept of monopoly and the measurement of monopoly power”, *Review of Economic Studies*, vol. 1, pp. 157–175.

Levine, R,. & Zervos, S. 1998, "Stock Markets and Economic Growth", *American Economic Review*, vol. 88, no. 3, pp. 537- 58.

Levine, R. 1999, “Law, finance and economic growth”, *Journal of Financial Intermediation*, vol. 8, pp. 8–35

Levine, R. 2005, "Finance and Growth: Theory and Evidence", Handbook of Economic Growth, in: Philippe Aghion & Steven Durlauf (ed.), Handbook

of Economic Growth, edition 1, volume 1, chapter 12, pages 865-934 Elsevier.

Levine, R., Loayza, N. & Beck, T. 2000, "Financial intermediation and growth: causality and causes", *Journal of Monetary Economics*, vol. 46, pp. 31–77.

Levy Yeyati, E. & Micco, A. 2007, "Concentration and Foreign Penetration in Latin American Banking Sectors: Impact on Competition and Risk", *Journal of Banking and Finance*, vol. 31, no. 6, pp. 1633–1647.

Liu, H. & Wilson, J.O.S. 2011, "Competition and Risk in Japanese Banking", *European Journal of Finance*, forthcoming

Liu, H., Molyneux, P. & Nguyen, L. 2012, "Competition and risk in South East Asian commercial banking", *Applied Economics*, vol. 44, Iss. 28, PP. 3627–3644.

Liu, H., Wilson, J.O.S. & Molyneux. P. 2010, "Competition and Stability in European Banking: A Regional Analysis", *Manchester School*, forthcoming.

Lloyd-Williams, D. M., Molyneux, P. & Thornton, J. 1994, "Market structure and performance in Spanish banking", *Journal of Banking and Finance*, vol. 18, pp. 433–43.

Loayza, N. & Rancière, R. 2006, "Financial development, financial fragility, and growth", *Journal of Money, Credit and Banking*, vol. 38, no. 4, pp. 1051-1076.

Maddala, G.S. & Wu, S. 1999. "A comparative study of unit root tests with panel data and a new simple test", *Oxford Bulletin of Economics and Statistics, vol.* 61, pp. 631–652.

Mamatzakis, E. & Remoundos, P. 2003, "Determinants of Greek Commercial Banks Profitability, 1989–2000", *Spoudai*, vol. 53, no. 1, pp. 84–94.

Mamatzakis, E., Staikouras, C. & Koutsomanoli-Fillipaki, N. 2005, "Competition and concentration in the banking sector of the South Eastern European region", *Emerging Markets Review*, vol. 6, no. 2, pp. 192-209.

Marcus A.J. 1984, "Deregulation and bank financial policy", *Journal of Banking and Finance*, vol. 8, pp. 557–565.

Matthews, K., Murinde, V. & Zhao, T. 2007, "Competitive conditions among the major British banks", *Journal of Banking and Finance*, vol. 31, pp. 2025–42.

Matutes, C. & Vives, X. 2000, "Imperfect competition, risk taking and competition in banking", *European Economic Review*, vol. 44, pp. 1–34.

Matutes, C. & Xavier, V. 1996, "Competition for Deposits, Fragility and Insurance", *Journal of Financial Intermediation*, vol. 5, pp. 184–216.

Maudos, J. & Fernandez de Guevara, J. 2004, 'Factors explaining the interest margin in the banking sectors of the European Union', *Journal of Banking and Finance*, vol. 28, no. 9, pp. 2259-2281.

Maudos, J. & Fernandez de Guevara, J. 2006, "Banking competition, financial dependence and economic growth", *MPRA Paper* 15254, University Library of Munich, Germany, revised 2006.

Maudos, J. & Fernández de Guevara, J. 2007, "The Cost of Market Power in the European Banking Sectors: Social Welfare Loss vs. Inefficiency Cost", *Journal of Banking and Finance*, vol. 31, pp. 2103–2125.

Maudos, J. & Perez, F. 2003, 'Competencia versus poder de monopolio en la banca espan˜ola', *Moneda y Cre´dito*, vol. 217, pp. 139-166.

Mayer, C. 1988, "New issues in corporate finance", *European Economic Review*, vol. 32, pp. 1167-1183.

Mayer, C. 1990, “Financial systems, corporate finance and economic development”, in R. Glenn Hubbard, ed.: Asymmetric Information, Corporate Finance and Investment (The University of Chicago Press, Chicago, IL).

McKinnon, R. I. 1973, “Money and Capital in Economic Development”, Washington, DC: Brookings Institution

Meon, P.G. & Weill, L. 2005, “Can mergers in Europe help banks hedge against macroeconomic risk?”, *Applied Financial Economics*, vol. 15, pp. 315–326.

Mercieca, S., Schaeck, S. & Wolfe, S. 2007, “Small banks in Europe: Benefits from diversification?”, *Journal of Banking and Finance*, vol. 31, pp. 1975-1998.

Micco, A., Panizza, U. & Yanez, M. 2007, “Bank ownership and performance. Does politics matter?”, *Journal of Banking and Finance*, vol. 31, no. 1, pp. 219–241.

Mishkin, F. S. 1999, “Financial Consolidation: Dangers and Opportunities”, *Journal of Banking and Finance*, vol. 23, pp. 675–91.

Molyneux, P, Nguyen-Linh, H. 2008, “Competition and risk in the South East Asian banking”, Bangor Business School working paper, Bangor, Wales

Molyneux, P. & Thornton, J. 1992, "Determinants of European Bank Profitability: A Note", *Journal of Banking and Finance*, vol. 16, no. 6, pp. 1173-1178.

Molyneux, P., Lloyd-Williams, D. M. & Thornton, J. 1994, “Competitive conditions in European banking”, *Journal of Banking and Finance*, vol. 18, pp. 445–59.

Molyneux, P., Thornton, J. & Lloyd-Williams, D. M. 1996, “Competition and market contestability in Japanese commercial banking”, *Journal of Economics and Business*, vol. 48, pp. 33–45.

Molyneux, Ph. & Teppet, J.L. 1993, “Structure-conduct-perfonnance in EFTA banking markets”, *Bank- en Financiewezen*, vol. 3, pp. 133-137.

Moore, T. 2009, “Soft budget constraint in EU transition economy enterprises”, *International Finance*, vol. 12, no. 3, pp. 411-430.

Myers, S. C. & Majluf, N. S. 1984, "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have", *Journal of Financial Economics*, vol. 13, no. 2, pp. 187- 221.

Naceur, S. & Goaied, M. 2001, “The Determinants of the Tunisian Deposit Banks’ Performance”, *Applied Financial Economics*, vol. 11, no. 3, pp. 317–319.

Naceur, S. & Goaied, M. 2008, “The determinants of commercial bank interest margin and profitability: evidence from Tunisia”, *Frontiers in Finance and Economics*, vol. 5, no. 1, pp. 106–130.

Nathan, A. & Neave, H. E. 1989, “Competition and contestability in Canada’s financial system: Empirical results”, *The Canadian Journal of Economics*, vol. 22, pp. 576–94.

Neely, M. & Wheelock, D. 1997, “Why does bank performance vary across states?”, Federal Reserve Bank of St Louis Reviews, 27–38.

Neven, D. & Roller, L. 1999, “An aggregate structural model of competition in the European banking industry”, *International Journal of Industrial Organisation*, vol. 17, pp. 1059–74.

Nier, E. & Baumann, U. 2006, “Market discipline, disclosure and moral hazard in banking”, *Journal of Financial Intermediation*, vol. 15, pp. 332-361.

Nier, E. 2005, “Bank stability and transparency”, *Journal of Financial Stability*, vol. 1, pp. 342-354.

Pagano, M. 1993, “Financial markets and growth: An overview”, *European Economic Review*, vol. 37, pp. 613-622.

Panzar, J. C. & Rosse, J. N. 1987, “Testing for monopoly equilibrium”, *Journal of Industrial Economics*, vol. 25, pp. 443–56.

Panzar, J. C., and James N. Rosse. 1982, "Structure, Conduct and Comparative Statistics", Bell Laboratories Economics Discussion Paper.

Park, K. H. 2009, “Has bank consolidation in Korea lessened competition?”, *The Quarterly Review of Economics and Finance*, vol. 49, pp. 651–67.

Paroush, J. 1995, “The effect of merger and acquisition activity on the safety and soundness of a banking system”, *Review of Industrial Organization*, vol. 10, pp. 53-67

Pasiouras, F. & Kosmidou, K. 2007, "Factors influencing the profitability of domestic and foreign commercial banks in the European Union", *Research in International Business and Finance*, vol. 21, no. 2, pp. 222-237.

Patti, E.B.d. & Dell'Ariccia, G. 2004, "Bank Competition and Firm Creation", *Journal of Money, Credit and Banking*, vol. 36, no. 2, pp. pp. 225-251.

Perotti, E. & Suarez, J. 2002, “Last bank standing: What do I gain if you fail?”, *European Economic Review*, vol. 46, pp. 1599-622.

Petersen, M. & Rajan, R. 1994, “The benefits of lending relationship: evidence from small business data”, *Journal of Finance*, vol. 49, pp. 1367-1400.

Petersen, M. A. & Raghuram G. R. 1995, "The Effect of Credit Market Competition on Lending Relationships", *Quarterly Journal of Economics*, vol. 110, pp. 407-43.

Prescott, H. & McCall, A. 1975, “Market power and structure and commercial bank instalment lending”, *Journal of Money, Credit and Banking*, vol. 7, no. 4, pp. 449-467.

Rajan, R. & Zingales, L. 1998, “Financial dependence and growth”, *American Economic Review*, vol. 88, pp. 559-587.

Rajan, R. G. 1992, "Insider and Outsiders, the Choice between Informed and Arm's-Length Debt", *Journal of Finance*, vol. 47, pp. 1367-1400.

Repullo, R. 2004, “Capital Requirements, Market Power, and Risk-Taking in Banking”, *Journal of Financial Intermediation*, vol. 13, pp. 156–82.

Rhoades, S. A. & Rutz, R. D. 1982, “Market power and firm risk: a test of the ‘quiet life’ hypothesis”, *Journal of Monetary Economics*, vol. 9, pp. 73–85.

Roy, A.D. 1952, “Safety First and the Holding of Assets”, *Econometrica*, vol. 20, No. 3, pp. 431-449.

Schaeck, K. & Cihak, M. 2007, “Banking Competition and Capital Ratios”, IMF *Working Papers* 07/216, International Monetary Fund.

Schaeck, K. & Čihák, M. 2008, “How Does Competition Affect Efficiency and Soundness in Banking? New Empirical Evidence”, (September 30, 2008), *ECB Working Paper*, No. 932. Available at SSRN: http://ssrn.com/abstract=1240856.

Schaeck, K. & Cihak, M. 2010, “Competition, efficiency, and soundness in banking: An industrial organization approach”, *CentER Discussion Paper*, No, 2010-68S.

Schaeck, K., Alessandrini, P., Zazzaro, A. & Fratianni, M. 2009a, “Bank Market Structure, Competition, and Stability: Issues and Concepts”, Book Chapter of The Changing Geography of Banking and Finance, Springer 978-0-387-98078.2.

Schaeck, K., Cihak, M. & Wolfe, S. 2006, “Are more competitive banking systems more stable?”, *Unpublished Working Paper*, No. 143, IMF.

Schaeck, K., Cihak, M. & Wolfe, S. 2006, “Competition, concentration and bank soundness: New evidence from the micro-level”, *Working Paper*, No. 06/143, IMF.

Schaeck, K., Cihak, M. & Wolfe, S. 2009b, “Are competitive banking systems more stable?”, *Journal of Money, Credit and Banking*, vol. 41, pp. 711–734.

Schumpeter, J. A. 1911, “A theory of economic development. Cambridge”, MA: Harvard University Press, 1911.

Seelanatha, L. 2010, "Market structure, efficiency and performance of banking industry in Sri Lanka", *Banks and Bank Systems*, vol. 5, no. 1, pp. 20-31

Shaffer, S. & DiSalvo J. 1994, “Conduct in a banking duopoly”, *Journal of Banking and Finance*, vol. 18, pp. 1063–82.

Shaffer, S. 1982, “A non-structural test for competition in financial markets”, in Proceedings of a Conference on Bank Structure and Competition (Federal Reserve Bank of Chicago, pp. 225–43).

Shaffer, S. 1985, “Competition, economies of scale, and diversity of firm sizes”, *Applied Economics*, vol. 17, pp. 467–76.

Shaffer, S. 1989, “Competition in the US banking industry”, *Economic Letters*, vol. 29, pp. 323–32.

Shaffer, S. 1993, “A test of competition in Canadian banking’, *Journal of Money, Credit, and Banking*, vol. 25, pp. 49–61.

Shaffer, S. 2004, ‘Patterns of competition in banking”, *Journal of Economics and Business*, vol. 56, pp. 287–313.

Shaw, Edward S., 1973, “Financial Deepening in Economic Development”, Oxford University Press, New York, NY.

Short, B. 1979, “The relation between commercial bank profit rates and banking concentration in Canada, Western Europe and Japan”, *Journal of Banking and Finance*, vol. 3, no. 3, pp. 209–219.

Shrieves, R. E. & Dahl, D. 1992, “The relationship between risk and capital in commercial banks”, *Journal of Banking and Finance*, vol. 16, pp. 439-457.

Smirlock, M. 1985, "Evidence of the (Non)-Relationship between Concentration and Profitability in Banking", *Journal of Money, Credit and Banking*, vol. 17, no. 1, pp. 69-83.

Smith, B. 1984, "Private Information, Deposit Interest Rates, and the 'Stability' of the Banking System", *Journal of Monetary Economics*, vol. 14, pp. 293–317.

Soedarmono, W., Machrouh, F. & Tarazi, A. 2011, "Bank Competition, Risk and Capital Ratio: Evidence from Asia", (February 1, 2011). Available at SSRN: http://ssrn.com/abstract=1633394

Spagnolo, G. 2001, "Debt as a (Credible) Collusive Device", *SSE Ec.&Fin. Working Paper*, No. 243.

Staikouras, C. & Geoffrey, E. W. 2000, "Competition and Banking Stability in Greece and Spain", *Journal of International Banking Regulation*, vol. 2, no. 1.

Staikouras, C. & Wood, G. 2004, "The determinants of European bank profitability", *International Business and Economics Research Journal*, vol. 3, no. 6, pp. 57–68.

Staikouras, C. K. & Koutsomanoli-Fillipaki, A. 2006, "Competition and concentration in the new European banking landscape", *European Financial Management*, vol. 12, pp. 443–82.

Stiglitz, J. E. & Weiss, A. 1981, "Credit rationing in markets with imperfect information", *American Economic Review*, vol. 71, pp. 393– 410.

Suominen, M. 1994, "Measuring competition in banking: a two-product model", *Scandinavian Journal of Economics*, vol. 96, pp. 95–110.

Toolsema, L. A. 2002, "Competition in the Dutch consumer credit market", *Journal of Banking and Finance*, vol. 26, pp. 2215–29.

Tregenna, F. 2009, "The fat years: the structure and profitability of the US banking sector in the pre-crisis period", *Cambridge Journal of Economics*, vol. 33, no. 4, pp. 609-632.

Turk-Ariss, R. 2009, "Competitive behavior in Middle East and North Africa banking systems", *The Quarterly Review of Economics and Finance*, vol. 49, pp. 693–710.

Turk-Ariss, R. 2010, "On the implications of market power in banking: evidence from developing countries", *Journal of Banking & Finance*, vol. 34, pp. 765-775.

Uchida, H. & Tsutsui, Y. 2005, "Has competition in the Japanese banking sector improved?", *Journal of Banking and Finance*, vol. 29, pp. 419–39.

Uhde, A. & Heimeshoff, U. 2009, "Consolidation in banking and financial stability in Europe: empirical evidence", *Journal of Banking & Finance*, vol. 33, pp. 1299–311.

Utrero-Gonzalez, N. 2007, "Banking regulation, information asymmetries and industry growth: new evidence", *Applied Financial Economics, Taylor and Francis Journals,* vol. 17, no. 1, pp. 63-76.

Vesala, J. 1995, "Testing for competition in banking: behavioral evidence from Finland", *Bank of Finland Studies*, E1 (Bank of Finland, 1995).

Vives, X. 2001, "Competition in the Changing World of Banking", *Oxford Review of Economic Policy*, vol. 17, pp. 535-545.

Weill, L. 2003, "On the relationship between competition and efficiency in the EU banking sectors", *Mimeo*. LARGE Universite Robert Schumann, Strasbourg, France.

Weiss, L.W. 1989, "A review of concentration-price studies in banking", L.W. Weiss, Editor, Concentration and price, *MIT Press*, Cambridge, MA (1989), pp. 219–254.

Yeyati, E. L. & Micco, A. 2007, "Concentration and foreign penetration in Latin American banking sectors: impact on competition and risk", *Journal of Banking & Finance*, vol. 31, pp. 1633–1647.

Yildirim, H. S. & Philippatos, G. C. 2007, "Restructuring, consolidation and competition in Latin American banking markets", *Journal of Banking and Finance*, vol. 31, pp. 629–39.

Yuan, Y. 2006, "The state of competition of the Chinese banking industry", *Journal of Asian Economics*, vol. 17, pp. 519–34.