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Université d'Auvergne, Clermont-Ferrand 1
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BANK COMPETITION IN AFRICA: THREE ESSAYS

Thèse Nouveau Régime

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L'université d'Auvergne n'entend donner aucune approbation ou improbation aux opinions émises dans cette thèse. Ces opinions doivent être considérées comme propres à leur auteur.

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Résumé

Cette thèse étudie le rôle de la concurrence bancaire en Afrique. Au cours de la dernière décennie, les systèmes bancaires africains ont connu de profondes modifications dans leurs structures affectant le niveau de concurrence bancaire. Alors que l'approche traditionnelle souligne que la concurrence incite les banques à accroître l'offre de fonds et à améliorer leur management, une vision plus pessimiste souligne que la concurrence entre banques peut être néfaste pour l'efficacité, l'inclusion et la stabilité des systèmes bancaires, en particulier dans les marchés opaques. Cette thèse vise donc à éclairer ce débat dans le contexte africain en proposant trois essais empiriques. La première partie de cette thèse fournit une description des systèmes bancaires africains et motive le propos de cette thèse. Une revue de la littérature sur les conséquences de la concurrence bancaire est présentée au chapitre 3. Les différentes mesures de la concurrence sont discutées dans le chapitre 4. Les trois chapitres suivant regroupent les contributions de cette thèse à la littérature. Le chapitre 5 évalue, à partir d'un échantillon de banques d'Afrique de l'Ouest, l'évolution du degré de concurrence bancaire en Afrique au cours de la dernière décennie. Les résultats empiriques issus de plusieurs mesures de la concurrence montrent une intensification du niveau de concurrence. Le chapitre 6 étudie la relation entre le pouvoir de marché et l'efficacité des banques. Les résultats soulignent un effet positif du pouvoir de marché sur l'efficacité-coût alors que son effet sur l'efficacité profit est nul. Le chapitre 7 analyse empiriquement la relation complexe entre le niveau de concurrence et l'accès au crédit pour un échantillon large de 70 pays en développement. Les estimations économétriques soulignent un effet positif de la concurrence sur l'accès au crédit. Les résultats montrent qu'une intensification de la concurrence induit une probabilité plus grande d'obtenir un crédit mais également une probabilité plus forte de demander un crédit pour les entreprises ayant un besoin de financement. La conclusion générale de cette thèse souligne les effets bénéfiques de la concurrence bancaire même au sein des systèmes financiers peu matures et discute plusieurs mesures visant à favoriser la concurrence sur ces marchés.

Mots clés: Banques, Concurrence, Pouvoir de marché, Afrique, efficacité, accès aux crédits

Summary

This thesis is concerned with the role of interbank competition in Africa. During the past decade, African banking systems have witnessed profound changes in their structure with some implications on the level of competition. Although the traditional view argues that intensified competition encourages banks to increase the supply of funds and improves banks management, a more pessimistic view sustains that competition can be detrimental for efficiency, inclusion and stability of banking sectors, especially in opaque markets. The aim of this dissertation is therefore to shed a new light on this debate in the context of Africa by offering three empirical contributions. The first part of this thesis provides an overview of financial systems in Sub-Saharan Africa and motivates the purpose of this dissertation. A review of the literature on the consequences of competition in banking is presented in Chapter 3. The different measures of competition in banking are discussed in Chapter 4. The three following chapters focus on the original contributions of this dissertation. Chapter 5 evaluates the evolution of bank competition over the last decade in African countries using a sample of West African banks. The findings, based on different measures of competition, show an increase of competition over the past decade. Chapter 6 investigates the relationship between market power and efficiency. Empirical results document that banks with more market power are able to reduce costs but do no better at maximizing profits than banks with less market power. In Chapter 7, the complex relationship between credit availability and competition is analyzed using a large sample of 70 developing countries. Findings show that firms located in countries with competitive banking markets have a significantly lower probability to be credit constrained. Results show that competition not only leads to less severe loan approval decisions but also reduces borrowers' discouragement. The general conclusion of this thesis underlines the beneficial consequences of competition even in non-mature banking systems and discusses several measures to enhance competition in these markets.

Keywords: Banks, Competition, Market power, Africa, efficiency, credit availability

List of Acronyms

BCEAO:	Banque Centrale des Etats d'Afrique de l'Ouest
CB-UMOA:	Banking Commission of the West African Monetary Union (UMOA)
CEMAC:	Communauté Economique et Monétaire d'Afrique Centrale
CFA:	Communauté Financière Africaine
CV:	Conjectural variation
DFI:	Development finance institution
DEA:	Data Envelopment Analysis
IMF:	International Monetary Fund
IO:	Industrial Organization
FI:	Financial Intermediary (with banking activities)
GMM:	Generalized Method of Moments
HIC:	high-Income Country
LIC:	Low-Income Country
LMIC:	Low-Middle Income Country
MFI:	MicroFinance Institution
NBFI:	Non-Bank Financial Institution
NEIO:	New Empirical Industrial Organization
OLS:	Ordinary Least Squares
PCM:	Price-Cost Margin
PR:	Panzar-Rosse
SCP:	Structure-Conduct-Performance
SFA:	Stochastic Frontier Analysis
SME:	Small- and Medium-sized Enterprise
SSA:	Sub-Saharan Africa
UMIC:	Upper-Middle Income Country
WAEMU:	West African Economic and Monetary Union (UEMOA)
WDI:	World Development Indicators
2SLS:	Two Stages Least Squares
3SLS:	Three Stages Least Squares

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General Introduction

In 1911, [Schumpeter \(1911\)](#) underlined the importance of financial sector for economic development. The Schumpeterian view is that growth is driven by innovations and innovation is driven by credit. In the end of the nineteenth century, [Bagehot \(1878\)](#) had already advanced that finance played a critical role in the industrialization of England by facilitating the mobilization of capital. However, [Robinson \(1952\)](#) argued that correlation between financial and economic development is due to reverse causation. Economic development creates demands for financial services, and the financial systems merely respond to these demands. [Patrick \(1966\)](#) distinguished the *supply-leading hypothesis* and the *demand-following hypothesis*. The *supply-leading hypothesis* argues that the financial development causes economic growth. On the contrary, the proponents of the *demand-following hypothesis* state that economic growth leads financial sector development. Until 1990, with some exceptions ([Gurley and Shaw, 1955](#); [Goldsmith, 1969](#); [Hicks, 1969](#); [McKinnon, 1973](#)), economists believed that finance is a relatively unimportant factor in economic development (see: [Levine, 1997](#); [Ang, 2008](#)). Starting with [King and Levine \(1993\)](#), extensive literature has, however, provided support for the *supply-leading approach* using cross-country, time series, panel data, and firm-level studies (see [Levine, 2005](#); [Ang, 2008](#); [Beck, 2013b](#); [Panizza, 2013](#)).¹

Several recent papers have challenged the view that finance-growth relationship is linear. Studies find that too much finance is detrimental for growth ([Arcand et al., 2012](#); [Law and Singh, 2014](#)).² At the opposite, there is evidence that the effect of financial development is stronger among middle-income countries than low-

¹Although there is by now a large literature showing that finance plays a positive role in promoting economic development, there are also few papers that question the robustness of the finance-growth nexus ([Ang, 2008](#); [Panizza, 2013](#)). For a discussion of econometric methods and problems, the interested reader can refer to [Ang \(2008\)](#) and [Beck \(2009\)](#). This literature has also provided insights into the channel through which finance fosters economic growth ([Beck, 2013b](#)). Recent evidence has shown that financial development is not only pro-growth, but also pro-poor and reduces inequality ([Beck et al., 2007](#); [Guillaumont-Jeanneney and Kpodar, 2011](#)).

²Several reasons have been put forward to explain that more finance is not always better ([Arcand et al., 2012](#)). Firstly, large financial sectors increase the financial instability and likelihood of crises ([Loayza and Ranciere, 2006](#); [Guillaumont-Jeanneney and Kpodar, 2007](#)). Secondly, a large financial sector may cause a brain drain from the productive sectors of the economy to financial sector ([Kneer, 2013](#)). Thirdly, [Aghion et al. \(2005b\)](#) document that financial development only affect convergence towards equilibrium and do not have any effect on steady-state growth. Finally, development of financial systems beyond a certain threshold may induce more households credit and less intermediation activities that have less impact on growth ([Beck et al., 2012a, 2013b](#)).

income countries (Deidda and Fattouh, 2002; Rioja and Valev, 2004; Valickova et al., 2013). The findings are consistent with recent works highlighting the weak (or the absence of) impact of financial development on growth in Sub-Saharan Africa (Gries et al., 2009; Demetriades and James, 2011; Rousseau and D’Onofrio, 2013; Menyah et al., 2014).³ This issue is at least as important as the dark side of finance in industrialized countries insofar as there is an urgent need for growth in low-income countries, especially in Africa.

Levine (1997, 2005) describes four main mechanisms through which finance can promote economic development: (i) the easing of exchange through the reduction of transaction costs and the provision of payment services; (ii) the pooling of savings through risk diversification and risk management; (iii) the improvement of capital accumulation through the *ex ante* screening activities, and (iv) the increase of investors’ willingness to finance new projects through *ex post* monitoring and corporate governance. Several explanations can be put forth to explain the small impact of finance on growth in African countries. Firstly, one might argue that low-income countries are blocked in a low equilibrium. Financial sector is too small to reap scale economies and financial intermediaries cannot provide financial services at affordable costs. Secondly, the finance-growth nexus can be conditional to specific characteristics of country (Harris, 2012). Many African countries suffer from weaknesses in legal systems and institutions. Greater financial development may only translate into more growth after a threshold of legal/institutional development is passed (Law et al., 2013). For instance, an increase in financial activity cannot spur growth due to corruption in the banking system that may divert credit to unproductive or even wasteful activities. Bad regulations and weaknesses in supervision can also impede the positive impact of finance on growth. Thirdly, the existing structure of financial systems in Africa may be unadapted to support growth. There is an intense debate in the literature about merits and demerits of bank-based and market-based systems. Empirical results are inconclusive (see: Levine, 2002). Banks and markets do not offer the same services and the need for specific financial services and intermediaries differ at the different levels of economic development (Boyd and Smith, 1998). Moving beyond the questions of banks versus markets, the same argument may apply regarding the relative merits of informal finance and microfinance in low-income countries. Finally, the size does not matter if the financial systems suffer from inefficiencies in their functioning. In most African economies, financial systems are characterized by the high costs of financial services, the low degree of financial intermediation and the preference of banks for liquid assets (T-bills, short-term loans, etc.). These characteristics can affect the ability of the financial system to stimulate economic growth and development (Ncube, 2007).

This dissertation focuses on one aspect that impacts the behaviors of banks and the functioning of banking systems, namely the degree of competition. The common belief states that competition among banks in Africa is minimal insofar as the

³Other papers, based on time-series analysis, support the hypothesis that the financial development causes growth in Sub-Saharan African countries (see: Murinde, 2012).

banking markets in many countries are oligopolistic. However, the banking industries have witnessed profound change over the past decade and things are changing. For instance, in recent years some banks from Africa such as Ecobank, United Bank for Africa, Bank of Africa or Attijariwafa Bank, have increased their presence in the continent. In 2005, Ecobank was implanted in 13 African countries, while it has currently branches in 35 countries. The same trends occur for United Bank for Africa (located in 2 African countries in 2005; 19 today), Bank of Africa (3 in 2005; 18 today) or Attijariwafa bank (3 in 2005; 13 today). The rapid expansion of cross-border African banks coupled with the entry of new banks might affect the degree of competition in banking.⁴ Competitive pressures induced by these recent transformations can in turn change the behaviors of lenders and borrowers. Despite its importance for policymakers, studies on the role of competition in African banking systems remain scarce and inconclusive. As stated by Beck (2013a), the issue of competition is one of the areas in which future research on financial development in low-income countries is needed. The importance of this issue is reinforced by the emergence of a new paradigm arguing that competition is one of major levers by which States may favor the development of financial sectors (see: Beck et al., 2011b; World Bank, 2013).

The aim of this thesis is to study whether competition among banks is beneficial for the development of financial sector in Africa. The continent faces specific conditions, especially the high degree of opacity and uncertainty, that render the consequences of bank competition undetermined. The traditional *market power* view argues that competitive pressures encourage banks to increase the supply of funds and improve banks management. A more pessimistic view (the *information hypothesis*) sustains that competition can be detrimental for efficiency, inclusion and stability of banking sectors. Banks may be reluctant to finance opaque borrowers or develop new products if they cannot recoup the initial investment due to competitive pressures (Petersen and Rajan, 1995; Hauswald and Marquez, 2006). In addition, thinning in margins can give banks' incentives to take more risks at the expense of their financial soundness (Keeley, 1990). By studying the behavior of banks in face

⁴The recent transformations in the structure of African banking markets can also affect the performance of banking systems through its effect on the size and ownership structure of banks. The conventional wisdom suggest that economies relying on industries with many small enterprises require financial systems relying on smaller financial institutions with local roots (Berger et al., 2001; Stein, 2002; Sengupta, 2007). The literature finds evidence consistent with the idea that small and local banks engage more with opaque small- and medium-sized firms through relationship lending than large and foreign banks (Berger et al., 2001, 2005; Mian, 2006; Detragiache et al., 2008; Gormley, 2010). Berger and Udell (2006) have recently challenged this conventional wisdom, arguing that large and foreign banks can be as effective in opaque firms lending through arms-length lending technologies instead of relationship lending. Several studies have empirically provided support in favor of this view (De La Torre et al., 2010; Beck et al., 2011a, 2013c). The size and ownership structure of banks might also affect the efficiency and stability of financial systems (see: Claessens and Van Horen, 2013b). However, the most direct impact of recent changes in African banking systems may translate through its effect on competition among banks. The entry of new banks might change the structure of the banking industry in the medium-run but puts pressure on incumbents in the short-run.

of competitive pressures, this dissertation also improves our knowledge about the microeconomics of credit markets in Africa. Knowing how actors conduct in credit markets is crucial for policymakers to design effective policies.

To analyze the role of competition in African banking systems, this dissertation is organized into the following chapters. The first chapter of this thesis presents the financial systems in Africa. Despite the fact that Africa faces challenges, things are changing and opportunities for solutions exist. Competition is often viewed by commentators as a good thing, driving financial development in the short-term. However, Chapter 3 points out that theoretical literature is ambiguous and empirical evidence somewhat inconclusive. I recall in this chapter the contributions of this thesis in relation with the literature. A critical point in applied studies concerns the measurement of competition in banking. Chapter 4 therefore discusses the existing measures of competition used in banking and underlines their strengths and weaknesses.

The first three chapters constitute a solid base, which enables me to carefully implement in the rest of the thesis three successive empirical essays to investigate the evolution and consequences of competition among banks in Sub-Saharan Africa. In Chapter 5, I provide indirect test of the implications of recent changes in banking industries on competition. While commentators often argue that the development of pan-African banking groups enhances competition, the chapter indirectly tests this intuition. Different non-structural measures of competition are used to proxy the evolution of competition in seven West African countries. These countries have been highly affected by recent changes in the past decade. The findings show that the degree of competition increased in Africa over the past decade, confirming the common view.

In the following two chapters of the dissertation, I carry out empirical analyzes in order to understand whether competition has a positive or negative effect on financial development. Chapters 6 and 7 were conceived in order to shed light on a set of fundamental issues:

- What is the effect of market power on bank efficiency?
- What is the impact of bank competition on credit availability?

The literature raises a third dimension in which competition among banks plays a role: the financial stability. In spite of the importance of financial stability in Africa, this work does not directly scrutinize the competition-stability nexus for several reasons. First, one paper has already investigated this issue in the case of Africa (Moyo et al., 2014). Second, this issue is indirectly analyzed insofar as weaknesses in management and loans concentration are among the most important causes of financial fragility in Africa (Beck et al., 2011b).

Chapter 6 investigates the relationship between market power and efficiency. While a common belief asserts that reduction in market power encourages banks to enhance internal management, things are more complex in banking. A large literature has investigated this issue in mature banking systems. To my knowledge,

however, no paper has analyzed the impact of market power on efficiency in low-income countries and in Africa. The results indicate that banks with more market power are able to reduce costs but do no better than other banks at maximizing profits. Insofar as these findings are somewhat counterintuitive, a possible explanation is suggested. Banks with lower levels of market power can develop niche market strategies by providing funds to opaque firms or offering new services. The structure of credit in terms of borrower type or maturity can in turn affect the level of cost and revenue and therefore the cost and profit efficiency scores.

In Chapter 7, I consider the complex relationship between credit availability and competition. Theoretical literature cannot provide clear predictions about the consequences of competition among banks on the access to finance in opaque markets. Meanwhile, empirical literature is inconclusive and suffers from some limitations. I therefore investigate this issue. Due to the lack of data, this essay analyzes this relationship on a large sample of developing countries. Furthermore, contrary to existing studies, several measures of competition are used. In addition, this essay not only tests the positive or negative impact of competition on credit availability but also tries to understand by which channels competition affects firms' access to credit. Findings show a positive impact of bank competition on credit availability, while bank concentration has no effect. This chapter documents that competitive pressure not only leads to less severe loan approval decisions but that it also reduces borrower discouragement. In addition, the findings tend to show that competition affects credit availability through price effect (lower interest rates) rather than relationship effect (banks invest more in relationship in competitive markets).

The general conclusion presents some policy implications of the main results provided by empirical analysis. Chapter 8 also discusses gaps in the literature and directions for future research.

Finance in Africa

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2.1 Introduction

A fast-growing body of literature has found a clear link between financial development, growth, poverty and inequality (Levine, 2005; Beck et al., 2007; Panizza, 2013). Although financial systems in Africa have become deeper, more efficient, and more stable over the past several years, some challenges remain. Africa continues to lag behind other regions of the world in terms of financial sector development. In addition, as emphasized by Demetriades and James (2011), the link between finance and growth in Sub-Saharan Africa appears to be broken. Furthermore, in some African countries, banks remain vulnerable and fragile in spite of improvements. African countries continue to face the challenge of improving the functioning of their financial systems in a manner that will promote growth. Africa exhibits specific characteristics that curb financial development by increasing costs and risks. Opportunities for solutions, however, do exist.

In this chapter, I discuss the obstacles to financial development in Africa and the role of the state to spur the development of the financial sector. Section 2.2 opens with a description of African financial systems.¹ After a brief history of financial sector development, the structure of financial systems is described. The section concludes by comparing Africa to other developing countries. The obstacles to financial development and the role of the state are discussed in Section 2.3. Following the terminology of Beck and De La Torre (2007), three types of policies are considered: *market-developing policies*, *market-enabling policies* and *market-stabilizing policies*. This section allows me to place the discussion about competition in the African context.

2.2 African financial systems

2.2.1 Early years

The financial systems in existence in many African countries following independence were dominated by colonial banks. At this time there was a great deal of discontent in the newly independent countries about the services offered by these foreign banks. Colonial banks focused their activities on a foreign minority, ignoring the majority of firms and households. Consequently, during the 1960s and 1970s, governments actively intervened in finance. Many governments introduced many types of distortion into the financial sector. Governments acquired already existing banks or set up new commercial banks and Development Financial Institutions (Fowowe, 2013).² In many countries, interest rates were subject to ceilings or other forms of regulation and controls and the allocation of credit was similarly constrained and directed to

¹Some information included in this section is extracted from Honohan and Beck (2007), Beck et al. (2011b), Allen et al. (2011b) and Beck and Maimbo (2013).

²Fowowe (2013) notes that many governments refused to nationalized foreign banks with notable exceptions (Malawi, Uganda, Nigeria and Zambia). Governments often acquired partially or totally domestic-owned and foreign-owned banks.

priority sectors. The goal was to support certain priority sectors and industries by providing cheap credit. However, the outcomes of financial repression policies did not reach the expectations. Weak resource mobilization due to low deposit rates coupled with misallocation of resources limited the quantity and effectiveness of investment. This explains why financial repression blocked growth instead of stimulating activity (Roubini and Sala-i Martin, 1992). Financial repression not only did not achieve its target but also weakened financial systems in Africa. Due to political pressure, loans were often based more on the proximity of power than on a project's potential returns. Repayments were sometimes irregular, increasing the share of non-performing loans (NPLs). The low levels of profits due to low interest rates, a high share of NPLs and weak efficiency coupled with limited compliance with regulatory rules created very vulnerable banks. As a result, numerous banking crises occurred throughout Sub-Saharan Africa in the 1980s and 1990s. These events concerned many African countries and were particularly harmful for some of them (Daumont et al., 2004; Laeven and Valencia, 2012). While government involvement in banking and financial repression policies were not the single cause of the crises, both played a determinant role (Daumont et al., 2004).³

Banking crises underlined the adverse effect of government interventionism in finance. Proponents of financial liberalization, namely McKinnon (1973) and Shaw (1973), argue that the problem with repression policies is not lack of investment opportunities but rather unattractive savings. Under a repressed financial system, interest rates were held below their competitive levels, discouraging agents from saving and consequently making capital for investment hard to come by. Furthermore, directed credit programs biased the allocation of capital towards some sectors and firms that were not always profitable. Financial liberalization was expected to correct all of these non-market disparities. Many countries in Africa began liberalizing their financial systems in the 1990s. Financial liberalization policies were often accompanied by structural-adjustment policies. While the scale, timing and speed of reforms differed between countries, trends were common (Fowowe, 2013).⁴ Controls on interest rates and credits were removed, entry into banking facilitated, insolvent banks restructured, some government-banks privatized and prudential regulation and supervision strengthened.

Fowowe (2013) provides surveys of literature on the consequences of financial liberalization in Africa. Empirical studies found diverse and contrasting effects on savings, investment and economic growth. Fowowe also notes that financial liberalization in Africa was accompanied by a sharp increase in lending interest rates and spreads, and only modest improvements in financial development. This skeptical view is shared by Andersen et al. (2012) that review both theoretical and empirical literature. Studying the effect on credit availability, O'Toole (2012) indicates that,

³African economies also experienced macroeconomic shocks and were subject to international shocks in a context of weak diversification and fragile financial systems.

⁴He focuses on 19 African countries namely Botswana, Burundi, Cameroon, Republic of Congo, Côte d'Ivoire, Gambia, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritius, Nigeria, Senegal, Sierra Leone, South Africa, Uganda, Zambia, and Zimbabwe.

while its effects are beneficial in other parts of the world, financial liberalization did not alleviate financing constraints for firms in Africa. All in all financial liberalization did not achieve its target. A number of explanations have been proposed to explain this failure (see [Fowowe \(2013\)](#) for a presentation of the different theories). For instance, [Delis \(2012\)](#) sheds light on the inefficiency of financial liberalization policies in promoting competition countries with low income or weak institutions. A consensus exists on the notion that some prerequisites were not met in Africa, including a stable macroeconomic environment and strong institutions.

2.2.2 Landscape of African financial systems

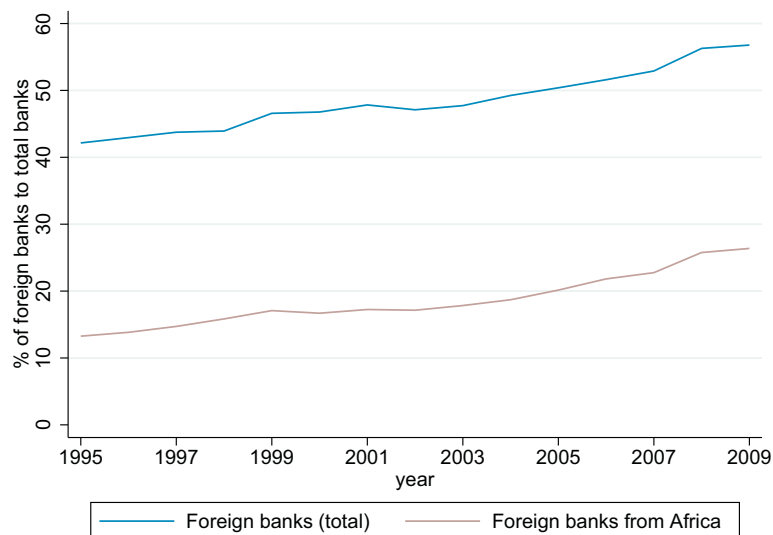
Although it remains dominated by banks, the landscape of financial systems in Africa has profoundly changed over the last decades in Africa. This sub-section presents the current structure and recent changes in banking and non-banking financial sectors.

2.2.2.1 Banking system

The banking sector is and will continue to comprise the largest part of financial systems across Africa. The universe of banks in Africa today is a diverse one, ranging from subsidiaries of the largest European banks to small domestically owned niche banks. The banking sector in most African countries is dominated by a handful of banks. The importance of government-owned commercial banks has declined in recent years mostly because of the privatization process. State-owned banks remain notable players only in Eritrea and Ethiopia ([Honohan and Beck, 2007](#); [Allen et al., 2011b](#)). In other countries, a part of the activity of state-owned banks is today ensured by other entities such as Development Finance Institutions. The experience of the privatization of the Uganda Commercial Bank has shown that well-designed privatization does not always reduce outreach ([Clarke et al., 2009](#)). The example of Uganda, however, also shows that privatization and foreign bank entry are not sufficient to increase efficiency and competition. There was no significant impact of privatization and foreign bank entry on the interest rate spread in Uganda ([Beck and Hesse, 2009](#)).

The privatization process has induced another important consequence for banking markets in Africa. Foreign bank penetration in Sub-Saharan Africa has not only risen but the structure of foreign ownership has dramatically changed. Africa's banking systems were dominated by colonial banks before independence. Following independence, nationalization reduced the share of foreign ownership significantly. During financial liberalization in the 1990s, many foreign banks returned, and new foreign banks expanded throughout the region. [Table 2.1](#) shows the share of foreign-owned banks in Sub-Saharan Africa over the last decade. While the situations of each country differ, foreign ownership has risen through acquisitions of domestic-owned banks by foreigners or establishments of greenfield banks. Today, Africa is the region with the highest share of foreign-owned banks in the world ([Claessens](#)

Figure 2.1: Foreign banks as a percentage of total banks



Note: Author's calculations from data of Claessens and Van Horen (2013a)

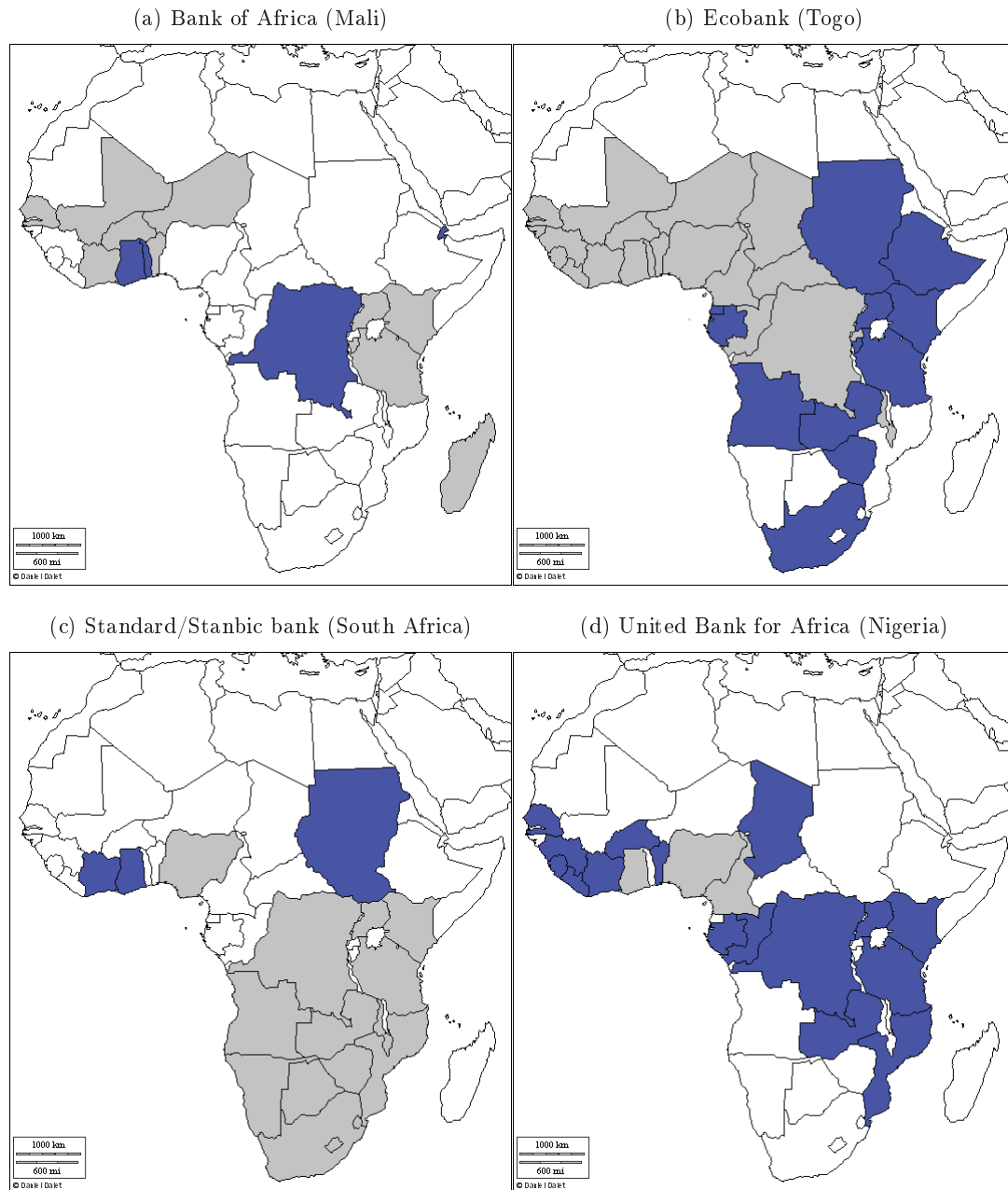
and Van Horen, 2013a).

Another important feature has been the development of cross-border banking groups from Africa.⁵ Banks based in South Africa have long been heavily involved in the provision of banking services in neighboring countries (Botswana, Lesotho, Namibia, or Swaziland). After the end of the Apartheid, several South African banks began expanding throughout the continent. Standard Bank, the largest bank in Africa, has recently aggressively expanded outside Southern Africa (see Figure 2.2). Barclays Africa Group (formerly Absa) has begun to expand in neighboring countries. Other South African banks, such as Nedbank or FirstRand Group, however, remain focused in Southern Africa.⁶ Over the last decade, two young West African banks (Bank of Africa and Ecobank) have begun expanding throughout the continent. From 1990 to the mid-2000s, both spread out in Western Africa. Since the mid-2000s, these groups have reached beyond that zone, and expanded across Africa. Ecobank has the most widespread presence in Africa (35 countries). Bank of Africa operates in 15 countries (See: Figure 2.2). This strategy can be easily explained by the necessity to grow due to the limited size of national markets in West Africa. Recently, Nigerian banks began expanding throughout West Africa, but increasingly throughout the rest of the continent as well. For example, United

⁵To simplify the analysis, the SSA is divided into four regional groups: Central, Eastern, Southern and Western Africa. More information can be found in the Appendix (page 175).

⁶In order to expand its activity outside its sphere of influence, Nedbank has developed a partnership with Ecobank.

Figure 2.2: Selected Pan-African banking groups



Note: Figures show SSA countries where Bank of Africa, Ecobank, Standard bank and United bank for Africa opened at least one branch. African countries colored in grey are countries where the group established branches before 2008; in blue, countries where the group has entered since January 2008 (Source: Banks' website, accessed December 2013).

Table 2.1: Major pan-African banking groups

Bank	Country of origin	Assets [†] (rank)	Presence in SSA [§]				
			East	West	Central	Southern	Total
Standard Bank Group	South Africa	185 (1)	4	3	1	11	19
Barclays Africa Group [‡]	South Africa	97 (3)	4	2	0	7	13
Attijariwafa Bank	Morocco	40 (6)	0	5	3	0	8
BMCE	Morocco	24 (11)	6	6	1	0	13
Ecobank Group	Togo	17 (17)	7	15	8	5	35
United Bank for Africa	Nigeria	12 (23)	3	9	5	2	19
Access Bank	Nigeria	10 (26)	2	3	2	1	8
Skye bank	Nigeria	6 (50)	0	5	1	1	7
BFGI bank	Gabon	4 (63)	1	2	6	0	9
Bank of Africa	Togo	5 (64)	5	8	1	1	15
Afriland First Group	Cameroon	2 (136)	1	2	5	1	9

[†] Assets are in \$ millions and rank refers the rank of banks in the SSA and MENA (Source: Jeune Afrique, Hors-série Spécial Finance, 34, 2013).

[§] Number of countries where banking group is located (Source: bank websites, accessed December 2013). Data for Barclays Africa Group refers to figures on ABSA in 2012. The countries included in each sub-region are presented in the Appendix (page 175).

[‡] Data for Barclays Africa Group refers to ABSA's financial figures in 2012.

Bank for Africa is currently established in 19 countries (See Figure 2.2). Recently, some Moroccan banks such as Attijawarifa, BCP and BMCE have begun expanding south. Although banks from other North African countries are less involved in Sub-Saharan Africa. The development of cross-border banks from Morocco could dramatically change the banking landscape in Africa. These banks are among the largest on the continent (Attijariwafa and BMCE are among the top 15 banks in Africa).

As a consequence, in addition to an increase in foreign bank ownership, there has been an expansion of African cross-border banks (see Figure 2.1). By the end of 2013, there were at least 25 African banks with cross-border operations in five or more countries of the SSA.⁷ A handful of African regional banking groups operate at a multiregional level, as documented in Table 2.1. These pan-African groups are and will be important players in the Sub-Saharan African banking markets. This is particularly true in West and Central Africa due to the strong implantation of major regional banks and the limited size of national markets. These transformations are less pronounced in more mature banking systems, especially in South Africa.

Expansion of pan-African banking groups could induce some changes in banking industries. Commentators often argue that the spread of these groups enhances competition in national banking systems. Indeed, regional banking groups may be better positioned to compete than banks from industrialized countries, given their

⁷Ecobank (35 countries), Standard bank (19), UBA (19), BoA (15), Barclays Africa Group/Absa (13), BMCE (13), BSIC (12), BFGI bank (9), Afriland First group (9), Attijariwafa bank (8), Access bank (8), Atlantic bank (8), Guaranty Trust bank group (8), Skye blue (7), Kenya commercial bank (6), First Rand bank (6), Oragroup (5), Commercial Bank group (5), Bank PHB group (5), BancABC (5), Diamond group (5), Oceanic bank (5), Equity bank group (5), FIB (5) and Zenith international (5).

experience (Raja Shah, 2013; Nkoutchou, 2013). Moreover, rapid expansion of these groups signals a willingness to erode rents of incumbents. The limited size of these groups and the fact that they meet in multiple markets (Bernheim and Whinston, 1990), however, could be a serious impediment to the capacity of regional groups to compete with incumbent banks. In addition, some banking groups (such as Attijariwafa) have expanded through mergers or acquisitions of existing structures, inducing more concentrated markets. The impact of the development of pan-African banks on competition is therefore unclear.

The expansion of regional banking groups raises a concern about bank stability. Despite recent improvements, Beck et al. (2011b) report that some sources of vulnerability in banking systems remain, especially in Central and West Africa. Regional banks may increase the fragility of banking systems. One might argue that cross-border activity strengthens regional banks by facilitating diversification across markets. In addition, headquarters may provide support for subsidiaries in period of crisis and therefore maintain the supply of credit. However, empirical results document that the presence of foreign banks does not stabilize the supply of loans (Brana and Lahet, 2012; Claessens and Van Horen, 2013b). Furthermore, most interconnections between markets may also induce greater transmission of external shocks (Jeon et al., 2013). Moreover, cross-border operations are challenging for supervisory authorities (Beck et al., 2013d). The effective supervision of cross-border regional banks requires strong cooperation between the regulators of the respective home country institutions and the subsidiary host countries. For example, Ecobank, which operates in 35 different countries is under the regulatory supervision of 21 agencies. The European experience shows the difficulty of building a coordinated supervision. Finally, African banks, including regional banking groups often suffer from limited size and weak capitalization which render them sensitive to external shocks.

2.2.2.2 Nonbank finance: From microfinance to stock markets

*Microfinance.*⁸

In order to provide financing for households and small businesses, many governments have facilitated the establishment of microfinance institutions (MFIs) in Africa and elsewhere. The microfinance industry in Africa has grown significantly over the last several years, but it remains relatively small in volume. Until the mid-2000s, the sector experienced impressive growth, despite contraction following the financial crisis of 2008. According to MixMarket data, between 2000 and 2012 the number of borrowers in Africa multiplied by more than eight and the number of depositors by almost twenty.⁹ Penetration rates vary greatly across the continent but remain lower than in other developing areas. The borrower (depositor) penetration rate is the ratio of total borrowers (depositors) to inhabitants below the national poverty

⁸For a more detailed presentation of microfinance in Africa, see Jarotschkin (2012).

⁹Data are extracted from the MixMarket website (<http://www.mixmarket.org/>).

line. According to Jarotschkin (2012), the borrower penetration rate is 2.8 percent in East Africa but less than 1 percent in other parts of the continent. As for loans, depositor penetration rates are higher in East Africa (11.5 percent) than Central (1.6), West (3.0), and Southern Africa (0.8). Microfinance was started with the objective to provide loans to poor entrepreneurs but today it is a far-ranging and dynamic sector, including institutions that provide savings and remittance services, sell insurance, and offer loans for a wide range of purposes. The differing penetration rates between the credit and deposit sides reflect the fact that MFIs are focused mainly on savings services.

The MFI industry ranges between informal and formal financial sectors. While some markets are dominated by several MFIs (such as in Mozambique), others assemble a large number of small suppliers not always registered (such as in West Africa). MFIs across Africa also differ greatly in terms of ownership: from NGOs to commercial bank affiliates (Allen et al., 2011b). Business models are not homogenous across Africa and are marked by informal systems that existed before the development of microfinance. Some African countries have a long history of informal financial systems such as the "tontines" (a specific form of informal rotating savings and credit associations) in former French colonies.

The rapid growth of MFIs poses a viability problem for many of the MFIs. In addition, many MFIs have become notable deposit-taking institutions. Adapting and strengthening regulatory frameworks and supervision of the microfinance sector is thus necessary. Regulation in microfinance cannot be a simple transposition of banks regulation. The microfinance sector faces specific challenges and MFIs do not have the same financial and human capacities as commercial banks. Compliance with rules can be very costly for MFIs and some may prefer not to be registered (Cull et al., 2011). Another challenge facing MFIs in Africa is the need to move beyond urban areas and into rural areas. In most countries, MFIs still operate mainly in urban areas (Jarotschkin, 2012). However, the loans provided by MFIs have had great impact in rural areas where financial provision is almost non-existent.

Other non-banking financial institutions:

Other types of financial institutions (e.g. insurance, leasing, factoring companies or private equity funds) are somewhat limited in Africa and play a marginal role in Africa's financial systems (Allen et al., 2011b).

The insurance sector is in its infancy in most African countries (Allen et al., 2011b; Beck et al., 2011b). The use of insurance products is rather limited and the insurance business in some countries is dominated by non-life insurance (the automobile insurance sector holds the largest proportion of the market share). Many countries have fragmented insurance systems characterized by many small, underfunded, and weak companies.

The development of leasing and factoring companies is even more limited. For instance, leasing markets in Africa represent a one percent share of the world leasing volume (Beck et al., 2011b). Pension funds, private equity funds and venture capital funds are relatively new in Africa. Allen et al. (2011a) report that these markets

are rapidly growing in most stable African economies. However, their impact on financial systems is marginal.

Islamic finance:

A new actor emerging in some African countries (and elsewhere) is the Islamic finance. Five main principles differentiate Islamic finance from conventional finance: (i) the prohibition of *riba* (usury); (ii) the prohibition of *gharar* (chance) and *maysir* (games of chance) and therefore prohibition of speculation; (iii) the prohibition of financing an illicit (*haram*) sector in Sharia such as weapons, drugs, alcohol, pork, or games; (iv) the profit and loss-sharing rule; and (v) the principle that financial transactions serve for an economic purpose and involve tangible assets. Faye et al. (2013) report that 21 of 54 African countries have Islamic institutions, including 116 providers.¹⁰ The African Islamic institutions account for only 3% of global Islamic financial assets. East Africa counts the largest number of Islamic finance providers followed by North Africa. However, this trend is mainly explained by the large number of financial institutions in Sudan (49 providers including 32 banks). Islamic finance is less developed in other parts of the continent (Central, Southern and West Africa) that account for only 22% of providers (26 Islamic financial institutions). Islamic banking dominates the African markets for Islamic finance, capturing almost two thirds of providers (74 out of 116). Other institutions include Islamic insurance (33 providers), investment funds (4) and microfinance institutions (5). Islamic banking providers represent less than 10% of bank assets in the 21 African countries offering Islamic financial services. Islamic banking in Africa combines fully fledged Islamic banks and *Sharia-compliant* banking products offered by commercial banks. A growing body of literature investigates the difference of business models, market power, efficiency and stability between Islamic banks and commercial banks (Aggarwal and Yousef, 2000; Turk-Ariss, 2010; Čihák and Hesse, 2010; Weill, 2011; Beck et al., 2012b; Abedifar et al., 2013, among others).¹¹ The first results document few significant differences in business orientation, market power, efficiency and stability. Indeed, Khan (2010) documents that Islamic banks often copy the practices of conventional banks. However, Faye et al. (2013) point out that Islamic banks are more efficient and more stable than commercial banks in Africa and Gheeraert (2014) points out that the development of Islamic banking in Middle-east and South-East Asia leads to a higher banking sector development.

Stock markets:

In spite of a boom of market capitalization over the last decade, stock exchanges remain thin and illiquid in Africa. There were 21 stock exchanges in Africa in 2013. Prior to 1990, only five stock markets existed in the SSA. Table 2.2 reports some information on the major stock exchanges in the SSA countries. The number of firms listed is below one hundred with the exception of the Nigerian Stock Exchange and the Johannesburg Stock Exchange (JSE). Several stock exchanges have less

¹⁰ All data are extracted from Faye et al. (2013).

¹¹ For a more complete review, see Baele et al. (2014) and Abedifar et al. (2013)

Table 2.2: Major Stock Exchanges in Africa

Stock Exchange	Country	Year of Foundation	# of Firms Listed	Market Cap (% of GDP)	Turn. Ratio
Botswana Stock Exchange	Botswana	1989	44	23.31	3.57
Bourse régionale des valeurs mobilières	WAEMU (Côte d'Ivoire)	1998	40	28.85	1.78
Ghana Stock Exchange	Ghana	1989	36	8.46	4.13
Nairobi Securities Exchange	Kenya	1954	62	35.35	7.39
Malawi stock Exchange	Malawi	1996	14	22.92	4.14
Stock Exchange of Mauritius	Mauritius	1988	76	60.26	7.7
Namibia Stock Exchange	Namibia	1992	34	9.61	1.21
Nigerian Stock Exchange	Nigeria	1960	188	17.3	9.84
Johannesburg Stock Exchange	South Africa	1887	>400	232.41	39.23
Seychelles Stock Exchange	Seychelles	2012	10	na.	na.
Swaziland Stock Exchange	Swaziland	1990	39	na.	na.
Dar es Salaam Stock Exchange	Tanzania	1998	17	5.62	2.56
Uganda Securities Exchange	Uganda	1998	18	26.22	0.38
Lusaka Stock Exchange	Zambia	1994	22	17.74	8.85
Zimbabwe Stock Exchange	Zimbabwe	1896	16	na.	na.

Stock exchanges with less than 10 listed firms are not reported. Data on year of foundation and number of listed firms are extracted from the stock exchange websites (accessed December 2013). Other variables are extracted from the World Bank's Global Financial Development Database. Market capitalization is the share price of listed companies times the number of outstanding shares as a percentage of GDP. Turnover ratio is the total value of shares traded during one year, divided by the average market capitalization. na: not available

than ten listed firms and are in fact not really active (unreported in Table 2.2). Market capitalization exceeds 50% of GDP only in Mauritius and South Africa. The turnover ratios are very low in comparison with international standards and the range of products is relatively thin. Bond markets and derivatives markets are either not well developed or are still in their infancy. Primary bond markets are small and dominated by government and financial institutions. Secondary bond markets are absent in some countries and where present, the range of products and maturities is very limited. Africa's stock exchanges are not currently a substantial source of financing for the private sector. Various governments have begun implementing measures to foster activity and liquidity of the stock markets (privatization through the stock exchange, regional consolidation or adoption of automated systems).

Despite rapid growth, non-banking finance remains a marginal aspect of African financial systems today. Facilitating the expansion of these segments could be useful. Financial markets, the insurance sector and microfinance could offer a range and variety of services that are not part of the standard product range of banks. Furthermore, dynamic non-banking sectors could induce competitive pressure on banks.

2.2.3 Africa's Financial Systems: An International Comparison

In spite of real progress over the last two decades, Africa's financial sectors are among the least developed in the world. For a more comprehensive overall assess-

ment, the development of financial systems may be benchmarked along four different dimensions: size of financial systems, access and use of financial services, efficiency of banking systems, and profit and stability of banking systems. In the first step, a general picture of financial development in Africa in comparison with other developing economies around the world is presented.¹² In the second step, each dimension is scrutinized in detail.

2.2.3.1 Financial development in Africa at a glance

In order to provide a general picture of Africa's financial development, a composite indicator of financial development is computed. The composite index of financial development summarizes four dimensions of financial development (size, access, efficiency and profit/stability). For each dimension, an indicator ranging from 0 to 10 is computed from standard variables (details on variables employed are presented in the Appendix, page 176). The financial development composite index is merely the average of the four sub-indicators for each country. This indicator ranges from 0 to 10 with a higher value indicating a more mature financial system (see Box 2.1).

Box 2.1: Financial development composite index: Methodological note^a

The composite index of financial development is comprised of four sub-indicators capturing the size of the components of financial systems, access and use of financial services, the efficiency of banking systems and the profitability and stability of financial systems. Sub-indicators are based on variables described in the Appendix (page 176). For each variable k of country i $X_{k,i}$, the value is normalized between 0 and 1 using the following formula:

$$X_{k,i}^N = \frac{X_{k,i} - \min(X_k)}{\max(X_k) - \min(X_k)}$$

where $\min(X_k)$ and $\max(X_k)$ are the minimum value and maximum value of X_k among the sample of developing countries for which X_k is available.^b In order to get sub-indicator (j), the average of the normalized variable is used as follows:

$$I_{j,i} = \frac{1}{K} \sum_{k=1}^K X_{k,i}^N$$

Finally, the composite indicator of the financial development of country i is obtained by averaging sub-indicators $I_{j,i}$: $I_i = \frac{1}{4} \sum_{j=1}^4 I_{j,i}$.

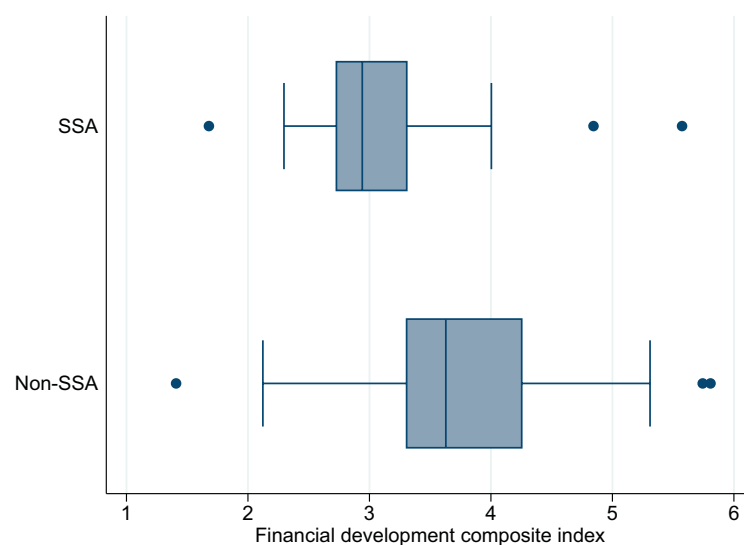
^aMethodology used to provide composite indicator is inspired by two previous contributions: **World Bank (2006)** and **Meisel and Mvogo (2007)**.

^bDeveloping countries group together low-income, lower-middle income and upper-middle income countries (World Bank's classification). Furthermore, for the computation of the sub-indicators, I excluded countries for which at least one variable used is not available.

The financial development composite index provides a general picture of financial development in Africa in comparison with other developing countries. The financial

¹²In this section, "Non-SSA" in tables and figures refers to non Sub Saharan African developing countries.

Figure 2.3: Financial development composite index across developing countries

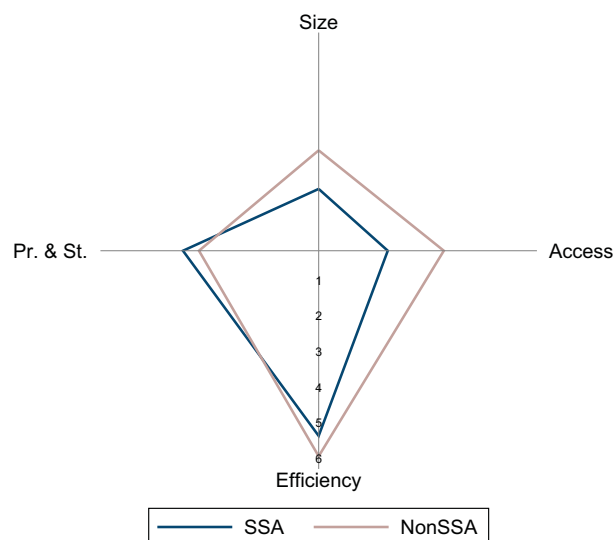


Note: Author's calculation from the Global Financial Development Indicators. More detailed can be found in Box 2.1.

development is lower in Africa than in all other developing countries. Individual notes for each African country are reported in the Appendix (page 177). While the average composite index takes the value of 3.12 in Africa, it equals 3.77 in other developing countries. The equality of means between two groups is rejected at the 1% level ($t=3.65$). Developing economies from other continents have on average more mature financial systems than Africa. Figure 2.3 documents that at each point of distribution (quartiles, median) African countries are lagging. The outliers in Africa are the Republic Democratic of Congo at the bottom and South Africa and Mauritius at the top.

Furthermore, one might be interested in discriminating between the four dimensions to see where Africa is lagging. Figure 2.4 displays the average of each sub-indicator for Africa and other developing economies (labelled "Non SSA"). There are notable differences between the two sets of countries in terms of the various dimensions. Financial systems are shallower and access to and use of financial services is more restrained for households and firms in Africa. Banks in Africa outperform their counterparts in the rest of world for generating profits, while Africa's banking systems are less efficient. This picture is general and demands some explanation provided in the following sub-section.

Figure 2.4: Financial development per dimensions

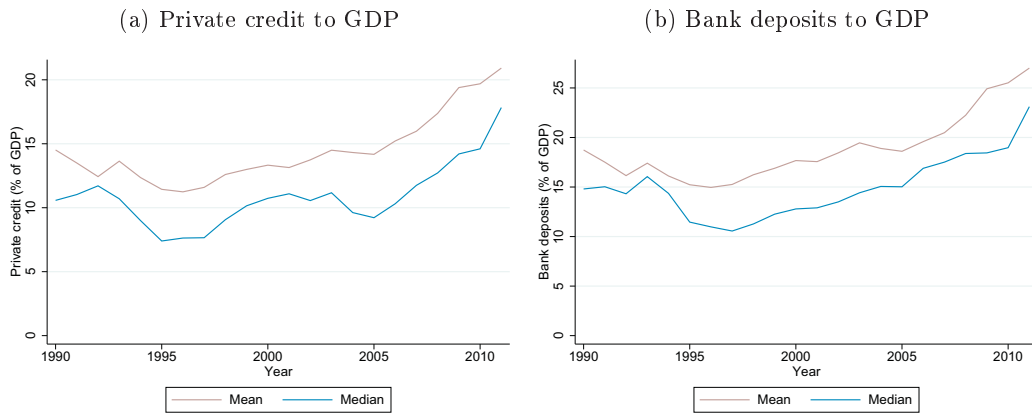


Note: Author's calculation from the Global Financial Development Indicators. Value of each sub-indicator for both groups of countries is presented in the Appendix (page 177). Pr. & St. refers to profit and stability.

2.2.3.2 The size of African financial systems

Africa's financial systems have improved over the last decade. Figure 2.5 documents that the relative size of African financial systems has increased over the past two decades. Following several decades of stagnation, both real and financial activities have increased in the 2000s. In relative terms, financial sectors have grown in some African economies. Both the ratio of private credit and of bank deposits to GDP have substantially improved since the mid-1990s. The earlier decline was partly due to banking crises experienced in the 1980s and 1990s. Median private credit to GDP increased by ten points between 1995 and 2011. Median ratio of bank deposits to GDP rose from 11 percent in 1995 to 23 percent in 2011. Nonetheless, African financial systems are among the smallest and lowly diversified across the globe. Figure 2.6 shows the size composite index calculated for 109 developing economies, including 38 African countries. Most African financial systems are small in comparison with other developing countries. Beck et al. (2011b) point out that in many African countries, the entire banking systems would be considered as mid-sized banks in Continental Europe. The average African bank has total assets of US\$220 million, while the total balance sheet size of a non-African bank is, on average, almost US\$1 billion. The gap between Africa and the rest of the world is even starker in non-banking segments of financial systems. Only one third of countries in the region have stock markets and these are mostly small and illiquid. Insurance sector penetration is below the median of developing economies in many

Figure 2.5: Financial deepening in Africa over the past decade



Note: Author's calculations from the Global Financial Development Database.

African economies. Microfinance plays a modest role and other non-bank financial institutions are almost non-existent in the majority of countries.

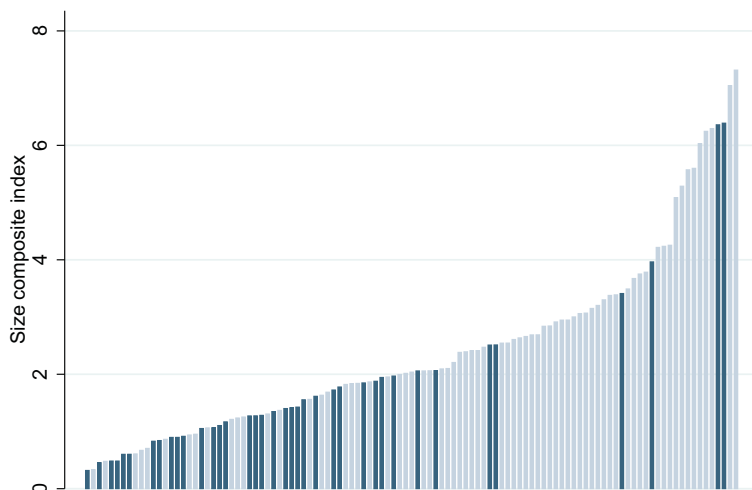
Beyond the larger picture, there are significant variations across Africa. On average, the financial systems are larger in Southern Africa (see page 177). On the contrary, Central Africa has among the shallowest financial systems in the world. The size of the banking sector in West Africa is close to the size of the banking sector in East Africa. However, contrary to Eastern African countries, the development of other segments of financial markets in West Africa is limited. For instance, the ratio of non-life insurance premium to GDP is, on average, twice as large in East Africa as in West Africa.

2.2.3.3 Access to and use of financial services by households and firms

Africa's banking systems are not only shallower than banking systems in other developing countries, they are also less inclusive. The access to and use of formal financial services by households and firms are lower in Africa than in other developing countries as shown in Figure 2.7. Regarding the financial inclusion of households, while more than 10 percent of adults in non-African countries used saving services in the past year, this share is only 5 percent in African countries. Only 21 percent of adults indicate that they have an account with a formal institution, while this share is 36 outside Africa. The Global Findex database allows me to explore the reasons why households do not have an account with a formal financial institution.¹³ The lower use of financial services in Africa is not explained by a lesser need of financial services. A smaller share of the population who did not use formal financial services quoted the absence of need in Africa (5%) than in other developing countries (9%). The lack of steady income flows coupled with high account fees, high minimum

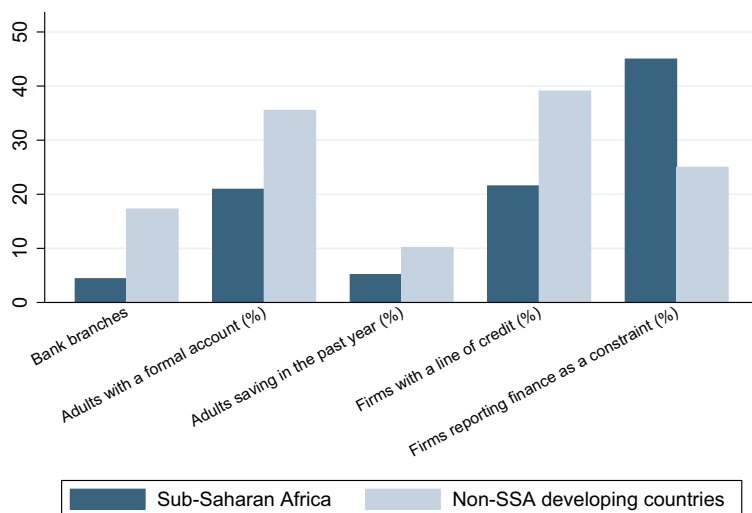
¹³Global findex data are extracted from [Global findex's website](#).

Figure 2.6: Size of financial systems



Note: Author's calculation from the Global Financial Development Indicators. The value of size composite index for SSA countries is represented in dark blue and in light blue for other developing countries (109 countries).

Figure 2.7: Access to and use of financial services in SSA and non-SSA developing countries



Note: Author's calculation from the Global Findex data and World Bank Enterprises Surveys data.

deposits and high documentation requirements make large parts of the population "unbankable" for banks. Indeed, lack of money and the high costs or lack of the necessary documentation were cited as the main barriers to the use of formal financial services by 68 percent and 25 percent of households surveyed in Africa, respectively. Beck et al. (2008) calculated that annual checking account fees alone exclude more than 90 percent of the population in several African countries from such accounts. Another important barrier is the complexity and inappropriateness of some products. Financial illiteracy renders some products hardly understandable for potential customers. Finally, the lack of physical access to financial institutions is detrimental for financial inclusion in Africa. 22 percent of households surveyed cited geographical barriers as an obstacle to use of financial services, while this share is 13 percent elsewhere. The access to financial services is blocked by the limited bank branch penetration in Africa. The number of bank branches per 100,000 people is significantly lower in Africa than in other developing regions. On average, there are less than 5 bank branches per 100,000 people in Africa, while outside Africa there are 17. The problem of access is amplified in Africa by transportation deficiencies.

The limited outreach of Africa's financial systems also appears on the limited access to financial services by enterprises in Africa. Enterprise surveys conducted by the World Bank across countries allow for quantifying and understanding the financial constraints of enterprises. Among the firms surveyed in Africa, 45 percent reported that access to finance is a major obstacle to their growth, although this share is only one quarter in other developing countries. The access to and condition of credit differ greatly inside and outside Africa. Only 22 percent of firms indicate that they have a line of credit or loan from a formal financial institution in Africa, while the corresponding share among enterprises in non-African developing countries is 39 percent (see Figure 2.7). Furthermore, there is a stark difference across small, medium and large enterprises. Among small firms (with less than 20 employees), only 13 percent have a line of credit in Africa, while outside Africa, the figure is 35 percent. In fact, access to credit is very stringent for the "*missing middle*". The missing middle encompasses firms which are too small to be financed by banks but also too large to access microfinance services. A large share of enterprises in Africa consists of informal microenterprises. These firms cannot really apply for formal financing in the short-term due to the lack of formal accounts or guarantees. Microcredit institutions are dedicated to serving this fringe of markets. By contrast, a second segment of medium-sized and well established enterprises already has access to bank finance, but struggles to get access to equity finance. Due to the transaction costs, information asymmetries and uncertainty, formal institutions are reluctant to provide external finance to Small- and Medium-sized Enterprises (SMEs).

Beyond the overall picture, outreach differs across African countries. Firms and households face fewer constraints to using formal financial services in southern Africa. More than 40 percent of firms use a line of credit not only in Mauritius and South Africa, but also in Botswana and Malawi. East African countries have better access to financial services than Central and West Africa, particularly in Kenya and Rwanda. Firms and households face more constraints in other Eastern African

economies. Financial systems in Central African and West Africa are characterized by very limited outreach, with less than one out of five firms having access to formal credit. Even if Ghana and Nigeria present a better index of access than their counterparts in West Africa, the use of financial services is lower than in the east and south of the continent.

2.2.3.4 Efficiency of banking systems

The limited use of financial services by firms can be explained in part by the inefficiency of banking systems to transfer funds from savers to borrowers. First, African banks fail at the main function of banks, namely the transformation of saving into loans.¹⁴ The ratio of loans to deposits gauges the ability of banking systems to transfer funds from savers to borrowers. While in industrialized countries the risk is to have a high value of loan to deposit ratio, in Africa, this ratio is too small. It is 70 percent, while it is around 100 percent in other developing countries. This indicates that African banks are reluctant to finance the real economy. In fact, many banks prefer to invest in safe assets rather than financing the private sector. [Beck et al. \(2011b\)](#) report that private loans represent less than half of assets in Africa. This share exceeds 60 percent in other developing regions (with the exception of banks in the Middle East and North Africa). In addition, almost 60 percent of loans have a term of less than one year, and less than 2 percent of loans have a term of more than 10 years ([Beck et al., 2011b](#)).¹⁵ Short-term maturities impede firms from undertaking investments, and thus block long term growth. From a survey of banks in 45 countries, [Martinez Peria \(2009\)](#) shows that 28 percent of loans to small firms are used to finance investment in Africa, while in other developing countries almost a half of loans are used for investment.

African banking systems are not only inefficient in translating funds to the private sector, but intermediation is more expensive than in other parts of the world. Figure 2.8 shows that compared to other developing regions of the world, financial systems in Africa exhibit high levels of spreads. High costs of intermediation can be explained by high operating costs (see Figure 2.9). Higher spreads and operational costs might indicate the inefficiencies discussed above but also high levels of risk which are more costly to mitigate for banks.

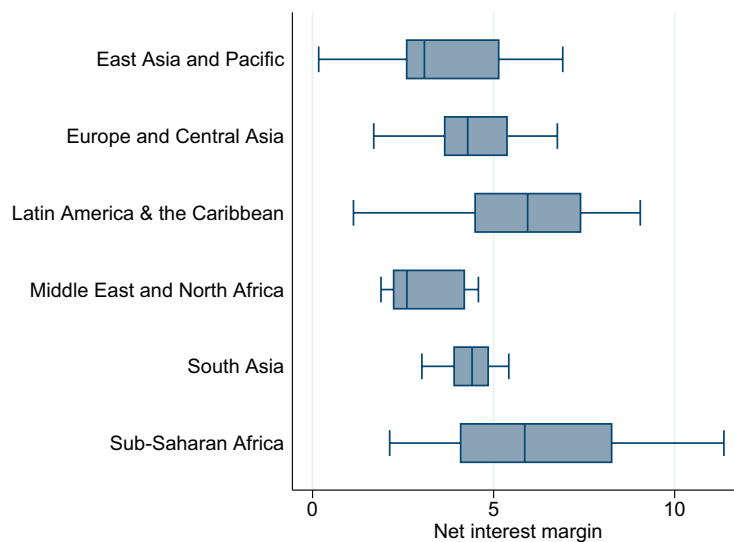
2.2.3.5 Profits and stability

In spite of high costs and high risks, banks in Africa are able to extract substantial profits. Figure 2.4 (page 20) documents that African banks are relatively profitable in comparison with other banks in the developing world. African banks perform well

¹⁴One should note that banks in Africa are also less efficient in mobilizing savings. For instance, the ratio of offshore deposits to domestic bank deposits is significantly higher in Africa than in other developing regions. In 2011, offshore deposits represented, on average, 28 percent of domestic bank deposits in Africa, ten points higher than outside Africa.

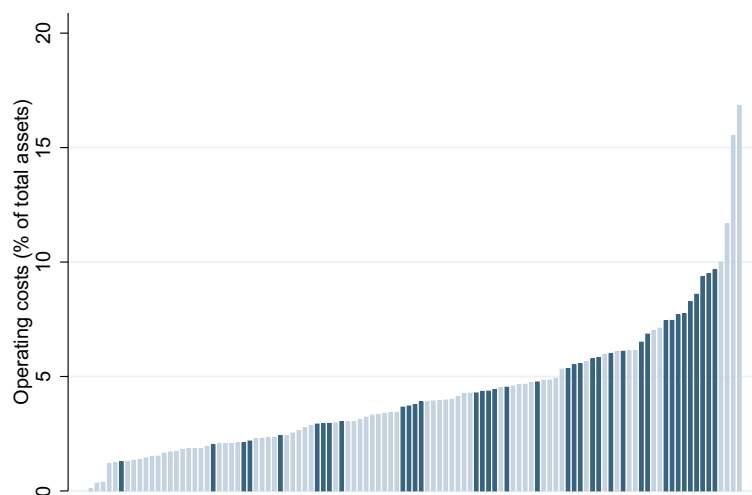
¹⁵This may be explained by the short-term nature of deposits. Indeed 80 percent of deposits are sight deposits or deposits with a maturity of less than one year.

Figure 2.8: Net interest margins across developing regions



Note: Author's calculation from the Global Financial Development Indicators.

Figure 2.9: Operating costs across countries



Note: Author's calculation from the Global Financial Development Indicators. The value of size composite index for SSA countries is represented in dark blue and in light blue for other developing countries (109 countries).

when compared to other regions. Returns on total assets and on equity are roughly three times higher than in the rest of the world. Banks in Africa are able to keep between one quarter and one third of spreads for themselves (Beck et al., 2010; Cull and Trandafir, 2010).¹⁶ Beck et al. (2011b) point out that banks in Africa are able to generate comfortable profits in spite of the specific environment in which they operate. According to their calculations, spreads in Africa exceed spreads in the rest of the world by almost 150 basis points. Even after controlling for contractual framework, bank characteristics (size, liquidity and ownership), and inflation, 23 basis points remain unexplained.¹⁷ While the high levels of profits can be viewed as a positive aspect for financial intermediaries, there are detrimental for the economy because the quest for profit induces high interest rates. One possible explanation of this ability for African banks to extract rent is certainly the lack of competitive pressure.

Profitability of African banks can stabilize financial systems. Even if Africa has been less directly impacted by the recent subprime crisis and has witnessed some improvements, the stability of financial systems remains a concern in some African countries.¹⁸ Even if most African banking systems are stable, well capitalized and highly (sometimes too) liquid, in several African countries some banks remain fragile owing to various factors. In spite of improvements, in many banks the high share of nonperforming loans threatens financial soundness. In addition, weaknesses in governance practices continue to be a source of vulnerability for some banks. Furthermore, insufficient capitalization and the small size of banks coupled with loan concentration render some banks fragile and vulnerable to shocks. The lack of an appropriate bank resolution framework and the difficulty of coordinating on the part of supervisory agencies are additional sources of fragility.

To summarize, financial systems in Africa are underdeveloped in comparison with other developing regions. Situations differ greatly across the continent. Southern African economies have more mature financial systems. By contrast, financial systems in Central Africa and to a lesser extent in West Africa, are among the least developed and most fragile in the world.

2.3 Resolving the African Financial Development Gap

Well-functioning financial systems are crucial to spurring growth and development. Efficient financial systems must provide a range of services including payment and

¹⁶These studies have undertaken a decomposition of spreads in Kenya (Beck et al., 2010) and Uganda (Cull and Trandafir, 2010). Profit is defined as a residual after adjusting for loan loss provisions, tax rates, reserves requirements, and overheads. Results from Cull and Trandafir (2010) are reported in Beck et al. (2011b).

¹⁷This method was initially developed by Honohan and Beck (2007). Authors noted that 60 basis points remain unexplained. Another approach is based on the determinants of margins in cross-sectional analysis. This literature will be presented later.

¹⁸For a complete review of the financial stability issue in Africa, see Beck et al. (2011b).

transaction services, deposit and savings services, credit services, and insurance and risk management services. The poor state of Africa's financial development raises a number of important questions as to what went wrong with the financial reforms in Africa and what could be improved.

2.3.1 Market frictions in Africa

Financial institutions exist to help overcome market frictions related to transaction costs, information asymmetries and uncertainty. Financial services imply high fixed costs at the transaction and institution levels.¹⁹ In addition to costs, financial intermediaries exist to manage risk particularly default risk. This is particularly harmful in markets with a high degree of information asymmetries and uncertainty, deficient contract enforcement institutions and a lack of diversification possibilities. Such an environment exacerbates agency problems and hinders the ability of financial institutions to diversify risk. While financial institutions help overcome these market frictions, their efficient operation is restricted by these same market frictions.²⁰ African countries face a specific environment that makes it more difficult to reap scale economies and manage risk (Honohan and Beck, 2007).

First, the *small scale* of many African economies does not allow banks to reap scale and scope economies. Scale refers to the small size of an economy. The small size of African economies is not only driven by the low income level across the continent but also by the weak population density. Directly related to scale, a more dispersed population is more difficult to serve, especially in countries with deteriorated transportation infrastructures. Allen et al. (2013) document that population density appears to be considerably more important for banking sector development in Africa than elsewhere.

Second, a large share of all economic agents operate in the *informal* sector and cannot provide the required formal documentation to use formal financial services. This increases the costs and risks for financial institutions and excludes large segments of the population from formal financial services. Even for firms operating in the formal sector, providing reliable information on activity or assets is a challenge and is very costly.

Third, Africa continues to suffer from *governance and institutional problems*. Governance problems at the bank level undermine the ability of banks to offer a wide range of products at the lowest price. Governance and institutional deficiencies at the country level increase the degree of uncertainty in which economic agents operate, and therefore cause agency problems. Access to and conditions of finance

¹⁹Processing an individual payment or granting a loan entails costs that are, at least in part, independent of the value of the transaction. At the level of the financial institution, fixed costs comprise the brick-and-mortar branch network, computer systems, legal services and accounting systems, among others. These costs are independent of the number of clients or number of transactions.

²⁰In addition to these frictions, De la Torre et al. (2013) document that "collective frictions" related to network externalities and first-mover disadvantages can prevent the development of financial markets.

depend on the certainty of the legal rights of borrowers, creditors and outside investors as well as the predictability and speed of the fair and impartial enforcement of these rights. Furthermore, corruption and political interference can have a negative effect on the optimal allocation of resources. Weaknesses in institutions also reduce the credibility of reforms.

Finally, African countries are subject to more *shocks* than elsewhere in the world. Africa has been marked by a high incidence of political and social unrest in addition to economic and climatic shocks over the past years. Shocks increase the risk faced by agents and the costs for financial intermediaries to manage this risk. Some shocks are not exogenous but are mainly driven by policies. In particular, macroeconomic shocks can be prevented by improving fundamentals such as reducing inflation.

Clearly, not all countries show the four characteristics. However, many countries across the continent are affected by at least one of them. These characteristics induce constraints on both demand- and supply-side. On the demand side, households and firms may refuse to take additional risk in a context of unstable stream of revenues and low income levels, particularly when the proposed product is expensive. On the supply side, providers may be reluctant to widen their client base or range of products. As a consequence, African financial services continue to be short-term and costly and many firms and households are still excluded from access to financial services.

2.3.2 Rethinking policies of financial development

Previous repression and liberalization policies tried to address market frictions in order to extend the size, efficiency and stability of the financial sector. These policies have been largely ineffective and thus the financial development policies should be rethought.

In order to prioritize reforms and analyze their consequences, [Beck and De La Torre \(2007\)](#) have introduced the concept of the access possibilities frontier.²¹ The frontier is the maximum possible commercial viable outreach of the formal financial system given the level of costs and risk. Costs and risk depend on state variables that can be distinguished between two types: structural characteristics and long-term policy. Structural characteristics include factors such as market size, demographic structure, population distribution, the geographic structure, and, in a certain sense, the levels and distribution of income. These factors might change in the long run or in an unanticipated manner. State variables also include long-term policy variables that either foster or limit financial deepening, including macroeconomic fundamentals, the available technology, the quality of transportation and communication infrastructures and contractual and supervisory frameworks.

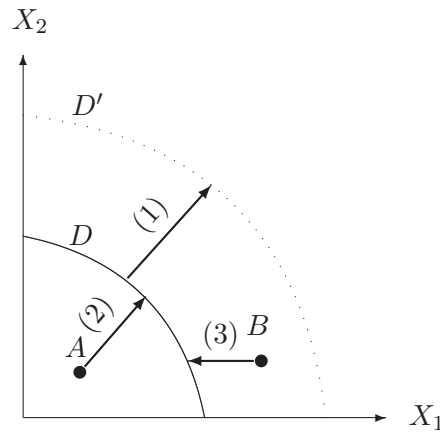
Figure 2.10 presents the access possibilities frontier for a hypothetical country offering two products (X_1 and X_2).²² The access possibilities frontier assesses the

²¹Empirical illustrations of the use of the frontier concepts can be found in [Allen et al. \(2013\)](#), [Barajas et al. \(2013\)](#) and [Beck and Feyen \(2013\)](#).

²²In reality, the frontier exceeds two dimensions insofar as the financial system does not offer

optimal product combination. The D curve shows the maximum possible level of one product that is sustainable for any given production level of the other, given the state variables. All points on the curve are points of maximum viable outreach given the state variables. All points inside the frontier (such as A) can be offered but are inefficient insofar as the financial system can offer more. All points (such as B) outside the curve cannot be sustained without threatening the stability of the system.

Figure 2.10: Access possibilities frontier and financial development policies



Depending on the position of the country's financial system relative to the frontier, policy options can be prioritized to address deficiencies (Beck and De La Torre, 2007). In less mature financial systems, the priority is often to raise the possibilities frontier by improving the state variables. "*Market-developing policies*" aim at improving the state variables and moving the frontier (from D to D' in Figure 2.10). These policies involve fundamental reforms that take time. It is possible for policy makers to improve the functioning of financial systems in the short-run (i.e. without changing the state variables). Financial systems in developing countries rarely operate on the frontier but more often below the frontier (cf. point A). "*Market-enabling policies*" may help to reach the frontier, as shown by vector (2). Finally, "*market-stabilizing policies*" try to prevent the financial system from moving beyond the frontier to an unsustainable equilibrium because of imprudent lending (see

only two products. X_1 and X_2 can be seen as loans offered to two groups of customers.

vector (3)). In the following sub-section the three types of policies are presented.

2.3.2.1 Market-developing policies

In some countries, the possibilities frontier is too low relative to countries with comparable levels of economic development. Market-developing policies involve fundamental reforms in order to push out the frontier. Governments cannot directly change structural characteristics but they can develop mechanisms to mitigate their adverse impacts. For instance, by upgrading transport and communication infrastructures, adopting active policy to build brick-and-mortar branches in remote areas (e.g. fiscal incentives) or establishing pro-innovation regulations, governments can alleviate constraints induced by low density. Constraints imposed by market size can be partly overcome through regional integration (Geourjon et al., 2013).

States can push out the frontier more directly by focusing on long-term policy variables. First of all, governments can reduce risk associated with credit by reducing macroeconomic volatility. Macroeconomic instability plays an important role in the functioning of the financial sector. High levels of inflation hamper financial sector developments (Boyd et al., 2001) and increase risk premiums (Beck and Hesse, 2009). Structural adjustment policies have improved some macroeconomic variables in Africa.

Improvements in legal and contractual institutions can also help to push out the frontier by mitigating risk for lenders. The link between law and finance development has been the subject of considerable interest.²³ Protection of investors and creditors is associated with stock market and banking market development (La Porta et al., 1997; López de Silanes et al., 1998; Djankov et al., 2007; De la Torre et al., 2013) even in Africa (McDonald and Schumacher, 2007; Andrianaivo and Yartey, 2010). In countries whose legislation favors creditors, a higher proportion of firms use long-term external financing (Demirgüç-Kunt and Maksimovic, 1999; Giannetti, 2003; Fan et al., 2012) and banks lend more to Small and Medium-sized Enterprises (Haselmann and Wachtel, 2010). Furthermore, Qian and Strahan (2007) find that in countries with strong protection of creditors, bank loans are associated with longer maturities and lower interest rates. It is not merely the existence of laws that matters but also their enforceability. Credit recovery is hampered in many countries by the malfunctioning of the judicial system. Poor enforcement of laws and contracts impedes the supply of external finance (La Porta et al., 1997; Demirgüç-Kunt and Maksimovic, 1998; Bianco et al., 2005; De la Torre et al., 2013) and induces higher interest spreads, shorter maturity and lower bank loan amounts (Laeven and Majnoni, 2005; Bianco et al., 2005; Bae and Goyal, 2009). In all these aspects, despite recent improvements, Africa is lagging in comparison with other developing economies. For instance, in 2013, according to the Doing Business database, the average cost of contract enforcement represented 50 percent of a typical debt

²³I do not discuss the considerable and controversial literature regarding the consequences of legal origins. The interested reader can refer to López de Silanes et al. (1998), Glaeser and Shleifer (2002), Rajan and Zingales (2003), Roe (2007) and López de Silanes (2008).

contract in Africa but only 32 percent in other developing economies.²⁴ Reforms in contractual framework should improve the functioning of banking systems. This includes a range of reforms including modernizing land title issuance regimes and bankruptcy legislation, facilitating foreclosure procedures, improving the judiciary system, establishment of appropriate bank resolution processes and establishing (or improving) asset and collateral registries. Such reforms take time to be implemented and outcomes materialize over a longer period. However, some reforms can be adopted fairly quickly with rapid results. For instance, [Haselmann et al. \(2010\)](#) document that changes in collateral law matter more for increases in bank lending than do changes in bankruptcy laws. [Love et al. \(2013\)](#) show that the introduction of collateral registries for movable assets increases the access to finance and reduces the cost of credit.

[Jappelli and Pagano \(2006\)](#) point out that information-sharing mechanisms appear to act as a partial substitute for the lack of good judicial enforcement in developing countries. Credit registries dramatically reduce the time and costs necessary to obtain information on borrowers and thereby relax credit constraints. This is particularly important for Small- and Medium-sized Enterprises (SMEs) because their creditworthiness is generally more difficult to evaluate and they have less tangible assets. Empirical evidence shows the positive effects of information-sharing mechanisms on credit depth and access in developing economies ([Galindo and Miller, 2001](#); [Jappelli and Pagano, 2002](#); [Love and Mylenko, 2003](#); [Djankov et al., 2007](#); [Brown et al., 2009](#); [De la Torre et al., 2013](#)). [Djankov et al. \(2007\)](#) document that information-sharing mechanisms are better than reform of the contractual framework as a tool for deepening financial systems in less developed countries.²⁵ [Triki and Gajigo \(2012\)](#) investigate the effect of credit registries on firms' access to finance in 42 African countries. They document that access to finance is on average higher in countries with credit registries, confirming previous results on the positive impact of information sharing on financial deepening in Africa ([McDonald and Schumacher, 2007](#); [Singh et al., 2009](#)). However, they document that private credit bureaus are more effective in relaxing credit constraints than public credit registries. Indeed, there has been an important debate about private versus public models in credit registries. The architecture of credit information systems is crucial ([Jappelli and Pagano, 2006](#)). The design of credit registries includes questions about the type of information collected (ranging from simple black lists of borrowers to positive information on firms) and the coverage and memory of the system. Poorly-designed registries can be inefficient and sometimes detrimental to credit access. Only a handful of credit registries are really operational in Africa. Developing information-sharing mechanisms will take time and supposes overcoming several challenges first (for more details, see [Mylenko, 2007](#)). In practice, the time required to develop a newly opened credit bureau into a fully operational one is at least 5-7 years. Such reform should be accompanied by additional measures. Disseminating information

²⁴Data are available at <http://www.doingbusiness.org/> (accessed December 2013).

²⁵[McDonald and Schumacher \(2007\)](#) find that both creditor protection and information sharing mechanisms impact positively financial depth in Africa.

accurately and effectively requires having reliable information. Strengthening accounting and auditing is therefore a key requirement for widening access to banks by SMEs. In many countries, however, the accounting profession is not well regulated and the quality of accounts varies widely, thus hampering transparency. Initiatives to increase transparency are under way in many countries. For example, a uniform accounting system was adopted in 2001 ("*Système Comptable Ouest Africain*") in the WAEMU.

The development of information-sharing mechanisms and improvements of institutional frameworks in Africa present a significant opportunity to support the development of African financial sectors. Market-developing policies are long-term in nature and their benefits also take significant time to materialize. This does not necessarily mean, however, that there is no scope for policy in the short-run.

2.3.2.2 Market-enabling policies

Changes in state variables, especially long-term policies, involve changes in fundamental institutions and, thus, take a significant amount of time to be implemented and materialize. Beyond institution building, governments could help deepen and broaden financial systems even in the absence of perceptible changes in state variables. Banking systems in developing countries rarely operate at the possibilities frontier and decision makers can implement policies to improve their functioning (cf. vector (2) in Figure 2.10, page 29).

Competition policy is one obvious market-enabling policy aimed at enhancing supply outreach. The state can promote competition by designing policies that guarantee market contestability and by creating a market-friendly framework. Governments can directly act in three directions to spur contestability in banking. Firstly, the state can develop practices that facilitate bank entry and exit. Secondly, the presence of nonbank intermediaries are likely to affect bank competition. Thus the state has a role to play by introducing regulation and practices that foster the entry and operation of nonbank competitors. Finally, competition can be promoted by assuring that the institutional environment is contestable. This implies that the various inputs required for the production and distribution of financial services need to be available, fairly and uniformly priced and effectively provided to all potential suppliers. Many of such reforms should be implemented at the regional level in Africa to overcome the limited size of local markets. The competition policy in the banking systems is discussed in more detail in the general conclusion.

Greater competition is expected to result in efficiency gains that would move the system closer to the possibilities frontier. However, as I will discuss in the following chapter, the consequences of competition on credit markets is less evident than expected, especially in Africa. In the presence of information asymmetries and agency costs, competition can reduce access and efficiency by making it more difficult for banks to internalize returns from investing in lending, in particular, with opaque clients. Moreover competition can impede financial stability.

While this thesis focuses on competition, market-enabling policies are not limited to competition policies and can encompass many other reforms. Policy makers can influence the supply of bank services dedicated to SMEs and households by adapting regulatory frameworks. Regulatory frameworks in some countries block access to credit for small firms and households. For instance, in order to comply with capitalization ratios, banks may be reluctant to provide SMEs loans if loan classification is not adapted. Policies can also simplify procedures on small loans or on small deposits. In some countries, the tax policies should also be rethought. Furthermore, policy makers can favor the development of non-banking financial intermediaries. Creating the necessary legal and regulatory frameworks for the development of non-banking financial activities could be promising. Leasing or factoring could be useful in financing SMEs because they do not rely on detailed information and do not require collateral requirements from borrowers. Developing non-banking financial sectors can have an indirect impact by increasing competitive pressure in the banking industry. Despite these advantages, these markets are still in their infancy in Africa (see Section 2.2). Facilitating the entry of private equity funds that specialize in SMEs could be another solution to providing external finance for the private sector. In many countries, microfinance cannot extend the amount of loans beyond a given size. Increasing the ceilings could be an opportunity to raise credit availability for the largest microenterprises with the risk that MFIs may desert the small microenterprises segment.

The role of government discussed until now refers to the market-activist view but government and donors can also intervene more directly in finance. This can include a large number of interventions ranging from credit guarantee programs to the creation of specific financial institutions (Development Finance Institutions, for example). These interventions can be useful in some contexts and for some borrowers (such as agricultural sectors). However, it can be important to evaluate both their benefits and costs insofar as decades of interventionism have underlined the limits of market-replacing policies.

Market-enabling policies can also be important on the demand side. While supply constraints are important in the access to finance, the demand-side constraints should not be underestimated. In Africa, less than one quarter of firms applied for a loan, while this share is almost 45 percent outside Africa. The share of firms that quote a lack of need is significantly lower in Africa (39%) than in other developing regions (64%). Firms from Africa more often quote the complex procedures, high interest rates or high collateral requirements as a reason for not applying. Governments can intervene to reduce the self-exclusion factor. For instance, programs favoring financial literacy can reduce self-exclusion and develop a culture of credit. There are many types of financial literacy programs using different medias and channels (Beck et al., 2011b). Demand-side constraints can also be alleviated through the relaxing of some regulations.

To summarize, many reforms can be implemented to develop financial sectors in the short-run. In particular, favoring competition in finance is often advanced as one

solution to reach the frontier. As I will discuss in the following chapter the positive impact of competition is questionable in banking markets, especially in countries with a high degree of informational asymmetry. Developing competitive markets may also destabilize financial systems. Sustainable financial development requires stability.

2.3.2.3 Market-stabilizing policies

The recent financial crisis has underlined the importance of the states in mitigating financial risks. A final set of policies aim at preventing the financial system from moving beyond the frontier. The market-stabilizing policies include regulatory and supervision frameworks, macro-economic and macro-prudential management and failure resolution frameworks. In spite of real progress over the last two decades, financial systems in some countries remain fragile and vulnerable. Some African countries have modernized their regulatory and supervisory frameworks in line with the best world standards (Beck et al., 2011b).²⁶ Implementing Basel II or Basel III regulations does not suffice. Regulatory and supervisory frameworks should be adapted to each national situation and set of problems. Sources of vulnerabilities are numerous in Africa and differ within it. Banks can be vulnerable due to the portfolio concentration in one country, while undercapitalization is the main issue in another one. Some rules are appropriate in one situation but not in another. In other words, one size does not fit all. National authorities must trade-off between international standards (important for foreign-owned banks, for example) and specific problems that need to be addressed.

Furthermore, financial systems in Africa have witnessed rapid changes with the development of regional banking groups and non-banking finance as well as the spread out of innovations (such as mobile banking). All of these changes induce new risks and challenges (cf. Box 5.1). Legislation should be flexible enough to take into account these rapid transformations. Changing laws in book does not always suffice. Strong capacity and independence of regulatory and supervisory bodies are at least as important. For example, non-compliance with norms is a major problem in some countries (such as in the WAEMU). Reforming regulations will be useless if no initiative is implemented to improve compliance with norms.

Market-stabilizing policies can be in opposition with market-enabling policies.²⁷ In particular, safeguarding financial systems may force legislators to impose laws that constrain competition. For instance, imposing high minimum capital requirements or establishing strong regulations on activities may soften competition. The conventional wisdom in academic and policy circles argues that lessening competition could be detrimental in stimulating innovations, and in improving efficiency, depth and access of financial systems. The view that competition in financial services is unambiguously good, however, is more naive than in other industries. In

²⁶More information on this subject can be found in Beck et al. (2011b) in Chapter 5.

²⁷In Figure 2.10 this trade-off cannot be materialized insofar as only two dimensions are considered.

particular, in Africa agents operate in a specific context thus rendering the benefits of competition less certain. In the following chapter, a review of theoretical and empirical literature on the implications of competition is done, drawing special attention on African financial systems specificities.

2.4 Conclusion

Despite recent promising changes, financial development in Africa remains problematic and hurts the prospects of future growth. Both repression and liberalization policies have failed to deepen, broaden and strengthen financial systems. Over the last decades, financial systems in Africa have witnessed rapid transformations. In addition to the rapid growth of non-bank financial segments, regional banks from Africa have expanded throughout the continent. These changes may affect the degree of competition in African banking systems. Furthermore, a new approach of financial sector policies focuses on the primary role of competition. Indeed, policy makers possess various tools to spur financial development in Africa. While *market-developing policies* are certainly the most promising, they take time to materialize. In the short-run, Governments may implement *market-enabling policies*, particularly competition policy. Greater competition is expected to result in efficiency gains that would move the system closer to the possibilities frontier. However, the consequences of competition on credit markets is less evident, especially in less mature markets. This raises concerns regarding the consequences of competition for the development of financial industries in Africa. The following chapter discusses the literature regarding the implications of competition in Africa.

The role of competition in banking: What do we know?

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3.1 Introduction

In response to state interventions in finance and to their potential negative consequences on competition, some authors point out the importance of competition in the banking sector in promoting efficiency and financial inclusion without necessarily undermining financial stability (Beck et al., 2011b; World Bank, 2013). This raises the question of competition in banking, an issue whose relevance is reinforced in Africa by recent trends. The expansion of African cross-border banking groups has brought on some transformations in African banking industries that have had repercussions in terms of competition. As a consequence, this thesis discusses the implications of competition among banks in Africa.

The conventional view suggests that market power is detrimental in banking as well as in other industries. By lowering financial intermediation costs, increasing loan quantities, and extending the ranges of financial services available, more competitive banking systems enhance financial intermediation. However, due to particularities of the banking industry, the impact of market power is more ambiguous in banking than in other sectors. Limited competition can help to provide incentives to acquire information on borrowers or to stabilize the financial system.

This chapter reviews the literature regarding the consequences of interbank competition. The literature has identified three reasons why competition in the financial sector is important: firstly, for efficient functioning of financial intermediaries and markets, secondly, for firms and households access to financial services and thirdly, for stability of the financial system.¹ Section 3.2 analyzes the literature regarding the relationship between competition and efficiency. The consequences of competition on credit availability are reviewed in Section 3.3 and Section 3.4 presents the competition - stability debate. Special attention is dedicated to empirical papers that focus on African banking systems.

3.2 Competition and banking efficiency

3.2.1 Testing the SCP hypothesis

Initial studies on the relationship between competition and efficiency originated from the *Structure-Conduct-Paradigm* (SCP paradigm). The *SCP* paradigm (Mason, 1939; Bain, 1956) states that higher concentration in the market causes less competitive bank conduct (higher interest rates, lower supply of funds) and hence higher profits. The first empirical contributions regarding the industrial organization of the banking industry were developed to give empirical support for the *SCP* hypothesis in the U.S (Gilbert, 1984; Berger and Hannan, 1989; Hannan, 1991; Gilbert and Zaretsky, 2003). These primary studies often documented that banks

¹Recent papers investigate the implication of competition on monetary policy transmission in industrialized countries (Van Leuvensteijn et al., 2013). Another intense debate in industrial organization literature beyond banking concerns the relationship between competition and innovation. The question is complex and results are inconclusive (Aghion et al., 2005a; Zarutskie, 2013).

outperform their counterparts in concentrated markets. However, the positive correlation between profitability and market concentration can be explained by reverse causation. According to the "efficient structure" (ES) hypothesis (Demsetz, 1973; Peltzman, 1977), better managed, more efficient firms can secure the largest market shares, leading to higher concentration and more market power. Berger (1995) attempted to distinguish between both explanations. He argued that after controlling for bank efficiency, market share captures the relative market power of banks.² His results did not provide support for the *SCP* hypothesis. Some works have used the same methodology to test the *SCP* hypothesis in industrialized countries with mixed conclusions (see: Gilbert and Zaretsky, 2003; Degryse et al., 2009).

Empirical tests of the *SCP* paradigm in the case of developing countries are scarce and findings have been largely inconclusive. Demirgüç-Kunt and Huizinga (1999) study the relationship between profitability and the share of assets controlled by the three largest banks in a sample of 80 countries, including both developed and developing countries. Results give weak support for the *SCP* paradigm. Using a sample of 55 developing countries and the Lerner index as a proxy of market power, Amidu (2011) finds a positive relationship between market power and profitability. As such, the author confirms the relationship from conduct to performance but not from structure to performance. Flamini et al. (2009) fail to provide support for the *SCP* hypothesis in the case of 41 African banking systems. Okeahalam (1998, 2002a,b) gives support for the *SCP* hypothesis in a subset of Southern African economies. Chirwa (2003) reaches a similar conclusion in Malawi, while evidence from Uganda, Nigeria, and Kenya does not support the *SCP* hypothesis (cf. Table 3.1).

A fast-growing body of literature has investigated the determinants of margins or interest spreads (Berger et al., 2004). Channeling funds from lenders to borrowers remains the primary activity of banks, especially in developing areas. As a result, intermediation costs is an alternative measure of bank performance more closely related to consumer welfare losses and bank conduct. The findings regarding the role played by the structure of the banking market on intermediation costs in cross-country studies are inconclusive (cf. Table 3.2: Panel A).³ Crowley (2007) documents some stylized facts on the determinants of margins in 18 English-speaking African countries. He highlights that bank concentration is unrelated to the level of margins. In a more robust analysis, Ahokpossi (2013) shows that bank concentration is negatively correlated to margins in Africa but the coefficient turns positive when interaction with operating costs is included. In addition to these papers, some articles have analyzed the determinants of margins or spreads in individual African countries.

²Concentration and market share were also regressed against the efficiency variables to test the necessary condition of the ES hypotheses, namely that efficiency affects market structure.

³Owing to the high spreads in Latin America, several works have focused their attention on this area (Barajas et al., 2000; Brock and Rojas-Suarez, 2000; Martinez Peria and Mody, 2004, among others) with mixed results regarding the implications of market power.

Table 3.1: The Structure-Performance hypothesis testing

Author(s)	Sample ^a	Period	Measures of		Control for ES hypothesis? ^d	Consistent with SCP hypothesis?
			Profitability ^b	Market structure ^c		
PANEL A: CROSS-COUNTRY STUDIES						
Demirgüç-Kunt and Huizinga (1999)	80 countries (5)	1988-1995	PBT/TA	CR3	Yes (Overhead)	Yes (No robust)
Flamini et al. (2009)	41 countries (41)	1998-2006	RoA	MS	Yes (Op. cost)	No
Amidu (2011)	55 countries (22)	2000-2007	RoA	Lerner	Yes (Op. cost)	Yes
PANEL B: SINGLE AFRICAN STUDIES						
Nannyonjo (2001)	Uganda	1993-1999	RoA	HHI and MS	Yes (Cost Eff.)	No
Mugume (2008)	Uganda	1995-2005	RoA	HHI and MS	Yes (Cost Eff.)	Yes
Chirwa (2003)	Malawi	1970-1994	RoA and RoE	CR3 and MS	No	Yes
Aburime (2008)	Nigeria	1980-2007	RoA and PBT/TA	CR3	No	No
Olweny and Shipho (2011)	Kenya	2002-2008	PBT/TA	HHI	Yes (Op. cost)	No
Okeahalam (1998) ^e	Botswana	1996-1998	Six interest rates	CR3 and HHI	No	Yes
Okeahalam (2002a) ^e	South Africa	1997-1999	Six interest rates	CR3 and HHI	No	Yes
Okeahalam (2002b) ^e	South Africa, Namibia, Lesotho, and Swaziland	1997-1999	Six interest rates	CR3 and HHI	No	Yes

^a The number of African economies (when available) is reported in parentheses

^b RoA: Return on Assets ; RoE: Return on Equity ; PBT/TA: Profit before tax to total assets

^c MS: Market share ; CR3 : Fraction of assets controlled by the 3 largest banks ; HHI : Herfindahl-Hirschman Index

^d Op. Cost: Operating costs; Cost Eff.: Cost efficiency score extracted from frontier analysis

^e Methodology proposed by Berger and Hannan (1989) is employed

Table 3.2: Determinants of margins and spreads

Author(s)	Sample ^a	Period	Measures of		Consistent with SCP hypothesis?
			Int. costs ^b	Competition ^c	
PANEL A: CROSS-COUNTRY STUDIES					
Demirgüç-Kunt and Huizinga (1999)	80 countries (5)	1988-1995	NIM	CR3	Yes
Demirgüç-Kunt et al. (2004)	72 countries	1995-1999	NIM	CR3	Yes (No robust)
Detragiache et al. (2005)	84 countries (31)	1999-2001	NIM	CR5	No (opposite sign)
Laeven and Majnoni (2005)	106 countries (12)	2000	IRS	CR5	No
Beck and Hesse (2009)	86 countries	2000-2004	NIM	CR3	No (opposite sign)
Dietrich et al. (2010)	96 countries	1994-2008	NIM	CR3	No
Gelos (2009)	From 30 to 60 countries	1999-2002	NIM	H-statistic and CR5	No
Amidu and Wolfe (2012)	55 countries (22)	2000-2007	NIM	Lerner	Yes (No robust)
PANEL B: CROSS-COUNTRY AFRICAN STUDIES					
Crowley (2007)	18 African countries	1975-2004	NIM and IRS	CR3 and HHI	No
Ahokpossi (2013)	41 African countries	1995-2008	NIM	HHI	Ambiguous
PANEL C: SINGLE AFRICAN STUDIES					
Nannyonjo (2001)	Uganda (17 banks)	1994-1998	NIM and IRS	CR3	NIM: No / IRS: Yes
Mugume (2008)	Uganda (14 banks)	1995-2007	IRS	HHI	No (opposite sign)
Beck and Hesse (2009)	Uganda (16 banks)	1999-2005	NIM and IRS	HHI	No
Chirwa and Mlachila (2004)	Malawi (5 banks)	1989-1999	IRS	HHI	Yes
Bawumia et al. (2005)	Ghana (16 banks)	2000-2004	NIM	MS	Yes
Aboagye et al. (2008)	Ghana (17 banks)	2001-2006	NIM	HHI and Lerner	Yes
Hesse (2007)	Kenya	2000-2005	IRS	HHI	No (opposite sign)
Beck et al. (2010)	Kenya (45 banks)	2000-2007	IRS	HHI	No

^a The number of African economies (when available) is reported in parentheses

^b Intermediation costs: NIM: Net Interest Margins ; IRS: Interest Rates Spreads

^c CR x : Fraction of assets controlled by the x largest banks ; HHI : Herfindahl-Hirschman Index

Results provide a mixed picture. Margins and spreads appear positively correlated with the market concentration in Malawi and Ghana, but not in Kenya. Results for the Ugandan banking system differ among studies (cf. Table 3.2: Panel C).

Box 3.1: Measuring bank competition: An overview

According to the *SCP* paradigm, market structure (i.e. concentration) is expected to influence the conduct of banks. As a result, initial studies on the industrial organization of the banking industry employed proxies of the market structure to assess the degree of competition (number of banks, share of assets held by the five largest banks, HHI). Several contributions have, however, cast doubt on the consistency and robustness of the structural approach as an indicator of competition in banking. For instance, both the theory of contestability (Baumol et al., 1983) and the theory of efficient-structure (Demsetz, 1973) argue that market structure is a weak proxy of competition.

Shortcomings in the structural approach have led to a number of attempts to collect empirical evidence on the nature of competition by observing conduct directly. The three most frequently non-structural measures of competition are the Lerner index, the Panzar-Rosse H-statistic and the Boone indicator.

The Lerner index is a measure of individual market power. The market power of a firm is identified by the divergence between the firm's price and its marginal costs (relative to price). Greater values of the Lerner index are associated with greater levels of market power.

Panzar and Rosse (1987) developed another measure of competition based on the transmission of input prices on firms' revenues. From the standard theory, they showed that the transmission of input price variation differs according to the degree of competition in the market (under certain assumptions). The degree of competition is therefore obtained by regressing the input prices on firms' revenues. Weak transmissions of input prices to bank's revenues are interpreted to indicate the exercise of market power in pricing. Higher values indicate more competition.

Boone (2008) has recently proposed a new indicator. The basic intuition underlying this indicator is that more efficient firms achieve superior performance in the sense of higher profit or higher market shares, and that this effect is stronger the heavier the competition is. The value of the Boone indicator is therefore obtained by regressing profits on marginal costs (in logarithm).

The Chapter 4 discusses the different measures of market power and competition in details.

All of these studies suffer from one major shortcoming: concentration measures are not good predictors of competition (see Box 3.1). The new empirical industrial organization literature provides measures of competition based on firm behavior such as the Lerner index, the Panzar-Rosse H-statistic or the Boone indicator. Using the Panzar-Rosse H-statistic to proxy competition, Gelos (2009) points out the absence of effect of competition on interest margins in the case of 60 countries. Amidu and Wolfe (2012) shed light on the positive relationship between the Lerner index and margins for 55 developing countries. Aboagye et al. (2008) adopt the same method in their investigation of determinants of margins in Ghana and reach the same conclusion. Contrary to other measures of competition, the Lerner index has the advantage of being firm-specific. This is particularly useful when the level of analysis is at the bank level and not at the market level.

However, one might be concerned about the fact of regressing margins on margins.⁴ Indeed, the Lerner index is a price to (marginal) cost margin (Carbó-Valverde and Rodríguez Fernández, 2007). Accountability margins (such as net interest margins or spreads) and price-cost margins are strongly related, particularly in countries where revenues diversification is limited. As a result, the positive coefficient is not only expected but also misleading.⁵

To summarize neither study investigating the determinants of margins nor works testing the *SCP* paradigm can reach a clear conclusion about the implications of competition (and market power) on bank behavior. While some papers give support to the *SCP* view, other works find the opposite results or an absence of impact. In addition, many papers suffer from certain limitations. Analyzing the determinants of margins (or profits) require bank-level measures of market power to get precise estimations. However, the natural candidate, namely the Lerner index, is subject to endogeneity problems. Indeed, the Lerner index captures price-cost margin that is closely related to interest margin or profits. Future works should provide innovative bank-level indicators of market power that are not strongly correlated with margins to revisit the relationship between market power and intermediation costs. In this dissertation, another channel by which competition and market power affect efficiency is under investigation.

3.2.2 Testing the Quiet Life hypothesis

The *SCP* paradigm asserts that banks in less competitive markets are more profitable because borrowers pay higher loan rates and depositors receive lower deposit rates. In the context of the literature that analyzes the relationship between competition and efficiency, other papers have focused on the implication of competition on the internal organization of banks.

The *Quiet Life hypothesis* documents that efficiency is lower in noncompetitive markets because of slack management (Hicks, 1935). Managers can relax their efforts in less competitive markets. Market power, by blurring the signals, may allow managerial incompetence or non-profit maximization behaviors not to be detected by the owners (principal) and thus to persist. On the contrary, assessing the performance of the banks relative to other banks is less complex in competitive markets. A small deviation from profit maximization is more rapidly detected in competitive markets (for more details, see Berger and Hannan, 1998).

There are alternative explanations advocating for the rejection of this hypothesis in the specific case of the banking industry. Banks with market power can enjoy lower costs of screening and monitoring borrowers (see below). In addition, market power allows banks to benefit from greater profits, which may create incentives to

⁴Maudos and Fernández de Guevara (2004) and Maudos and Solis (2009) have used the same procedure in the case of European countries and Mexico, respectively.

⁵The same argument may apply for studies regressing the Lerner index on profit, which can be considered as a form of margin (Carbó-Valverde et al., 2009a).

behave prudently, this behavior leading to the selection of less risky activities with lower monitoring costs. Finally, banks with market power are under less pressure to increase the quality of banking services, which consequently decreases the operating costs.

In a widely cited paper, [Berger and Hannan \(1998\)](#) tested the *Quiet Life hypothesis* using U.S. data from the 1980s. They found evidence that banks in more concentrated markets exhibit poorer cost efficiency than other banks.⁶ However, some papers raise doubts about the structural approach to proxy competition (see Box 3.1). As a result, this issue has been reinvestigated using the Lerner index as proxy of market power. Some papers have explored the relationship between market power and efficiency in banking in developed countries, with mixed results. Findings from developing countries are also ambiguous ([Maudos and Solis, 2009](#); [Turk Ariss, 2010](#); [Williams, 2012](#); [Fungáčová et al., 2013](#)).

The relationship between market power and efficiency might be specific in low-income countries from Africa, and elsewhere, due to high degree of opacity and agency problems. To my knowledge, however, no paper has analyzed the impact of market power on efficiency in Africa (and in the case of low-income countries from elsewhere). An initial strand of works investigated the evolution of competition and efficiency over time ([Hauner and Peiris, 2008](#); [Mwega, 2011](#)) but did not analyze the direct relationship between market power and efficiency. On the other hand, some studies on the determinants of efficiency in Sub-Saharan Africa include a measure of bank concentration ([Ndiaye, 2008](#); [Kirkpatrick et al., 2008](#); [Kablan, 2009a,b](#)). Only [Chen \(2009\)](#) and [Zhao and Murinde \(2011\)](#) include non-structural measures of competition in the determinants of bank efficiency in Africa.⁷ Both studies give support for the *Quiet Life hypothesis* but both studies suffer from two drawbacks. On the one hand, they assume that the level of bank competition is exogenous in contradiction to the *efficient structure hypothesis*. On the other hand, both works employ market-based measures of competition and thus implicitly assume that all banks have the same degree of market power.

Overall, the literature examining the link between market power/competition, efficiency and performance is somewhat limited on Africa. Findings do not provide a clear picture as some works support the view that competition is beneficial and other

⁶Several works assess cost efficiency using accounting data such as overhead expenses to total assets ([Demirgüç-Kunt et al., 2004](#); [Barth et al., 2004](#)). Nonetheless, the majority of studies compute (cost and profit) efficiency score using frontier methods (stochastic frontier analysis or data envelopment analysis). These methods have the major advantage of getting a more accurate measure of firm performance.

⁷[Chen \(2009\)](#) investigates the determinants of efficiency in a sample of 77 banks from 10 middle-income countries (Angola, Botswana, Cameroon, Cape Verde, Rep. of Congo, Eq. Guinea, Gabon, Lesotho, Mauritius, Namibia, Seychelles, South Africa and Swaziland). The level of competition is assessed by the H-statistic. [Zhao and Murinde \(2011\)](#) analyze the determinants of bank efficiency in a sample of 91 Nigerian banks and an elasticity-adjusted Lerner index (conjectural variation method) is used to proxy competition.

papers find the opposite. Future works should extend the literature in two directions. Firstly, the relationship between market power/competition and margins should be revisited by employing innovative measures of market power. Secondly, the *Quiet Life hypothesis* should be tested in the context of opaque credit markets. While many papers have tested this hypothesis in industrialized and emerging countries, this issue has not yet been investigated for African banking systems. In this thesis, I contribute to the literature by testing the *Quiet Life hypothesis* on a sample of African banks (see Chapter 6).

3.3 Competition and access to finance

Access to finance is another area in which the implication of competition is discussed. The conventional view arguing that competition is always beneficial has been challenged since the mid-1990s. The *Information hypothesis* posits that in the presence of information asymmetries and agency costs, competition reduces access by making it more difficult for banks to internalize the returns from investing in lending, in particular, with opaque clients. Theory makes ambiguous predictions regarding the effect of competition on access to finance.

3.3.1 Theoretical literature

3.3.1.1 Market power hypothesis

The conventional view suggests that market power is detrimental in banking as well as in other industries. The *Structure-Conduct-Performance* paradigm, as well as the Monti-Klein model (Klein, 1971; Monti, 1972), states that higher concentration in the market increases interest rates and reduces the supply of funds. Besanko and Thakor (1992) examine loan and deposit markets in a theoretical model where banks can differentiate themselves from competitors. The model shows that equilibrium loan rates decline and deposit interest rates increase after removing entry barriers, even when allowing for differentiated competition. Guzman (2000) confirms the negative effect of market power in a general equilibrium model of capital accumulation. He compares the effect of capital accumulation of an economy that has a monopoly banking system versus one that has a competitive system. He shows that a banking monopoly is more likely to result in credit rationing and leads to a lower capital accumulation rate.⁸

Barth et al. (2009) propose an indirect channel whereby competition may be beneficial for access to finance. They note that corruption in lending undermines a bank's function of allocating scarce capital efficiently. In a simple bargaining

⁸Three different situations may occur in which monopoly power in banking is detrimental. First, a monopoly banking system will ration credit under conditions where a competitive system would not. If the conditions imply rationing in both systems, quantities are more rationed by a monopolistic bank than within a competitive setting. Finally, without credit rationing, monopoly power is still inefficient because a monopoly bank will charge a higher interest rate on loans (owing to excessive monitoring).

model, they show that higher concentration (less competition) in the banking sector is associated with more bank-lending corruption. Extending the argument, decisions on funds allocation are more often made on the basis of project return than on non-economic considerations (corruption, personal ties or networks) in competitive credit markets. Finally, Hainz et al. (2013) point out another channel whereby competition can alleviate credit constraints for small firms. Banks can solve the resulting adverse selection problem either by screening or by asking for collateral. The need for collateral in loan contracts is more likely when competition is limited.⁹ Insofar as small enterprises have limited tangible assets, increasing competition can improve the access to credit for these firms.

3.3.1.2 Information hypothesis

The *Information hypothesis* sheds light on one specificity of credit markets, namely the informational asymmetry between lenders and borrowers.¹⁰ The asymmetries of information induce the risk of adverse selection and moral hazard and therefore credit rationing (Stiglitz and Weiss, 1981). Since the 1990s, researchers have begun to examine how banks might mitigate information problems in opaque firms lending. Lenders might get accurate information on borrowers' characteristics though *ex-ante* screening and/or *ex-post* monitoring activities. The *Information hypothesis* argues that market power may alleviate the information wedge between lenders and borrowers by impacting both screening and monitoring activities.

Competition and relationship lending:

Petersen and Rajan (1995) acknowledge that banks will be less reluctant to finance riskier ventures if competition is limited. They may accommodate an intertemporal smoothing of contract terms, including losses for the bank in the short term that are recouped later in the relationship. The bank relies on the fact that the successful firms will not be bid away by rivals in the future. By contrast, in a competitive setting, a bank sustaining the initial cost of offering credit at a lower rate can not retain its successful customers. Petersen and Rajan (1995) underline that bank competition may be inimical to the formation of relationships between firms and lenders. This idea was already advanced by Mayer (1988). Relationship lending (or relationship banking) is one of the most powerful technologies available to reduce

⁹The intuition is the following. Firms located close to a bank are financed through a screening contract. Indeed, due to limited (physical and therefore informational) distance between the firm and the bank, the bank can obtain a perfect signal on creditworthiness with a limited cost. As a result, a contract based on screening is less costly for the firm. By contrast, for firms located away from the bank, a collateralized contract is more profitable. When the number of banks increases, it becomes more profitable for many firms that initially used a collateralized contract to adopt a screening contract. They provide empirical evidence on 70 developing countries that supports their intuition.

¹⁰The Information hypothesis groups together heterogenous papers that draw special attention to specificities of the banking industry, especially the importance of information. This strand of literature is sometimes named differently in the literature.

information problems in opaque firm finance that have little credit history or collateral (tangible assets).¹¹ Alongside its effect on intertemporal smoothing of contract terms, relationship lending is expected to relax financing constraints in several other ways (for more details, see [Boot, 2000](#); [Eber, 2001](#)).¹² Strong relationships between firm and lender allow for monitoring the firms during the course of lending. Not only is the lender willing to engage more resources in the acquisition of information, but the borrower might also be more inclined to reveal strategic information exclusively to its bank rather than to disseminate it to financial markets that would benefit its competitors ([Bhattacharya and Chiesa, 1995](#); [Yosha, 1995](#)). In addition, a privileged link between a bank and a firm allows the firm to be partly protected from adverse business conditions ([Berlin and Mester, 1999](#)). A third way whereby the lending relationship may relax financing constraints is through better control of managers. Relationship lending might reduce the moral hazard issue through the threat of termination ([Stiglitz and Weiss, 1983](#); [Bolton and Scharfstein, 1990](#)) and the reputation effect ([Boot and Thakor, 1994](#)).¹³ Therefore, the *information hypothesis* argues that competition can be detrimental to credit availability through its negative impact on relationship lending.

A fast-growing body of theoretical literature has analyzed the relationship between relationship lending and competition.¹⁴ The "strategic theory of relationship lending" challenges the *information hypothesis*. Private information may constrain competition in the refinancing stage ([Sharpe, 1990](#); [Fischer, 1990](#); [Rajan,](#)

¹¹According to [Berger and Udell \(2006\)](#), a lending technology can be defined as "*a combination of a primary information source, screening and underwriting procedures, loan contract structure, and monitoring mechanisms*". Lending technologies are often categorized into two types: transaction lending ("arm's length" lending) that is based on quantitative "hard" information and relationship lending, which is based on qualitative "soft" information ([Rajan, 1992](#); [Stein, 2002](#); [Petersen, 2004](#)). Relationship lending implies two elements: acquisition of confidential information (proprietary) and multiple interactions with the same customer over time and/or across products ([Boot, 2000](#)).

¹²While the lending relationship is expected to alleviate financial constraints, this technology has less clear-cut implications in terms of interest rates. Close ties between bank and firm reduce both verification costs and risk-premiums and should thus decrease the interest rates charged by banks. However, [Sharpe \(1990\)](#), [Fischer \(1990\)](#), and [Rajan \(1992\)](#) point out that lending banks possess ex post information monopoly. As a result, this information asymmetry allows banks to capture some of the rents generated by their customers through higher interest rates. Switching is not a credible threat insofar as a borrower can lose its reputation and be unable to obtain lower interest rates from outside banks. As a consequence, theory cannot provide an unambiguous conclusion on the impact of relationship lending on rates.

¹³However, it should be noted that the threat of denial of additional loans is not a credible commitment. Due to the soft-budget constraint problem, lending relationships might exert a perverse ex ante incentive on firms' behavior ([Dewatrimont and Maskin, 1995](#); [Bolton and Scharfstein, 1996](#)).

¹⁴[Berger and Udell \(2006\)](#) argue that this characterization is flawed. There exist a number of distinct transaction technologies used by banks, including financial statement lending, small business credit scoring, asset-based lending, factoring, fixed-asset lending, and leasing. While financial statement lending is well-fitted for transparent borrowers, other transaction technologies are all targeted to opaque borrowers. [De La Torre et al. \(2010\)](#) show that banks offer a wide range of products and services on SMEs, through the use of new technologies, business models and risk managements systems.

1992) and serve to constrain entry into the industry (Dell'Ariccia et al., 1999; Dell'Ariccia, 2001; Marquez, 2002; Weill, 2002). Relationship lending may be used strategically as a competitive device, when banks and the products they offer are not homogenous. In this light, relationships emerge as a prime source of an incumbent bank's comparative advantage over *de novo* lenders. Boot and Thakor (2000) argue that a more competitive environment may encourage banks to become more client-driven and to customize services, thus focusing more on relationship banking. Yafeh and Yosha (2001) suggest that facilitating entry (increased competition) in the arm's length market may strengthen bank-firm relationships. Dell'Ariccia and Marquez (2004) find that greater competition from out-of-market banks generates an increase in relationship lending by local banks. On the other hand, Dinc (2000) shows that there is an inverted U-shaped relationship between the amount of relationship lending and the number of banks. As a result, the theoretical literature on the effects of interbank competition on bank orientation, and thus access to credit, is somewhat inconclusive. Some studies empirically investigate the effect of competition on bank orientation without solving the puzzle. Papers find evidence for negative effects (Petersen and Rajan, 1995; Fischer, 2000), positive effects (Kysucky and Norden, 2013) or U-shaped effects of competition on relationship lending (Elsas, 2005; Degryse and Ongena, 2007; Presbitero and Zazzaro, 2011). One should note that a similar argument can apply to studying the incentives for banks to develop new products or open new branches in remote areas (see Box 3.2). A dominant position may allow the provider to reach scale economies. On the other hand, competitive pressure may give a bank incentive to stand out from its competitors.

Competition and screening activity:

The *information hypothesis* points out another possible shortcoming associated with bank competition. Banks may actively produce *ex-ante* information by screening projects. Banks use (imperfect) creditworthiness tests which allow them to discriminate between worthy and unprofitable projects. Screening takes place in both arm's length lending and relationship lending. Contributions have investigated how competition affects the quality of screening activities and banks' incentives to invest in screening.

Increasing the number of banks in the credit market may blur the signal that banks receive on firms' quality (Broecker, 1990; Cao and Shi, 2001). Rejected applicants (either of high or low quality) can continue to apply to other banks; the more banks there are in the market, the more chances the worst applicants have of being mistaken for a good risk. Increasing the number of banks performing screening tests decreases the average credit-worthiness of firms, and increases the probability that a bank will not grant a loan. This phenomenon is known as the "winner's curse" problem. Marquez (2002) shows that with more competing banks, each bank becomes informed about a smaller pool of borrowers, resulting in less efficient borrower screening. As a result, due to less efficient screening, banks become more conser-

vative and the efficiency of allocation decreases, while interest rates increase when competition is fiercer.

Box 3.2: Can bank competition help to reach the poor? Some thoughts

While bank competition has certainly more impact on the missing middle, it can also help or hinder the financial inclusion of the poorer population. The conventional view argues that enhancing competition among banks can reduce costs of financial services and therefore can improve the access and the use of financial services. [Beck et al. \(2008\)](#) find support to this view. However, bank competition might be detrimental for financial inclusion. Financial inclusion of the poorer population is mainly driven by the microfinance institutions (MFIs) in Africa. Greater competition in the banking industry might affect the performance of the MFIs and therefore their ability to reach the poor. A thinning in margins in the traditional sector because of intensified competition between banks may push them to develop new products dedicated to microenterprises ([De La Torre et al., 2010](#)). The entry of new actors can reduce the profits of MFIs, in particular if banks are able to finance the largest (and certainly most profitable) borrowers. In addition, the entry of new providers of microfinance can impact the repayment rates which should have a negative impact on profits ([McIntosh et al., 2005](#)). By contrast, the entry of banks can be associated with MFIs pushing toward poorer markets, as documented by [Cull et al. \(2013\)](#).

Another channel whereby competition among banks might affect the financial inclusion is through the adoption of new technologies, in particular the mobile-banking (m-banking). The rapid growth of mobile phone usage has potential impacts on economic performances in Africa ([Aker and Mbiti, 2010](#)). Mobile phone technology can serve as a "silver bullet" for financial inclusion in remote areas through the development of the mobile banking and especially the mobile money transfer ([Beck and Cull, 2013](#)). The adoption of new technologies such as m-payment can be more easily in less competitive markets, which allow the provider to reach scale economies rapidly. Indeed the success of M-Pesa in Kenya has often been associated with the dominant market position of Safaricom. However, in parallel with the literature on relationship lending ([Boot and Thakor, 2000](#)), innovations may be used strategically to soften competition from other banks. The first mover may benefit from the network externalities and therefore block the entry of new suppliers in the industry. As a result, the linkages between m-banking and competition are relatively.

Competition plays a role not only on the quality of screening, but also on banks' incentives to invest in screening technologies. Previous contributions assume that creditworthiness tests are imperfect filters between worthy and unprofitable projects but their precision can be adjusted by the investment of resources. [Gehrig \(1998\)](#) investigates the incentives of banks to produce information by allowing them to choose the level of their screening effort. Banks like to invest in costly screening activities for two reasons. More precise screening reduces credit risk and therefore the cost of lending and increases the approval of profitable projects since less of them are erroneously rejected. Competition exerts an ambiguous impact on investment in screening. A compression of lending margins reduces screening incentives if, and only if, the value of identifying good projects exceeds that of rejecting bad ones. In other words, in economies where banks are mainly concerned with avoiding bad projects, harsher competition may improve screening incentives. According to [Gehrig \(1998\)](#), this scenario is particularly relevant for developing countries. In a different setting, [Dell'Arizza \(2000\)](#) also documents an ambiguous relationship

between market structure and screening incentives. The net effect varies depending on which of the following two opposite effects prevails. On the one hand, fiercer competition aggravates the adverse selection problem that banks face, causing them to invest more in screening. On the other hand, more competition corresponds to a stronger temptation to deviate from a screening equilibrium and consequently increases the incentive to stop screening applicant borrowers.

None of these models take into account the fact that acquisition of information may be a strategic tool. Banks can use proprietary information in order to soften lending competition from outside banks. Uninformed banks cannot really compete with a lender that possesses private information. Hauswald and Marquez (2006) take into account the strategic role of information acquisition. They point out that increased competition reduces intermediaries' rents and decreases their overall incentives to generate information. This result is in line with previous models that study the relationship between competition and screening incentives (Villas-Boas and Schmidt-Mohr, 1999; Manove et al., 2001).

3.3.2 Empirical literature

Theoretical literature is somewhat inconclusive regarding the impact of competition on access to finance. One might expect that the empirical literature would provide some insights on this debate. The empirical literature regarding the consequences of bank competition on credit availability has made some progress over the past decade. Contrary to literature on the consequences of bank competition on efficiency, identifying credit constraints and thus studying the implications of competition on credit availability requires having information on non-financial firms (see Box 3.3). Unfortunately, firm-level data on Africa is often too scarce to provide robust econometric works. As a result, no study has directly investigated this question on Africa. In this section, I thus review the studies on developing countries as well as indirect evidence from Africa.

3.3.2.1 Competition and dynamics of real sectors

In line with the debate on the impact of bank competition on credit availability, some papers have studied the role of competition on the dynamics of non-financial industries (entry and life duration of new firms, growth or structure of non-financial industries). Studies including developing countries provide mixed results regarding the impact of competition on real activity (see Table 3.3).¹⁵

¹⁵Evidence of effects of interbank competition on real activity in developed countries is also mixed. Some papers support the market power view (Jayaratne and Strahan, 1996; Black and Strahan, 2002; Cetorelli, 2004; Cetorelli and Strahan, 2006; Bertrand et al., 2007), while others give support for the information hypothesis (Jackson and Thomas, 1995; Bonaccorsi di Patti and Dell'Ariccia, 2003; Fernández de Guevara and Maudos, 2009).

Table 3.3: Bank competition and real economic activity

Author(s)	Sample ^a		Period	Method ^b	Measures of Competition ^c	Consistent with Market power view?
	Ind.	Count.				
Cetorelli and Gambera (2001)	36	41	1980-1990	C&G	CR3 and CR5	No
Deidda and Fattouh (2005)	36	41	1980-1991	C&G	CR3	Yes for LIC; No for HIC ^d
Fernández et al. (2010)	-	84	1980-2004	Growth equation	CR3	Yes (non-linear)
Claessens and Laeven (2005)	36	16	1980-1990	C&G	H-stat	Yes
Liu and Mirzaei (2013)	23	48	2001-2010	C&G	Boone indicator	Yes
Fernández de Guevara and Maudos (2011)	53	21	1993-2003	C&G	Lerner and H-stat	No
Hoxha (2013)	36	37	1994-2006	C&G	H-stat	No

^a Ind: number of industries or sectors; Count: Number of countries

^b C&G refers to the method proposed by Cetorelli and Gambera (2001)

^c CR_x: Fraction of assets controlled by the x largest banks

^d LIC: low-income countries; HIC: high-income countries

Box 3.3: Measuring credit constraints in developing countries

The traditional methodology for identifying credit constraints originates in the Modigliani-Miller theorem (MMT). Modigliani and Miller (1958) suggest that in frictionless markets, the investment behavior of a firm is irrelevant to its financing decisions and internal and external funds are perfect substitutes. With market imperfections, however, the level of investment is positively related to available internal funds. Empirically higher sensitivity of investment to internal funds suggests the presence of financing constraints. The main problem with this approach stems from the possibility that cash flow may be correlated with investment for other reasons (e.g. current cash flow is a good predictor of future profitability). Possible solutions are to include the Tobin Q-ratio in the estimated equation (Tobin, 1969; Fazzari et al., 1988; Kaplan and Zingales, 1997) or to estimate the neoclassical investment Euler equation for capital stock. The Euler equation approach is more relevant for developing countries because it does not require information on stock market values. However, some studies point out that cash flow is an important determinant of investment even in the absence of financial frictions (Gomes, 2001; Altı, 2003).

Alternative empirical methodologies in identifying financing constraints also invoke the MMT but use a simple proxy of the mix between internal and external funds. The ratio of debt to total assets (Petersen and Rajan, 1994, 1995; Carbó-Valverde et al., 2009b) or the trade credit (Petersen and Rajan, 1994, 1995; Jayaratne and Wolken, 1999) are often employed to proxy credit constraints. However, in addition to the theoretical underpinnings, a major shortcoming is the relative scarcity of firm-level financial figures for SMEs in developing and emerging countries.^a

Recently, the availability of firm survey data containing questions on access to formal finance has facilitated the estimation of direct measures of credit constraints for firms. Researchers use this information in two ways. Studies use survey data on managers' perception of finance as an obstacle to growth and development (Beck et al., 2004; Beck and Demirgüç-Kunt, 2006; Clarke et al., 2006). The survey design and measure employed are open to criticism due to perception bias or inability to quantify the severity of obstacles reported (Ergungör, 2004). Researchers often use these surveys to go in another direction and investigate the credit market experience of firms. Credit constraints are thus measured by the likelihood to obtain a loan or line of credit (Love and Martinez Peria, 2012; Mudd, 2013). However, the fact that a firm does not have credit is not sufficient to prove constraints, since this firm may not have a demand for credit, which is possible even in less developed financial markets (Bigsten et al., 2003; Cole, 2010). Hence, recent works on developing and emerging countries have tried to distinguish between constrained borrowers and other firms without a loan (Brown et al., 2011; Popov and Udell, 2012; Chong et al., 2013). The principle is to identify only firms who are constrained due to failures/imperfections in capital markets. This measure is closer to a possible definition of credit constraints as a situation wherein a firm with a viable project cannot obtain external funds due to financial market imperfections (whereas this firm would obtain external funds in market without frictions).

^aIdentifying supply-side constraints by using the debt ratio is complex insofar as changes in debt ratio can be due to changes in demand for credit (Carbó-Valverde et al., 2009b). Moreover, studies employing trade credit assume that trade credit is one of the most expensive forms of external finance, a view challenged by recent works (Giannetti et al., 2011).

Cetorelli and Gambera (2001) (CG) extend the model of Rajan and Zingales (1998) by introducing bank market concentration as an explanatory variable of growth

for 36 industries in 41 countries.¹⁶ The findings suggest a non-trivial impact of bank concentration on industrial growth. Banking sector concentration exerts a depressing effect on overall economic growth even as it promotes the growth of industries that depend heavily on external finance. [Deidda and Fattouh \(2005\)](#) use the same methodology and data but divide the sample into two groups of countries: low-income and high-income countries. They find that banking concentration is negatively associated with industrial growth only in the sub-sample of low-income countries. There is no significant relationship between banking concentration and growth in high-income countries. [Fernández et al. \(2010\)](#), however, find opposite results. They analyze the effect of bank concentration on economic growth for 84 countries. Results indicate that bank concentration has a negative effect on economic growth, an effect that disappears in countries with poorer quality institutional environments.¹⁷

Given the limitations of the concentration measures to proxy competition (see [Box 3.1](#)), some papers have assessed the level of competition by non-structural measures. In spite of the use of the same methodology (the CG's method), these papers do not provide the same conclusions (see [Table 3.3](#)). While some articles give support for the *market power hypothesis* ([Claessens and Laeven, 2005](#); [Liu and Mirzaei, 2013](#)), other papers are in line with the *information hypothesis* ([Fernández de Guevara and Maudos, 2011](#); [Hoxha, 2013](#)).

3.3.2.2 Competition and credit availability

Since the mid-2000s, in the footsteps of [Petersen and Rajan \(1995\)](#), some works have scrutinized the direct effects of competition on the availability of bank credit to firms in developing economies and have found mixed results.¹⁸ Using data on 74 countries, [Beck et al. \(2004\)](#) show that bank concentration increases the probability that a firm perceives finance as a major obstacle to its growth. [Clarke et al. \(2006\)](#) suggest that

¹⁶[Rajan and Zingales \(1998\)](#) assume that industries that are more dependent on external financing will have relatively higher growth rates in countries that have more developed financial markets. To test this hypothesis, they regress an index of external financial dependence of industry j interacted with financial development on growth of value added in sector j . The industry's dependence on external finance is extracted from U.S. data (the U.S. market is assumed to be the market in which financial constraints are the lowest).

¹⁷This finding is in line with the theoretical framework developed by [Cetorelli and Peretto \(2012\)](#) which states that in economies where market uncertainty is high, less competition leads to higher capital accumulation.

¹⁸The empirical evidence related to the effect of bank competition on small firm credit availability is mixed in industrialized countries. Some cases find concentration associated with improved small firm credit availability ([Petersen and Rajan, 1995](#); [Fischer, 2000](#)) or to have no effect ([Jayaratne and Wolken, 1999](#); [Berger, 2007](#)). [Zarutskie \(2006\)](#) documents that newly formed firms have significantly less outside debt on their balance sheets following deregulation. [Rice and Strahan \(2010\)](#) find that in states more open to branching, small firms are more likely to borrow and do so at lower rates. However, the authors find that there no effects on the amount that small firms can borrow. [Scott and Dunkelberg \(2010\)](#) shows a significant positive association between changes in bank competition reported by small firms and their reports of changes in quality of services provided by banks.

foreign bank penetration (increasing competition) reduces the perception of finance as an obstacle in 38 emerging countries, confirming the *market power view*. Measures extracted from firms' perception are open to criticism (see Box 3.3). Other research assesses the need for external funds by using a mix of external and internal funds or the sensitivity of investment on cash-flow. González and González (2008) give support for the *Information hypothesis view*, while the results from Lin et al. (2010) are in line with the *Market Power hypothesis*.

Carbó-Valverde et al. (2009b) document that the results are sensitive to the choice between structural and non-structural measures of competition. Exploiting a dataset on SMEs in Spain, the authors find evidence that competition (a lower Lerner value) promotes access to finance, despite the fact that firms face fewer constraints in concentrated markets. Using a sample of 53 developing countries, Love and Martinez Peria (2012) reach similar findings. They find that the probability of a firm having a line of credit is reduced in countries where Lerner values are higher (more market power). Using data for 33 countries, Mudd (2013) points out that the relationship between competition and access to credit is more complex. He documents that competition (assessed by Panzar-Rosse H-value) has a positive but declining effect on firm use of bank loans which turns to a negative impact for competitive markets above the mean.

3.3.2.3 Indirect evidence in the case of Africa

Only a handful of papers have given special attention to Africa. Kpodar (2005) gives support for the *market power view*. He documents that the weak relationship between finance and growth in Africa is partially due to concentration in the banking industries. Two other studies investigate the consequences of financial liberalization in Africa and are more in line with the *Information hypothesis*. O'Toole (2012) documents that financial liberalization does not alleviate financing constraints in Africa. Kabango and Paloni (2011) find that financial liberalization in Malawi resulted in an increase in industrial concentration and a decrease of net firm entry, especially in sectors that are more dependent to finance. However, concentration and liberalization are different than competition. Liberalization policies do not necessarily increase competition (Delis, 2012) and banks may behave competitively in concentrated markets (Baumol et al., 1982). In addition, these studies do not directly investigate the impact on access to credit but rather analyze the implications of competition on real sector activity.

To summarize, while the relationship between bank competition and credit availability has been largely investigated in industrialized countries, few papers study it in the case of developing countries. Findings are largely inconclusive insofar as some studies give support for the *market power hypothesis* and others for the *information hypothesis*. Furthermore, the existing papers that investigate the consequences of bank competition on credit availability often exclude many low-income countries, especially from Africa, due to the lack of data. Some indirect evidence has been

provided in the case of African economies but conclusions are mixed. The final essay of this dissertation sheds new light into this issue. This work considers a large sample of developing countries including many African countries (see Chapter 7) to scrutinize the implications of bank competition on credit availability.

3.4 Competition and financial stability

There is a hot debate in the banking literature regarding the effect of competition on overall financial stability. Interest on this subject intensified during the recent global financial crisis, as many questioned whether high competition in developed and emerging countries was partly to blame. Theoretical and empirical studies have not come to a conclusive finding on the relationship between competition and stability. The *competition-fragility view* posits that more competition among banks leads to more fragility, while the proponents of the *competition-stability view* argue that instability is more likely in less competitive markets.

3.4.1 Theoretical literature

3.4.1.1 Competition-fragility view

Under the *competition-fragility view*, restrained competition should encourage banks to protect their higher franchise values by pursuing safer policies that contribute to the stability of the entire banking system (Marcus, 1984; Keeley, 1990; Hellmann et al., 2000, among others).¹⁹ A bank with more market power enjoys higher profits and has more to lose if it takes on more risk. Cordella and Yeyati (2002) show that increased competition reduces differentiation and margins. This may not only provide an incentive to take more risk (*Charter Value hypothesis*) but may also render banks more vulnerable to shocks. Higher profits allow banks to maintain higher levels of capital ("buffer") that protect them from external shocks and diversification is a way to cope with idiosyncratic risk. Another channel through which competition can impact stability is its detrimental effect on the incentives and effectiveness of screening activity (Broecker, 1990; Hauswald and Marquez, 2006). This aggravates the information problem that banks face, thus increasing the risk of defaults. Competition can also destabilize the banking sector through its impact on the interbank market and the payments system. Allen and Gale (2000) show that banks do not have incentives to provide liquidity to a troubled bank when the interbank market is competitive, because each of them acts as price taker and assumes that its action does not affect the equilibrium.

3.4.1.2 Competition-stability view

The proponents of the *competition-stability view* argue that less competition is detrimental for financial stability. A common assumption of the models based on the

¹⁹For in-depth discussions about the theoretical linkages between competition and stability in banking, see Allen and Gale (2004) and Carletti (2008).

charter value is that banks have complete control over the risk of their portfolios. Existing theory ignores the potential impact of market power on borrowers' behavior. [Boyd and De Nicolo \(2005\)](#) investigate the implications of competition on loan markets and borrowers' behavior. Greater competition in the loan market reduces the interest rates that entrepreneurs pay. These lower interest rates may induce firms to assume lower risk due to higher profits, which results in a lower probability that loans turn non-performing. [Martinez-Miera and Repullo \(2010\)](#) extend the Boyd and De Nicolo's (BDN) model. As in the BDN model, the "risk shifting" effect captures the result that more competition leads to lower loan rates, lower firm default probabilities and improved bank stability. However, lower rates also reduce interest payments and thus overall bank revenues, which can lead to potentially greater bank risk and bank failures. This effect is defined as the "margin" effect. A U-shaped relationship between the number of banks and the risk of bank failure is found to represent the net effect of these two forces. The "risk-shifting" effect is shown to dominate in very concentrated markets, such that increased entry improves bank risk measures. In already competitive markets, the margin effect dominates such that further entry worsens bank risk.²⁰ Other arguments focus on indirect effects of bank competition. Banks in less competitive environments are often more likely to be inefficiently managed and more likely to fail ([Schaeck and Cihák, 2013](#)).²¹ Furthermore, [Allen et al. \(2011a\)](#) show that competition may motivate banks to hold higher levels of capital because this indicates a commitment to monitoring and attracts creditworthy borrowers.²²

3.4.2 Empirical literature

Numerous empirical papers have used different samples, risk measures and competition proxies to discriminate between the competition-fragility and competition-stability views.²³

²⁰[Caminal and Matutes \(2002\)](#) propose another model based on the entrepreneurial moral hazard problem. They consider that banks have two ways to deal with moral hazard: monitoring and rationing. They show that less competition can lead to less credit rationing (more monitoring), larger loans and higher probability of failure.

²¹The same argument may apply in concentrated markets if larger banks are more likely to receive public guarantees ([Mishkin, 1999](#)).

²²Closely linked to the market structure and fragility debate is the issue of bank size. Larger banks can better diversify their portfolios. Furthermore larger banks may be easier to supervise. Hence, supervision of banks may be more effective and the risk of a system-wide contagion should presumably recede ([Allen and Gale, 2000](#)). Financial fragility is therefore reduced in more concentrated markets. Advocates of the competition-stability view disagree with the notion that concentrated banking systems are more stable. More concentrated markets with larger banks can be more complex and hence harder to supervise. Furthermore, larger banks can take more risks because the "too big to fail" principle protects them against failure.

²³Only a handful of cross-sectional studies regarding the competition-stability nexus are presented. Readers may refer to [Beck \(2008\)](#) or [Jiménez et al. \(2013\)](#) for additional references on country specific studies.

Table 3.4: Bank stability and competition

Author(s)	Sample (# of African countries)	Period	Stability ^a	Measure(s) of Competition ^b
<i>Papers in line with competition-stability view</i>				
Uhde and Heimeshoff (2009)	25 European countries	1997-2005	Z-score	CR3, CR5 and HHI
Boyd et al. (2009)	134 countries	1993-2004	Z-score	HHI
Schaeck and Cihák (2013)	10 European countries	1995-2005	Z-score	Boone indicator
Armdu and Wolfe (2013)	55 Developing countries (22)	2000-2007	Z-score, NPLs and Cap. Ratio	Lerner and H-statistic
Schaeck and Cihák (2012)	10 European countries	1995-2005	Cap. Ratio	H-statistic
<i>Papers in line with competition-fragility view</i>				
Yéyati and Micco (2007)	8 Latin American countries	1993-2002	Z-score	H-statistic
Türk Ariss (2010)	60 Developing countries (14)	1999-2005	Z-score	Lerner
Beck et al. (2013a)	79 countries	1994-2009	Z-score	Lerner
Agoraki et al. (2011)	13 CEE countries	1998-2005	NPLs	Lerner
Fu et al. (2014)	14 Asian countries	2003-2010	Market distance to default	Lerner
<i>Papers with ambiguous or non-linear results</i>				
Berger et al. (2009)	23 industrialized countries	1999-2005	Z-score and NPLs	Lerner
Tabak et al. (2012)	10 Latin American countries	2003-2008	Z-score (SFA)	Boone indicator

^a NPLs: Ratio of non-performing loans to total loans; Cap. Ratio: Ratio of Equity to total assets; SFA: Stochastic frontier analysis

^b CRx: Fraction of assets controlled by the x largest banks ; HHI : Herfindahl-Hirschman Index

3.4.2.1 Competition and financial system stability

The first strand of studies analyzes the impact of bank competition on financial stability. Bank stability is often measured by systemic banking distress, defined as periods where the banking system is not capable of fulfilling its functions. Papers often use the occurrence of a banking crisis to define such events (Demirgüç-Kunt and Detragiache, 1997; Laeven and Valencia, 2012). The majority of works are in line with the *competition-stability view*. One exception is the work of Beck et al. (2006). They investigate the impact of bank concentration on the likelihood of a systemic banking crisis on a sample of 69 countries. They show that crises are less likely in economies with more concentrated banking systems. Considering 91 countries, however, Boyd et al. (2010) document that sharp decreases in loan growth are more likely to occur in less diluted markets.²⁴ Schaeck et al. (2009) investigate the relationship between occurrence and duration of financial crises and competition for 45 countries. Competition is assessed by the Panzar-Rosse H-statistic. The authors document that crises are more likely to occur and for longer periods in less competitive banking markets, in line with the *competition-stability view*. In a recent paper, Anginer et al. (2012) introduce a new measure of systemic risk. Systemic risk is measured as the codependence in default probability across banks. They find that lower market power (as measured by the Lerner index) encourages banks to diversify risk rendering the banking system less fragile to shocks. They also show that lack of competition has a more adverse effect in countries with low levels of foreign ownership, weak investor protection, generous safety nets and weak regulation and supervision.

3.4.2.2 Competition and individual bank soundness

Rather than focusing on systemic bank distress, numerous studies use bank-level data to calculate individual bank soundness. The most widely used proxy is the Z-score, which is the sum of capital-asset ratio and return on assets, weighted by the standard deviation of return on assets. The Z-score measures the distance from insolvency and a higher Z-score implies a lower probability of insolvency (Roy, 1952). Alternatively, researchers have used the non-performing loans (NPLs) ratio. This proxy captures the risk of default related to the loan portfolio.

There is no academic consensus on whether bank competition leads to more or less financial soundness. Some studies support the *competition-fragility view*, while others find positive links between competition and bank stability (see Table 3.4). These studies differ in their samples and in the measures of competition employed. Channels whereby competition impacts bank soundness remain imperfectly known. Recent works have investigated this question. Berger et al. (2009), using data for banks in 23 industrialized countries, show that more market power (measured by the Lerner index) results in a higher share of non-performing loans but reduces the risk

²⁴Boyd et al. (2010) find that the likelihood of crisis, measured by government interventions, is unaffected by the market concentration, in line with Beck et al. (2006).

of insolvency (*Z*-score). The authors argue that these findings are not in opposition. Even if market power in the loan market results in riskier loan portfolios, the overall risk of banks need not increase if banks protect their franchise values by increasing their equity capital or engaging in other risk-mitigating techniques. This hypothesis is confirmed by [Schaeck and Cihák \(2012\)](#). They show that banks hold higher capital ratios in more competitive environments in the context of European banking. [Amidu and Wolfe \(2013\)](#) reach a similar conclusion in the case of developing and emerging countries. [Schaeck and Cihák \(2013\)](#) suggest that efficiency is the conduit through which competition contributes to stability, while [Delis and Kouretas \(2011\)](#) present strong empirical evidence that low-interest rates indeed substantially increase bank risk-taking in the Euro zone.

The context in which banks operate can impact the competition-stability nexus. [Beck et al. \(2013a\)](#) document that even if the average relationship between competition and bank soundness is in line with the *competition-fragility view*, there is a large variation both over time and across countries. There are several countries for which the competition-stability view is validated. [Agoraki et al. \(2011\)](#) and [Beck et al. \(2013a\)](#) provide empirical evidence that the relationship between competition and stability varies across markets with different regulatory frameworks, market structures and levels of institutional development. For instance, [Beck et al. \(2013a\)](#) document that competition may be particularly harmful in countries where banks have less incentives to invest in information acquisition (more effective systems of credit information sharing), where alternative sources of finance for transparent firms exist (stock markets are more liquid), where higher risk of moral hazard is likely (deposit insurance schemes are more generous) and where financial activity is more restricted.

Insofar as the environment plays a role in determining the competition-stability nexus, it should be instructive to investigate the specificities of African economies. African banks face specific challenges that render the competition-stability nexus specific. To my knowledge, only [Moyo et al. \(2014\)](#) has investigated the relationship between stability and competition in Africa. Using information on more than 600 banks in 16 SSA countries over the period 1995-2010, they document that banks are more stable in countries with competitive banking systems (higher level of *H*-statistic). This study tends to show that competition enhances financial stability in Africa. Future research should be welcomed to confirm or infirm their results. In particular, future works could investigate the channels by which competition affects stability in Africa and elsewhere (regulation, institutional development, etc.). In addition, studies employing bank-level data and the Lerner index should keep in mind that price-cost margins are influenced by a bank's risk-taking behavior ([Oliver et al., 2006](#)). Developing a risk-adjusted Lerner index to investigate the market power-stability nexus is therefore crucial.

3.5 Conclusion

Recent trends in financial systems in Africa raise questions about the implications of competition among banks. The literature has identified at least three reasons why competition in the financial sector is important: banking efficiency, access to finance, and stability. The literature that focuses on African banking systems is scarce and largely inconclusive.

Some papers have scrutinized the relationship between competition (or market power) and efficiency in African economies. These works have tested the SCP hypothesis or studied the relationship between market structure and margins. However, these articles focus on a handful of African countries and findings are inconclusive. Furthermore, no paper has tested the *Quiet Life hypothesis* in Africa. Chapter 6 attempts to fill this gap by testing this hypothesis on a sample of banks from seven West African economies.

The implications of bank competition on credit availability have rarely been investigated in the case of less mature banking systems. Some works have directly or indirectly studied the relationship between bank competition and access to credit for developing countries. Unfortunately, African countries (or low-income countries) are rarely included in the samples. In addition, results do not provide a clear conclusion. In Chapter 7, I give some highlights of the implication of competition on access to finance for firms. The relationship between bank competition and credit availability is analyzed on a large sample of firms in 70 developing countries.

Finally, only one paper has investigated the competition - stability nexus in Africa, providing support for the *competition-stability view*. Although this thesis does not investigate the complex relationship between competition and stability, it provides some insights on the indirect effects of competition through its impact on internal management (Chapter 6). I leave for future research a more complete analysis of the relationship between bank competition and financial stability. In particular, in future works special attention should be dedicated to the channels by which bank competition impacts stability.

The crux of this thesis is to employ non-structural measures of competition to analyze the implications of competition and market power on efficiency and credit availability. As a result, Chapter 4 discusses the different measures developed in the literature and Chapter 5 applies these different measures to gauge the evolution of competition among banks in a sample of African countries over the past decade.

Measuring competition in banking: A critical review of methods

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4.1 Introduction

The issue of competition in the banking sector has attracted much interest in recent years, not least because of the recent financial crisis. Alongside the usual concerns about competition, the issue has additional significance in banking because of its crucial role on non-financial activity. Many theoretical papers have attempted to explain the ambiguous consequences of competition on access to credit, cost and quality of financial services, innovation, the stability of financial systems, and thus economic development. To empirically address these important questions, one first needs to come up with reliable measures of the intensity of bank competition. The more accurate the measure, the more precise empirical results are likely to be.

The fact that competition is a complex notion, and therefore not directly observable, has resulted in the development of many methods for its assessment. The assessment of competition in the banking industry has a long tradition. The literature on the measurement of competition is generally categorized into two major streams. Based on traditional Industrial Organization, early research focused on market structure-performance linkages (the *Structure-Conduct-Performance* paradigm) which stated that the likelihood of collusion increases with market concentration. Some authors, however, raised doubt about the reliability of the *Structure-Conduct-Performance* paradigm and associated structural measures of competition. In response to deficiencies found in the structural approach, non-structural measures of competition have been developed. The aim of the New Empirical Industrial Organization (NEIO) measures is to directly assess the competitive conduct of firms. The first generation of non-structural measures is based on oligopoly theory and a static model of competition. The Lerner index, the conjectural variation model and the Panzar-Rosse model can all be attached to this conception of competition. Subsequently, other non-structural measures, especially the Boone indicator, have been developed with the objective of capturing the dynamic of the market rather than focusing on static analysis.

While some researchers may prefer one measure over another, there is no consensus regarding the best measure by which to gauge competition. The different indicators of banking market competition do not provide the same inferences about competition (Carbó-Valverde et al., 2009a; Liu et al., 2013). Therefore, the choice of a particular indicator influences conclusions regarding the implications of competition. The choice of techniques involves tradeoffs. The usefulness of the different approaches hinges on data availability, the conceptions of competition assumed, and the questions being addressed. This chapter's objective is to present the most widely-applied methods in banking, highlighting their strengths and weaknesses. It complements existing reviews written by Degryse et al. (2009) and Liu et al. (2013).

The rest of the chapter is structured as follows. Section 4.2 briefly presents the different conceptions of competition in the history of economic thought. The following sections review the different methodological approaches that have been employed to investigate competition in banking. This empirical research can be subdivided into the structural (Section 4.3) and non-structural (Section 4.4) approaches. These

sections highlight assumptions, advantages and shortcomings of the different measures as well as differences and similarities between them. The final section provides a synthesis for studies on banking systems in developing countries.

4.2 Two conceptions of competition

Although the concept of competition has always been central to economic thinking, it is one that has taken on a number of interpretations and meanings. Conceptions of competition originate in *The Wealth of Nations* (Smith, 1776).¹ In the Smithian analysis, free competition is an ordering force toward equilibrium. In the long run, free competition leads to prices being equal to the costs of production. Nonetheless, for Smith, competition is not a state or situation but a race between competitors to gain market share. It is rivalry that forces price towards the equilibrium of supply and demand. An essential condition for free competition is not the number of rivals (while it may help) but rather individual freedom.

Subsequent works on the conception of competition were inspired by Smith but have developed two major views of competition (McNulty, 1967; Vickers, 1995; Blaug, 2001). Standard theory refers to the results of competition as a static equilibrium outcome. According to this theory, competition is a static state in which firms cannot charge over-price and then earn abnormal profit. On the other hand, other economists, particularly the Austrian School, have criticized this static view and have retained the central role played by rivalry to define competition.

4.2.1 Competition as a static state

Cournot (1838) was the first to relate free competition to the result of competition.² Cournot defined the ideal of competition, not as the process that in the long run tends toward a certain equilibrium position, but rather as the equilibrium condition itself. Competition is a situation where prices equal the costs of production (natural prices). To obtain a competitive situation, there must be several assumptions (a considerable number of rivals, possessing common knowledge about market opportunities, free entry and exit), which was never explicitly mentioned by Smith with the exception of the number of rivals (Blaug, 2001). This latter assumption plays a central role in Cournot's analysis. According to him, the excess of the price of cost approaches zero as the number of producers increases. The analytical refinement was extended by some economists, particularly Edgeworth, Jevons, Walras, Marshall, Clark, and received its fullest expression in Knight's book *Risk, Uncertainty and Profit*.³ Perfect competition is the antithesis of monopoly. In monopoly, there

¹Competition was a familiar concept in economic writing when Smith published *The Wealth of Nations*. McNulty (1967) points out that the merit of Smith was his description of the competitive process as a central element of economy.

²Stigler (1957) acknowledges that Cairnes, while attached to Classics, expressed a similar idea.

³Stigler (1957) documents how each of them add and specify the neoclassical definition of competition.

is no one to compete and a monopolist could extract abnormal profits, although limited by the elasticity of demand.

By 1883, Bertrand criticized Cournot's oligopoly theory arguing that relevant strategies for firms are prices and not quantities. As a result, the linkages between structure and conduct are less clear than postulates of the Cournot model. A half century later, Chamberlin (1933) and Robinson (1933) wrote other important contributions to the oligopoly theory. They proposed reconciling perfect competition and reality by developing a theory of workable competition. Much of the business world is a mixture of competition and monopoly. Monopolistic competition is a type of imperfect competition such that many producers sell products that are differentiated from one another as goods but are not perfect substitutes.⁴ In monopolistic competition, a firm takes the prices charged by its rivals as a given and ignores the impact of its own prices on the prices of other firms.

Different critiques have been introduced in the static oligopoly theory that recognize different possible forms of market structure (Vives, 2001). The oligopoly theory allows scholars to derive testable hypotheses and therefore measure degree of competition. As a consequence, the *neoclassical conception of competition* based on the oligopoly theory is at the root of both structural and the majority of non-structural measures of competition (the Lerner index, the conjectural variation model and the Panzar-Rosse model). The oligopoly theory distinguishes between the different forms of market structure (perfect competition, imperfect competition and monopoly). This conception of competition is, however, challenged by another view that focuses on dynamic aspects of competitive rivalry.

4.2.2 Competition as a process of rivalry

The Austrian School, led by von Mises, Schumpeter and Hayek, argue that economists in the neoclassical tradition misuse the term competition by applying it to a state rather than to a process.⁵ Competition is viewed not as a static state but as a complex process of rivalry between firms. The core of competition is the behavior of firms (and entrepreneurs) in the market. Firms are engaged in a continuing dynamic competitive process, constantly creating and adopting new products and processes in order to cope with competition. The competition process acts as a selection mechanism through the destructive-creation principle: Less efficient incumbents are removed and replaced by more efficient entrants. Stigler (1957) defines competition as "*a rivalry between individuals (or groups or nations), and it arises whenever two or more parties strive for something that all cannot obtain*". Vickers (1995) points out that this rivalry "*encompasses all sorts of forms of rivalry (market trading, auctions, races, wars of attrition, etc.), instruments of rivalry (prices, ad-*

⁴In 1929 Hotelling developed the model of horizontal differentiation. He emphasized the softening effect of differentiation on price competition. According to Vives (2001), Edgeworth considered product differentiation and imperfect substitution.

⁵Other economists have developed some related arguments such as the theorists of evolutionary economics (Nelson and Winter, 1982, 2002) or heterodox economists (e.g. Perroux).

vertising, R&D, takeover bids, effort levels, etc.), objects of rivalry (profits, market share, corporate control, promotion, prices, survival, etc.), as well as types of rival".

Box 4.1: An attempt of synthesis: The theory of contestability

The Austrian School's arguments were revived by the Chicago School. Economists in the Chicago tradition tend to the view that many if not most markets tend to approximate perfect competition in the long-run. Thus positive profits are considered a transitory phenomenon since their presence stimulates entry and hence leads to their demise (Posner, 1979).

Baumol et al. (1982) give a neoclassical formalization of this idea through the theory of contestability.^a They argue that regulation is unnecessary when markets are contestable. In contestable markets, the threat of entry would not only restrain incumbents' market power, but also generally satisfy the requirements for static welfare maximization. A market is contestable if (i) the entry is free and without limit; (ii) the entry is absolute; and, (iii) the entry is perfectly reversible. Market forces ensure that monopoly power will usually be short lived. The intensity of competition is then unrelated to market structure but linked to market contestability. Audretsch et al. (2001) shed light on the divergence between the two conceptions of contestability. In the theory of market contestability, the analysis remains static, divergence from long-run equilibrium is temporary and focuses on prices. By contrast, the Austrian School argues that disequilibrium and monopoly power are the normal functioning of competitive markets. The theory of contestability cannot explain why entrepreneurs innovate or adopt risky strategies in markets, and thus it cannot explain the evolution of economics.

Subsequent developments in industrial organization have rediscovered the major contributions of the Austrian School (dynamics analysis, non-price strategy, etc.). The literature has provided significant advances moving beyond the traditional static models and price competition (Audretsch et al., 2001). Audretsch et al. (2001) point out that the evolution of industrial economics from static to dynamic analysis does not capture the central attribute of Austrian dynamic competition, namely technical change.

^aWhile Baumol's thought about competition and entrepreneurship was highly influenced by Schumpeter's view, Baumol cannot be considered as a member of the Chicago School.

In the Austrian School's perspective, a market is competitive when rivals are sufficiently aggressive to give an incumbent incentive to improve (better quality, lower price, new services, more innovation, improved management, etc.) in order to maintain its advantage. Inefficient firms are directly sanctioned by consumers while more efficient and innovative companies are rewarded.

The role of monopoly and market power is revisited in the Austrian School perspective. While firms are unable to raise prices over marginal cost in a perfect competition framework, for the Austrians the existence of rents is a normal aspect of the competitive process. In a free competitive market, each firm innovates and develops risky strategies in order to gain a competitive advantage over its rivals. Firms that do obtain such an edge temporarily derive static monopoly power during the interval before imitating competitors replicate their innovation, or supersede it with one that is superior. Successful firms earn temporary monopoly profits as their reward for risky strategies. As a result, a free competitive market is compatible with market power and "abnormal" profit rates.

The fact that the *neoclassical conception of competition* poses some clear testable hypotheses explains that a majority of competition measures are rooted in this model. The structural approach refers to the structure-performance relationship that exists in Cournot's analysis. The first generation of NEIO measures (the Lerner index, the conjectural variation model and the Panzar-Rosse model) was built on this model. More recently, new non-structural measures which are in many ways sympathetic to the *Austrian conception of competition* have been proposed, most notably the Boone indicator.

4.3 Structural approach

4.3.1 From SCP paradigm to concentration measures

The *Structure-Conduct-Performance* (SCP) paradigm, initially developed by Mason (1939) and Bain (1956), seeks to explain aspects of the conduct and performance of firms in terms of the structural characteristics of the markets in which they operate. The structural characteristics of a market cover the number of firms and their absolute and relative size as well as the entry and exit conditions and the extent of product differentiation. Market structure is expected to influence the conduct of firms. Conduct variables include pricing strategies, collusion and other forms of strategic decisions (such as product quality and advertising expenditures). Conduct, influenced by structure determines performance. The SCP paradigm's most important insight is that the more concentrated an industry is, the easier it is for firms to operate in an uncompetitive manner. For instance, tacit collusion becomes more likely when the number of firms operating in an industry decreases (Tirole, 1988). Remaining firms can exploit their market power in order to charge prices above marginal costs and thus become more profitable at the expense of social welfare.

The SCP paradigm argues that competitive features of industry are inferred from structural characteristics. Empirical works focus on the number of firms and their relative size in order to gauge market concentration. General agreement prevails on the elements that constitute concentration measures. Concentration indices take both the distribution in firm size (inequality) and the number of firms into account in a given market.

Attention is focused on the three widely-used measures of concentration namely the number of firms, the concentration ratios and the Herfindahl-Hirschman index (HHI).⁶ Measures of concentration differ according to their weighting schemes and structure. Existing measures of concentration do not respect all the criteria listed above.

⁶Bikker and Haaf (2002) present other concentration measures such as the Hall-Tideman index, the Rosenbluth index, the CCI, the Hannah-Kay index, the U-index, the Hause indices, and the Entropy measure. Insofar as industrial organization literature focuses on concentration ratios and the HHI, this chapter ignores the other concentration measures.

The number of firms is the simplest index to compute insofar as the data requirement is very limited. However, this index does not take into account the distribution of firms. The level of concentration between two industries may differ greatly if one industry is dominated by one firm, while another industry assembles firms with same size. As a result, few papers employ the number of firms as an index of concentration.

Simplicity and limited data requirements make the concentration ratio one of the most frequently used measures of concentration in the empirical literature. The concentration ratio requires more information than the number of firms, insofar as researchers need to obtain the market share of leading firms. The k -firm concentration ratio measures the market share of the top k firms in the industry:

$$CR_k = \sum_{i=1}^K s_i, \quad \text{with } s_1 \geq \dots \geq s_K \geq s_N, \quad \forall N \geq K$$

where s_i is the market share of the i 'th firm, when firms are ranked in descending order of market share and N is the total number of firms. The index approaches zero for an infinite number of equally sized firms and equals 1 if the firms included in the calculation make up the entire industry. While there is no rule for the determination of the value of K , commonly used values include 3, 5 or 10. By focusing only on the market share of the top k firms, the concentration ratio takes no account for the size distribution of remaining firms. For example, a merger between small firms may not be reflected in the concentration ratio, although the market becomes more concentrated. Some of the criteria listed above fail to be fulfilled by the concentration ratio (e.g., the third criteria).

The Herfindahl-Hirschman Index (HHI) is the concentration measure most frequently used by researchers and antitrust agencies (Hirschman, 1964). The HHI is more data intensive than the number of firms or the CR_k , insofar as it requires information on the entire firm size distribution (market share of each firm). It is computed by summing the squares of the market share of all firms:

$$HHI = \sum_{i=1}^N s_i^2, \quad \forall i = 1, \dots, N$$

where N is the total number of firms in the market. The HHI index ranges between $1/N$ (for equal-sized firms) and 1 for monopolies. According to current screening guidelines in the USA, the banking industry is regarded to be a competitive market if the HHI is less than 0.10, a somewhat concentrated market if the HHI lies between 0.10 and 0.18, and a very concentrated market if the HHI is more than 0.18 (Cetorelli, 1999). The HHI stresses the importance of larger firms by assigning them a greater weight than smaller ones, thus reflecting their relative importance. Contrary to the concentration ratio, the HHI avoids the arbitrary cut-off by incorporating each firm individually.

4.3.2 Advantages and shortcomings

The major advantage of concentration measures is the low data requirement. Even for developing countries, concentration measures can be computed at least at the national level. The majority of contributions focusing on industrial organization in low- and middle-income countries use concentration measures to proxy competition.

Unfortunately, the *SCP* paradigm and associated concentration measures suffer from major conceptual and practical limitations. A number of studies have questioned the theoretical underpinnings of these concentration measures. Under the *SCP* hypothesis, a rise in concentration is regarded as increasing collusive opportunities between firms, and hence would lead to higher prices and profitability. Alternative theories undermine the linkage between structure and conduct. Even in a duopoly, price competition can be fully efficient as the Bertrand equilibrium is a possible outcome. The theory of contestability (Baumol et al., 1982) suggests that a concentrated markets industry can behave competitively if hurdles for entry and exit are low (see Box 4.1). The threat of entry can exert pressure on incumbents and keep the sector competitive. Other theories show that collusive actions can be sustained even in the presence of many firms. For instance, multimarket contacts raise the incentive for collusion by changing the relative costs and benefits of cooperating (Bernheim and Whinston, 1990).

Not only is the linkage between structure and conduct uncertain, but the direction of causality is also problematic. The efficiency structure (ES) hypothesis (Demsetz, 1973; Peltzman, 1977) entails the notion that the structure of the market may reflect differences in efficiency rather than a competitive situation. Under the ES hypothesis, firms that have higher productive efficiency tend to gain market share, which can lead to higher market concentration. Therefore, concentration indices are not exogenous and may reflect differences in terms of efficiency.⁷ The core of the problem is the difficulty of knowing what different levels of concentration exactly reflect. Market structure and concentration may proxy for a whole range of conduct-determining bank and market characteristics, including average bank size, bank complexity in terms of product variety and activities, the ease of information flow within the market and the overall size of the market itself, for instance (Ergungor, 2004).

Another part of the argument against concentration measures concerns empirical implementation. The major practical problem concerns the appropriate definition of the market. Defining the relevant geographical market (local, regional, or national) as well as the product market can be difficult (Shaffer, 2004b). The relevant geographical market may differ according to banking activities. For example, banks compete locally to provide credit to SMEs due to informational requirements. Credit

⁷Without referring to the ES hypothesis, one should raise concerns about the exogeneity of market structure. In a two-stage game, such as the Salop model, entry decision (market structure) and price setting (conduct) are both endogenous and are determined by the equilibrium of the game. A firm will enter only if it expects to earn profit in the future.

to transparent firms, however, is based on hard information that is easily transferable in impersonal ways. Therefore, a bank outside the local market may compete to provide funds for well-established firms. At the extreme, the geography of the relevant market for granting loans to multinational firms is international. Furthermore, all products that are substitutes need to be included in the product market definition. In the financial sector, a number of substitutable products are supplied by non-banking firms. As a consequence, defining the relevant market may be a complex issue. In practice, the choice is often constrained by data availability. Studies on industrialized countries often produce market share and concentration indices at the local level (such as the *Metropolitan Statistical Areas* in the U.S.). In studies on developing economies, concentration indices can only be calculated at the national level due to the lack of disaggregated data. This might raise concerns about the relevance of concentration measures used in applied works. For example, studies on credit conditions for SMEs should employ concentration measures at the local level insofar as SMEs borrow locally. When disaggregated data are available, researchers should use proxy concentration at the local level. An illustration of this approach can be found in [Chong et al. \(2013\)](#). They consider each Chinese city as a separate banking market and measure concentration using the number of branches for each bank in the city. Unfortunately, for many economies such intensive information is rarely provided. Researchers employ national measures of concentration to infer conclusions about the degree of concentration in local banking markets. They implicitly assume that national concentration indices are a good proxy for local ones.

Despite the fact that concentration measures continue to be widely used in the banking literature, they suffer from some theoretical and empirical limitations. Unfortunately, especially in studies on developing countries, researchers do not benefit from rich information on banks. They do, however, keep in mind that concentration and competition are two different concepts that are not always related.

4.3.3 New structural measures: Regulation in banking

Concentration indicators are still used as the main structural indicators mainly because they are easier to measure than other dimensions of structure (entry and exit conditions and product differentiation). Nevertheless, several studies have begun to investigate other elements of market structure, especially entry and exit conditions. The theory of contestability argues that firms behave competitively in the absence of entry and exit barriers (see Box 4.1).

Barriers consist of both formal and informal obstacles to entering and exiting a market. Financial regulation is one of the major constraints to free entry in banking. The financial sector is among the most regulated sectors in many countries. Several contributions ([Claessens, 2009](#); [Demirgüç-Kunt and Peria, 2010](#)) propose considering regulatory framework to gauge the degree of contestability in banking. Following the initial work of Barth, Caprio and Levine ([Barth et al., 2005, 2013](#)), a rich international database on bank regulations (and supervision) has been developed and may be used. It takes into account entry requirements

for domestic and foreign banks, capital requirements and the regulations affecting bank activities. Not only are *de jure* regulations included but the database also considers regulator activities and *de facto* limits.

A major limitation with this approach is the omission of non-regulatory barriers and sunk costs that play a significant role in the banking industry (Dietsch, 1992). The degree of contestability in banking is influenced by non-legal barriers, such as technical and informational barriers. The existence of scale and scope economies may create barriers to entry, while empirical contributions on developed economies fail to provide evidence for the existence of scale and scope economies in banking (Degryse et al., 2009). Another important element affecting the nature of competition in retail banking is the presence of networks. Incumbents can choose to share or extend their network to exclude rivals from the market and limit competition (Matutes and Padilla, 1994).⁸ The most important economic barrier is certainly the presence of informational rents of incumbent banks. The informational gap between incumbents and outside banks acts as a barrier in the market. Private information may limit effective competition from uninformed outside banks (Sharpe, 1990; Fischer, 1990; Rajan, 1992) due to the adverse selection problem. The adverse selection problem for potential entrant banks stems from their inability to distinguish new (good) borrowers from old (bad) borrowers who have been rejected by their previous bank. The adverse selection problem and incumbent banks' information act as a barrier to entry in the banking industry (Dell'Ariccia et al., 1999; Dell'Ariccia, 2001; Marquez, 2002). Unfortunately, no paper gives a simple method to assess the information gap between incumbents and outside banks.⁹ One might expect that this gap is larger in more opaque markets. The presence of an informational wedge may explain why regulatory frameworks are weakly related to competition in banking for developing economies (Delis, 2012).

To summarize, although the structural approach is open to criticism, these proxies have often been employed in recent contributions on developing countries. Information on the structure of markets or regulatory framework is often the sole data that researchers focusing on less mature banking systems can obtain. However, it is important to be aware of the strong limitations of these different indicators. With the development of micro-data on banking institutions, new measures of competition based on bank behavior have been developed and are beginning to be used for developing countries.

⁸The Stackelberg-Spence-Dixit model (Tirole, 1988) shows that incumbent(s) may endogenously deter entry or at least try to limit the expansion of entrants through overinvestment in production capacity. The bank branches network of incumbent banks is often heavy. An incumbent must establish several branches and bear the high fixed costs to compete with incumbents.

⁹Non-structural models have been developed to assess the sunk-cost (Sutton, 1991; Dick, 2007) or the decision to enter for outside banks (Bresnahan and Reiss, 1991). These models require strong assumptions and/or strong data requirements. As a result, they are rarely implemented in the banking industry. For a presentation of these models and their implementation in the banking industry: see Degryse et al. (2009).

4.4 New Empirical Industrial Organization

Shortcomings in the structural approach have led to a number of attempts to collect empirical evidence on the nature of competition by observing conduct directly. The New Empirical Industrial Organization (NEIO) make conclusions about competitive pressure by directly observing the conduct of firms in the market. The NEIO employs a variety of alternative methodologies requiring different data and assumptions. Carbó-Valverde et al. (2009a) point out that the first generation of non-structural measures is based on the oligopoly theory (*neoclassical conception of competition*). These models include the Lerner index, the conjectural variation models (Iwata, 1974; Bresnahan, 1982; Lau, 1982) and the Panzar and Rosse (1987) model. While sharing a common standard theoretical framework, results are often divergent (Carbó-Valverde et al., 2009a; Liu et al., 2013).

A second generation of NEIO measures focus on the dynamics of markets and are thus in line with the *Austrian (dynamic) conception of competition*. These include the Persistence of Profits developed by Mueller (1977, 1986) and the Boone indicator recently proposed by Boone (2008).

This subsection reviews the widely-used non-structural measures in banking, namely the Lerner index, the conjectural variation model, the Panzar-Rosse model and the Boone indicator.¹⁰

4.4.1 Lerner index

4.4.1.1 From theory to application

The Lerner index (or price-cost margin) is a popular measure of market power in empirical research. The market power of a firm is identified by the divergence between the firm's price and its marginal cost. The price and marginal cost should be equal in perfect competition, but will diverge in less competitive environments. A bigger wedge between price and marginal cost signals greater monopoly power.

The theoretical foundation of the Lerner index is rooted in static oligopoly theory. Let us suppose a quantity-setting oligopoly model (Cournot model). In an industry producing a single good, let P be the market price of product Q and let q_i be the quantity produced by firm i . The profit maximization problem for firm i is written as:

$$\max_{q_i} [P(Q)q_i - C(q_i, \omega_l)] \quad (4.1)$$

¹⁰Insofar as applications of Persistence of Profits in banking are scant, this method is not presented in this paper. Furthermore its implementation may be complex in highly unstable countries, such as developing economies. The interested reader may refer to Goddard et al. (2011) for more on this methodology. Other methods have been developed in the literature such as the Hall-Roeger model (Rezitis, 2010) and the structural demand models (Dick, 2008). These models require strong assumptions and/or have strong data requirements. As a result, they are rarely implemented in the banking industry. Implementation of the persistence of the profit model remain scarce in banking. For a presentation of these models and their implementation in the banking industry, the interested reader may refer to Degryse et al. (2009) and Liu et al. (2013).

where q_i is the quantity produced by firm i , Q is the total quantity ($Q = \sum_{j=1}^J q_j$), and $P(Q)$ the price in the market. $C(q_i, \omega_l)$ is the total cost of firm i , where ω_l is the vector of the prices of the factors of production employed by firm i . Lerner (1934) proposes the following measure of market power, known as the Lerner index:

$$L_i = \frac{P(Q) - C'_{q_i}(q_i, \omega_l)}{P(Q)} \quad (4.2)$$

where $C'_{q_i}(q_i, \omega_l)$ is the marginal cost of firm i . The Lerner index ranges from 0 in situation of perfect competition to the inverse of the price elasticity of demand in situation of monopoly or collusion.

Although the Lerner has been known by economists since the mid-1930s, its application to banking is relatively recent due to the difficulty of assessing marginal costs. Marginal costs have only been econometrically estimated during the last two decades and are extracted from the estimation of the cost function. Cost function is often assessed using the intermediation approach (see Box 4.2) from a translog equation including a single output (total assets) and three inputs (labor, deposit, and physical capital). The translog function is generally as follows:

$$\begin{aligned} \ln(C_i) = & \beta_0 + \beta_1 \ln(q_i) + \frac{1}{2} \beta_2 [\ln(q_i)]^2 + \sum_{l=1}^3 b_l [\ln(\omega_{l,i})] + \frac{1}{2} \sum_{l=1}^3 b_{3+l} [\ln(\omega_{l,i})]^2 \\ & + \sum_{l=1}^3 \beta_{2+l} [\ln(q_i)] [\ln(\omega_{l,i})] + \sum_{l \neq l'} b_{6+l} [\ln(\omega_{l,i})] [\ln(\omega_{l',i})] + \sum_{k=1}^K \kappa_k Z_{k,i} + \varepsilon_i \end{aligned} \quad (4.3)$$

where $C_i (= C(q_i, \omega_l))$ represents total costs of bank i , q represents a proxy of bank output (total assets), ω_l the price of l^{th} input, and Z a set of control variables. From Eq. 4.3, the marginal cost is merely obtained by taking the first derivative and multiplying by the average cost:

$$C'_{q_i} = \frac{\partial C_i}{\partial q_i} = \left(\beta_1 + \beta_2 \ln(q_i) + \sum_{l=1}^3 \beta_{2+l} [\ln(\omega_{l,i})] \right) \frac{C_i}{q_i} \quad (4.4)$$

The price of output (P) is computed as the average revenue.

Box 4.2: Models of banking firms and measures of prices and quantity

Non-structural measures of competition often require a model of a banking firm to specify the output(s) and input(s). In the literature, two main approaches may be identified.

Under the *production approach*, financial institutions are thought of as primarily producing services for account holders. Banks offer various financial services such as savings or credit by mobilizing labor and physical capital. This view argues that deposit products provide a valuable service for depositors (safe storage of valuable, record keeping, and means of payment).

Many empirical studies use an alternative approach; the *intermediation approach* (Klein, 1971; Monti, 1972; Sealey and Lindley, 1977). A bank is considered as an intermediary between depositors and borrowers. A bank employs labor and physical capital to attract deposits, which are used to fund loans. In addition to labor and physical capital, deposits are considered as an input. Bank output is often defined as total assets, or total loans.

Insofar as intermediation function remains the core of bank activity in developing economies, this thesis keeps the traditional intermediation approach. Under the intermediation approach, outputs are computed as total assets. Contrary to total loans, total assets take into account other earning assets.^a Three inputs are considered, namely labor, physical capital and deposits.

Insofar as prices are not directly observable, researchers use balance sheets and income statements to infer prices. Using banks' financial figures to proxy prices may be problematic. Prices reflect average prices for each bank and mix the price of each product (or factors) and the mixing of product (or factors). Changes in prices may reflect changes in absolute prices or changes in the composition of outputs or inputs. By contrast, changes in absolute (outputs or inputs) prices are not automatically captured by average price if the bank modifies the composition of its portfolio or of its production factors. One might keep in mind these limitations and be cautious when interpreting results employing "endogenous" prices.

^a Various factors have fostered the growth of non-traditional banking activities, especially in mature markets. Non-traditional activities include securitization, standby letters of credit, and derivative securities, which have rarely been considered as outputs. Recent contributions, in particular on developed countries, should more explicitly consider these new products insofar as their share in bank revenues increases.

This indicator is a good measure of individual market power. It allows researchers to simply quantify the pricing market power of an individual bank. The Lerner index has the main advantage to be bank-specific and to vary over time, allowing comparison of market power among banks and/or over the period. Many papers have tried to assess banking competition by averaging the individual Lerner indices (Fernández de Guevara et al., 2005, 2007; Maudos and Solís, 2011; Weill, 2013, among others). The Lerner index for the market j is obtained as follows:

$$L_j = \sum_{i \in j} \phi_{ij} L_{ij}$$

where L_{ij} is the Lerner index of firm i in market or country j and ϕ_{ij} the weighting of firm i (often the market share of firm i in market j). An unweighted Lerner index implies that $\phi_i = 1/N$, where N is the number of firms in market j .

4.4.1.2 Advantages and shortcomings

The main reasons for the popularity of the Lerner index are its simplicity, its straightforward interpretation, and the fact that it does not pose stringent data

requirements. Insofar as the Lerner index provides a firm-year specific measure of market power, it offers the possibility of studying the evolution of bank pricing behavior over time. This indicator has other interesting advantages. The Lerner index is a flexible indicator and does not require defining the relevant market. It allows market power to be measured separately for the different banking markets (geographic and by products). Furthermore, researchers may easily disentangle monopoly and monoposony power by excluding financial costs to total costs and deposit prices (Turk Ariss, 2010). Finally, the Lerner index can be calculated with a limited number of observations. The latter advantage is far from anecdotal insofar as competitive concerns occur mainly when the number of firms is limited (in such cases, the marginal costs may be proxied by average costs).

The Lerner index, however, suffers from major theoretical and practical limitations. In fact, it is a measure of pricing market power and not a proxy of competition. In other words, an increase of average market power over time can be consistent with an increase in the intensity of competition. Contributions show that there are theoretically possible scenarios in which price-cost margins increase with more intense competition (Stiglitz, 1987, 1989; Bulow and Klemperer, 2002; Amir, 2010, among others).¹¹ Recent works show that even if individual Lerner indices decreases with competition, the average degree of market power may increase, decrease or remain stable due to the reallocation effect from inefficient to efficient firms (Boone, 2008; Boone et al., 2013). Efficient firms have higher price-cost margin than their counterparts. Thus, the weighted average Lerner index can increase if the increase in the market share of more efficient firms overcompensates the decrease of the respective individual Lerner indices.¹²

Other practical concerns have been raised about the Lerner index. Vives (2008) maintains that the Lerner index is not able to appropriately capture the degree of product substitutability. Oliver et al. (2006) emphasize that, when a bank's risk taking is not accounted for, the Lerner index could overestimate market power, because banks that in relative terms spend more of their resources granting credits enjoy higher margins. This issue is particularly problematic for studies employing the Lerner index to investigate the competition-stability nexus (Berger et al., 2009; Turk Ariss, 2010; Beck et al., 2013a). Koetter et al. (2012) point out that the

¹¹The Austrian School reaches similar conclusions in a completely different framework. In the Austrian perspective, competition gives firms incentives to innovate in order to cope with competition. Incumbent's banks will develop new products or expand their network of branches to maintain an advantage over their rivals. These banks can continue to extract some margins on customers even after the increase of competition. An increase of Lerner indices over time does not necessarily signal a worsening of competitive conditions. On the contrary, this might suggest a strengthening of competitive conditions. Extraction of market power may be a normal feature of competitive behavior. Therefore, the Lerner index is, at least theoretically, potentially misleading.

¹²The reallocation effect can be partly eliminated by using the unweighted Lerner index as measure of competition. This reduces the problem caused by the reallocation effect to a certain extent but does not remove it completely: an increase in competition can induce the destruction of inefficient firms (with low margins) which raises the average Lerner index in the market.

conventional approach of computing the Lerner index assumes perfect technical and allocative efficiency. Unfortunately, banks rarely operate under perfect efficiency. Operating costs and efficiency vary depending on the economic environment in which banks operate (Chaffai et al., 2001). As a consequence, differences across countries (or changes over time) in Lerner indices can be justified by differences (or changes) in non-competitive factors. I will discuss this problem and the ways to solve it in more detail in Chapter 6 when I investigate the market power - efficiency nexus in Africa.

4.4.2 Conjectural-variation model

4.4.2.1 From theory to application

The Lerner index cannot distinguish between markets that have high margins due to inelastic demand and markets that have high margins because they are less competitive or perhaps collusive. To overcome this problem, the conjectural-variation method has been introduced by Iwata (1974), Bresnahan (1982), and Lau (1982). The aim is to control the changes of the Lerner index due to demand changes, and therefor isolate firms' competitive behavior.

The conjectural variation refers to the beliefs that one firm has about the way its competitor(s) may react if it varies its output or price (Bowley, 1924).¹³ Recalling the profit maximization problem for firm i (Eq. 4.1), the first order condition for a firm i is given as:

$$P'_Q Q'_{q_i} q_i + P = C'_{q_i} \quad (4.5)$$

For the firm i , the conjectural variation parameter (in quantity) is measured as:

$$\lambda_i = \frac{\partial \sum_{j \neq i} q_j}{\partial q_i} = Q'_{q_i} - 1 \quad (4.6)$$

λ_i is the expectation of firm i of the extent to which its own output initiatives will trigger changes in the outputs of its rivals.

Eq. (4.5) becomes:

$$P'_Q (1 + \lambda_i) q_i + P = C'_{q_i} \quad (4.7)$$

By multiplying Eq. (4.7) by Q/P and rearranging the equation, the Lerner index can be rewritten as:

$$L_i = \frac{P - C'_{q_i}}{P} = -\frac{(1 + \lambda_i) s_i}{\varepsilon_d} \quad (4.8)$$

where ε_d is the elasticity of demand and s_i the market share of firm i .

Firm i 's expectations about the reactions of its rivals (conjectural variation parameter) ranges from -1 to $N - 1$ (N is the number of firms in the market).

¹³The validity of the conjectural variation model is criticized by theorists as a dynamic principle in a static framework (Tirole, 1988; Vives, 2001). There is no opportunity for rivals to react to firm i 's change in the context of one-shot simultaneous moves games. Nevertheless, the conjectural variation approach has proved useful in applied works because it parameterizes the degree of competition in a market (Tirole, 1988; Martin, 2002).

In a collusive situation if firm i increases its production by 1, all firms will do the same thing and raise their production by one. Hence, the full exploitation of market power exercised by firm i coincides with $\lambda_i = N - 1$ and the total output increases by N unities.¹⁴ Perfect competition (or Bertrand competition) implies that $\lambda = -1$ what changes expression (5.7) in the well-known $P = C'_{q_i}$ condition. Firm i expects a change in output of firms j which exactly compensates its own, so as to leave the price unchanged. If $\lambda = 0$, then firm i expects no reaction to its change in output and therefore it is a Cournot situation.

In practise, the conjectural elasticities is employed instead of the conjectural variation (Degryse et al., 2009). The conjectural elasticities is defined as: $\theta_i = Q'_{q_i} \frac{q_i}{Q}$. After some manipulations, the Eq. 4.7 can be rewritten as (Angelini and Cetorelli, 2003):

$$P = C'_{q_i} - \lambda_i = C'_{q_i} - \frac{\theta_i}{\tilde{\varepsilon}_i} \quad (4.9)$$

where θ_i is the conjectural elasticities and $\tilde{\varepsilon}_i$ the semi-elasticity of demand ($\tilde{\varepsilon}_i = Q'_P/Q$). The conjectural elasticity ranges from 0 (perfect competition) to 1 (collusive situation). The Cournot equilibrium or zero-conjectural variation model occurs when $\theta = 1/n$.¹⁵ Eq. 4.9 can be rearranged to give an expression of the Lerner index: $L_i = \lambda_i/P$ (Angelini and Cetorelli, 2003).

A critical step in applied works is to confront the theory to data. This has historically been done in two ways. The first approach is to estimate a parameter that represents the behavior of firms. The Iwata (1974) model provides a framework for estimating conjectural variation values for individual firms that supply homogenous products. Bresnahan (1982) and Lau (1982) propose an alternative approach based on industry data. The advantage of this method is the ability to use industry aggregate data (more available than firm-level data). More recently, different variants based on panel data have been proposed (Angelini and Cetorelli, 2003; Coccoresse, 2005, 2009; Uchida and Tsutsui, 2005). All methods confront demand and supply equations in a system in order to disentangle changes in elasticity demand and modifications of banks' behavior. The demand equation estimation gives the value of demand elasticity (ε) and the supply equation (based on Eq 4.9) provides the λ parameter. By confronting both parameters, the behavioral parameter θ and the Lerner index can be easily derived.

4.4.2.2 Advantages and shortcomings

The conjectural parameter methods have been widely applied in banking following (Shaffer, 1989, 1993). The structural model in this approach consists of a market

¹⁴It is easy to show that the Lerner index equals the inverse of the elasticity of demand in this case.

¹⁵Other contributions have extended the classical conjectural variation model. Coccoresse (2005) develops a model of conjectural variation in a price-setting framework and Suominen (1994) develops a two-product Cournot model.

demand function and an associated supply function for either an individual firm or an average firm. The advantage of this method is the direct analysis of firms' conduct based on static industrial organization theory. The parameter estimated can be treated as a continuous variable under unrestricted conditions and test statistic maps into all oligopoly solution concepts: perfect competition, Cournot competition, Bertrand competition, and collusion (Shaffer, 2004b,a). The conjectural variation model builds a bridge between different conceptions of oligopoly (Cournot and Bertrand). Furthermore, Shaffer (2004b) points out that even if firms follow a strategy other than profit maximization or if regulations constrain banks' behavior, the test remains a valid technique. However, Xu et al. (2013) shed light on the impossibility for this model to consider interest rate regulations. Finally, this test can cope with monopsony power in a deposit market without revising the model (Shaffer, 1999).

The conjectural variation model is open to criticism. Insofar as the conjectural variation approach is merely an elasticity-adjusted Lerner index, all concerns about Lerner apply (see above). The conjectural variation methods have additional practical drawbacks, especially for studies on less mature banking markets. The structural model in this approach requires specifying functional forms for demand and supply equations. One might raise concerns about the functional forms adopted. Flexible functional forms often imply the need to assess a large number of parameters. This induces two econometric problems. Firstly, the risk of multicollinearity increases when researchers add interactions (Perloff and Shen, 2012); secondly, studies based on a limited number of observations face major small-sample issues (identification issue and instability). The latter issue is particularly problematic insofar as concerns about competition occur in markets with few suppliers. As a consequence, results may be highly sensitive to the specification employed, rising doubts about the conclusions. It is therefore important to verify that the estimated parameters are consistent with theoretical requirements (e.g. negative price elasticity or convex marginal costs). Furthermore, Shaffer (2001) points out that the estimated parameter can exhibit a bias if the sample fails to span the complete market.¹⁶ The latter shortcoming may cause serious problems in cross-country samples based on a limited sample of banks.

4.4.3 Panzar and Rosse model

4.4.3.1 From theory to application

The Panzar-Rosse model (Rosse and Panzar, 1977; Panzar and Rosse, 1982, 1987) is the most widely applied assessment of competition in the banking literature. This indicator catches the transmission of input prices on firms' revenues. Weak

¹⁶In the financial industry, this issue is far from anecdotal due to the development of non-traditional banking activities by banks and non-bank financial firms. As a result, defining market borders becomes more difficult.

transmission is interpreted to indicate the exercise of market power in pricing and higher values indicate more competition.

The intuition is straightforward in two opposite cases: collusion and perfect competition. For a monopolist, marginal cost equals marginal revenue at the equilibrium. After input prices increase, marginal cost increases. To maintain the equilibrium between marginal cost and marginal revenue, the monopolist should increase the marginal revenue by reducing the total quantity (insofar as marginal revenue is a decreasing function of quantity). *Rosse and Panzar (1977)* show that total revenue is reduced if the price elasticity of demand exceeds one. Intuitively, an increase in marginal cost reduces quantity but increases output price. If the demand elasticity exceeds one, the gain due to price increase does not compensate for the loss due to reduction of quantity. By contrast, in a competitive setting an increase in input prices induces an increase in total revenue. Because cost functions must be homogenous of a degree of one in the input prices, any increase in input prices generates an equal percentage increase in costs. A firm's revenue changes by the same percentage as its total cost, and so by the same percentage as its inputs prices to ensure the zero profit condition (total cost equals total revenue). The required adjustments in the total quantity are achieved by a reduction in the number of firms (long-run equilibrium). As a consequence, an increase of 1 percent in input prices induces an increase of 1 percent of total revenue in competitive markets.

From this theoretical framework, the identification of competitive conditions is obtained by calculating the sum of the elasticities of the revenue with respect to all input prices. The sum of elasticity, often called the H-statistic, ranges from $-\infty$ to $+1$. The greater the transmission of cost changes into revenue changes, the more competitive the market is. Under perfect competition, input prices and total revenue increase by the same percentage and the H-statistic equals one. *Shaffer (1982b)* proves that the H-statistic value equals one for a monopoly in a contestable market (free entry). The H-statistic is null or negative for a monopoly. An increase in input prices induces a reduction of total revenue under certain assumptions (e.g. demand elasticity higher than one). *Vesala (1995)* documents that the H-statistic is non-positive in the monopolistic competition equilibrium without threat of entry or for a collusive oligopolist. This measure is between 0 and 1 for a monopolistic competitor (*Rosse and Panzar, 1977; Panzar and Rosse, 1987; Vesala, 1995*).

Applied economists estimate a reduced-form revenue equation. The test is obtained by regressing revenue (in logarithm) on input prices (in logarithm) and other control variables:¹⁷

$$\ln(Rev_i) = \alpha + \sum_{l=1}^L \beta_l \ln(\omega_{l,i}) + \sum_{k=1}^K \gamma_k Z_{k,i} + \varepsilon_i \quad (4.10)$$

where Rev is the total revenue (or interest revenue), ω_l the price of l^{th} input, and

¹⁷This specification assumes that the production function is a Cobb-Douglas. This assumption is open to criticism and a more flexible production function should be used. However, *De Brandt and Davis (2000)* show that loglinear specification reduces simultaneity bias and gives similar results to more flexible equations (such as translog equations).

Z_k a set of control variables. In line with the intermediation approach, input prices consider prices of labor, physical capital and deposits (see Box 4.2). The H-statistic is defined as:

$$H = \sum_{l=1}^L \beta_l \quad (4.11)$$

Hence, the H-statistic is the sum of the elasticities of the total interest revenue of the banks with respect to their factor prices. It is worth stressing that the interpretation of the H-statistic requires that the sector be in a long-run equilibrium insofar as the identification of a monopolistic situation implies an endogenous number of firms.

4.4.3.2 Advantages and shortcomings

The success of the PR model can be explained by its simplicity and the fact that it does not pose stringent data requirements. The test can be derived by running only one equation requiring a few numbers of variables and banks. As a result, the PR model can be obtained from a relatively small number of observations, which is crucial for studies on less mature banking industry. Furthermore, [Shaffer \(2004a\)](#) points out that the PR model is robust to the extent of the market as no specific market definition appears in the revenue equation. Only the data from firms included in the sample are required to estimate revenue equation. This is a huge advantage in cross-country studies ([Claessens and Laeven, 2004](#)).

Nonetheless, these benefits come at the cost of other shortcomings. The major pitfall concerns the econometric identification and the interpretation of the H-statistic. A sample of firm-level observations in a long-run competitive equilibrium would exhibit $H = 1$, while a sample of observations from a profit-maximizing monopoly yields $H \leq 0$. However, theoretical studies report that the H-statistic can be negative in a competitive market and positive for a monopoly. A negative H-statistic can occur even in highly competitive conditions in the short-run with a fixed number of firms ([Shaffer, 1983](#)) or in the case of constant average cost ([Bikker et al., 2012](#)). [Shaffer and Spierdijk \(2013\)](#) point out that the H-statistic can be positive in highly noncompetitive settings. Furthermore, for firms facing constant elasticity of demand, theoretical studies report the H-statistic as alternatively an increasing ([Shaffer, 1983](#)) or decreasing ([Panzar and Rosse, 1987](#)) function of the Lerner index. Put differently, higher values of the H-statistic do not necessarily imply lower market power.

Another issue is related to the continuous nature of the H-statistic. This outlook has been adopted in many empirical works ([Bikker et al., 2012](#), Table 1). According to [Panzar and Rosse \(1987\)](#), the H-statistic can be interpreted as a continuous monotonic index of conduct; not only the sign of the H-statistic matters, but also its magnitude. [Shaffer \(2004b\)](#), however, casts doubt on the use of the H-statistic as a continuous measure of competition although [Vesala \(1995\)](#) proves that the H-statistic is a continuum under certain conditions. In empirical studies, the H-value

is often considered as a continuum value although the question remains unsolved (Bikker et al., 2012).

As a consequence, the interpretation of the value of the H-statistic is more complex than the canonical PR model predicts. In fact, the interpretation of the H-statistic depends on the hypotheses assumed regarding the market equilibrium, demand elasticity and cost function (Shaffer, 1983; Panzar and Rosse, 1987; Vesala, 1995; Bikker et al., 2012). Unfortunately, with the exception of the market equilibrium, applied economists cannot test these required assumptions. As shown above, the long-run equilibrium (endogenous number of firms) is necessary to derive testable hypotheses. An equilibrium test has been developed to validate the market equilibrium hypothesis (Shaffer, 1982b). The profits are uncorrelated with the input prices in the long-run equilibrium. Hence, the test consists in switching the total revenue by profit rates in Eq 4.10:

$$\ln(\pi_i) = \alpha' + \sum_{l=1}^L \beta'_l \ln(w_{l,i}) + \sum_{k=1}^K \gamma'_k Z_{k,i} + \varepsilon'_i \quad (4.12)$$

where π is the return on assets. The E-statistic is $E = \sum_{l=1}^L \beta'_l$. The market equilibrium condition is $E = 0$. Bikker et al. (2012) show that the equilibrium test is essentially a joint test for competitive conduct and long-run equilibrium, which substantially narrows its applicability. In a market operating under imperfect competition or a monopoly, the E-statistic may differ from 0.

Alongside these difficulties, applications suffer from additional limitations. First, the PR model is sensitive to monopsony power. Inputs should be homogenous and their prices exogenously fixed. The price of deposits is not always exogenous. A bank may behave as a monopsony when alternative savings products are not available. Monopsony power would tend to yield higher values of the H-statistic and thereby mask any market power present on the output side (Shaffer, 2004a). The other non-structural measures of competition are less subject to the monopsony issue.¹⁸ The monopsony issue is rarely discussed in the literature.

Finally, Bikker et al. (2012) acknowledge that some applications employ a scaled revenue equation (introducing size as control) or estimate a price function by using the ratio of revenue to total assets as dependent variable. However, the properties of the price and revenue equations are identical in the case of long-run competitive equilibrium but critically different in the case of monopoly or oligopoly. This disqualifies a large number of studies. The proper revenue equation must exclude the scale variable and use the total revenue as dependent variable.

To summarize, the first generation of non-structural measures of bank competition is based on standard oligopoly theory. The Lerner index assesses the average pricing market power. The conjectural-variation model observes how rivals react to

¹⁸Other methods employ a cost function. As expressed above, the econometrician may run a cost function excluding financial costs and deposits to test the sensitivity of results to monopsony power.

changes in a bank's behavior. The Panzar-Rosse model investigates how changes in input prices are transmitted in revenue. A major advantage of these approaches is that they allow discrimination between the different possible situation: collusion, perfect competition and imperfect competition (oligopoly). Nonetheless, these measures neglect dynamics in the market and non-pricing strategies. The second generation of NEIO measures of competition takes into account these factors. In the following section, I present the Boone indicator, which has begun to be used in the banking literature.

4.4.4 The Boone indicator

4.4.4.1 From theory to application

Recently, Boone (2008) has extended the existing set of competition measures by suggesting a new measure based on the idea that efficient firms are more highly rewarded in more competitive markets. The indicator starts from the notion that in a more competitive market firms are punished more harshly in terms of profits for being inefficient.¹⁹ Under the efficiency hypothesis (Demsetz, 1973), more efficient firms achieve superior performance in terms of higher profits at the expense of their less efficient rivals and also attract greater market share. The Boone indicator exploits this reallocation effect from inefficient to efficient firms. In the most extreme case, the reallocation effect is combined with a selection effect insofar as the least efficient firms leave the market. Boone (2008) shows that the reallocation effect increases monotonically with the degree of competition.²⁰ While an intensification of competition can decrease the output of firms, this decrease will be smaller for more efficient firms. As a result, the market share and profits for more efficient firms increase while those the less efficient firms shrink. Phrased differently, the relative profit difference is sensitive to the degree of competition (Boone, 2008, Theorem 1).

Boone (2008) demonstrates how relative profit difference can measure the level of competition in practice. Although the procedure is theoretically applicable, it is computationally intensive. It requires the ranking of firms by efficiency levels. In practice, researchers often gauge the strength of the relationship between efficiency and performance. The intensity of competition is estimated from the following

¹⁹It should be noted that Hay and Liu (1997) develop a similar concept of competition by investigating the relationship between market share and firm costs to assess the level of competition.

²⁰Boone (2008) considers two different forces as causing an increase in competition. The first is a fall in entry barriers. The lower the entry barriers, the more firms should enter and the more competitive the industry should be. This intuition underlines the use of the structural approach. Boone, however, considers another source of competition: the aggressiveness of rivals' conduct in the market.

simple profitability equation (Boone et al., 2007):²¹

$$\ln\pi_i = \alpha + \beta \ln c_i + \varepsilon_i \quad (4.13)$$

where π_i stands for profit and c_i a measure of costs (proxied efficiency). The coefficient β gives the profit elasticity (PE), that is, the percentage drop in profits of bank i as a result of a percentage increase in bank i 's costs. This indicator is in theory negative, reflecting the fact that higher marginal costs are associated with lower profits. In addition, its value should be lower the more competitive market conditions are. Boone et al. (2007) conducted simulations for the PE indicator and found that changes in competition are correctly identified with this measure.

Recent contributions introduce two modifications of Eq. 4.13. First, Van Leuvensteijn et al. (2011) directly estimate the marginal cost c_i . When data allow for computing marginal costs, studies employ this measure of efficiency (Delis, 2012; Tabak et al., 2012). Otherwise researchers use imperfect proxies such as average costs (Schaeck and Cihák, 2013). Second, efficient banks may choose to translate lower costs either into higher profits or into lower output prices in order to gain market share. As a consequence, the bank's market share rather than its profits is often used as the dependent variable to take into account the second possibility (Van Leuvensteijn et al., 2011, 2013; Tabak et al., 2012):

$$\ln s_i = \alpha + \beta' \ln c_i + \varepsilon'_i \quad (4.14)$$

where s_i is the market share of bank i .

Equations 4.13 and 4.14 are often run by introducing fixed-effects in order to take into account unobserved heterogeneity. Recent works also control for endogeneity by running an instrumental approach. Indeed, changes in performance and costs may be induced by a third factor unrelated to competition.

4.4.4.2 Advantages and shortcomings

The fact that the relationship between costs and profits is both continuous and monotonic is the main advantage of the Boone approach. In almost all cases, higher competition implies that the value of β is larger in absolute terms (more negative), and therefore, β serves as a continuous indicator of competition. As expressed by Boone in different works (Griffith et al., 2005; Boone et al., 2007; Boone, 2008; Boone et al., 2013), his indicator avoids some major theoretical drawbacks of price-cost margin measures (see above). Moreover, while the identification of a situation from the PR model is a challenge, the Boone indicators are monotonically related to competition. Furthermore Xu et al. (2013) show that the existence of binding

²¹Instead of in a log/log specification, the costs and profits can be expressed in levels. Employing levels allows for introducing non positive profit values. In doing so, the estimation may introduce a bias in the sample towards profitable banks. Boone et al. (2013) shows that results are weakly sensitive to this exclusion. The main advantage of a log/log specification is to facilitate the interpretation of the β coefficient as an elasticity.

interest rate regulations renders the Boone measure more robust than other NEIO measures.

In practice, the Boone approach has additional advantages for studies on developing countries. This method requires only information on profits (or market shares) and costs. In particular, if costs are assessed by average costs, the computation of the Boone indicator does not require information on prices. Furthermore, the Boone estimation is obtained by a simple linear econometric specification (only one equation with one exogenous variable).

Like other models, the Boone indicator is a simplification of reality and suffers from some limitations. The Boone indicator approach focuses on one important relationship affected by competition, thereby disregarding other aspects. Efficient gains may not be translated into lower prices or higher profits in the short-term. For instance, a bank may invest these gains (developing new products, building brick-and-mortar branches, etc.) in order to cope with competition in the future. [Van Leuvensteijn et al. \(2011\)](#) acknowledge that these distortions are more likely when the Boone indicator is assessed year by year rather than estimations covering the full sample period. Indeed, banking industry may be defined as producing homogenous goods in the long term. Differences in terms of quality, design and innovation are more or less equivalent among firms over the long term.

[Schiersch and Schmidt-Ehmcke \(2011\)](#) show that the Boone indicator makes critical assumptions relative to the definition of the extent of the market. The more precisely we can capture a market, the less other factors or markets influence the outcome and the better the subsequent competition estimates should be. This rule is common to all non-structural measures of competition.²²

Finally, the β parameter is expected to be negative but can be positive in empirical implementation. The Boone indicator model assumes that efficiency should be one dimensional and observable. Using costs is the simplest way to capture difference in efficiency. However, in a market where suppliers offer heterogenous goods, changes in costs may merely reflect changes in strategies. In response to competitive pressure, banks may adopt strategies to cope with competition (offering well-designed products, targeting new customers, etc.) instead of reducing prices. In such cases, banks offering the most highly demanded products may not only yield more profit but also spend more. The relationship between marginal costs and performance thus turns to positive. Put differently, the β coefficients may be positive when firms compete in quality ([Tabak et al., 2012](#)). In such cases, identi-

²²A second problem underlined by [Schiersch and Schmidt-Ehmcke \(2011\)](#) is related to firm size. Under the model assumption, the most efficient firm must become the biggest firm in terms of market share and must make the greatest profit. They note that in reality big firms are not necessarily the most efficient ones and thus, it is possible to find a nonnegative β parameter. However, when panel data are used, this issue can be avoided by including fixed-effects. As such, the β parameter will capture change in terms of profit (or market share) and not the level differences among firms. Another possibility is to normalize profits by size ([Schiersch and Schmidt-Ehmcke, 2011](#)). For example, [Schaeck and Cihák \(2013\)](#) use the return on assets instead of profits as the dependent variable.

fication becomes impossible. One should note that this is not only a limit of the Boone approach but also a limit of all non-structural measures. All non-structural measures assume that banks offer homogenous goods and services.

The main advantage of the Boone indicator is that it can both capture market dynamics and be easily implemented for a limited number of observations (by employing average costs as measure of efficiency). Nonetheless, one should note that the Boone indicator is a young tool and therefore has not yet been thoroughly scrutinized by the literature.

4.5 Synthesis for studies on less mature banking systems

The important role of banking in the economy renders competition among banks a crucial and timely policy issue. Many studies have attempted to investigate the determinants and implications of competition in the banking industry. A critical step is to determine the degree and/or evolution of competition. The literature on the measurement of competition can be divided between the structural and non-structural approaches. The structural approach infers the degree of competition from the structure of the market. The likelihood of collusion is higher in markets with fewer firms and high barriers to entry and exit. The non-structural approach, based on the New Empirical Industrial Organization, assesses the degree of competition directly by observing behavior of firms in the market. The non-structural measures of competition can be sub-divided into two strands. The first generation of NEIO measures originates in the neoclassical model of oligopoly (Vives, 2001). This includes the Lerner index, the conjectural variation model, and the Panzar-Rosse model. Another strand of empirical research considers a dynamic approach of competition more in line with the Austrian School's notion of competition. In banking, the Boone indicator can be attached to this second generation of works.²³ Indeed, each non-structural indicator of competition is based on different assumptions, and thus measures different things. The Lerner index assesses the average degree of pricing power in the market. The conjectural variation model investigates rivals' reactions if a bank in the market increases its output by one percent. The Panzar-Rosse model analyzes the transmission of changes in input prices to bank revenue and the Boone indicator is based on the idea that efficient firms are more highly rewarded in more competitive markets. As a consequence, measures of competition cannot be considered as perfect substitutes. Each indicator has its practical and theoretical advantages as well as its limitations. Table 4.1 provides a synthesis of advantages and disadvantages of each measure of competition.

This discussion has provided four main results. First, despite their large use in the empirical papers, the structural measures suffer from major theoretical and practical limitations. Second, while the Lerner index (and the associated conjectural

²³The Persistence of Profit is also attached to this generation but remain rarely applied in banking. Moreover, its implementation may be complex in highly unstable countries, such as developing economies. For more information, see: Goddard et al. (2011).

elasticity) is a good measure of individual market power, it is not always the best measure of competition. The average degree of market power may increase, decrease or remain stable, even if individual Lerner indices decrease due to reallocation effect from inefficient to efficient firms. Third, the Panzar-Rosse H-statistic is a good measure of competition in a static perspective. However, it requires strong assumptions (long-term equilibrium, demand elasticity must exceed one, etc.) that cannot always be tested and checked. In addition, many empirical applications suffer from limitations by estimating scaled revenue equation or price equation. Finally, the Boone indicator catches dynamic aspects of competition but may sometimes fail to identify the degree of competition in the short-run.

In studies focusing on less mature banking systems, the choice of measures of competition is often constrained by data. Despite its strong limitations, the structural approach cannot be avoided when firm-level data are not available. This approach has the major advantage of being easily computed for many markets. Non-structural measures require access to substantial firm-level information. When firm-level information is available, the Lerner index can be computed even with few numbers of firms. However, one should remember that the Lerner index is not a measure of competition but rather a measure of firm pricing power. The Lerner index is thus more useful when the objective is to analyze the consequences of market power on behavior (e.g., risk-taking) or performance (e.g., efficiency) of banks. The associated conjectural variation model is rarely used in developing countries due to strong data requirements. By contrast, even with a limited number of observations (less than one hundred), the Boone indicator can be estimated. If price information is available, the Panzar-Rosse model can also be estimated.

In a perfect world, different measures of competition should be employed insofar as each of them catches an aspect of competition. Researchers should be aware of the limitations of their analysis if multiple measures cannot be considered. In the next chapter, I assess the evolution of competition over time in African banking systems using the different measures presented in this chapter. In Chapter 7, different proxies for competition presented here will be employed to investigate the credit availability - bank competition nexus, while in Chapter 6 attention is focused on implication of market power on efficiency and therefore the Lerner index is employed.

Table 4.1: Synthesis of the major advantages and shortcomings of measures of competition

Method	Advantages	Shortcomings
<i>Structural approach</i> Concentration measures (CR_t , HHI)	Low data requirement (available for almost all countries) Does not require firm-level variables	Weaknesses in theoretical foundations (Structure-conduct linkage is uncertain) Require to define relevant market (geographical, products)
Banking sector contestability (regulatory and supervision framework)	Data available for a large number of countries (BCL database) Does not require firm-level variables	Entry and exit in banking industry can be influenced by non-legal barriers (technological and informational barriers), especially in developing countries
<i>New Empirical Industrial Organization approach</i> Lerner index	Bank-year specific measure of market power Requires a few number of observations Simplicity and straightforward interpretation Flexible indicator	Weaknesses in theoretical foundations (Market power \neq Competition) Requires firm-level variables and information on prices Can be fooled by spending in other activities and inefficiency
Conjectural variation (Iwata model and Bresnahan-Lau model)	Test gives direct estimate of firm's conduct that is continuous and maps into all oligopoly solution concepts Technique remains valid if firms do not maximize profit	Requires a large number of observations on firms including prices (system estimation) Sensitive to market definition Limits to Lerner index apply
Panzar-Rosse model	Can be estimated by simple, single-equation, linear model Robust to the extent of market Requires a limited number of observations	Identification can be an issue and some important assumptions have to be verified Requires information on prices and monopsony power can mask monopoly power
Boone indicator	Strong theoretical foundations Can be estimated by simple, single-equation, linear model Requires only a few number of observations Continuous measure of competition Considers (partially) non-price strategies	Efficiency should be one dimensional and observed Different forms of competitive situation cannot be distinguished Requires firm-level variables and information on prices Identification could be an issue in specific cases (e.g. if firms compete in quality)

Has competition in African banking sectors improved? Evidence from West Africa¹

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¹This chapter is an adapted version of an article submitted to *Applied Economics*.

5.1 Introduction

During the past decade, African banking systems have undergone major transformations. Following the process of deregulation, bank privatization and financial liberalization, the industry has witnessed profound changes in its structure. The number of banks has undoubtedly increased across Africa. Meanwhile, pan-African banking groups began to expand in Africa. A major question is whether the recent development in banking industries has contributed to raising competition in Africa. Commentators often argue that these changes spur competition. However, this may not be the case if market concentration does not necessarily imply exercise of market power. Furthermore, African groups are relatively young, small and often focus their activity on few countries limiting their ability to compete with incumbent banks. In addition, cross-border African banks interact in many markets reducing their willingness to compete (Bernheim and Whinston, 1990).

The aim of this essay is to provide evidence on the implications of recent changes on competition among banks in Africa during the past decade. To investigate this issue, an original database covering all banks in seven West African countries over the period 2002-2009 is employed. Countries under consideration, all members of the West African Economic and Monetary Union (WAEMU), have seen profound changes in the structure of the banking market. Over the last decade, the WAEMU banking landscape has been dramatically changed through the arrival and expansion of new banks from Africa. As a result, the countries considered provide an excellent foundation for testing the consequences of pan-African banking groups development due to the rapid expansion of these groups in West Africa. This paper tests whether bank competition has increased in the wake of these changes employing different non-structural measures of competition: the Lerner index, the conjectural elasticity, the Panzar-Rosse H-statistic and the Boone indicator.

Data exploration shows that concentration in the WAEMU's banking industry decreased over the second part of the 2000s. However, this trend is less marked than in other African economies. The findings reveal that banks in the WAEMU operate in a climate of imperfect competition. Both the conjectural variation and Panzar-Rosse models allow me to reject the hypotheses of perfect competition and collusion among banks. Furthermore, with the exception of the results from the Lerner index, the different measures show that changes in the market structure since the mid-2000s have induced more competition in banking. This period corresponds to the rapid expansion of pan-African banking groups in the zone. Put differently, the findings tend to show that the entry of new actors has spurred competition.

This paper makes several contributions to the literature. First, this chapter investigates the evolution of competition in Africa. A great deal of literature has investigated the degree and evolution of competition using the New Empirical Industrial Organization (NEIO) approach in industrialized countries. African banking industries received less attention and there has been a bias towards a handful of former English colonies. Studies focusing on or including other African countries are rather limited (Saab and Vacher, 2007; Fosu, 2013). In particular, this essay is

the first to employ non-structural measures of competition to assess the degree of competition in the WAEMU. In addition, studies on African banking systems often focus on the degree of competition at a given period in time in spite of dramatic changes in the African banking systems. Second, this essay implements different New Empirical Industrial Organization (NEIO) measures of competition. Evaluations of the competition of African banking sectors using non-structural measures often refer to the Panzar-Rosse model. In this work, competition is assessed by four different models. There are few studies, even if one includes those on industrialized countries, that compare the results from different non-structural measures of competition. Recent works, however, acknowledge that there is no consensus about the best measure to gauge competition in banking (see the previous chapter). Comparing different models offers a more complete picture of competition insofar as each measure proxies a specific aspect of competition. Finally, from a methodological perspective, this chapter provides a simple way to assess the evolution of bank competition when the number of observations is limited. By contrast to studies on developed economies (Bikker and Spierdijk, 2008; Weill, 2013), papers investigating evolution of competition over time in developing economies cannot benefit from a large number of observations per country. In this study, a simple approach based on year-dummies is employed. This method can be particularly useful in investigating the evolution of competition when the number of market participants is small.

The rest of the paper is organized as follows. Section 5.2 presents some background information about banking sectors in the WAEMU. Section 5.3 discusses measures of competition and reviews existing studies on Africa. Section 5.4 details the econometric estimation methods, and Section 5.5 presents the results. The final section concludes.

5.2 Overview of the WAEMU's financial sector

In this section, a summary of the financial system of the West African Economic and Monetary Union (WAEMU) is presented, drawing special attention to the structure of the banking industry.² The WAEMU, established in 1994 following the devaluation of the franc, is made up of eight countries (Benin, Burkina-Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo), which are members of the Franc Zone and use the CFA Franc as their common currency. In addition to a common currency, some initiatives to promote regional financial integration in the WAEMU were implemented including a common legal and regulatory framework, a single licensing regime, common regulators and supervisors and common financial infrastructure.³ As a result, in comparison with other parts of the continent, countries in the WAEMU have achieved a relatively high degree of financial integration (Sy, 2007).

²In this section, financial data are extracted from Banking Commission annual reports or other Central Bank publications (available on the [Central Bank website](#)). Data are complemented by the [Global Financial Development Database](#), (Čihák et al., 2013).

³Sy (2014) provides an overview of the different initiatives implemented in the WAEMU.

5.2.1 Financial system in the WAEMU: Structure and performance

Despite the recent growth of other financial segments, the WAEMU's financial system is bank-based. The stock and debt markets are not well developed. In 1998, the regional stock exchange for the eight members of the WAEMU (the "Bourse régionale des valeurs mobilières", BRVM) began operating. However, the market activity remains shallow. The stock market capitalization is low (10% of GDP) and turnover is very limited. Less than 50 firms, mostly in the financial and industrial sectors, were listed in 2013 and two companies (Ecobank and Sonatel) account for almost 50% of market capitalization. The debt market has developed rapidly in recent years, although it is dominated by the government bonds segment (Allen et al., 2011b; Sy, 2010). Only a handful of large firms has issued bonds in the debt market, and the secondary market is almost non-existent. The debt market is not currently a significant source of funding for the private sector. Despite the over-liquidity of many banks, the interbank market does not perform a major role in the reallocation of liquidity. Most interbank loans take place within banking groups.

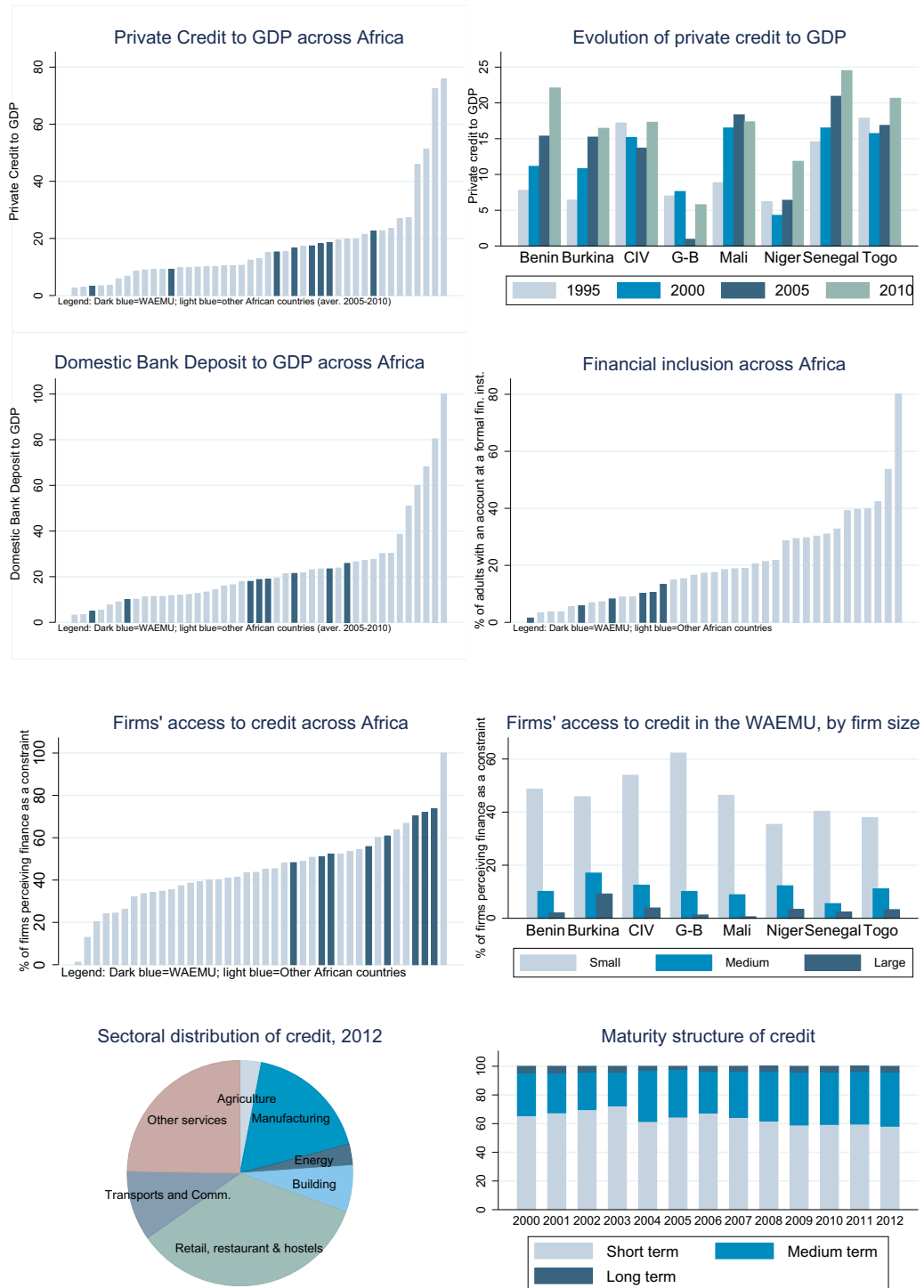
Other segments of financial systems, such as the insurance sector or private equity sector, are underdeveloped with the notable exception of microfinance. Microfinance institutions (MFIs) represent a small but rising share of the financial system. Microfinance has been in existence in the WAEMU countries for over 30 years in Benin, Burkina, Côte d'Ivoire and Togo, and for over ten years in Mali, Niger and Senegal. This industry has experienced a quick expansion in the past decade. The WAEMU 739 registered MFIs in the end of 2012, mixing large and many small MFIs.⁴ A process of consolidation is ongoing in most countries. This industry faces specific challenges such as limited profitability of many (small) MFIs, inexperienced staff in some MFIs, the difficulty to reach rural areas and difficulty designing a regulatory framework to supervise MFIs, among others.⁵ The heavy MFIs network (almost 5000 points of services in 2012) and the large number of clients (11.6 to 101.3 million people living in the WAEMU) are welcome from the perspective of access to finance. The microfinance industry is becoming an important driver in fulfilling the gap between informal finance and bank loans. In spite of the rapid growth of microfinance, the MFIs' total loan amount represents only 8% of total bank credit.

Despite a decade of progress in expanding access to financial services and strengthening the banking system, gaps remain. African banking sectors are generally well below the standards of developing countries, notwithstanding recent reforms across the continent. This is particularly true in the case of the WAEMU, where financial intermediation activity remains at low levels. Financial activity in

⁴A large MFI is an institution with assets or deposits above CFAF 2 billion (about 3 million Euros). In the end of 2012, 61 MFIs were classified as large MFIs. These institutions are supervised by the Banking Commission and account for 90% of microfinance assets.

⁵Imam and Kolerus (2013) report that a 2011 survey in Benin revealed that 721 MFIs were then operating in the country but that only 226 were licensed.

Figure 5.1: Financial depth in the WAEMU



Source: GFDD and Banking Commission, Author's calculations

the WAEMU is in line with many SSA economies and thus moderate in comparison with other developing economies. Standard indicators of financial development show that the banking systems of the WAEMU's members are in line with the average of other African countries (cf. Figures 5.1). Most WAEMU banking systems fall near the center of the scale, with the notable exception of Guinea-Bissau and Niger. Guinea-Bissau and Niger have among the shallowest banking systems in the world. While private credit to GDP is less than 5 percent in Niger, it is between 15 and 25 percent in other countries of the WAEMU. The figures of liquidity (bank deposit) are quite similar.

The access to financial services is an area where the WAEMU is lagging, even in comparison with other SSA countries. Financial inclusion has certainly increased in recent years due to the sharp increase in the number of bank branches and accounts. Between 2003 and 2012, the number of bank branches increased by more than three times and the number of accounts by more than four times. However, commercial bank branches (and accounts) are mainly located in the largest cities. Some remote areas have no access to formal financial services and financial inclusion is still moderate (cf. Figures 5.1). The percentage of adults with a formal savings account in the countries of the WAEMU is among the lowest in the world. According to the Findex surveys, Niger is the country with the lowest level of financial inclusion in Africa (1.5% of adults have access to a formal account) and, with the exception of Turkmenistan, in the world (Demirgüç-Kunt and Klapper, 2012). Household access to financial services is better but remains very limited.⁶ Nonetheless, the development of microfinance tends to fill the gap by providing deposit services, and thereby increasing financial inclusion. In the future, innovations such as mobile banking could be a useful way to extend basic deposit and payment services.

While the lack of resources might be a longer-term impediment to the economic growth, a more immediate problem is the fact that existing resources are not efficiently intermediated into the private sector where they are needed most. Credit constraints are particularly high in the WAEMU (see: Figure 5.1). According to the World Bank's Enterprises Surveys (WBES), more than 50% of firms report that finance is a major or severe obstacle to the firm's growth. Credit constraints are particularly high for Small and Medium Enterprises (SMEs). This is consistent with the observation across the WAEMU region that banks prefer to invest in government securities or well-established (foreign-owned) firms rather than in SMEs loans. The lack of economic diversification, the large informal sector and different needs for external finance lead banks to concentrate lending on only a small number of sectors or firms. In the WAEMU, the 50 largest companies account for one-third of total bank credit. A non-negligible part of assets is allocated to Government and State-owned Enterprises. This is not only a major vulnerability for banks (see below), but also

⁶The BCEAO produces different figures that provide similar general results. Contrary to Findex, the methodology is not based on surveys. The Central Bank's staff merely reports the number of accounts to people. According to their calculations, in 2012, only 7.2% of adults in the WAEMU used a savings account. This ratio ranged from 1.9% in Niger to 11.9% in Côte d'Ivoire. However, these estimations assume that each person uses only one account.

a limitation for access to credit. Banks do not extend loans equally across sectors. More than one third of loans to the private sector are allocated to the trade and tourism sectors, 15% to communication and transports sectors and 20% to other service sectors. The agricultural sector is significantly underrepresented. Less than ten percent of formal loans are allocated to agriculture, very little indeed given the large contribution of agriculture to GDP (about one third). The maturity structure and range of products are also a constraint. Short-term loans represent 60% of total loans, while long-term loans remain marginal (less than 5% of total credit).

In terms of stability, the banking system is, on average, liquid and well capitalized. The evolution of the quality of the risk portfolio of banks is encouraging, with Non-Performing Loans (NPLs) falling from 20% in 2007 to 15% in 2012 despite the financial crisis (Table 5.1). Nonetheless, NPLs remain relatively high, compared with other African economies. On average, the NPLs were below 10% in Africa over the period 2005-2010 (Beck et al., 2011b). Furthermore, financial soundness in the WAEMU differs greatly across banks. The average indicators hide diversity between banks. While some banks are weakly exposed to risks, others are in more fragile situations. Non-performing loans are particularly high in some banks. For instance, Beck et al. (2011b) acknowledge that in Togo more than half of the banks are in trouble. Several factors explain these difficulties. Recent stress tests underline the risks induced by lending (sectoral/company) concentration and weak asset quality (Imam and Kolerus, 2013). Liquidity risk and interest risk are lower due to limited maturity mismatches between assets and liabilities. Other sources of vulnerability, not revealed by stress tests, are weather-related risks or exposure to sovereignty risks in a context of political instability (Côte d'Ivoire or Mali, recently). In addition, many banks suffer from weaknesses in corporate governance. Some banks remain undercapitalized inducing a risk of bankruptcy in case of difficulties. The increase of capital requirement can be seen as a first step in forcing banks to reinforce their capital structure. Clear legislation exists to force banks to be well-capitalized, diversify portfolios and limit related party lending. However, compliance with prudential norms is low for several ratios. A part of non-compliance may be due to badly designed norms.⁷ Nonetheless, some useful and more or less binding rules are not respected by a significant share of banks. For instance, in 2012, only three out of four banks respected the legislation on capital (capital adequacy ratio or minimum capital requirement) or on lending policies (exposure to large borrowers and related party lending). These norms are central to producing a stable financial system. Improving norms is arguably useless if the Banking Commission cannot enforce them and supervision of WAEMU banking systems should treat these problems (see Box 5.1).

⁷For instance, the ratio of portfolio structure was so rarely respected that the Banking Commission decided to remove this rule in 2012.

Box 5.1: Banking supervision in the WAEMU: Organization and future challenges

The banking activity in the WAEMU is governed by the Banking Regulation Act. The regional Banking Commission (CB-UMOA) is in charge of supervision of financial institutions with a banking activity at the exception of small MFIs.^a The CB-UMOA, created in 1990, is under the control of the Central Bank of the West African States (BCEAO). It does not depend on any single government, and then less subject to political pressure. The favorable assent of the CB-UMOA is required for delivering or removing a banking licence, for extending activities in other country of the WAEMU, or in certain cases for change in the ownership structure. One of its missions is to ensure the prudential rules decided by the Central Bank. It enjoys significant investigation powers and can impose penalties to banks and managers ranging from admonition to withdrawing of license. The CB-UMOA can also decide the placement of a bank in dire straits under temporary administration.

In theory, the inspection and sanction powers of the CB-UMOA are important. In practice, the persistence of the partial compliance underlines the difficulty to enforce the legislation. As a consequence, improving the enforcement of norms is the first challenge of the CB-UMOA. **Imam and Kolerus (2013)** acknowledge that a part of the problem is the lack of resources and a lack of reputation. Second, strengthening corporate governance in some banks and cleaning up the banks' balance sheets (removing bad assets) are two other important challenges in the short-term.

Whilst progress was made in reforming prudential norms^b, a number of prudential norms and practices will need to be introduced or brought closer to best international practice. For instance, the current ratio sets a limit to single exposure at 75 percent of capital, rather than the international norm of 25 percent, while stress tests underlined the risk induced by lending concentration. Besides, the solvability ratios could be improved. Despite its increase in 2010 from FCFA 1 billion to FCFA 5 billion, the minimum capital requirement remains moderate.^c The design of the Capital Adequacy Ratio, based on Basel II principles, could be enhanced, by considering new risks or revising some weighting. For instance, in a situation of political instability (Côte d'Ivoire, Mali), it should be useful to raise the sovereign debt weighting. These examples underline the importance to remove some complex and useless ratios and change or introduce new ratios. The legislation should be adapted to specific problems of the WAEMU and closer to best international practices.

Finally, the future challenge will be the supervision of regional groups (and the design of resolution frameworks in case of distresses). The increasing cross-border nature of banking was not accompanied by a regulatory and supervision framework at the supranational level. Supervision authorities currently have limited capacity to conduct prudential oversight of complex and rapidly expanding regional banking groups. Adequate supervision of regional groups requires a strengthening of collaboration with other supervisors. Besides, insofar as banking groups have become holding companies, the mission of the Banking Commission should be changed by extending its power. Discussions should consider not only supervision but also crisis resolution mechanisms. The authorities are aware of these issues and some steps have been engaged in these ways (**Imam and Kolerus, 2013**).

^aSmall MFIs (with less than CFAF 2 billion in deposits or loans) are supervised at the national level by the Ministry of Economy and Finance. The *Conseil Régional de l'Épargne Publique et des Marchés Financiers* (CREPMF) is in charge of the supervision of the regional financial market and the insurance sector is a conjoint supervision of the Ministries of Economy and Finance and the *Conférence Interafricaine des Marchés d'Assurances* (CIMA). In 2010, the micro-prudential supervision mechanisms have been completed by the creation of the Financial Stability Council, charged with macro-prudential supervision and guaranteeing the stability of the overall financial system at the regional level.

^bIn 2012, the transformation ratio have been lowered from 75% to 50% and the ratio on portfolio structure was abolished.

^cThe minimal requirement is three times larger in Ghana and twenty times larger in Nigeria

Table 5.1: Selected financial soundness and efficiency indicators

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Financial soundness													
<i>Solvency ratio</i>													
Regulatory capital to risk weighted assets	-	11.70	10.50	10.60	11.40	11.80	11.80	10.30	11.90	11.70	13.10	12.60	12.80
% of banks with CAR>8%*	-	79.70	83.10	66.15	72.86	83.54	80.65	75.00	82.45	72.64	83.00	81.63	78.10
<i>Quality of assets</i>													
Gross NPLs to total loans	20.20	18.90	19.50	19.70	20.70	19.90	20.50	18.90	19.20	17.90	17.00	16.30	15.60
Net NPLs to total loans	7.50	6.80	7.30	7.40	9.20	7.60	8.00	7.40	7.10	7.30	6.60	6.10	6.40
Provisioning over NPLs	66.60	68.90	67.40	67.70	61.10	66.90	66.20	65.70	68.00	63.60	65.50	66.30	62.80
Liquid assets to total assets	36.63	48.50	38.80	40.14	63.57	49.02	47.92	44.42	42.23	39.95	38.12	38.09	36.53
Earnings and profitability													
Average interest rate on loans	12.20	12.30	12.30	13.10	12.80	12.40	12.40	12.50	12.90	12.70	13.60	12.20	12.20
Average interest margin	6.60	6.50	6.10	7.50	7.20	7.30	7.50	7.50	8.00	7.60	7.90	7.30	7.30
After-tax return on average assets	0.45	0.66	1.05	0.79	1.50	0.84	0.73	0.57	0.21	1.90	0.65	1.11	1.49
After-tax return on average equity	4.50	5.10	10.10	7.40	8.50	6.10	5.60	4.80	1.90	11.20	5.30	9.20	12.40
cost to income ratio (operating ratio)	66.90	69.30	68.00	68.40	66.60	69.20	70.20	72.10	68.90	73.50	75.30	71.00	68.50

Source: Banking Commission annual reports (CB-UMOA, 2012)

Despite an increase of operational costs and a stabilization of margins, banks have become more profitable since mid-2005. This may be explained by an improvement in the quality of portfolios, and a resulting in non-performing loan losses. Another possible explanation is the fact that banks are orienting their assets towards higher-yielding assets. The possible competitive pressure induced by recent development in the banking market may explain this strategy.

5.2.2 Recent developments in banking industry

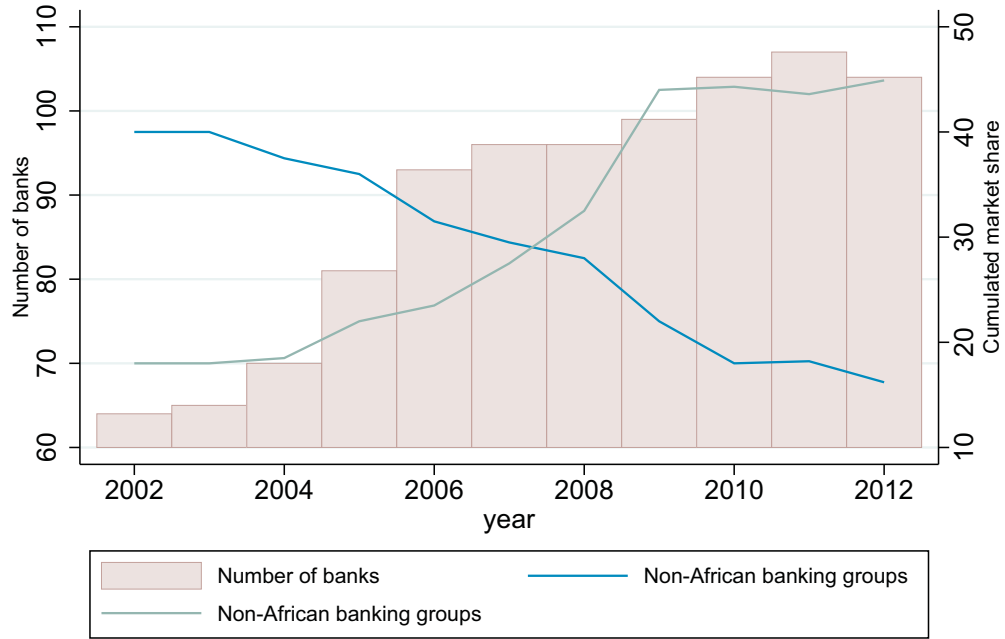
The banking industry has witnessed some transformations during the past two decades. As in many other African economies, in the end of the 1980s there was severe crises in the banking systems in West Africa (Azam et al., 2004; Daumont et al., 2004; Laeven and Valencia, 2012). Following the crises, efforts focused on cleaning up and restructuring the banking sectors. Many insolvent banks were restructured or liquidated. Insofar as crises were due, at least partially, to political interferences, the role of State in finance was reduced. Some State-owned banks were totally or partially privatized. Limits were imposed on the ownership of banks by the State and 14 development financial institutions were liquidated in the WAEMU. Interest rates were liberalized and directed credit programs were abandoned. A regional regulatory institution (the Banking Commission), less subject to political pressure, was created with the aim to ensure the supervision.⁸ The authorities have significantly strengthened bank regulation, increasing capital adequacy ratio and the minimum capital required to operate. A new banking law was adopted in 1990. In order to foster competition, a single banking license procedure to operate in the zone ("agrément unique") was approved in 1998. Banks that have been granted a license to operate in one of the countries can operate in any of the other countries without further administrative formalities.

Following reforms, the WAEMU's banking sectors experienced a decade of huge transformation in their structures. In the end of 2012, 105 banks were formally approved compared with 64 banks ten years before. Figure 5.2 offers a graphic representation of the evolution of the number of banks over the last decade. Côte d'Ivoire has the largest number of credit-deposit institutions (25) followed by Senegal (21), while only 4 FIs operate in Guinea-Bissau. The number of institutions ranges between 10 and 20 in Benin, Burkina-Faso, Mali, Niger, and Togo. In 1990, Côte d'Ivoire and Senegal had the largest number of banks (16 and 10 respectively), while other countries had less than 10 banks (Azam et al., 2004). The WAEMU banking industry is currently dominated by 9 cross-border banking groups (Société Générale, BNP Paribas, Ecobank, Bank of Africa, Attijariwafa Bank, Atlantic Business International, United Bank for Africa, Diamond Bank, and BSIC). These banks cumulated two thirds of assets, and more than 60% of branches, accounts and employees and the three largest hold more than a third of assets.

The last decade was a period of profound change in the market structure with

⁸A description of supervision mechanism in the WAEMU is presented in Box 5.1. Before the reform, each country had its own regulatory body.

Figure 5.2: The structure of banking sector in the WAEMU



Note: Author's calculations from data of the Banking Commissions. Non-African banking groups include the 5 largest banking groups originate from non-African countries (Société Générale, BNP Paribas, Belgo-laise, Citibank and Crédit Agricole). African banking groups include the 5 largest banking groups from Africa (Ecobank, Bank of Africa, Attijariwafa, UBA and AFG).

Table 5.2: Main banking groups in the WAEMU

	Group information			Since	Presence in WAEMU			
	Country	Creation	Presence in SSA*		Presence*		Market share (rank)	
					2003	2012	2003	2012
Ecobank (ETI)	Togo	1985	35	1985	7	8	8.9 (4)	15.8 (1)
Société générale	France	1864	14	1962	4	4	14.9 (1)	10.6 (2)
BOA Group**	Mali	1982	15	1982	6	6	9.0 (3)	10.5 (3)
Attijariwafa Bank	Morocco	1911	8	2007	-	4	-	8.1 (4)
ABI (ex-AFG)**	Cote d'Iv.	1978	8	1978	1	7	-	7.0 (5)
BNP Paribas	France	1848	9	1962	6	7	12.6 (2)	5.6 (6)
UBA***	Nigeria	1961	19	2008	-	4	-	3.5 (7)
DIAMOND bank	Nigeria	1991	5	2001	1	4	-	3.0 (8)
BSIC	Lybia	1998	13	2004	-	7	-	2.4 (10)

Source: Banking Commission and banks websites

* Number of countries in which the group is implanted

** BOA Group was acquired by the BMCE (*Banque Marocaine du Commerce Extérieur*) in 2010, and ABI by the BCP (*Banque Populaire du Maroc*) in 2012, two banks from Morocco

*** United bank for Africa is currently implanted in 5 countries (opened a branch in Burkina-Faso in 2013)

the emergence of pan-African banking groups. Among the 9 groups dominating the market, 7 originate from Sub-Saharan Africa or North Africa (cf. Table 5.2). At the time of independence, the WAEMU's banking systems were inherited from the colonial period and had been mostly dominated by French banks. Between the time of independence and the 1990s, West African States increased their involvement in the banking sectors with the expansion of development banks and government-owned commercial banks. On the eve of the African financial crises to the end of the 1980s, banking systems were dominated by large French groups and some State-owned banks. The crises and subsequent reforms profoundly changed the banking landscape. The role of the State in finance decreased. The French groups, highly impacted by the crises, reduced their presence in Africa. The BIAO (*Banque Internationale pour l'Afrique Occidentale*) did not survive. The *Crédit Lyonnais/Crédit Agricole* left the market step by step due to internal difficulties.⁹ The two major remaining groups, *BNP Paribas* and *Société Générale*, adopted a consolidation policy by strengthening their position rather than expanding their activity. At the same time, young African banks have become important actors in the banking industry of the WAEMU. From the 1990s to the mid-2000s, two young West African banks (*Ecobank* created in 1985 and *Bank of Africa* created in 1982) began expanding throughout the zone. Since the mid-2000s, Nigerian (*United Bank for Africa*) and Moroccan banks (*Attijariwafa bank*, *BCP* or *BMCE*) have also begun to expand their activity in the WAEMU. Many of the new entrants have adopted offensive strategies, putting a much higher weight on sustainable outreach, introducing new products and technologies, expanding bank branch networks, and targeting potential clients unserved by European groups (Derreumaux, 2013a,b). As a consequence, the African banks have gained market share, while French banks have lost their dominant position (see Figure 5.2). For instance, in 2003, *Société Générale* and *BNP Paribas* were the two major holdings with 27.5% of market share. They are currently the second and sixth, respectively, with a cumulated market share of 16.2% (in 2012) while the two West African groups, *Ecobank* and *Bank of Africa*, are in first and third place. *Attijariwafa bank*, which entered the market in the mid-2000s, is already the fourth largest banking groups.

Despite the entry of new banks and the expansion of pan African groups, a high level of concentration characterizes the WAEMU banking industry. Table 5.3 shows that the three largest banks hold 60% of assets and the five largest banks 80% of assets. The level of HHI gives a more nuanced picture insofar as its value is lower than 1800 (a value that characterizes the more concentrated market according to the U.S. Anti-trust agency). Côte d'Ivoire is the least concentrated banking market even if the five largest banks hold two thirds of assets. By contrast, the banking market is highly concentrated in Guinea-Bissau. Other countries with a similar number of banks present different levels of concentration due to the essential domination of

⁹The African subsidiaries of *Crédit Lyonnais* were partially acquired by *Crédit Agricole*. Nonetheless, *Crédit Agricole* ceased activities in Africa by selling some of their participation to other banks, mainly Moroccan ones (e.g. the *Société Ivoirienne des Banques* sold to *Attijariwafa bank*). Another Belgian bank, the *Belgolaise* ceased its activity following internal difficulties.

Table 5.3: Evolution of concentration indices, by country

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Mean
<i>Share of assets owned by the three-largest banks</i>											
Benin	78.33	79.91	79.04	74.99	71.12	68.67	66.30	64.86	66.81	67.58	71.76
Burkina	66.93	61.18	60.64	59.34	57.40	54.53	50.20	49.38	46.00	55.65	56.12
Côte d'I.	51.33	51.02	51.57	50.58	49.01	46.95	45.62	43.62	42.26	42.98	47.50
Guinée-B.		100	100	100	100	100	100	94.06	95.20	94.05	98.15
Mali	54.53	65.04	63.37	61.10	60.84	60.12	56.86	55.04	51.83	49.67	57.84
Niger	71.28	69.98	74.19	70.75	71.08	69.53	64.87	66.22	63.76	62.26	68.39
Sénégal	54.90	56.29	59.43	58.50	59.03	57.31	57.30	60.64	74.06	55.40	59.29
Togo	56.64	56.26	65.17	67.11	72.51	69.19	65.57	64.97	65.53	61.08	64.40
WAEMU	61.99	62.81	64.77	63.19	63.00	60.90	58.10	57.82	58.61	56.38	60.76
<i>Share of assets owned by the five-largest banks</i>											
Benin	99.09	98.39	97.53	92.27	86.96	84.48	82.27	78.81	80.65	82.06	88.25
Burkina	85.55	82.33	82.28	81.53	79.75	78.13	75.01	74.83	71.55	81.18	79.21
Côte d'I.	73.85	71.54	71.88	68.45	65.75	63.75	63.55	61.32	62.76	63.65	66.65
Guinée-B.		100	100	100	100	100	100	100	100	100	100
Mali	76.91	84.33	85.37	82.85	81.63	79.29	76.30	76.65	74.94	71.19	78.95
Niger	91.01	93.36	93.20	93.63	91.76	91.82	87.27	88.77	87.49	86.35	90.47
Sénégal	74.97	75.95	77.18	76.46	76.36	74.64	72.94	75.21	87.86	73.00	76.46
Togo	79.34	78.94	93.95	94.48	98.48	95.19	90.66	87.17	85.59	80.60	88.44
WAEMU	82.96	83.55	85.91	84.24	82.96	81.04	78.29	77.54	78.69	76.86	81.20
<i>Herfindahl-Hirschman index</i>											
Benin	2671	2851	2749	2535	2425	2199	1950	1852	1921	1941	2309
Burkina	1947	1723	1738	1650	1578	1494	1378	1340	1286	1502	1564
Côte d'I.	1299	1315	1295	1205	1124	1086	1064	1054	1055	1091	1159
Guinée-B.		10000	10000	10000	10000	8287	4960	3427	3434	3319	7048
Mali	1506	2181	2067	1930	1819	1808	1593	1450	1345	1249	1695
Niger	2015	2021	2134	2082	2042	2009	1785	1867	1766	1710	1943
Sénégal	1445	1447	1522	1455	1470	1387	1405	1477	2246	1341	1520
Togo	1458	1463	1899	1945	2113	1959	1788	1703	1726	1562	1762
WAEMU	1763	1857	1915	1829	1796	1706	1566	1535	1621	1485	1707

The Table displays the common concentration indicators. The last column reports the average of each indicator for each country over the period. The last line shows the average of each indicator in the WAEMU for each year, excluding Guinea-Bissau. The HHI ranges from 0 to 10,000 and increases with the degree of concentration.

leading banks. For instance, the Beninese banking industry is more concentrated than the Togolese one due to the domination of two leading banks in Benin (BoA and Ecobank). These recent changes have been followed by a slight decrease in the market concentration. Different indicators of concentration show a downward trend since the mid-2000s in the WAEMU. However, the diminution is less marked than in other SSA countries, as documented by Fosu (2013).

An important question is how competition has evolved following these changes in the banking market. Recent changes such as the increase of the number of banks and expansion of regional groups appear as a positive trend. However, banking sector concentration may not necessarily suggest less competition. Several theoretical explanations may explain the divergence between changes in structure and changes in conduct (see the large amount of literature on the limits of the *Structure-Conduct-Performance* (SCP) paradigm in Chapter 4). While the emergence of cross-border

banking groups bring new risks (see: Box 5.1), this change may also spur competition in the WAEMU banking industry. However, the fact that African groups, at the center of recent changes, interact in many markets may reduce their willingness to compete. Multi-market contacts may reinforce collusive behaviors instead of spur competition (Bernheim and Whinston, 1990). Furthermore, with the exception of Moroccan groups, regional groups intervening in West Africa are relatively small in comparison with incumbent banks. In addition, pan-African banking groups are often focused on few countries and some of them (such as *Ecobank*) suffer from internal management difficulties reducing their ability to compete. Using the NEIO approach, this paper documents the evolution of competition in the WAEMU over the past decade marked by profound changes in the structure of banking industry of the WAEMU.

5.3 Literature review

In order to measure the degree of competition in banking markets, empirical studies have usually made use of two different methodologies: the structural approach and the non-structural approach (also named the NEIO approach). The structural approach infers the degree of competition from the structure of the market. Based on SCP paradigm, it assumes lower competition in concentrated markets, while more competition is associated with less concentrated markets. Authors raise concerns about the reliability of the SCP paradigm and therefore of the structural approach to assess the degree of competition. For instance, the linkage from structure to conduct is less obvious than the SCP paradigm argues, eg. an oligopoly may be the place of intense competition. The threat of entry can be a more important determinant of the behavior of market participants (Baumol et al., 1982). The New Empirical Industrial Organization (NEIO) approach, on the other hand, provides non-structural tests to circumvent the problems with structural measures of competition. The aim of the NEIO approach is to obtain a direct measure of firms' conduct. The NEIO measures include different models. In recent years, an increasing number of articles has investigated competition in the banking industry by employing the non-structural perspective. The Panzar-Rosse model, the conjectural variation parameter estimations and Lerner index have all been widely applied to assess the degree of competitiveness in the financial services sector for developed and emerging economies. However, less attention has been paid to Africa due to the lack of reliable data.¹⁰

The Panzar-Rosse (PR) model has been extensively used to analyze the nature of competition in mature banking systems (see: Bikker et al., 2012). The PR model is based on the evaluation of the transmission of variations in input prices, and then marginal costs, on firms' revenues. The main advantage of the PR model is the need for limited firm-specific data on revenues and factor prices only. The reduced

¹⁰Studies on South Africa are not taken into consideration in this review. Mlambo and Ncube (2011) present a review of researches focused on South Africa.

form revenue equation can be estimated through a limited number of observations. Some cross-country studies include Kenya and Nigeria, two countries for which some banks' information is available in the international Bankscope database. Recently, several single country studies have been conducted in Ghana, Kenya, Nigeria, Tanzania, Uganda, or Zambia. The main results of these studies are reported in the Appendix (page 181). The findings are consistent with monopolistic competition. The competitiveness of the banking systems in non-former English colonies is, however, rarely investigated. [Saab and Vacher \(2007\)](#) reveal that the degree of competition in the *Communauté Economique et Monétaire d'Afrique Centrale* is relatively low. In a recent contribution, [Fosu \(2013\)](#) goes further by analyzing the differences between sub-regional African regions. He finds that Southern African banks face lower competitiveness than their counterparts in Africa.

The number of studies based on other non-structural measures is limited. Many empirical studies on developed countries have been done assessing the competitiveness of the financial services sector based on the estimation of the conjectural variation parameter or its variants (see: [Carbó-Valverde et al., 2009a](#); [Coccorese, 2009](#)). This parameter represents the reaction of firms to the behavior of changing rivals. Only a handful of papers has employed this method to assess the degree and evolution of competition in SSA banking industries. Results underline that banking industries are characterized by monopolistic competition in Sub-Saharan Africa. Studies on Nigeria show an increase of market power over the 2000s ([Kasekende et al., 2009](#); [Zhao and Murinde, 2011](#)), while the market power of the four major Ghanaian banks ([Biekpe, 2011](#)) and the Kenyan banks ([Mwega, 2011](#)) decreased over the period. The major limitation for the application of this technique in Africa is the lack of detailed information on demand. As a result, some papers assess the degree of market power by computing the Lerner index.

The Lerner index measures the divergence between the price and marginal cost (relative to price). [Turk Ariss \(2010\)](#) estimated the value of the Lerner index in a sample of 61 countries including 14 Sub-Saharan African countries over the 1999-2005 period.¹¹ Banks tend to extract larger rents in Africa than in others regions. The Lerner indices in Africa range from 17% in Mozambique to 48% in Angola. [Sanya and Gaertner \(2012\)](#) study the evolution of the Lerner indices for a sample of 4 countries of the East African Community (Kenya, Rwanda, Tanzania, and Uganda). The average Lerner indices are around 30%, with no real change over the last decade. However, the Lerner index is a good measure of individual market power but is not always well-fitted to assess the degree and evolution of competition. Due to reallocation effect from inefficient to efficient firms, which are able to extract more rents, the average Lerner index can increase, decrease or remain stable following an intensification of competition ([Boone et al., 2013](#)).

An alternative of the Lerner index is the Boone indicator. The Boone indicator has the advantage of being more theoretical robust and requires the same data

¹¹Unfortunately, the sample description is very limited. For instance, the number of banks by country is not specified.

as the Lerner index. The intuition of the indicator is that in more competitive market firms are punished more harshly in terms of profits (or market share) for being inefficient. [Delis \(2012\)](#) assesses the Boone indicator for a large sample of developing and developed countries, including some SSA economies. Among the 11 African economies under consideration, the degree of competition is higher than the world mean for only three countries (Cameroon, Kenya, and Senegal). Recently, [Amidu and Wilson \(2014\)](#) have estimated the value of Boone indicator for 29 African countries, highlighting huge disparities in levels and evolutions.

In this study, the level of bank competition is addressed in the WAEMU by using different non-structural measures. No paper has yet investigated this issue in the WAEMU due to the lack of reliable data. The paper considers all banks of the WAEMU to assess not only the degree but also the evolution of competition over the 2000s. Indeed, a limited number of studies have analyzed changes in competitiveness over the past decade, despite huge transformations in Sub-Saharan Africa's banking industries.

5.4 Data and Methodology

5.4.1 Data and variables

The data have been obtained from consolidated annual individual bank balance sheets and bank income statements published in the Banking Commission's annual reports ([CB-UMOA, 2012](#)). By contrast to the Bankscope database, the database has the main advantage of covering all banks and not only the foreign-owned or largest banks. The sample considers all active banks in the WAEMU over the period 2002-2009. Given the small size of the sample for some WAEMU countries, the analysis is conducted for the region as a whole. The banking systems in the WAEMU have the advantage to achieve a relatively high degree of financial integration due to some initiatives such as the introduction of a single banking license in 1998 and the common regulatory and supervisory arrangement ([Sy, 2007](#)). A number of data exclusion criteria are applied. First, all banks from Guinea-Bissau are excluded for econometric analysis. Indeed, the banking industry in Guinea-Bissau is relatively young and has been dominated for a long period of time by only one bank. Second, observations for which output and input prices cannot be calculated are excluded. The final sample considers 92 banks (610 observations). Table 5.4 reports the number of observations by country and year.

Different measures of competition require computing output and prices and then choosing a banking firm model (cf. Box 4.2). Insofar as traditional intermediation remains the crux of banking activity in the WAEMU, the intermediation approach is adopted. The output is assessed by the total assets. Contrary to total loans, total assets allow me to consider non-interest earning assets. Output price is computed as the ratio of total revenue to total assets.¹² In the intermediation approach, three

¹²Substituting the total assets by total loans (and the price of output by the average interest revenue) does not alter the results.

Table 5.4: Sample number of banks by country and year

	2002	2003	2004	2005	2006	2007	2008	2009	Total
Benin	6	7	9	11	12	12	12	11	80
Burkina-Faso	7	7	8	8	11	11	11	10	73
Côte d'Ivoire	14	14	16	16	18	17	18	17	130
Mali	8	9	10	10	12	13	13	13	88
Niger	7	7	8	7	9	9	9	10	66
Sénégal	11	11	12	13	16	16	12	16	107
Togo	7	7	6	7	10	10	10	9	66
Total	60	62	69	72	88	88	85	86	610

Table 5.5: Mean values of key variables by year

Variables		2002	2003	2004	2005	2006	2007	2008	2009
Total assets	y	85940	88932	89670	82625	80017	92407	104320	119939
Total revenue	TR	8874	8931	9136	8695	8142	9329	13325	12586
Total cost	TC	6395	6429	6510	6371	6075	6958	7893	9085
Profit	π	1282	1200	1591	1020	1015	705	799	1787
Price of output	p	0.1027	0.0984	0.1012	0.0969	0.0901	0.0994	0.1166	0.1030
Wage	w_1	10.575	11.406	11.101	11.186	11.678	12.195	11.157	12.876
Price of deposits	w_2	0.0249	0.0233	0.0212	0.0201	0.0201	0.0225	0.0245	0.0242
Price of capital	w_3	1.0634	0.9388	1.0033	0.8132	0.7921	0.9209	1.1424	1.2751

inputs are considered: labor, physical capital and deposit. The price of labor is measured by the ratio of personnel expenses to the total number of employees, the price of funds by the ratio of interest expenses to total funds, and the price of physical capital by the ratio of other expenses (operational and depreciation) to total fixed assets. Table 5.5 gives a short description of the main variables used in the estimations.

5.4.2 The Lerner index

The Lerner index reflects firms' ability to set prices over marginal costs. It is defined as the difference between price and marginal cost, divided by price. The price and marginal cost should be equal in perfect competition but will diverge in less competitive environment. The price is defined as the ratio of total revenues to total assets. Marginal costs are inferred from estimation of a translog cost function with one output (total assets) and three inputs (labor, physical capital and funds). One common cost function to all WAEMU countries is considered due to the lack of data. Nonetheless, technology differences between countries are taken into account by including interactions between country dummies and output as well as interactions between dummies and input prices.¹³ As usual, the estimation is done under the restrictions of symmetry and of degree one homogeneity in the prices of inputs. The cost function takes the following form:

¹³To avoid multicollinearity, I drop the country dummy for Benin.

$$\begin{aligned}
 \ln(TC_{it}) = & \beta_0 + \beta_1[\ln(y_{it})] + \frac{1}{2}\beta_2[\ln(y_{it})]^2 + \sum_{l=1}^3 b_l[\ln(w_{l,it})] + \frac{1}{2} \sum_{l=1}^3 b_{3+l}[\ln(w_{l,it})]^2 \\
 & + \sum_{l=1}^3 \beta_{2+l}[\ln(y_{it})][\ln(w_{l,it})] + \sum_{l \neq l'} b_{6+l}[\ln(w_{l,it})][\ln(w_{l',it})] \\
 & + \gamma_1 T + \frac{1}{2}\gamma_2 T^2 + \gamma_3 T[\ln(y_{it})] + \sum_{l=1}^3 \gamma_{3+b} T[\ln(w_{l,it})] + \sum_{j=2}^J \delta_j C_j \\
 & + \sum_{j=2}^J \zeta_j C_j[\ln(y_{it})] + \sum_{j=2}^J \sum_{l=1}^3 \kappa_{jl} C_j[\ln(w_{l,it})] + \sum_{k=1}^K \mu_k M_{k,jt} + \varepsilon_{it} \quad (5.1)
 \end{aligned}$$

where $i, j, t,$ and l refer to bank, country, period and input respectively. TC is the total costs, w_l the price of the l^{th} inputs, y total assets, T a trend that captures the effect of technical progress, and C_j the country-dummies and $M_{k,jt}$ a matrix of time-variant country variables (GDP per capita, population density, inflation, and growth). Total costs are the sum of operational costs and interest costs. The individual Lerner index can be easily calculated from the price-cost margin. The (weighted) average Lerner index for each year is then computed as follows:

$$L_t = \sum_{i=1}^N s_{it} L_{it} = \sum_{i=1}^N s_{it} \frac{p_{it} - MC_{it}}{MC_{it}} \quad (5.2)$$

where s_{it} is the market share, MC_{it} the marginal cost of bank i in period t and N the number of banks in period t .¹⁴

5.4.3 The conjectural variation model

The traditional Lerner index cannot distinguish between markets that have high margins due to inelastic demand and markets that have high margins because they are less competitive or perhaps collusive. The conjectural variation model proposes to disentangle between both explanations. Recall Eq. 4.9 in the previous chapter, the first order condition of the Cournot model can be written as follows:

$$p = MC + \lambda, \text{ with } \lambda = -\frac{\theta}{\tilde{\varepsilon}} \quad (5.3)$$

where p is the price, MC the marginal cost, θ the conjectural elasticity and $\tilde{\varepsilon}$ the semi-elasticity of demand ($\tilde{\varepsilon} = \frac{dQ/dp}{Q}$). The conjectural elasticity measures the relative changes of rivals' outputs when firm i change raises its output by 1 percent.

¹⁴From Eq. 5.1, the marginal cost of bank output is:

$$MC_{it} = \frac{\partial TC_{it}}{\partial y_{it}} = \left(\beta_1 + \beta_2[\ln(y_{it})] + \sum_{l=1}^3 \beta_{2+l}[\ln(w_{l,it})] + \gamma_3 T + \sum_{j=2}^J \zeta_j C_j \right) \frac{TC_{it}}{y_{it}}$$

In a situation of perfect competition, the price equals the marginal cost and the conjectural elasticity equals 0. By contrast, in a collusive market, θ equals 1. If the firm i increases its output by 1%, all firms increase their output by the same percentage.

To identify separately the behavioral parameter (θ) and the price elasticity (ε), a three-equation system is estimated (Angelini and Cetorelli, 2003; Coccoresse, 2005, 2009). The first equation represents the market demand function which allows me to get the market demand elasticity for the price. The second is a total function that allows me to get the marginal cost for each firm. Finally, the supply equation is required to compute the behavioral parameter. The demand equation takes the following form:

$$\begin{aligned} \ln(y_{it}) = & \alpha_0 + \alpha_1 \ln(p_{it}) + \alpha_2 \ln(\bar{p}_{jt}) + \alpha_3 Y_{jt} + \alpha_4 \ln(Empl_{it}) + \alpha_5 \ln(Br_{it}) \\ & + \alpha_6 \ln(Age_{it}) + \alpha_7 IG_i + \alpha_8 Eff_{it} + \alpha_9 E/TA_{it} + \alpha_{10} GDP_{jt} \\ & + \alpha_{11} POP_{jt} + \alpha_{12} Inf_{jt} + \alpha_{13} Growth_{jt} + \sum_{j=1}^J \gamma_j C_j + \sum_{t=1}^T \delta_t D_t + \tau_{it} \end{aligned} \quad (5.4)$$

where i , j and t refer to bank, country and period respectively. Variables y_{it} and p_{it} are the quantity and the price of the output of bank i ; \bar{p}_{jt} is the calculated average value expressing the price set and Y_{jt} the total quantity offers by the banks belonging to the same country as bank i . A set of bank-specific control variables influencing the demand is added: the number of employees ($Empl_{it}$), the number of branches (Br_{it}), the age of the bank i (Age_{it}), a dummy indicating if the bank belongs to an international group (IG_i), the ratio of cost to income capturing the bank operational inefficiency (Eff_{it}), and the equity to total assets ratio (E/TA_{it}). Finally, in addition to country (C_j) and year dummies (D_t), some country variables are included: GDP per capita (GDP_{jt}), population density (POP_{jt}), inflation rate (Inf_{jt}), and real GDP growth ($Growth_{jt}$). The expected signs are positive for α_2 , α_4 , α_5 , α_6 , α_7 , and α_{13} , negative for α_1 , α_3 , α_8 , and α_{12} , and undetermined for the rest of the coefficients. The coefficient α_1 gives the value of the demand elasticity (ε).

The second equation is the total cost function presented above (Eq. 5.1). The last equation is a price equation obtained from the Eq. 5.3 by substituting the marginal costs by its expression (cf. previous footnote):¹⁵

$$p_{it} = \left(\beta_1 + \beta_2 [\ln(y_{it})] + \sum_{l=1}^3 \beta_{2+l} [\ln(w_{l,it})] + \gamma_3 T + \sum_{j=2}^J \zeta_j C_j \right) \frac{TC_{it}}{y_{it}} + \lambda + \nu_{it} \quad (5.5)$$

The system is formed by Eqs. (5.1), (5.4) and (5.5). System equations are estimated simultaneously in order to improve the precision and efficiency of estimations.

¹⁵The marginal cost is obtained by forcing some parameters in Eqs (5.1) and (5.5) to be equal.

Owing to the endogeneity of the cost, price, and quantity, the instrumental variables estimator (2SLS) should be employed. Nevertheless, owing to cross-equation contemporaneous correlations, seemingly unrelated regressions (SUR) is preferable. Affected by both problems, the Three-Stage Least Square (3SLS), which combines 2SLS and SUR estimators, is used. Instruments are obtained by lagging the endogenous variables.¹⁶

By recalling that $\lambda = -\theta/\tilde{\varepsilon}$ in Eq 5.3, the estimated competitive behavior ($\hat{\theta}$) can be easily obtained confronting $\hat{\lambda}$ and the estimated price elasticity ($\hat{\alpha}_1$):

$$\hat{\theta} = -\hat{\lambda} \frac{\hat{\alpha}_1}{\bar{p}} \quad (5.6)$$

where \bar{p} is the mean of output price and $\hat{\alpha}_1/\bar{p}$ the average semi-elasticity of demand.¹⁷ The parameter $\hat{\theta}$ describes the estimated degree of average market power exploitation in the WAEMU banking system.

The objective is not only to assess the average degree of competition, but also to investigate its evolution over time. The year-specific behavioral parameter is obtained as follows:

$$\hat{\theta}_t = -\hat{\lambda}_t \frac{\hat{\Lambda}_t}{\bar{p}_t} \quad (5.7)$$

where Λ_t is the demand elasticity in year t obtained by including interactions between year-dummies and price in Eq. 5.4 as follows:

$$\ln(y_{it}) = \alpha'_0 + \sum_{t=1}^T \Lambda_t \ln(p_{it}) D_t + \sum_{k=2}^{13} \alpha'_k Z_k + \sum_{j=1}^J \gamma'_j C_j + \sum_{t=1}^T \delta'_t D_t + \tau'_{it} \quad (5.8)$$

where Z_k are the matrix of control variables included in Eq. 5.4. The parameter λ_t is get by introducing year-dummies in Eq. 5.5:

$$p_{it} = \left(\beta_1 + \beta_2 [\ln(y_{it})] + \sum_{l=1}^3 \beta_{2+l} [\ln(w_{l,it})] + \gamma_3 T + \sum_{j=2}^J \zeta_j C_j \right) \frac{TC_{it}}{y_{it}} + \sum_{t=1}^T \lambda_t D_t + \nu_{it} \quad (5.9)$$

The 3SLS is used to estimate the system formed by Eqs. (5.1), (5.8), and (5.9).

5.4.4 The Panzar-Rosse model

The Panzar-Rosse model, popularized by Rosse and Panzar (1977) and Panzar and Rosse (1987), is an approach to measuring competition that is based on a reduced-form revenue equation. The PR model catches the transmission of inputs prices, and then marginal costs, on firms' revenues. The degree of competition is inferred from the sum of elasticities of revenues with respect to input prices. The estimated

¹⁶Whereas 3SLS are convergent and efficient by correcting the variance-covariance matrix, results should be treated with caution insofar as the sample is small. Convergence requires a large sample and otherwise results are highly sensitive to specification.

¹⁷The demand elasticity is $\varepsilon = \frac{dQ/Q}{dp/p} = \frac{dQ}{dp} \frac{p}{Q} = \frac{dQ/dp}{Q} p = \tilde{\varepsilon} p$; hence, $\tilde{\varepsilon} = \varepsilon/p$

value ranges between $-\infty$ to 1. Under perfect competition, the H-statistic equals one, while its value is negative under collusion. Finally, in a situation of imperfect competition, the H-statistic is positive but below one. The H-value is obtained through a reduced-form revenue equation. According to Panzar and Rosse (1987), not only the sign of the H-statistic matters, but also its magnitude.

The specification of the PR model employed in this paper differs from existing literature in two ways. First, studies often estimate a revenue function that includes total assets as a control variable. Other articles estimate a price function instead of a revenue equation, in which the dependent variable is revenue divided by total assets. Bikker et al. (2012) prove that the properties of the price equation and the scaled revenue equation function cannot identify the degree of competition, disqualifying a large number of studies (cf. Table B.3). They show that the appropriate H-statistic should be based on an unscaled revenue equation. As a consequence, an unscaled revenue equation is employed instead of the commonly-used scaled revenue equation.¹⁸ Second, Goddard and Wilson (2009) show that the static Panzar-Rosse model is biased in the case where there is not instantaneous adjustment towards equilibrium in response to factor input price shocks. A dynamic model is then more appropriate than a static one. In order to take into account the partial adjustment, a lagged dependent variable is included. Thus the following equation is estimated:

$$\ln(TR_{it}) = \alpha \ln(TR_{i,t-1}) + \sum_{l=1}^3 \beta_l \ln(w_{l,it}) + \sum_{k=1}^K \gamma_k Z_{k,it} + \sum_{t=1}^T \delta_t D_t + \varepsilon_{it} \quad (5.10)$$

where TR denotes total revenue, w_l the price of l th input factor, D_t the year-dummies and Z a set of K control variables. In line with the intermediation approach, three inputs are considered: labor, deposit and physical capital. The H-statistic is merely the sum of price elasticities:

$$H = \sum_{l=1}^3 \beta_l \quad (5.11)$$

Control variables include the ratio of equity to total assets to control for a bank's risk aversion. The income diversification index (*IDI*) proposed by Laeven and Levine (2007) is included to control for product structure. The *IDI* takes values between 0 and 1 and increases with the degree of product diversification. Credit risk exposure is taken into account by including the ratio of loans to customers to total assets. Finally, the ratio of customers' deposits to short-term funding is included to consider the bank's funding mix.

A number of working assumptions are required to apply the PR approach to banks. Banks must be treated as single product firms and inputs are homogeneous.¹⁹ Moreover, the demand elasticity must be superior or equal to one. Finally,

¹⁸Bikker et al. (2012) show that additional assumptions regarding the market equilibrium and cost structure is required to obtain valid values.

¹⁹In other words, higher input prices cannot be correlated with higher quality services that generate higher revenues.

banks should be observed from a (long-run) equilibrium perspective (Shaffer, 1982a). Regarding the last assumption, an equilibrium test should be performed by using an indicator of firm return as the dependent variable, with the same econometric specification (method and independent variables). The equilibrium statistic E is calculated as the sum of the elasticities of the firm return with respect to its input prices. The market is in equilibrium if the E-statistic is zero. To fulfill this condition, the following regression is run:

$$\ln(\pi_{it}) = \alpha' \ln(\pi_{i,t-1}) + \sum_{l=1}^3 \beta'_l \ln(w_{l,it}) + \sum_{k=1}^K \gamma'_k Z_{k,it} + \sum_{t=1}^T \delta'_t D_t + \varepsilon'_{it}$$

where $\pi_{i,t}$ is the pre-tax return on assets. The equilibrium statistic E is calculated as the sum of the input price elasticities. If the E-statistic equals zero, this implies that the banking market is in long-run equilibrium.²⁰

Unobserved firm heterogeneity is taken into account by including a bank specific effect.²¹ In the presence of a lagged dependent variable, the within estimator is no longer consistent. First differentiating all variables is another way to wipe out the unobserved firm specific effect. By construction, the lagged dependent variable introduce an endogeneity problem. The most commonly used approach to get a consistent and unbiased estimator is to apply the instrumental variables method on transformed variables. If no instrument can be found outside the model, the solution is to use lagged values of the regressors as instruments. Arellano and Bond (1991) propose using the lagged values of the variables in level as instruments for the equation in first difference. This estimator may suffer from a lack of correlation of the instruments with the regressors (weak instruments). Blundell and Bond (1998) suggest overcoming the problem of weak instruments by estimating a system of equations. The system-GMM estimator thus combines the standard set of equations in first-differences with suitably lagged levels as instruments, with an additional set of equations in levels with suitably lagged first-differences as instruments. The lagged endogenous variable and other explanatory variables are considered as weakly exogenous. Therefore, the lagged levels and differences of explanatory variables are used as instruments. Although precision is gained by considering additional moment restrictions, it is not desirable to have too many instruments (Roodman, 2009). For this reason, not all the instruments available were included. The set of instruments is limited to two lags. In order to ascertain the validity of the instrument set, several usual specification tests are implemented. The statistic proposed by Arellano and Bond (1991) tests for the absence of second-order serial correlation of the first difference residuals. However, a second-order correlation among the residuals would reveal a violation of the exclusion restrictions.²² In addition, the Hansen over-identifying tests the exogeneity of the instrument set. Two-step GMM estimators

²⁰The profit is independent to price in the long-run equilibrium (Shaffer (1982a)). However, according to Bikker et al. (2012), this equilibrium is a joint test for competitive conduct and market equilibrium.

²¹A classical F-test rejects the pooled OLS specification.

²²By taking the first difference of variable, first-order correlation is automatically created in the

are employed using the finite sample correction proposed by Windmeijer (2005).

The objective of this paper is to analyze change of competitive behavior over time. The model specification presented above does not allow for computing the H-statistic by year. A simple way to obtain it could be to estimate the revenue function year by year. Due to the lack of data, however, this solution cannot be implemented. Evolution over time is taken into account by including interactive terms between input prices and year-dummies. Therefore, the reduced form revenue equation is as follows when evolution over time is investigated:

$$\ln(TR_{it}) = \alpha \ln(TR_{i,t-1}) + \sum_{l=1}^3 \sum_{t=1}^T \beta_{l,t} D_t \ln(w_{l,it}) + \sum_{k=1}^K \gamma_k Z_{k,it} + \sum_{t=1}^T \delta_t D_t + \varepsilon_{it} \quad (5.12)$$

The equilibrium test is also modified in the same way. For each year, the H value is computed as the sum of input price elasticities: $H_t = \sum_{l=1}^L \beta_{l,t}$.

5.4.5 The Boone indicator

Recently, Boone (2008) developed a new measure of competition based on relative profit difference. The basic intuition underlying this indicator is that more efficient banks achieve superior performance in the sense of higher profit or higher market shares, and that this effect is stronger the heavier the competition is. This measure has gained considerable support in banking more recently (Van Leuvensteijn et al., 2011; Tabak et al., 2012; Delis, 2012; Schaeck and Cihák, 2013).

Most empirical studies adopting the Boone indicator regress the logarithm of profit on the logarithm of marginal costs (Liu et al., 2013). In line with recent contribution, the Boone indicator is obtained by regressing the logarithm of profit on the logarithm of marginal costs.

$$\ln \pi_{it} = \alpha + \beta \ln MC_{it} + \sum_{t=1}^T \delta_t D_t + \varepsilon_{it} \quad (5.13)$$

where π_{it} stands for profits, D_t is a time dummy, MC_{it} denotes marginal costs (see Eq. 5.1). The coefficient β is in theory negative, reflecting the fact that higher marginal costs are associated with lower profits. Its value should be lower the more competitive market conditions are.

An alternative method consists to assess the market share elasticity by using the logarithm of market share instead of profit as the dependent variables (Van Leuvensteijn et al., 2011; Tabak et al., 2012). The alternative Boone indicator is then obtained by the following regression:

$$\ln s_{it} = \alpha + \beta' \ln MC_{it} + \sum_{t=1}^T \delta'_t D_t + \varepsilon'_{it} \quad (5.14)$$

residuals. Therefore the value of the m_1 test should be significantly different from zero. Otherwise, the errors in level follow a random walk, and the OLS applied to first difference of our variable could be consistent (Arellano and Bond, 1991).

where s_{it} is the market share of the i th bank. β' captures therefore the market share elasticity and its interpretation is similar the interpretation of β .

Previous contributions (Van Leuvensteijn et al., 2011; Tabak et al., 2012; Schaeck and Cihák, 2013) highlight the possibility of joint determination of performance and cost, inducing a possible endogeneity issue. In the first step, a Hausman-based test is applied to gauge the validity of within estimator. The test compares the equation where marginal costs are treated as endogenous and the equation where marginal costs are treated as exogenous. Consequently, if this problem is confirmed, a two-step method with one lag of marginal costs as instrument is used. Otherwise, the efficient within estimator is employed.

Insofar as this study focuses on evolution over time, interactions between marginal costs and time-dummies are included in both specifications to study the changes in competitiveness (Van Leuvensteijn et al., 2011; Tabak et al., 2012):

$$\ln\pi_{it} = \alpha + \sum_{t=1}^T \beta_t D_t \ln MC_{it} + \sum_{t=1}^T \delta_t D_t + \varepsilon_{it} \quad (5.15)$$

$$\ln MS_{it} = \alpha + \sum_{t=1}^T \beta'_t D_t \ln MC_{it} + \sum_{t=1}^T \delta'_t D_t + \varepsilon'_{it} \quad (5.16)$$

The degree of competition in period t is given by β_t (or β'_t).

5.5 Results

This section is devoted to the presentation of the results. The findings obtained for each measure of competition (Lerner index, conjectural variation model, PR model and Boone indicator) is displayed. For each measure, the average degree of competition is assessed. In the second step, the time evolution is observed and analyzed in line with recent change in the structure of banking industry presented in the first sub-section.

5.5.1 The Lerner index

Figure 5.6 presents the evolution of market power measured by the weighted average Lerner index. The estimation results for the cost function that is required to compute the marginal costs is reported in the Appendix (page 179). The Lerner indices range from 31% in Côte d'Ivoire to 37% in Niger. The average Lerner index is higher in Benin, Togo, and Niger. The average degree of market power is around 34%. These figures are comparable to what is observed in other studies. Using a similar approach and figures from the Bankscope database, Turk Ariss (2010) reveals that the conventional Lerner indices are around 30-32% for the three countries of the WAEMU considered (Burkina-Faso: 32.8; Côte d'Ivoire: 32.9; and Senegal: 30.0).

In terms of evolution, the results suggest the absence of dramatic change over the last decade (cf. Figure 5.3). The degree of market power slightly decreased in 2006

Table 5.6: Evolution of Lerner indices, by country (2002-2009)

	2002	2003	2004	2005	2006	2007	2008	2009	<i>Aver.</i>
Benin	39.64	38.07	37.89	32.20	30.97	35.31	34.49	42.98	<i>36.44</i>
Burkina-Faso	37.11	37.22	33.70	35.80	28.55	33.20	32.22	31.90	<i>33.71</i>
Côte d'Ivoire	24.26	30.05	29.02	33.01	32.68	31.46	38.81	29.09	<i>31.05</i>
Mali	31.85	38.84	32.45	35.70	31.93	33.37	34.93	30.70	<i>33.72</i>
Niger	33.85	34.81	33.48	38.66	36.55	37.84	42.14	41.14	<i>37.31</i>
Senegal	33.74	30.16	31.63	31.56	33.38	31.46	34.31	31.78	<i>32.25</i>
Togo	30.21	30.46	40.13	40.38	29.54	42.27	51.39	37.16	<i>37.69</i>
WAEMU	32.95	34.23	34.04	35.33	31.94	34.99	38.33	34.97	34.60

The table displays the average of Lerner index for each year and each country. The last column reports the average Lerner index for each country over the period. The last line shows the average Lerner index in the WAEMU for each year.

and increased in 2007-2008 but decreased afterwards. The peak in 2008 is certainly explained by the beginning of global financial turmoil, generating an increase in risk premium. According to this measure, the recent changes in the banking industry have not induced profound modifications in terms of market power. However, [Boone et al. \(2013\)](#) point out that intensification of competition may not always be reflected in average Lerner index due to reallocation effect from inefficient to efficient firms.

5.5.2 The conjectural variation model

As expressed above, the Lerner index is not only influenced by banks' conduct but also by demand elasticity. The conjectural variation model allows for disentangling the effects of changes of the two components. This method has the advantage of being more precise by isolating banks' conduct. However, it is impossible to obtain information on evolution across countries. This remark is valid for the two following NEIO measures employed. As a consequence, attention is then focused on the degree and evolution of competition in the WAEMU as a whole. Table 5.7 displays the results from the 3SLS estimation. The coefficients are generally significant at the usual thresholds. Moreover, the signs are as expected for the demand equation. The demand is negatively correlated to bank's price, but positively to the price proposed by rivals. Moreover, when competitors offer a large amount of goods, the demand that faced the bank is reduced. These results are in line with standard theory. Moreover, demand is higher for a bank that has been established for a long period of time, has a large number of employees, a heavy network of branches, and belongs to an international group. On the contrary, the less efficient a bank is, the lower its demand. Finally, demand is procyclical, increasing when growth is dynamic. The value of the average λ parameter is positive as expected, and highly significant. The value of conjectural elasticity can be deduced. The point estimate of θ is 0.51. Wald tests show that it is possible to reject both hypotheses of perfect competition ($\theta = 0$) and collusion between banks ($\theta = 1$) at the 1% level of significance. Therefore, the results show that in the WAEMU the banking market is characterized by a certain degree of competition, although imperfect. This finding

Table 5.7: Conjectural variation estimation result

Variable		Coef.	z-stat
<i>Demand equation (dependent variable: y)</i>			
$\ln(p)$	α_1	-0.745***	(-9.98)
$\ln(\bar{p})$	α_2	0.235	(1.26)
Y	α_3	-5.28e-7***	(-4.39)
$\ln(Empl)$	α_4	0.777***	(16.59)
$\ln(BR)$	α_5	0.092**	(3.10)
$\ln(Age)$	α_6	0.088**	(3.13)
IG	α_7	0.181***	(4.84)
E/f	α_8	-0.668***	(-11.98)
E/TA	α_9	-0.193	(-1.44)
$GDPpc$	α_{10}	2.22e-5	(0.55)
$POPDens$	α_{11}	0.004	(0.34)
Inf	α_{12}	-0.006	(-0.57)
$Growth$	α_{13}	0.019*	(1.93)
R^2		0.89	
<i>Cost function (dependent variable: $\ln(TC)$)</i>			
$\ln(y)$	β_1	-3.16e-17***	(-4.65e+17)
$[\ln(y)]^2$	β_2	0.062***	(11.22)
$[\ln(y)][\ln(w_1)]$	β_4	-0.157***	(-6.49)
$[\ln(y)][\ln(w_2)]$	β_5	0.037*	(2.06)
$[\ln(y)][\ln(w_3)]$	β_6	0.120***	(6.25)
$\ln(w_1)$	b_1	1.485***	(4.82)
$\ln(w_2)$	b_2	1.230***	(3.93)
$\ln(w_3)$	b_3	-1.715***	(-7.08)
$[\ln(w_1)]^2$	b_4	0.027**	(2.67)
$[\ln(w_2)]^2$	b_5	0.149***	(5.21)
$[\ln(w_3)]^2$	b_6	-0.009	(-0.62)
$[\ln(w_1)][\ln(w_2)]$	b_7	-0.093***	(-4.41)
$[\ln(w_1)][\ln(w_3)]$	b_8	0.066***	(3.89)
$[\ln(w_2)][\ln(w_3)]$	b_9	-0.057***	(-4.28)
$POPdens$	δ_1	-0.014*	(-2.44)
$GDPpc$	δ_2	4.04e-6	(1.90)
$Inflation$	δ_3	-0.002	(-0.59)
$Growth$	δ_4	-4.48e-4	(-0.09)
R^2		0.96	
<i>Supply equation (dependent variable: p)</i>			
$\theta/\bar{\varepsilon}$	λ	0.070***	(17.31)
R^2		0.19	
θ		0.51	
Wald test ($\theta = 0$)		75.90***	
Wald test ($\theta = 1$)		68.84***	

The table displays results from 3SLS. *, ** and *** indicate significance at the 10%, 5% and 1% respectively (t-statistics are reported in parentheses). In the demand and cost equations a full set of dummy capturing time effect and country effects is also included (coefficient estimates are not reported). The cost function also includes a trend, its interactions with output and input prices as well as interactions between country-dummies and output and input prices.

is in line with the conjectural variation model of competition applied to other SSA economies (Kasekende et al., 2009; Biekpe, 2011; Mweha, 2011; Zhao and Murinde, 2011).²³

In order to study the evolution of competition over time, time-dummies are included in the supply equation and in interactions between time-dummies and price in the demand equation. The specification regarding the cost function is unchanged. Figure 5.3 reports the evolution of conjectural elasticities over time. More details on value and associated tests can be found in the Appendix (page 180). For each year, both hypotheses of perfect competition and collusion can be rejected. Banks operate under imperfect competition throughout the whole period, as the Wald tests show. The degree of collusion has been reduced since 2008 with a fall of the value of θ from 0.75 to 0.35. Despite a slight increase in 2009, competition increased in the end of the decade. This period coincides with the rapid expansion of pan-African banking groups.

5.5.3 The Panzar-Rosse H-statistic

The finding from the conjectural variation model provides evidence of intensification of competition at the end of the decade, while result using Lerner index documents the absence of trend. The Panzar-Rosse model is run to provide more insightful about evolution of competition over the period. In the first part, the average degree of competition in the 2000s is investigated. Table 5.8 reports the results of the static and dynamic PR model. For the dynamic H-statistic, in addition to (biased) within estimator, Arellano-Bond's (AB) and Blundell-Bond's (BB) estimators are used. The usual tests are implemented to gauge the validity of these methods (Autoregressive tests, Hansen J-test of overidentification). The different tests tend to validate the Blundell-Bond method, while Arellano-Bond results are subject to caution. The lag dependent variable is positive and significant. While the values of the H-statistic differ greatly among different specifications, findings suggest a monopolistic competition in both the static and dynamic models. The conjoint test allows for rejecting the hypothesis of collusion among banks. The hypothesis of perfect competition also appears invalid, although not always rejected. This finding is in line with the conclusion from the CV model and with the vast majority of studies which estimate the PR model on African banks (see: Table B.3). Following Vesala (1995), the H-statistic can be employed as a continuous measure of competition. In this regard, banking sector competition in the WAEMU is somehow comparable to that existing in other banking markets in Africa. Comparisons should be treated with caution due to differences in methodology.²⁴

It is not sufficient to observe how strong competition is for the period as a whole. Therefore, I am also interested in observing the time evolution of the degree of

²³Insofar as each paper employs a different model, the values of the conjectural parameter cannot be compared.

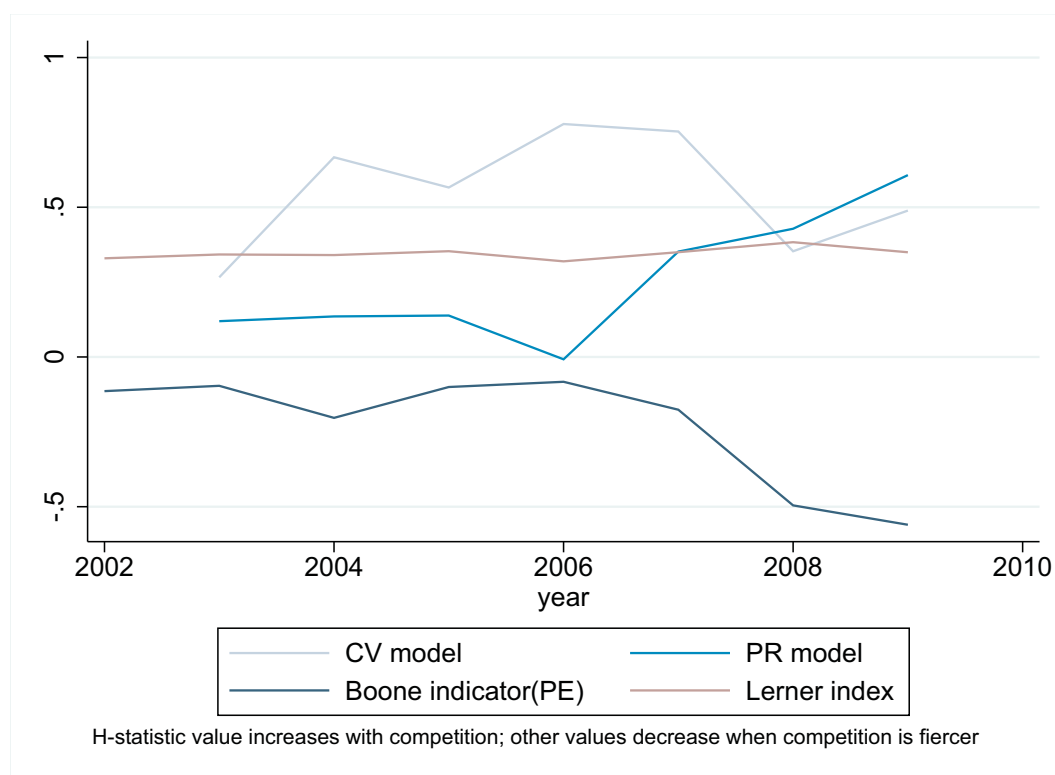
²⁴Existing published papers often employed scaled revenue equation that may render results irrelevant (cf. Table B.3).

Table 5.8: Panzar-Rosse model results

	Static	Dynamic		
	FE	Dynamic FE	AB	BB
$\ln(TR_{t-1})$	-	0.368*** (8.95)	0.230*** (3.51)	0.615*** (10.18)
$\ln(w_1)$	-0.0943 (-0.73)	-0.00594 (-0.08)	0.0781 (0.40)	0.622*** (3.38)
$\ln(w_2)$	0.557*** (6.95)	0.168* (1.92)	0.319** (2.47)	-0.0905 (-0.84)
$\ln(w_3)$	0.380*** (5.12)	0.155*** (3.14)	-0.0688 (-0.26)	0.141* (1.73)
IDI	-0.0301 (-0.13)	-0.186 (-1.01)	-0.302 (-0.51)	0.206 (0.55)
E/TA	0.158 (0.53)	0.330 (0.99)	-0.748 (-0.85)	0.758 (1.44)
CreditRisk	0.00390 (0.03)	-0.0130 (-0.21)	0.193 (1.20)	0.0256 (0.23)
FundMix	-0.666** (-2.22)	-0.405* (-1.96)	-0.239 (-0.61)	-0.848*** (-2.63)
Intercept	11.33*** (23.85)	6.536*** (10.09)		2.196*** (4.02)
H-statistic	0.842	0.317	0.328	0.673
H=0 (F-test)	21.57***	7.29***	0.63	10.50***
F=0 (F-test)	0.75	33.90***	2.69*	2.47
E=0 (F-test)	0.00	0.00	0.19	0.19
Obs.	510	487	399	487
# banks	87	87	86	87
R^2	0.65	0.69	-	-
AR(1) [p-value]	-	-	0.222	0.015
AR(2) [p-value]	-	-	0.059	0.292
Hansen [p-value]	-	-	0.566	0.249
# instruments	-	-	30	39

Dependent variable is the logarithm of total revenue [$\ln(TR)$]. *, ** and *** indicate significance at the 10%, 5% and 1% respectively. Time-dummies are included in all models. Arellano-Bond order 1 (2) are tests for first (second)-order serial correlation, asymptotically $N(0, 1)$. These test the first-differenced residuals in the system GMM estimators. The Hansen test is a test of overidentification restrictions. Under the null hypothesis, the test statistic is distributed as a chi-squared in the number of overidentifying restrictions, p-values are presented in square brackets. System GMM results are two-step estimates. The two-step standard errors are computed in accordance to the Windmeijer (2005) finite-sample correction. The reported t-statistics are based on robust standard errors.

Figure 5.3: Evolution of competition in the WAEMU banking sector, 2002-2009



competition. To assess this time development, interactions between time-dummies and input prices are included. Details on values of the H-statistic and associated tests are reported in the Appendix (page 180). In Figure 5.3, the H-value over time is reported. The analysis is focused on results using the robust Blundell-Bond estimator. After a decrease in 2006, the level of competition has increased since 2007. In other words, the PR model shows that the banking sector in the WAEMU has become more competitive since 2007, a period corresponding to significant changes in the structure of the market. This finding is in line with the results from the conjectural variation model.

5.5.4 The Boone indicator

Boone (2008) has recently presented a new measure of competition, based on the relative profit difference, assessing the sensitivity of profits to changes in competition relative to firm's efficiency. This measure assumes a different hypothesis than existing static methodologies, and it is more robust than the price-cost margin. Two empirical approaches have been developed to assess the degree of competition from the relative profit difference (Degryse et al., 2009). Some studies assess the profit elasticity regressing the log of marginal costs on log of profit. Other paper estimate

Table 5.9: Profit elasticity and market share elasticity

	Profit elasticity		MS elasticity	
	Within	Within	IV-FE	IV-FE
$Ln(MC)$	-0.1539*** (-5.57)		-2.1429** (-2.23)	
$Ln(MC_{2002})$		-0.1140 (-1.47)		
$Ln(MC_{2003})$		-0.0963 (-1.37)		-1.1825 (-1.50)
$Ln(MC_{2004})$		-0.2033*** (-4.15)		-1.3922* (-1.81)
$Ln(MC_{2005})$		-0.1003* (-1.79)		-1.9228** (-2.18)
$Ln(MC_{2006})$		-0.0829 (-1.44)		-2.2221 (-1.62)
$Ln(MC_{2007})$		-0.1761*** (-3.54)		-2.5319* (-1.78)
$Ln(MC_{2008})$		-0.4956*** (-10.21)		-2.6450** (-2.15)
$Ln(MC_{2009})$		-0.5603*** (-12.80)		-2.2696** (-1.99)
Time dummies	Incl.	Incl.		
Obs.	610	610	510	510
# banks	92	92	91	91
Endogeneity test (p-value)	0.8340	0.7915	0.00	0.00
F test / Wald test	4.57***	9.19***	273.03***	269.38***

Dependent variables are the natural logarithm of profit (PE) and of market share (ME). Within refers to within estimator and IV-FE to instrumental variable model. Standards errors are clustered at the bank level and t-Statistics reported in parentheses. F-test and Wald-test test the conjoint significance of all variables. Endogeneity test is a Hausman-based test comparing results from OLS and 2SLS models. Under the null hypothesis, both models give similar results.

the market share elasticity regressing the log of marginal costs on log of market share. To assess the degree of competition, the value of marginal costs for each bank at each period is obtained from the estimation of Eq. 5.1. The log of marginal cost is then regressed on log of profit (profit elasticity) and on log of market share (market share elasticity). For both, the average degree of competition is assessed in the first step, and the evolution of competition over time is evaluated in the second step by including interactions between time-dummies and log of marginal costs.

The results of the endogeneity test indicate marginal costs have been considered endogenous only for market share elasticity equation. Thus, a two-step estimator is employed for this equation, and a within estimator is run for the profit elasticity equation. The results are presented in Table 5.9. The estimated β is in absolute terms larger for market share elasticity than for profit elasticity but are not comparable. Due to the lack of studies, it is impossible to compare the degree of competition in the WAEMU with other African countries.

The Boone indicators are more useful in gauging the evolution of competition over time. Once again, market share elasticity is subject to the endogeneity issue, while profit elasticity is not. PE and MSE results show that the competitiveness of the banking industry has risen since the mid-2000s, while dates differ. The estimated β value decreases over time. Differently phrased, banks operate under more competition at the end of the decade. As shown in Figure 5.3, this finding is in line with conclusions from CV model and PR models. Different models highlight that the competitiveness of the banking markets has increased since 2007. This period corresponds to the expansion of new actors in the banking industry.²⁵

To sum up, the different models highlight that the competitiveness of the banking market in the WAEMU has increased since 2007/2008, a period corresponding to the expansion of pan-African banking groups.

5.6 Conclusion

African banking sectors have witnessed significant changes in their structure over the past several decades. In line with the privatization process, consolidation, and liberalization, pan-African banking groups have expanded their activity throughout Africa. African banks often adopt an aggressive strategy to gain market share and profit. This paper analyzes how such changes have induced transformation in the competition among banks. Employing an original database on seven West African countries, this paper investigates the degree and evolution of competition over the past decade. The countries considered, members of the WAEMU, provide an excellent foundation for testing the consequences of recent changes in competition. These banking systems have encountered substantial structural change during the

²⁵One might wonder that recent financial crisis explains the evolution of competition in recent years. However, this conjecture are in line neither with economic intuition (Pérez Montes, 2014) nor with studies that document a negative effect (Lapteacru and Lahet, 2014) or an absence of clear impact (Efthymoulou and Yildirim, 2014) of crises on competition .

past ten years with the entry and expansion of banks from West Africa and from Morocco.

This study contributes to the literature in three important ways. First, the degree of competition in the WAEMU has never been investigated due to the lack of data. Second, the evolution of competition over time has been investigated in the case of developed countries but rarely for the developing world, particularly in the case of Africa. Nonetheless, insofar as African banking systems face rapid transformations, it is crucial to gauge its effects in terms of competition. Third, in line with the most recent literature, several measures of competition from the NEIO have been adopted. Each method has its advantages and drawbacks.

Findings highlight that banks operate under imperfect competition in the WAEMU. Data exploration shows that concentration in the WAEMU's banking industry decreased over the second part of the 2000s. However, this trend is less marked than in other African economies. With the exception of the Lerner index, the different empirical assessments of competition (conjectural elasticity, Panzar-Rosse H-statistic, and Boone indicator) show an intensification of competition since the mid-2000s. This period corresponds to the rapid expansion of African banking groups and the relative decline of European banks. The entry of new actors appears to have added a new dynamic to the banking industry in West Africa. One might expect that the level of competition has continued to increase in the most recent period during which these changes have continued and accelerated.

An unresolved question is how the intensification of competition may change the functioning of financial markets in Africa. The performances of African financial industries remains low in comparison with the rest of the world in almost all aspects. Future works should investigate the potential consequences of competition on financial stability, access to finance and bank performance. In this dissertation, the two latter issues are investigated. The impact of market power on bank efficiency in Africa is analyzed in the next chapter. In the final essay, benefiting from large surveys, the consequences of competition on firms' access to credit is under investigation.

Market power and bank efficiency in Africa¹

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¹This chapter is an adapted version of an article submitted to the *Journal of Financial Services Research*.

6.1 Introduction

Despite a decade of expansion, there is concern that the fragile and inefficient banking systems in Sub-Saharan Africa (SSA) are a major hindrance to future growth and economic development on the continent. The African financial sector remains significantly underdeveloped and inefficient by the standards of other developing countries. Furthermore, mismanagement continues to impede the stability of some African banks (Beck et al., 2011b). As a result, how to increase the efficiency of financial intermediation is a key policy challenge. One possible explanation for the poor level of efficiency lies in the lack of competition within African banking systems. However, things are changing. During recent years, African banking systems have been engaged in a process of deregulation, bank privatization and financial liberalization. Meanwhile, ownership structure has undergone significant changes with the penetration of pan-African banks due to consolidation and privatization processes. These recent transformations affect competitive conditions and market power and therefore might impact the efficiency of financial systems in Africa.

Although the issue of bank efficiency is of prime importance, there is a clear gap in empirical works on whether competition in Sub-Saharan Africa has increased the efficiency of the banking system. A common belief, deeply rooted in both academic and policy circles, is that market power in banking is detrimental. Economic literature typically associates higher levels of market power with lower efficiency in production and delivery of financial services. For instance, bank's managers may have fewer incentives to manage the firm efficiently or they may pursue objectives other than the maximization of profit in banks with more market power. Furthermore, managers may devote resources to maintaining and increasing levels of market power. This theory is known in the literature as the *Quiet Life hypothesis* (Hicks, 1935). However, several authors have expressed doubt that more market power automatically implies less efficiency in banking. Banks can acquire more information about borrowers when they exert more market power. On the one hand, competition is likely to be associated with shorter and less stable relationships between customers and banks (Petersen and Rajan, 1995).² On the other hand, banks with market power are likely to increase information acquisition activities (Hauswald and Marquez, 2006) as well as screen loan applicants more efficiently (Broecker, 1990; Marquez, 2002). By facilitating information acquisition, market power promotes an efficient allocation of resources. Consequently, the *Information hypothesis* points to the positive impact of a higher degree of market power on bank efficiency.

The available empirical evidence on the *Quiet Life hypothesis* focuses mainly on developed countries with mixed results. Some papers give support for the *Quiet Life hypothesis* (Berger and Hannan, 1998; Delis and Tsionas, 2009; Casu and Girardone, 2009; Schaeck and Cihák, 2013), while Weill (2004), Maudos and Fernández de Guevara (2007) and Koetter et al. (2012) reject it for the U.S. and European banking

²Boot and Thakor (2000), however, show that banks may decide to lend on a relational basis in order to create a competitive edge with respect to their rivals and insulate themselves from pure price competition.

sectors. Only a handful of papers have examined the relationship between market power and efficiency in the case of developing countries. Turk Ariss (2010) examines this issue for a sample of 60 developing countries. The author finds that banks with higher market power endure cost-efficiency losses but manage to improve their profit efficiency. The relationship between market power and efficiency is implicitly assumed to be the same for all developing countries. However, one might expect that market power may be detrimental for some developing countries and beneficial for others insofar as banking sectors and economic environments differ greatly. Solis and Maudos (2008) and Williams (2012) do not support the *Quiet Life hypothesis* in Latin America, while Fungáčová et al. (2013) find no significant relationship between market power and efficiency in China.³ Lapteacru and Nys (2010) tend to support the *Quiet Life hypothesis* in the case of Central and Eastern European countries. To my knowledge, no paper has studied this issue in the case of African countries. Banks in Africa operate in specific environments, especially the high degree of opacity and uncertainty, that render the consequences of market power undetermined. In particular, the *Information hypothesis* can be particularly relevant in these countries due to the difficulty for lenders to obtain reliable information on borrowers.

This paper fulfills this gap by exploring the implications of market power on bank efficiency in a sample of low-income countries from Africa. The dataset considers 92 banks from seven countries whose are all members of the West African Economic and Monetary Union (WAEMU) over the period 2002-2009. These countries provide an excellent testing ground for the relationship between market power and bank efficiency. Banks represent the main providers of credit to their respective economies. In addition, these banking systems have witnessed substantial change to their structure during the last decade with the expansion of cross-borders banks from Africa. As shown in the previous chapter, the recent transformations of the banking structures have spurred competition among banks, and therefore might affect efficiency.

The econometric analysis is based on the two-step procedure. In the first stage, efficiency scores are computed using the stochastic frontier analysis; and in the second stage, the efficiency scores are explained by market power and control variables. Due to the possibility of reverse causation (Demsetz, 1973), an instrumental method is used in addition to classical OLS regressions. The level of market power is assessed by the Lerner index. The computation of the conventional Lerner index assumes that banks are fully efficient. To circumvent this limiting assumption, Koetter et al. (2012) have developed an efficiency-adjusted Lerner index. Therefore in addition to the conventional Lerner index, the efficiency-adjusted Lerner index is employed.

The findings indicate that banks with more market power are able to reduce costs but do no better at maximizing profits than banks with less market power. Changing the econometric method, the sample or the measure of market power does

³The results from Solis and Maudos (2008) are less clear-cut. The *Quiet Life Hypothesis* is rejected in the deposits market and only weakly accepted in the loans market in Mexico.

not alter the results. The results do not support neither the *Quiet Life hypothesis* nor the *Information hypothesis*. An explanation of these findings is thus suggested. Market power may impact a bank's choice regarding credit allocation that in turn has an effect on both costs and revenues, and therefore profit. Banks with less market power may become niche players. For instance, they may decide to finance opaque borrowers in order to survive. This policy is more costly than serving transparent borrowers but may also generate higher revenues. In order to ascertain the validity of the explanation proposed, two indirect tests are carried out. Both give support to the explanation put forth.

This paper makes several contributions to the literature. First, this study differs from previous works in terms of the sample considered. To my knowledge, no prior research has addressed the complex interaction between market power and efficiency in the low-income countries in general and in Sub-Saharan Africa's banking systems in particular. Several papers have investigated the levels of competition in Africa (cf. section 5.3) or the determinants of bank efficiency (Chen, 2009; Kablan, 2009a,b; Kiyota, 2011). Hauner and Peiris (2008) compared the evolution of both competition and efficiency in Uganda but did not analyze the market power - efficiency nexus directly. To my knowledge, no work has investigated the direct consequences of changes in market power on bank efficiency in Africa or in low-income countries. In addition, the scant literature studying the industrial organization of banking in Africa focuses mainly on a handful of English-speaking countries. However, Chapter 5 points out that the banking systems in the WAEMU are among the least developed and the least efficient banking systems in Africa. These facts might explain why finance is less beneficial to growth and development in these countries (Atindéhou et al., 2005; Assane and Malamud, 2010) and why, despite improvements in fundamentals, long-term growth in the WAEMU has been low in comparison to other Sub-Saharan Africa economies (IMF, 2010). This paper is one of the first analyzing the role of industrial organization in banking in these countries. Finally, the paper also contributes to the literature by suggesting a new explanation for the link between market power and efficiency. The findings are inconsistent with the *Quiet Life hypothesis* and the *Information Hypothesis*. Therefore, an additional channel by which market power may affect cost and profit efficiency is suggested. Banks with less market power may have incentives to serve specific (opaque) borrowers or to offer different products (e.g. loans with longer maturity) to develop a market niche. In turn, a bank's choice regarding portfolio allocation impacts both its costs, revenues and profits. Although the hypothesis put forth is well-fitted for economies considered, the framework can also be extended to other markets.

The remainder of the paper is organized as follows. The data and methodology implemented are described in Section 6.2. The results are presented in Section 6.3. Section 6.4 performs a series of sensitivity checks and Section 6.5 proposes a way to read the findings. The final section draws some conclusions.

6.2 Data and methodology

6.2.1 Data

The data have been obtained from annual individual bank balance sheets and income statements of financial institutions published in the WAEMU Banking Commission's annual reports (CB-UMOA, 2012). The dataset is combined with other information, such as ownership structure of banks, taken from various documents produced by the Central Bank and the Banking Commission. The initial dataset covers all financial institutions in the WAEMU over the period 2002-2009. Some filtering rules are applied. Guinea-Bissau is omitted because only 8 bank-year observations are available. Additionally, banks with less than 3 years of available data were excluded. Finally, observations between the first and last percentile of interest variable were kept in order to avoid the outliers issue. The final sample considers 92 banks in 7 countries. The goal is to assess the impact of market power on efficiency in the case of African countries.

Regarding the econometric analysis, two major questions emerge: (i) what is the best way to measure a bank's efficiency and degree of market power? And, (ii) which econometric model is the best suited?

6.2.2 Bank efficiency

Following the literature, the stochastic frontier analysis is used to model the cost and profit efficiency scores. The stochastic frontier model enables us to take into account the possibility that the deviation between the observed output and the frontier output is due not only to a firm's own inefficiency, but also to stochastic shocks and measurement errors. Cost efficiency gives a measure of how close a bank's cost is to what a best-practice bank's cost would be for producing the same output bundle under the same conditions. It is derived from a cost function in which total costs (C_i) depend on the quantities of outputs (y_i), the prices of inputs (w_i), random error (v_i) and inefficiency (u_i):

$$C_i = C(y_i, w_i, v_i, u_i) \quad (6.1)$$

Following the literature, the intermediation approach is used to define output and inputs used to estimate the cost function (see Box 4.2). Total assets account for the aggregate product of the bank and three inputs are considered: deposits, labor and physical capital. The price of labor is measured by the ratio of personnel expenses to the total number of employees, the price of deposits by the ratio of interest expenses to total funds, and the price of physical capital by the ratio of other expenses (operational and depreciation) to total fixed assets. Total costs are the sum of operational costs and interest costs. A trend is included and interacts with output and input prices to capture the technical change. The country-specific environment conditions could explain large difference in efficiency (Chaffai et al., 2001). Therefore country-dummies are included and interact with output and input

prices.⁴ Finally, a translog specification is used and the estimated cost equation is as follows:⁵

$$\begin{aligned}
\ln(C_{it}) = & \beta_0 + \beta_1[\ln(y_{it})] + \frac{1}{2}\beta_2[\ln(y_{it})]^2 + \sum_{l=1}^3 b_l[\ln(w_{l,it})] + \frac{1}{2} \sum_{l=1}^3 b_{3+l}[\ln(w_{l,it})]^2 \\
& + \sum_{l=1}^3 \beta_{2+l}[\ln(y_{it})][\ln(w_{l,it})] + \sum_{l \neq l'} b_{6+l}[\ln(w_{l,it})][\ln(w_{l',it})] \\
& + \gamma_1 T + \frac{1}{2}\gamma_2 T^2 + \gamma_3 T[\ln(y_{it})] + \sum_{l=1}^3 \gamma_{3+l} T[\ln(w_{l,it})] + \sum_{j=2}^J \delta_j C_j \\
& + \sum_{j=2}^J \zeta_j C_j [\ln(y_{it})] + \sum_{j=2}^J \sum_{l=1}^3 \kappa_{jl} C_j [\ln(w_{l,it})] + v_{it} + u_{it} \tag{6.2}
\end{aligned}$$

where i , j , t , and l refer to bank, country, period and input respectively. C is the total costs, w_l the price of the l^{th} inputs, y total assets, T a trend, and C_j the country-dummies. The error term is broken down into two parts: the first part of the term (v_{it}) captures well-behaved disturbance and follows a symmetric normal distribution. The second part of the error captures cost efficiency and follows a positive half-normal distribution (u_{it}).

Profit efficiency measures how close a bank is to producing the maximum possible profit, given a particular level of input prices and output prices. It is a broader concept than cost efficiency since it takes into account the effects of choosing the vector of production on both costs and revenues; it therefore incorporates both cost minimization and revenue maximization (Berger and Humphrey, 1997). Using the standard profit efficiency measure requires many strong assumptions, in particular perfect competition in output market (Berger and Humphrey, 1997). The alternative profit specification proposed by Humphrey and Pulley (1997) is therefore adopted. The alternative profit function explains profits by the quantities of output, input prices, random errors and inefficiency.

$$\pi_i = \pi(y_i, w_i, v_i, u_i) \tag{6.3}$$

where π_i is the profit. The specification is identical to the cost function (Eq. 6.2) but the dependent variable is the profit before tax and the sign before u_{it} is negative.

Following Jondrow et al. (1982), the specific inefficiency term for each bank i can be estimated as the conditional expectation of the inefficiency term, given the composite error term as follows:

$$E(u_i | \varepsilon_i) = \frac{\sigma \lambda}{1 + \lambda^2} \left[\frac{\phi(\varepsilon_i \lambda / \sigma)}{\Phi(-\varepsilon_i \lambda / \sigma)} - \frac{\varepsilon_i \lambda}{\sigma} \right] \tag{6.4}$$

⁴Due to the lack of data by country, we are unable to obtain accurate estimations of country-specific frontier.

⁵We apply standard restrictions of linear homogeneity in input prices and symmetry of the second order parameters.

where $\sigma^2 = \sigma_u^2 + \sigma_v^2$ is the total variance; $\lambda = \sigma_u/\sigma_v$; $\phi(\cdot)$ is the density of the standard normal distribution and $\Phi(\cdot)$ is the cumulative density function.

6.2.3 Market power measures

In the academic sphere there has been great interest in the measurement of the degree of competition in banking markets. In recent years a substantial number of studies have appeared that employ different indicators of market power or competition (cf. Chapter 4). No consensus prevails in the literature. However, market power is generally assessed by computing the Lerner index (Fernández de Guevara et al., 2005; Berger et al., 2009; Turk Ariss, 2010; Fungáčová et al., 2013, among others). The Lerner index has the advantage of being a firm specific measure of market power and of changing over time. It is obtained by computing the disparity between price (p_{it}) and marginal costs (MC_{it}) relative to the price. The conventional Lerner index of market power is defined as:

$$L_{it} = \frac{p_{it} - MC_{it}}{p_{it}} \quad (6.5)$$

The price is computed by the average revenue and the marginal cost is obtained from the estimation of the cost function without inefficiency as follows:⁶

$$MC_{it} = \left(\beta_1 + \beta_2[\ln(y_{it})] + \sum_{l=1}^3 \beta_{2+l}[\ln(w_{l,it})] + \gamma_3 T + \sum_{j=2}^J \zeta_j C_j \right) \frac{TC_{it}}{y_{it}} \quad (6.6)$$

The conventional Lerner index estimations can beget a potential problem as the conventional Lerner index implicitly assumes full bank efficiency. In the footsteps of Koetter et al. (2012), an efficiency-adjusted Lerner index is computed from a single structural model. To deal with both cost and profit efficiencies, the stochastic frontier approach is used. Using the estimated profit ($\hat{\pi}_{it}$), the estimated total cost (\hat{C}_{it}), and the corresponding marginal cost function from Eq. 6.2, the efficiency-adjusted Lerner index can be written as:

$$L_{it}^{EA} = \frac{\hat{AR}_{it} - \hat{MC}_{it}}{\hat{AR}_{it}} = \frac{[\hat{\pi}_{it} + \hat{C}_{it}]/y_{it} - \hat{MC}_{it}}{[\hat{\pi}_{it} + \hat{C}_{it}]/y_{it}} \quad (6.7)$$

where AR_{it} denotes the average revenues and y_{it} the total assets. Contrary to the conventional Lerner, the efficiency-adjusted Lerner accounts for inefficiency. Thus it provides a better basis for the examination of the implications of the degree of market power on efficiency.

6.2.4 Control variables

A set of bank- and country-specific variables are included to take into account the omitted variable issue. The market share (MS) and the share of capital owned by

⁶Computing separate Lerner indices for loans and deposits markets provide very similar value.

the State (*State*) and by foreigners (*Foreign*) for each bank is included to control whether size and ownership matter. Banks exposed to greater competition are more likely to venture into nontraditional banking activities (Koetter et al., 2012). The income diversification index (*IDI*) proposed by Laeven and Levine (2007) is thus included. The *IDI* takes values between 0 and 1 and increases with the degree of diversification. Building bricks-and-mortar branches in a remote market is another way of extracting market power. The bank branch network could have a negative (or positive) impact on efficiency, depending on the coordination and organizational problems (or opportunities). Hence, the number of bank branches (*Branches*) is include (in log) to capture the impact of bank branches on efficiency. The ratio of non-customer loans to total assets (*LiqRisk*) holds credit and illiquidity risks. The credit risk is taken into account by including the ratio of loans to total assets (*CreditRisk*). Finally, the ratio of equity to total assets (*E/TA*) accounts for leverage and capitalization, reflecting differences in the risk preferences across banks. As discussed in the final section, these proxies are imperfect and fail to catch the structure of portfolio. The descriptive statistics are presented in Table 6.1.

Table 6.1: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max	5th Perc.	95th Perc.
Cost Efficiency	439	0.8635	0.0508	0.5511	0.9609	0.7705	0.9303
Profit Efficiency	425	0.7523	0.1280	0.0739	0.9710	0.4958	0.8756
Lerner	439	0.3068	0.2161	-1.9832	0.6773	-0.0238	0.5174
Adj. Lerner	439	0.3641	0.1822	-0.2904	0.8741	0.0405	0.6472
Market Share	439	9.2199	8.2135	0.3003	41.5348	0.7644	25.1743
Foreign	439	0.6125	0.3368	0	1	0	1
State	439	0.1311	0.2347	0	1	0	0.6149
IDI	439	0.7423	0.1810	0.1196	0.9995	0.4040	0.9797
Branches	439	11.726	14.285	0	119	1	36
LiqRisk	439	0.7452	0.1303	0.2037	0.9848	0.4877	0.9292
CreditRisk	439	0.7944	0.0964	0.2916	0.9583	0.6297	0.9127
E/TA	439	0.0918	0.1341	-0.8515	1.2521	-0.0658	0.2294

6.2.5 Empirical model

Following the literature (Turk Ariss, 2010; Koetter et al., 2012), a two-step approach is adopted to test whether competition results in poorer or higher efficiency, and to evaluate how strong this relationship might be. In the first stage, the efficiency scores are computed, and in the second stage the efficiency scores are explained by market power and control variables. The second stage takes the following linear

form:⁷

$$Efficiency_{it} = \alpha + \beta Lerner_{it} + \sum_{i=1}^n \gamma_i Z_{it} + \mu_t + \omega_{it} \quad (6.8)$$

where the dependent variable $Efficiency_{it}$ is the efficiency level (cost and profit efficiency score), $Lerner_{it}$ the measure of market power (conventional Lerner and efficiency-adjusted Lerner), Z_{it} a vector of control variables (see above). All time-varying factors that could affect the relationship are captured through the insertion of year-dummy variables (μ_t). Subscripts i and t refer to bank and period respectively and ω_{it} is a random error term. In addition to the OLS specification, the within estimator is used to control for unobserved time invariant banks heterogeneity. A negative β coefficient will indicate support for the *Quiet Life hypothesis*, while a positive coefficient is suggestive of the *Information hypothesis*.

The correction proposed by Koetter et al. (2012) and the inclusion of control variables do not completely solve the endogeneity issue. As stated by the proponents of the efficiency-structure hypothesis (Demsetz, 1973), efficiency may affect market power. Most efficient firms can gain market share and therefore leading to higher level of concentration and market power. To ensure that the direction of causality runs from market power to bank efficiency I use an instrumental variables approach. Finding relevant instruments is a challenge due to the lack of data. The instruments should explain the variation in market power (strong hypothesis) and their impact on efficiency should go through market power exclusively (exogenous hypothesis).⁸ The entries of new banks are used as an instrument. The entrant generally adopts aggressive behavior to gain market share. This strategy reduces the market power of incumbent banks. The number of entries in the national market is weighted for each bank by the percentage of branches located in the economic capital. The impact of entry is more intense for incumbent banks that concentrate their activities in the major markets insofar as entrants generally locate their branches in the major

⁷Wang and Schmidt (2002) explain that two-step procedures may be biased if variables are omitted. However, using a one-step method is an artificial solution when the Lerner index is employed. To compute the Lerner index, the cost function should be estimated in the first step to extract marginal costs. Another issue is related to the estimation technique. Since bank efficiency scores are bound between 0 and 1, Tobit model is appropriate. However, the efficiency scores are not generated by a censoring process but are fractional data. The ordinary least squares method is thus a consistent estimator (McDonald, 2009). Another advantage of the linear model is the ability to easily address both the panel dimension and the endogeneity issue. The way to estimate a panel Tobit with endogenous variable is not well-defined in the literature.

⁸Ideally, variables which are bank-specific and vary over time should be used. For instance, bank market power may be explained by a bank's reputation or location in the territory. However, it is difficult to get a good proxy of reputation or location that is also exogenous and varies over time. In the literature, bank market power is often instrumented by changes in the supervisory and regulatory framework (Berger et al., 2009). I cannot use this instrumental strategy as the banks within the WAEMU share a common supervisory and regulatory framework. A change in legislation impacts all banks in the same way at the same time. Even if the regulatory framework is similar, the market structures of each national market differ. The usual structural measures such as the Herfindahl-Hirschman Index cannot be used. Demsetz (1973) has shown that market structure is not exogenous. The most efficient bank may become the largest and the market structure may become concentrated.

city. The potential drawback concerns the exogeneity of the entries. In particular, a third factor can impact both entries into the market and bank efficiency. Owing to the inclusion of the time and country dummies, the unobserved factor must be country-year specific. For instance, a major economic disaster (such as the drought in Niger) or a political event (in Côte d'Ivoire or Togo) can impede potential entry and impact the efficiency of incumbent banks. However, it is unlikely that a third factor would impact the results. The number of entries appears to be driven more by regional waves than by specific country factors. To reinforce the instrument strategy, the classical panel literature is followed and the lagged value of the Lerner index is added. This variable impacts bank efficiency through its effects on bank market power. Moreover, it largely explains the variation in the endogenous variables.

Finally, insofar as the dependent variables are generated, the standard errors are bootstrapped in different specifications (Pagan, 1984). They are also clustered by bank to account for heteroscedasticity.

6.3 Results

I present in the Appendix the evolution of the weighted Lerner indices and weighted efficiency scores for each of the WAEMU's countries, as well as the estimations of cost and profit function (pages 183-184). The highest values of the Lerner index during the period correspond to Togo and Niger. At the opposite extreme are the Côte d'Ivoire and Senegal, with low levels of market power. Market power has increased in Benin, Senegal and Togo and decreased in Mali. The evolution of the average Lerner index is non monotonic in Burkina-Faso and Côte d'Ivoire and quite stable in Niger. While cost efficiency levels are closely aligned across countries, profit efficiency levels exhibit greater disparity. Average cost efficiency is quite stable and ranges around an average level of 86%. Average profit efficiency has decreased in Benin, Burkina and Niger, while its evolution in other countries is less clear-cut. In the Appendix (page 185), the pairwise correlations are reported. Both conventional- and efficiency-adjusted Lerner indices are strongly and positively correlated with the cost efficiency scores. The correlations between the profit efficiency scores and the Lerner indices are positive, albeit lower.

Table 6.2 presents the baseline results. The table shows results for: (i) cost and profit efficiency as dependent variables, (ii) conventional- and efficiency-adjusted Lerner indices, and (iii) with and without taking into account the unobserved banks' heterogeneity (within and OLS, respectively). The empirical estimation supports a positive association between a bank's degree of market power and its level of cost efficiency. The positive relationship holds across different specifications. Including the unobserved bank heterogeneity by employing the within estimator does not change the coefficients. Economically, the impact is also significant: an increase of 1% in the adjusted-Lerner index determines an increase of 8% in the cost efficiency. The same increase in the conventional-Lerner induces an increase of 4% in the cost efficiency.

Table 6.2: Market power and bank efficiency

	<i>Dependent variable: Cost Efficiency</i>				<i>Dependent variable: Profit Efficiency</i>			
	Lerner		Adjusted Lerner		Lerner		Adjusted Lerner	
	OLS	Within	OLS	Within	OLS	Within	OLS	Within
Lerner	0.108*** (4.35)	0.114*** (4.89)	0.187*** (7.24)	0.217*** (7.63)	0.089* (1.85)	0.084 (1.21)	0.050 (0.89)	0.036 (0.38)
MS	0.001 (1.33)	0.003*** (3.34)	0.001** (2.16)	0.001* (1.71)	0.001 (0.69)	-0.003 (-0.73)	0.001 (1.06)	-0.004 (-0.82)
Foreign	0.002 (0.22)	-0.010 (-1.21)	0.008 (0.85)	0.002 (0.19)	0.028 (0.89)	0.055 (0.84)	0.030 (0.91)	0.057 (0.85)
State	-0.019 (-0.86)	-0.049 (-1.46)	-0.016 (-0.71)	-0.029 (-0.76)	-0.024 (-0.43)	0.105 (0.97)	-0.030 (-0.51)	0.101 (0.98)
IDI	-0.060*** (-3.18)	-0.030 (-1.08)	-0.053*** (-3.32)	-0.036* (-1.87)	0.024 (0.51)	-0.034 (-0.62)	0.030 (0.62)	-0.037 (-0.62)
Branches	-0.007 (-1.38)	-0.020*** (-3.85)	0.0055 (1.15)	-0.004 (-0.74)	-0.007 (-0.55)	0.009 (0.45)	-0.003 (-0.26)	0.012 (0.71)
LiqRisk	-0.065*** (-2.79)	-0.069** (-2.47)	0.000 (0.00)	0.016 (0.95)	0.011 (0.22)	0.112* (1.80)	0.041 (0.85)	0.147** (2.25)
CreditRisk	-0.014 (-0.35)	-0.005 (-0.09)	-0.025 (-0.70)	0.011 (0.41)	0.189** (2.05)	0.203 (1.35)	0.191** (2.13)	0.216 (1.53)
Equity	0.088*** (3.08)	0.049 (1.38)	0.057*** (2.15)	0.027 (0.78)	0.202* (1.71)	0.142 (0.85)	0.217* (1.80)	0.147 (0.95)
Dummies								
- Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
- Country	Yes	No	Yes	No	Yes	No	Yes	No
Obs.	439	439	439	439	425	425	425	425
# Banks	90	90	90	90	90	90	90	90
Adj. R ²	0.346	0.640	0.458	0.717	0.097	0.259	0.080	0.249

The dependent variables are the cost and profit efficiency score. Higher values of cost (profit) efficiency scores indicate better cost (profit) efficiency levels. All models are run with bootstrapped standard errors clustered by bank (t-statistics reported in parentheses). *, ** and *** indicate significance at the 10%, 5% and 1% respectively.

While banks with more market power are more effective in terms of costs, it is important to assess whether they are able to generate more revenue and profit. The sign of the coefficients of the Lerner index is positive but not significant at the usual thresholds. The lack of significance of the variables can be explained by weaker explanatory power of the model but also by weaker impact of market power on profit efficiency. Even if the econometric significance is not taken into account, the economic impact of the Lerner indices is reduced. For instance, an increase of 1% in the Lerner index determines an impact on profit efficiency ranging from 1.5% (adjusted-Lerner) to 3% (conventional-Lerner).

Due to reverse causation, estimations are subject to the endogeneity issue. Therefore, the instrumental variables method is applied to control for any endogeneity with respect to the Lerner index. The results are reported in Table 6.3. Before analyzing the results of the estimation it is important to analyze the validity of instrumentation. The conventional tests procedure is used to gauge the validity and relevance of the instruments. These tests are presented at the bottom of the table for each specification. Using the Hansen overidentification test (OIR) test, the null hypothesis that the instruments are not correlated with the residual is not rejected. Furthermore the Cragg-Donald test rejects the null hypothesis of under-identification (not reported). To determine the relevance of the instruments, the F-statistics associated with the instruments in the first stage are used. The first stage F-statistic tests (Cragg-Donald F-statistic) the hypothesis that the coefficients on all the excluded instruments are zero in the first stage regression of the endogenous regressor on all instruments. [Staiger and Stock \(1997\)](#) determine a simple rule of thumb. The F-statistic must exceed 10 to avoid the weak instrument issue. The weak identification test proposed by [Stock and Yogo \(2005\)](#) is also used. Both the Kleibergen-Paap rank Wald F statistic and the Stock-Yogo critical value for a relative bias of 10% are reported. The different specifications pass the test with the exception of the IV-within model with efficiency-adjusted Lerner indices. In this case, the set of instruments is weakly correlated with the endogenous regressors as the Cragg-Donald F-statistics and the Stock-Yogo weak identification test show. This raises concerns about the validity of instrumentation in this case.

The findings are in line with previous results from OLS estimations. The results show that the signs and statistical significance of the Lerner indices are maintained in almost all specifications when interest variable is instrumented. According to the Durbin-Wu-Hausman tests of endogeneity, the efficiency-adjusted Lerner index is not subject to endogeneity and the OLS estimator is more relevant. On the contrary, the conventional Lerner index is endogenous.⁹ Nonetheless the signs and coefficients associated with the Lerner index remain quite similar than to the OLS specifications. To summarize, the findings from the IV estimations confirm the results in OLS specifications. Put differently, banks with more market power are able to reduce costs but do no better than other banks at maximizing profits.

⁹The fact that efficiency-adjusted Lerner are not infected by endogeneity contrary to conventional Lerner is not surprising. The efficiency-adjusted Lerner index inhibits the bias in the measurement of the Lerner index due to inefficiency ([Koetter et al., 2012](#)).

Table 6.3: Market power and bank efficiency, IV estimations

	<i>Dependent variable: Cost Efficiency</i>				<i>Dependent variable: Profit Efficiency</i>			
	Lerner		Adjusted Lerner		Lerner		Adjusted Lerner	
	IV	IV-Within	IV	IV-Within	IV	IV-Within	IV	IV-Within
Lerner	0.083*** (3.48)	0.075** (2.35)	0.133*** (3.20)	0.178 (1.07)	0.003 (0.06)	-0.053 (-0.49)	0.052 (0.41)	-0.280 (-0.35)
Market Share	0.001 (1.52)	0.003*** (2.78)	0.001** (2.33)	0.002 (1.10)	0.002 (1.07)	-0.003 (-0.82)	0.002 (1.04)	-0.001 (-0.07)
Foreign	0.002 (0.20)	-0.011 (-0.89)	0.006 (0.63)	-0.000 (-0.01)	0.028 (0.86)	0.055 (1.00)	0.028 (0.93)	0.039 (0.48)
State	-0.022 (-0.91)	-0.054 (-1.46)	-0.020 (-0.88)	-0.036 (-0.74)	-0.033 (-0.58)	0.091 (0.69)	-0.030 (-0.50)	0.061 (0.27)
IDI	-0.059*** (-3.13)	-0.033 (-1.49)	-0.053*** (-3.47)	-0.036 (-1.63)	0.030 (0.61)	-0.037 (-0.46)	0.030 (0.61)	-0.026 (-0.25)
Branches	-0.007 (-1.24)	-0.020*** (-3.47)	0.002 (0.40)	-0.006 (-0.47)	-0.006 (-0.50)	0.011 (0.53)	-0.003 (-0.23)	-0.009 (-0.14)
LiqRisk	-0.060** (-2.57)	-0.057** (-2.20)	-0.012 (-0.56)	0.007 (0.15)	0.029 (0.58)	0.156* (1.88)	0.042 (0.77)	0.077 (0.37)
CreditRisk	-0.012 (-0.30)	0.001 (0.01)	-0.019 (-0.50)	0.011 (0.26)	0.195** (2.16)	0.222* (1.69)	0.191** (2.05)	0.210 (1.09)
E/TA	0.096*** (3.24)	0.052 (1.33)	0.076*** (2.59)	0.032 (0.61)	0.233* (1.88)	0.157 (0.91)	0.217* (1.73)	0.189 (0.65)
Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
- Year	Yes	No	Yes	No	Yes	No	Yes	No
- Country	439	439	439	439	425	425	425	425
# Banks	92	92	92	92	92	92	92	92
Adj- R ²	0.367	0.306	0.460	0.463	0.122	0.068	0.124	0.009
Cragg-Donald F-st.	188.2	92.51	52.38	3.57	187.5	99.68	53.37	2.92
KP test	188.2	19.06	52.38	2.720	187.5	19.25	53.37	1.715
[Stock-Yogo CV]	[19.93]	[19.93]	[19.93]	[19.93]	[19.93]	[19.93]	[19.93]	[19.93]
OIR test (p-value)	0.48	0.32	0.91	0.31	0.29	0.42	0.25	0.48
DWH test(p-value)	0.01	0.02	0.03	0.89	0.00	0.02	0.98	0.45

The dependent variables are the cost and profit efficiency score. Higher values of cost (profit) efficiency scores indicate better cost (profit) efficiency levels. All models are run with bootstrapped standard errors clustered by bank (t-statistics reported in parentheses). *, ** and *** indicate significance at the 10%, 5% and 1% respectively. Cragg-Donald F-st. test the hypothesis that the coefficients on all the excluded instruments are zero in the 1st stage regression of the endogenous regressor on all instruments. KP test refers to Kleibergen-Paap weak-identification statistic. The test is used to test that the equation is only weakly identified (null hypothesis). The critical value for a 10% is reported in square brackets (Stock and Yogo CV). The Sargan/Hansen test (OIR test) is a test of overidentification restrictions. The Durbin-Wu-Hausman test (DWH test) is an Hausman-type test. Under the null hypothesis, OLS performs better than instrumental specification.

Regarding the rest of the explanatory variables, several results are interesting. The income diversification has a negative impact on cost efficiency but not a statistically significant effect on profit efficiency. This result is not in line with previous investigation on emerging countries (Sanya and Wolfe, 2011). Large banks are more efficient in reducing costs but unable to produce higher profits than other banks. In line with a previous study regarding the determinants of efficiency in West-African countries (Kablan, 2009b), the foreign banks are not more efficient. A plausible explanation is that *Foreign* variable does not account for the origins of ownership. In the WAEMU, many foreign-owned banks originate from Africa and we could expect that African foreign-owned banks behave more like local banks than European banks.

6.4 Sensitivity analysis

The robustness of the baseline econometric results is examined in a number of additional ways.¹⁰ First, the findings may be driven by the sample considered. One might be concerned that relationship between efficiency and market power could be guided by one year and/or by country. The model for each country is rerun separately. With the exception of the Togo, market power is positively related to the level of cost efficiency but unrelated to profit efficiency. The model is rerun year by year and the results initially obtained are confirmed.¹¹ The findings are also checked by running a cross-section analysis and the main findings are unchanged. One might also be concerned that large and small banks behave differently in the credit market. This could explain why the results from Turk Ariss (2010) differ from my results. Indeed Turk-Ariss uses the Bankscope database that does not include all banks in each country. To take this possibility into account, the model is run by keeping the 25 largest banks. Once again, the econometric results are unchanged. The Lerner index explains the cost efficiency positively but has no impact on profit efficiency.

Some authors argue that the linear model is not adapted to examine the determinants of efficiency. Thus, the Tobit model is implemented instead of linear regression. Next the logistic transformation of the dependent variable is used. The conclusions are not altered. Following Turk Ariss (2010), a quadratic term for the Lerner index is also included to allow a nonlinear relationship between market power and efficiency. The results give no reason to favor this specification. In addition, a dynamic panel model has been estimated in order to take into account the potential inertia of efficiency scores which could bias the results. For this purpose, the methodology proposed by Blundell and Bond (1998) is employed (the "system GMM" estimator). Findings show that the inclusion of an inertia term provides no additional information. The coefficient associated to the lagged value of dependent

¹⁰The results are not reported in order to conserve space but are available upon request.

¹¹It should be noted that the two tests presented should be treated with caution owing to the small sample used.

variable is not significant.

Furthermore, the frontier estimations may drive the results. To take this criticism into account, the frontiers are estimated by using an exponential distribution of the inefficiency instead of a half-normal function. The unique output (total assets) is also replaced by four outputs: inter-bank lending, customer loans, other earning assets and deposits. The findings are not significantly changed.

Finally, one might argue that the results are simply driven by the monopsony power of the banks. A bank in a monopsony automatically presents a higher Lerner index and lower costs. Hence, the relationship between cost efficiency and Lerner index could be driven by a bank's ability to reduce rates pay to depositors. To tackle this issue, the financial costs and price of deposits are excluded in the estimation of the cost frontier and Lerner construction. The previous findings are maintained.

6.5 Discussion of the results

Findings suggest that banks with more market power are able to reduce costs and achieve higher cost efficiency levels compared to their peers. However, banks with more market power are unable to produce higher profits than other banks. These robust results are somewhat counterintuitive and do not support neither the *Quiet Life hypothesis* nor the *Information hypothesis*. In this section, a hypothesis explanation is put forth. The idea is that a bank with less market power develops a market niche by serving specific borrowers or by offering risky products. The bank's strategy in turn has an impact on cost and revenues, and therefore on cost and profit efficiency scores.

Banks are particularly reluctant to finance opaque sectors and firms due to the difficulty of mitigating informational asymmetry, especially in less mature credit markets. For instance, in Africa some sectors such as agriculture and most opaque firms cannot get loans from commercial banking systems and long-term loans remain exceptional. Insofar as banks are risk-averse, banks with more market power have few incentives to expand outside their comfort zone (credit to State or to transparent firms, loans with short-term maturity). By contrast, banks with less market power need to develop a niche market in order to survive. It is difficult for not well-established banks to compete with their rivals in the traditional sectors. Therefore they target other segments of the market not already served by the well-established banks such as loans to specific sectors (e.g. agriculture) or provisions of long-term loans.¹² This strategy of expansion is risky, albeit viable.

A bank's choice regarding the structure of credit impacts its costs and revenues, and therefore its profits. For instance, lending to opaque borrowers and serving affiliates of multinational firms' requires different lending technologies. Financing transparent companies is less costly than lending to opaque borrowers. Due to

¹²In a dynamic perspective, the same argument can apply. Banks that experienced a thinning of margins in the traditional sectors due to intensified competition can become more active in other segments of the market. [Berg and Fuchs \(2013\)](#) document that competition in traditional segments of the credit market is a strong determinant of a bank's involvement with SMEs in Africa.

information asymmetry, a bank has to acquire information about opaque borrowers by using soft information that requires frequent and personal contacts before and during the life of the loan. On the contrary, financing large companies is based on quantitative and objective information that is less costly and easier to obtain and exploit (Petersen, 2004). In terms of revenue, the link might be inverted. Less conservative banks can earn higher revenues. Loans to opaque borrowers have higher interest rates than other types of loans not only because they are more costly. Opaque borrowers face credit rationing. They thus agree to pay higher interest rates because the marginal productivity of capital is also higher. From in-depth studies in five Sub-Saharan countries, Berg and Fuchs (2013) note that the contribution of Small- and Medium-sized Enterprises (SMEs) to a bank's net income is higher than the share of SME lending, underlining the high profitability of SME portfolios. As a consequence, the effect of a bank's strategy on its profit is unclear. A bank's strategy can also differ in other dimensions such as loan maturity.

In frontier analysis, it is generally impossible to get clear information about the structure of credit in terms of maturity or borrower characteristics. The structure of credit is a black box. A bank's risk-profile is often taken into account indirectly by proxies such as the ratio of equity to total assets or the ratio of loans to total assets. These variables, however, cannot capture a bank's strategy in terms of credit allocation (type of borrowers, maturity, etc.), while these characteristics affect costs and bank revenue and so cost and profit efficiency scores.

The hypothesis argues that market power impacts cost and profit efficiency through its impact on banks' strategy about credit. In order to provide support for the explanation suggested, I run two indirect tests. Due to the lack of data, the effect of credit structure on efficiency cannot be tested.¹³ Nonetheless, I investigate the second channel from market power to banks' strategy. If banks with less market power adopt riskier strategies by expanding activities outside traditional segments, financial stability would be positively correlated with market power. The implications of market power on bank stability are analyzed by using bank-level data. Following the literature (Berger et al., 2009), bank risk is assessed by the Z_{score} . A higher Z_{score} indicates that the bank is more stable. As expected, the results, reported in Table 6.4, point to a significant and positive relationship between a bank's degree of market power and its level of stability across all specifications. Employing the risk-adjusted measure of return on assets instead of Z_{score} provides the same conclusion.

¹³Future research benefiting from richer dataset may directly analyze the relationship between structure of credit and efficiency.

Table 6.4: Market power and bank stability

	Dependent variable: Z_{score}				Dependent variable: ROR			
	Lerner		Adjusted Lerner		Lerner		Adjusted Lerner	
	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]
Lerner	52.51** (2.09)	58.68** (2.59)	96.85 (1.42)	86.76* (1.66)	10.61*** (2.92)	8.583*** (3.46)	15.02** (2.53)	12.72** (2.61)
Market Share	0.683 (0.54)	0.434 (0.33)	1.255 (1.09)	0.876 (0.73)	0.218** (2.35)	0.288*** (3.43)	0.342*** (3.90)	0.352*** (4.02)
Foreign	-2.387 (-0.20)	-2.822 (-0.24)	-0.913 (-0.08)	-3.588 (-0.34)	-1.916 (-1.14)	-1.436 (-0.93)	-1.786 (-1.06)	-1.546 (-1.03)
State	-18.65 (-0.75)	-19.89 (-0.81)	-15.75 (-0.61)	-17.94 (-0.73)	-7.463* (-1.87)	-7.838* (-1.95)	-7.116* (-1.93)	-7.552** (-2.02)
IDI	-14.12 (-0.53)	-18.70 (-0.76)	0.754 (0.03)	-7.599 (-0.29)	1.265 (0.32)	2.096 (0.60)	4.241 (1.13)	3.719 (1.16)
Branches	9.957 (0.85)	11.90 (1.00)	15.93 (0.98)	20.69 (1.25)	1.464 (1.20)	0.647 (0.78)	2.254* (1.68)	1.935* (1.92)
LiqRisk	22.63 (0.37)		76.62 (1.13)		-11.28 (-1.18)		-1.298 (-0.16)	
CreditRisk	17.14 (0.33)		25.07 (0.48)		2.759 (0.34)		4.312 (0.56)	
Equity	23.19 (0.53)		11.15 (0.24)		-5.824 (-0.89)		-6.402 (-0.93)	
# banks	85	85	85	85	85	85	85	85
R^2	0.1958	0.1934	0.3621	0.3470	0.2078	0.1950	0.3569	0.3491
F-statistic	3.13***	3.67***	7.80***	9.58***	3.41***	3.86***	7.53***	8.89***

The dependent variables are the Z-score and risk-adjusted measure of return on assets (ROA). The Z_{score} equals the average return on assets (ROA) plus the average equity to total assets (E/TA) divided by the standard deviation of asset returns (σ_{ROA}): $Z_{score} = [ROA + E/TA]/\sigma_{ROA}$. The risk-adjusted measure of return on assets (ROA) is defined as follows: $ROA = ROA/\sigma_{ROA}$. Higher values of dependent variables indicate more stability. Robust t-statistics are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% respectively.

Table 6.5: Competition and credit allocation

	Dependent variable: % of loans to Government				Dependent variable: % of long-term loans			
	HHI		Lerner		HHI		Lerner	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
HHI	0.015* (2.10)	0.010*** (11.05)			-0.002* (-2.16)	-0.003 (-1.96)	-0.130** (-3.27)	-0.149** (-3.59)
Lerner			0.265 (1.15)	0.259** (2.81)				
Ln(GDPpc)		39.95 (1.75)	41.67 (1.83)	41.67 (1.83)	4.122 (0.72)	4.122 (0.72)	2.300 (0.56)	2.300 (0.56)
Growth		-0.443 (-1.46)	-0.541 (-1.80)	-0.541 (-1.80)	0.0399 (0.38)	0.0399 (0.38)	0.0801 (0.83)	0.0801 (0.83)
Inflation		0.824* (2.25)	0.766* (2.37)	0.766* (2.37)	0.104** (3.55)	0.104** (3.55)	0.0771 (1.39)	0.0771 (1.39)
Rule of Law		-5.596 (-1.42)	4.297 (0.76)	4.297 (0.76)	0.517 (0.48)	0.517 (0.48)	-2.767** (-2.70)	-2.767** (-2.70)
Pop.		-0.013*** (-5.31)	-0.016*** (-5.40)	-0.016*** (-5.40)	-0.000 (-0.41)	-0.000 (-0.41)	0.001 (1.07)	0.001 (1.07)
Obs.	48	48	48	48	48	48	48	48
Adj. R ²	0.359	0.772	0.123	0.718	0.284	0.262	0.243	0.300

The dependant variables are the bank provision of credit to government and State-owned enterprises to the total credit and the share of long-term loans to total loans. Country and year dummies are included. The other covariates are the logarithm of the GDP per capita (GDPPC extracted from WDI), Growth (WDI), Inflation (WDI), Rule of Law (extracted from the WGI) and the population (WDI). All models are run with clustered errors by country (t-statistics reported in parentheses). *, ** and *** indicate significance at the 10%, 5% and 1% respectively.

The second test directly investigates the relationship between market power and credit structure. Detailed information on credit structure by bank was not available but the Central Bank publishes the distribution of credit by borrower type and maturity at the country level. Thus, the share of credit to government and State-owned enterprises to total credit and the share of long-term loans to total loans to the level of market power (and other country's characteristics) is provided. One would expect banks to have more incentives to finance opaque borrowers or to provide more long-term loans in markets with lower levels of market power. The Hirschman-Herfindahl index (HHI) and weighted average of the Lerner index are used to proxy the average degree of market power. As expected, the results, presented in Table 6.5, show that the share of credit to government increases with the level of market power, while the share of long-term loans is negatively correlated with the level of market power.¹⁴ Both indirect tests, without proving the hypothesis suggested, are in line with the explanation proposed.

6.6 Conclusion

This paper estimates a path by which market power affects financial performance and stability in Africa. Market power may influence the efforts of managers to control costs and generate profits. With this aim, the work investigates the impact of a bank's degree of market power on cost and profit efficiency in a sample of African countries. The sample considers 92 banks from seven countries of the West African Economic and Monetary Union over the period 2002-2009. The stochastic frontier analysis method is used to compute the cost and profit efficiency scores. Market power is assessed by the Lerner index. Insofar as the Lerner index measure is sensitive to the level of efficiency, adjusted-Lerner index is computed, initially proposed by Koetter et al. (2012). Efficiency scores are regressed on the Lerner index and other control variables.

The findings indicate that banks with more market power are able to reduce costs but do no better than other banks at maximizing profits. Findings survive multiple robustness checks. Next, a possible explanation of the results is suggested. Market power may impact a bank's choice regarding the structure of credit. Banks with lower levels of market power can develop niche market strategies by providing funds to opaque firms or offering new services. The structure of credit in terms of borrower type or maturity can in turn affect the level of cost and revenue and therefore the cost and profit efficiency scores. Two indirect tests on the relationship between market power and bank credit strategy are provided. Both provide support for the hypothesis suggested.

Future works are needed to explain the absence of consensus regarding the market power - efficiency nexus. The literature provides very mixed results, both in industrialized and developing countries. Some papers give support for the *Quiet*

¹⁴Due to the few number of observations, a large set of control variables could not be included. The results should be considered as simple correlations.

Life hypothesis, while other works find the opposite or the absence of effect. Future research should solve this puzzle by understanding in which circumstances market power enhances, or hinders, efficiency in banking. The relationship between market power and efficiency is certainly driven by bank's and country's characteristics. In particular, it could be interesting to investigate the relationship between market power and efficiency in other low-income countries.

From a policy perspective, these findings suggest that competitive pressure in low-income countries plays a positive role on financial inclusion. Cull et al. (2013) document that the competitive pressure due to the presence of banks is associated with microfinance pushing toward poorer markets. In this work, I point out that banks tend to have more incentives to finance opaque consumers when margins in the traditional sector are thinning. Future research are needed to confirm the positive impact of competition on financial inclusion in low- and middle-income countries. Both the theoretical and empirical literature is ambiguous on this subject, as documented in section 3.3. In the next chapter, this issue is explicitly investigated by employing a rich database covering 70 developing countries.

Bank competition and credit constraints in developing countries: New evidence

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7.1 Introduction

Limited access to bank credit is viewed by many policymakers and academics as a major growth constraint for developing economies, in particular for small- and medium-sized enterprises (Beck and Demirguc-Kunt, 2006; Ayyagari et al., 2008). As a result, many resources have been devoted to improving credit availability around the world. Competition in the banking sector may be an important driver of access to credit. The structure of banking industries in developing countries have undergone major transformations. The impact of competition on credit availability is then a crucial policy and academic question. Economic theory makes conflicting predictions. The traditional *market power view* argues that market power is detrimental in banking as well as in other industries. As a result, fiercer competition leads to lower costs and better access to finance (Besanko and Thakor, 1992; Guzman, 2000). In the presence of information asymmetries and agency costs, however, competition can reduce access by depriving banks of the incentive to build lending relationship (Petersen and Rajan, 1995).¹ Other contributions document that the quality of screening (Broecker, 1990; Marquez, 2002) and banks' incentives to invest in information acquisition technologies (Hauswald and Marquez, 2006) are higher in less competitive markets. Therefore, the *information hypothesis* argues that access to credit for opaque borrowers can be reduced when competition is harsher due to the difficulty to mitigate the agency problems.

Which of these views best describes the implications of competition in terms of access to credit is ultimately an empirical issue, particularly in opaque markets. Despite the policy relevance of this issue, empirical evidence on the effect of interbank competition on access to finance in developing countries is inconclusive. Using data from 74 developed and developing countries, Beck et al. (2004) show that bank concentration increases the probability that firms report finance as a major obstacle to growth, in line with the *market power view*. Chong et al. (2013) confirm the *market power view* documenting that credit availability is restrained in local markets that are concentrated in China. Adopting a similar approach on data from Philippines, Tacneng (2014) provides support for the opposite view. Local concentrated banking markets are generally associated with an increase in credit accessibility, particularly to more opaque borrowers. González and González (2008) also find results in line with the *information hypothesis*. The authors point out that firms use more external funds in countries with more concentrated markets.² A major concern with these studies refers to the proxy of competition used. Several contributions have cast doubt on the consistency and robustness of the structural approach as an indicator of competition in banking (see Chapter 4). Carbó-Valverde et al. (2009b) document

¹Boot and Thakor (2000), however, document that the role exerted by competition on bank relationships is somewhat inconclusive.

²The implication of concentration on economic or industrial growth is also inconclusive. Cetorelli and Gambera (2001) give some support for the *information hypothesis*. Deidda and Fattouh (2005) give support for the *market power hypothesis* for low-income countries, while Fernández et al. (2010) show that concentration is not detrimental for growth in countries with weak institutions.

that this issue is not only a technical problem insofar as conclusions may be sensitive to the proxy of competition employed.

A recent wave of works has tried to overcome this issue by employing non-structural measures of competition. Claessens and Laeven (2005) examine the influence of banking competition on economic growth in 16 countries, using the Panzar-Rosse H-statistic as a non-structural approach to indicate market competition. They find that sectors heavily dependent on bank financing grow faster in countries where there is fierce bank competition. Liu and Mirzaei (2013) confirm the *market power view* by employing the sensitivity of market share to relative costs, an indicator of competition initially proposed by Hay and Liu (1997) and extended by Boone (2008). Fernández de Guevara and Maudos (2011) find opposite evidence that the exercise of market power enhances economic growth, supporting the *information hypothesis*. They measure competition by employing both the Lerner index and the Panzar-Rosse H-statistic. Hoxha (2013) reaches similar conclusions using the Panzar-Rosse H-statistic. Recent papers directly investigate the relationship between the use of credit and bank competition. Using a panel data analysis on 53 developing countries and the Lerner index as proxy for competition, Love and Martinez Peria (2012) show that the use of bank loan is lower in more competitive markets, giving support for the *market power view*. However, in a sample of 33 countries, Mudd (2013) obtains a more complex relationship between interbank competition and a firm's probability of having a line of credit. Competition (measured by Panzar-Rosse H-statistics) has a positive but declining effect on a firm's use of bank financing, turning to a negative impact for competitive markets above the mean level.

This essay examines the implication of bank competition on credit availability in the context of developing countries using different measures of competition. Econometric analysis considers almost 30,000 firms from 70 developing countries across four continents. Firm-level variables are extracted from World Bank Enterprises Surveys (WBESs) and country-level variables are taken from diverse sources. Following Popov and Udell (2012), firms those that were either discouraged from applying for a loan or were rejected when they applied are classified as credit constrained. Information on bank competition is extracted from the Global Financial Development Database. Competition in the banking industry is assessed by the traditional concentration ratio (the share of assets held by the three largest banks) and three non-structural measures (the Lerner index, the Boone indicator and the Panzar-Rosse H-statistic). The effect of bank competition on credit availability is obtained by running a random-effect probit model including a competition measure and controlling for firm- and country-level characteristics.

The results show that financing constraints are alleviated in countries where banking markets are more competitive, irrespective of whether competition is measured by the Boone indicator or the Panzar-Rosse H-statistic, supporting the *market power hypothesis*. Employing the Lerner index to proxy market power suggests a similar conclusion, while the results are not robust. The degree of concentration has no impact on credit availability. The empirical set-up allows me not only to test

the *information hypothesis* versus the *market power hypothesis* but also to investigate the channels by which competition affects credit availability. In particular, I investigate the determinants of a firm's decision to apply for a credit and a bank's decision to approve or reject the request. The results show that competition not only leads to less severe loan approval decisions but that it also reduces borrower discouragement. An additional result of this paper documents that banking competition enhances credit availability more by reducing prices than by increasing relationship lending.

This chapter makes contributions to the literature on the relationship between bank competition and credit availability in developing countries by addressing a number of issues that have not yet been resolved. First, to my knowledge, this paper is the first that considers different non-structural measures of competition to investigate the implications of competition on credit availability. Non-structural measures of competition are more relevant than structural measures to proxy competition. However, there is no consensus regarding the best measure by which to gauge competition. The choice of a particular indicator can influence conclusions regarding the implications of competition (Carbó-Valverde et al., 2009b). By confronting the findings from several non-structural measures, this essay gives a more complete picture of the role of competition on credit availability. In particular, it is the first work to use the Boone indicator to document the linkage between competition and access to credit. Second, the identification of financially constrained firms remains a challenge. Existing studies measure credit constraints by a firm's perception of finance as an obstacle to growth (Beck et al., 2004; Clarke et al., 2006) or the mix of internal and external funds (Petersen and Rajan, 1995; González and González, 2008; Carbó-Valverde et al., 2009b). The survey measures are subject to perception bias (Ergungor, 2004) and the mix of funds requires data on firms' balance sheets, rarely available for SMEs in developing countries. Recent works proxy credit constraints by the use of credit (Love and Martinez Peria, 2012; Mudd, 2013). The fact that few firms obtain credit is, however, not sufficient to prove constraints, since certain firms may not have a demand for credit. This hypothesis is far from anecdotal in developing countries insofar as more than half of firms had no demand for credit (Cole and Dietrich, 2012). A comprehensive definition of credit constraints should measure the demand for credit that is unfulfilled by the existing supply of credit due to market imperfections. As a result, I classify a firm as constrained if its demand is not fulfilled by the supply of funds due to market frictions. In line with Popov and Udell (2012), this includes not only firms whose application was turned down, but also firms who refused to apply in spite of a viable project. Third, this work not only tests the *market power hypothesis* versus the *information hypothesis* but also tries to understand how competition affects credit availability and in particular its differential impact on lenders and borrowers on a large sample of countries. The final contribution involves country coverage. The sample considers 70 developing countries including many countries from Africa and other low-income countries.

In addition to its contributions to the literature regarding the impact of bank competition on credit availability, this work also adds to the empirical literature

on borrower discouragement and approval/denial decisions in developing countries. Empirical studies are generally focused on the U.S. (Cole, 1998; Cavalluzzo et al., 2002; Han et al., 2009; Cole, 2010). Recent contributions have begun to investigate these issues in the case of developing countries (Bigsten et al., 2003; Cole and Dietrich, 2012; Brown et al., 2011; Chakravarty and Xiang, 2013) but often analyze the characteristics of firms or managers to explain a firm's discouragement or a bank's rejection decision. Brown et al. (2011) underline that country characteristics play a significant role in borrower discouragement and in bank decisions to deny in Eastern Europe. Cole and Dietrich (2012) confirm the importance of macroeconomic factors to explain discouragement and denial in the case of 80 developing countries. Taking advantage of the large country coverage, I investigate a large set of country characteristics, including interbank competition. The findings shed light on the important role played by country characteristics to explain borrower discouragement and bank decisions.

The rest of the chapter is organized as follows. Section 7.2 presents the data and describes the construction of variables and the empirical methodology. The baseline results are discussed in Section 7.3. Section 7.4 presents some tests in order to understand how competition affects credit availability and the final section concludes.

7.2 Data, variables and method

7.2.1 Data

The database used in this paper combines firm- and country-level data from various sources. The firm-level data come from the World Bank Enterprises Surveys (WBES). The dataset is supplemented with country-level data from diverse sources such as the World Development Indicators, the Global Financial Development Database, and the Doing Business databases. Some filtering rules are applied. Firms for which information about credit market experience was not available and for whom at least one of the firm- and country-level control variables were not available have been dropped. I then excluded observations when the interviewer did not believe that the responses were reliable (question a16). Finally, firms with more than 5,000 employees that can access equity markets have been excluded. The final sample includes 28,952 firms from 70 low-income and middle income countries spanning four continents (Africa, Latin America, Europe and Asia). Two fifths of the firms were surveyed in 2006 and one third in 2009. Others were surveyed in 2007, 2008 and 2011. The sample considered has the advantage of grouping together economies with heterogenous characteristics.

7.2.2 Measuring credit constraints

The survey data collected include quantitative as well as qualitative information. Among other topics, surveys address questions about access to finance. To identify

credit constrained firms, I refer to a number of questions regarding the credit experience of the firm in the year previous to the survey. The methodology employed follows previous contributions (Brown et al., 2011; Popov and Udell, 2012). The first question is whether or not the firm applied for a loan (*k.16: In last year, did this establishment apply for loans or lines of credit?*). In order to distinguish between discouraged borrowers and non-borrowers among non-applicants, I turned to the subsequent question (question k.17) which asks the main reason for not applying. Firms are considered as "Non-Borrowers" if they declared that they did not apply because they did not need a loan. Among the applicants (firms that answered "yes" in question k16), a distinction is made between approved and denied applicants. A firm is declared as approved if at least one request was not turned down. The question k.18 gives the number of applications submitted and the question k.19 the number of applications rejected. A firm is coded as "Approved Borrowers" if the number of applications is larger than the number of applications rejected (and 0 if all applications were rejected). For several countries, I did not have this information. In such case, I used the question k18a: *"Did the firm apply for any new loans/lines of credit that were rejected in last fiscal year?"*.³

From this classification, I divided firms among financially constrained firms and others. A firm is declared as rationed if it is classified as "Discouraged Borrower" or "Denied Borrower". This measure allows me to identify firms expressing a demand for formal funds that was not fulfilled by supply. Contrary to measures based on firms' use of formal loans (Love and Martinez Peria, 2012; Mudd, 2013), I am able to discriminate between constrained firms and firms that have expressed no demand for loans. According to the definition proposed, one third of firms are rationed (see the Appendix, page 187). Sixty-three percent of firms reported a need for external funds but only 58% of these firms applied. Among the applicants, a large number obtained at least one loan (85%). As documented in Table 7.1, the credit market experiences differ greatly across developing countries. More than 3 out of 4 firms are rationed in the Democratic Republic of Congo, Angola, Ivory Coast, Mali or Mozambique, but this ratio is below 10% in Hungary and Slovenia.

At this stage, it is important to discuss two caveats in the data. The surveys do not allow me to capture the structure of loans and the dynamics of credit relationships. The paper considers credit as uniform but it is not. Loan terms such as loan rates, loan maturity, collateral requirements or other provisions differ greatly. The data does not allow me to discriminate between different types of credit (e.g. short term vs. long term). In the paper, I merely consider a firm as rationed if the firm has a need for funds but does not use credit. However, a firm with a loan may be considered as rationed if the loan requested differs from the loan granted (Kirschenmann, 2011; Chong et al., 2013). For example, a firm may apply for a long-term loan and get a short-term credit or may obtain only a share of the total amount desired. I do not believe that this issue alters my study. The measure built in this paper allows

³It should be noted that surveys do not capture the reason for the refusal. I then assume that all applicants had a rate of return at least equal to the market cost of capital.

me to detect the most financially constrained firms (firms that did not receive credit at all). One may expect that this proxy of strong credit rationing is closely related to partial credit rationing. Another concern involves the dynamics of credit. For instance, the data do not allow me to observe borrowers who were rejected in a first attempt but approved in a second attempt (after the survey) or to observe firms that had already applied in the past. Taking into account the dynamics of relationship is crucial in the analysis of credit rationing (Kirschenmann, 2011). However, the main results are probably not affected by this caveat. One might expect that the database mixes firms applying for the first time and firms applying for the tenth time in all countries, irrespective to the level of bank competition.

Table 7.1: Access to finance and interbank competition

Country	% of firms			Interbank competition			
	Rationed	Disc.	Denied	CR3	Lerner	Boone	H-st.
<i>Africa (25 countries)</i>							
Angola	0.81	0.83	0.75	74.60	0.44	-0.14	
Botswana	0.25	0.81	0.23	74.39	0.25	-0.07	
Burundi	0.58	0.73	0.33	100.00		0.05	
Congo	0.52	0.83	0.33	100.00	0.14		
D.R. Congo	0.84	0.88	0.71	61.59		-0.20	
Gabon	0.39	0.86	0.27	96.62		-0.01	
Gambia	0.57	0.86	0.32	90.42		0.02	
Ghana	0.66	0.76	0.36	79.26	0.22	-0.19	
Ivory Coast	0.78	0.86	0.32	59.63	0.24	-0.05	
Lesotho	0.31	0.68	0.30	100.00		0.00	
Liberia	0.44	0.77	0.06	100.00		0.00	
Madagascar	0.39	0.76	0.13	89.72		0.00	
Mali	0.76	0.73	0.66	70.03	0.32	-0.11	
Mauritania	0.76	0.76	0.62	66.89	0.36	0.02	
Mauritius	0.19	0.73	0.19	50.56	0.29	-0.14	
Mozambique	0.72	0.84	0.41	95.62	0.24	-0.04	
Namibia	0.19	0.79	0.31	88.70		0.00	
Rwanda	0.47	0.67	0.22	87.01		-0.06	
Senegal	0.68	0.77	0.47	67.24		-0.07	0.38
Sierra Leone	0.56	0.72	0.18	60.79	0.14	-0.33	
South Africa	0.28	0.78	0.12	70.94	0.29	-0.05	0.87
Swaziland	0.27	0.80	0.16	67.67		-0.23	
Tanzania	0.63	0.78	0.21	55.50	0.28	-0.09	
Uganda	0.56	0.80	0.15	62.99		-0.04	
Zambia	0.43	0.78	0.19	51.92	0.35	-0.10	0.18
<i>Latin America and the Caribbean (16 countries)</i>							
Argentina	0.34	0.66	0.10	43.21	0.29	-0.22	0.49
Bolivia	0.28	0.61	0.08	50.25	0.17	-0.14	0.65
Brazil	0.23	0.46	0.18	49.89	0.36	-0.05	0.75
Chile	0.11	0.41	0.03	54.90	0.30	-0.05	
Colombia	0.16	0.39	0.06	41.39	0.27	-0.02	0.78
Ecuador	0.13	0.44	0.04	48.10		-0.75	0.95
El Salvador	0.20	0.57	0.08	67.50	0.33	-0.07	0.99
Guatemala	0.18	0.69	0.08	48.03	0.19	-0.07	
Honduras	0.23	0.58	0.09	40.75	0.19	-0.05	0.88
Mexico	0.27	0.90	0.16	59.03	0.19	-0.13	
Nicaragua	0.24	0.64	0.09	84.00	0.37	-1.59	

continued on next page

Country	% of firms			Interbank competition			
	Rationed	Disc.	Denied	CR3	Lerner	Boone	H-st.
Panama	0.12	0.71	0.02	48.84	0.31	-0.04	0.57
Paraguay	0.23	0.62	0.05	47.77	0.12	-0.11	0.86
Peru	0.16	0.37	0.03	76.51	0.32	-0.09	0.62
Uruguay	0.34	0.71	0.09	57.57	0.24	0.54	0.78
<i>Europe and Central Asia (26 countries)</i>							
Albania	0.14	0.72	0.01	88.34	0.26	-0.01	
Armenia	0.21	0.58	0.09	43.32	0.31	-0.14	0.76
Azerbaijan	0.44	0.83	0.39	59.70	0.28	-0.08	0.60
Belarus	0.21	0.42	0.09	82.56	0.29	-0.11	0.81
Bosnia	0.27	0.42	0.15	49.32	0.18	-0.04	
Bulgaria	0.25	0.78	0.13	38.73	0.28	-0.51	0.30
Croatia	0.25	0.52	0.18	56.05	0.18	-0.06	0.41
CzechRep	0.15	0.58	0.11	58.69	0.22	-0.09	0.73
Estonia	0.11	0.54	0.12	92.52	0.16	0.04	
Macedonia	0.27	0.62	0.19	70.18	0.21	-0.06	-0.02
Georgia	0.23	0.54	0.13	70.64	0.24	-0.17	0.61
Hungary	0.10	0.69	0.07	53.51	0.19	-0.08	0.66
Kazakhstan	0.28	0.62	0.18	56.00	0.31	0.17	0.57
Latvia	0.22	0.58	0.19	57.60	0.28	0.09	0.90
Lithuania	0.13	0.49	0.10	72.71	0.18	0.15	0.79
Moldova	0.29	0.49	0.19	45.50	0.24	-0.10	0.42
Mongolia	0.35	0.41	0.22	96.93		-0.05	
Montenegro	0.37	0.53	0.14	79.41		-0.09	
Poland	0.20	0.63	0.13	48.68	0.24	-0.09	0.81
Romania	0.17	0.53	0.10	64.37	0.20	-0.10	0.91
Russia	0.27	0.49	0.18	38.84	0.25	-0.04	0.67
Serbia	0.26	0.40	0.19	33.47	0.17	-0.20	0.63
Slovak Rep.	0.16	0.63	0.10	66.02	0.21	0.03	0.59
Slovenia	0.09	0.40	0.09	51.72	0.15	-0.03	0.55
Tajikistan	0.31	0.63	0.17	100.00		0.11	
Turkey	0.15	0.43	0.16	43.94	0.21	-0.02	0.61
Ukraine	0.33	0.62	0.12	26.08	0.22	-0.12	0.69
<i>Others (3 countries)</i>							
Iraq	0.58	0.85	0.49	57.41		0.00	
Laos	0.31	0.88	0.00	88.29		0.17	
SriLanka	0.51	0.77	0.05	54.64		-0.11	

7.2.3 Measuring bank competition

The purpose of this essay is to investigate the implications of bank competition on credit availability. The choice of the appropriate proxy for bank competition is therefore crucial. All measures of bank competition are based on bank-level information. The Bankscope database, which covers a large range of banks in the world, is employed to extract balance sheet and income statement information on banks. Computations of indicators of competition are made by World Bank staff and reported in the Global Financial Development Database.

Despite some limitations with the structural approach, the share of assets held by the three largest banks is used as a proxy of the impact of market concentration. I complement the information on market structure that imperfectly captures bank conduct by using three indicators of competition based on the New Empirical Industrial Organization (NEIO) approach: the Lerner index, the Panzar-Rosse H-statistic and the Boone indicator. These different measures do not provide the same information about competition, and thus catch different aspects of competition.

The Lerner index is often used in empirical works. It captures the extent to which banks can maintain a price level above their own marginal costs. Greater values of the Lerner index are associated with greater levels of market power. For each individual bank, average revenues proxy price and marginal costs are obtained from the estimation of cost function with three inputs: labor, physical capital and deposits (more details can be found in [Love and Martinez Peria, 2012](#)). The Lerner index for country c is the weighted (by bank size) average of individual Lerner indices of all banks in country c as follows:

$$L_c = \sum_{i \in c} s_{ic} L_{ic} \quad (7.1)$$

where s_{ic} is the market share of bank i in country c and L_{ic} the value of the Lerner index for this bank. The Lerner index is not a measure of competition but an indicator of market power. [Boone et al. \(2013\)](#) show that the Lerner index at the country level consistently has problems picking up increasing competition due to more aggressive conduct of incumbent firms. The Lerner index is sensitive to the reallocation of activity from inefficient to efficient firms when competition intensifies. This concern is particularly relevant in concentrated markets that encompass the banking industry in many developing countries ([Boone et al., 2013](#)). Furthermore, price cost margins are sensitive to the degree of efficiency ([Koetter et al., 2012](#)) and risk ([Oliver et al., 2006](#)), and therefore macroeconomic conditions ([Carbó-Valverde et al., 2009a](#)). As a consequence, the Lerner index, widely-used in the literature, may be not the most relevant measure of competition. In addition, the Lerner index is available for only 51 countries.

The Panzar-Rosse model is often used to assess the degree of competition in banking. This indicator catches the transmission of input prices, and thus marginal costs, on firms' revenues. [Panzar and Rosse \(1987\)](#) showed that under certain assumptions, the transmission of input price variation differs according to the degree of competition in the market. Weak transmissions are interpreted to indicate the exercise of market power in pricing and higher values indicate more competition. Under perfect competition, an increase in input prices raises both marginal costs and total revenues by the same amount. The elasticity of bank revenues relative to input prices, also called the H-statistic, equals one. In a market where firms collude, an increase in input prices results in a rise in marginal costs, a fall in output, and a decline in revenues, leading to an H-statistic less than or equal to zero. [Panzar and Rosse \(1987\)](#) and [Vesala \(1995\)](#) show that when the H-statistic lies between 0 and 1, the system is operating under monopolistic competition. The value of the H-statistic is calculated in two steps. First, the logarithm of total revenues is regressed against the logarithm of input prices for each country and other control variables as follows (more details can be found in [Schaeck et al., 2009](#)):

$$\ln(\text{Rev}_{it}) = \alpha + \sum_{l=1}^L \beta_l \ln(w_{l,it}) + \sum_{k=1}^K \gamma_k Z_{k,it} + \mu_i + \varepsilon_{it} \quad (7.2)$$

where subscripts i, t refers respectively to bank and year. Three inputs ($w_{l,it}$) are considered: labor, physical capital and deposits. The model is run by country over the period 1990-2010 and includes bank fixed effects (μ_i) and control variables ($Z_{k,it}$). Adding the estimated coefficients for each input price in the second step allows me to obtain the value of the H-statistic:

$$H = \sum_{l=1}^3 \beta_l$$

Claessens and Laeven (2004) point out that the Panzar-Rosse model is well-suited to compare competition between markets. An important pitfall, however, concerns identification. The interpretation of the values of the H-statistic requires respecting many assumptions regarding the market equilibrium, demand elasticity, cost structure or exogeneity of input prices (Bikker et al., 2012). Finally, in this work, an additional limitation comes from data availability. The H-statistic is available for only 35 countries which reduce the sample by half.

Boone (2008) has recently developed a new indicator based on the idea that efficient firms are more rewarded in more competitive markets. The Boone indicator is beginning to be used in banking literature (Van Leuvensteijn et al., 2011; Delis, 2012; Tabak et al., 2012). The basic intuition underlying this indicator is that more efficient firms achieve superior performance in the sense of higher profit or higher market shares, and that this effect is stronger the heavier the competition is.⁴ Boone et al. (2007) shows that the Boone indicator can be calculated as the elasticity of profits to marginal costs. To calculate this elasticity, the log of return on assets is regressed against a log measure of marginal costs.

$$\ln(ROA_i) = \alpha + \beta \ln(MC_i) + \varepsilon_i \quad (7.3)$$

where ROA_i stands for profit and MC_i a measure of marginal cost. Marginal costs are obtained from an estimated translog cost function with three inputs. The more negative the β -coefficient is, the higher the level of competition is in the market. The Boone indicator has two major advantages. On the one hand, it is based on strong theoretical foundations and catches competition due both to a fall in entry barriers and to more aggressive behavior on the part of incumbents. On the other hand, it captures the dynamics and non-price strategy in the market, while the Panzar-Rosse model and Lerner index are based on static price competition. These advantages come with shortcomings. The Boone indicator approach focuses on one important relationship, affected by competition, thereby disregarding other aspects. Efficient gains may not be translated into higher profits in the short-term.

The different indicators employed here catch different aspects of competition. The Lerner index measures the static pricing market power, the Panzar-Rosse H-statistic the transmission of input price changes to revenues, and the Boone indicator the dynamics of markets. Measures of competition differ greatly among countries

⁴The same idea was already developed by Hay and Liu (1997).

and are imperfectly correlated. Finally, it should be noted that indicators of competition are computed at the country level. This may mask subnational differences which may be important for larger countries. Furthermore, the Bankscope data may ignore many small and domestic-owned banks in some countries. I assume that the measures of competition used reflect the real levels of interbank competition in local markets.⁵

7.2.4 Empirical methodology

The main objective of this essay is to evaluate the net impact of bank competition on firms' credit availability. Given the nature of the dependent variable, a binary model is required. The dependent variable is a dummy variable taking the value one if firm f in country c is not subject to credit rationing and 0 otherwise. In addition, it could be important to control for unobservable heterogeneity across countries insofar as the interest variable is country-specific. The structure of data considered is a form of panel data with two dimensions: country (c) and firm (f). As a result, a random effects probit model is used to take into account unobserved country heterogeneity.⁶

The basic econometric specification estimation through the random effect probit estimator is as follows:

$$Pr(Credit_{fc} = 1) = \Phi(\alpha + \beta Competition_c + \Theta \mathbf{F}_{fc} + \Gamma \mathbf{C}_c) \quad (7.4)$$

where subscripts f and c refer to firm and country respectively. $Credit_{fc}$ is a dummy variable equal to 1 if firm f in country c is not credit constrained; \mathbf{F}_{fc} is the matrix of firm characteristics and \mathbf{C}_c the matrix of country characteristics. $Competition_c$ is the indicator of bank competition (concentration ratio, Lerner index, H-statistic or Boone indicator). To facilitate the reading of the results, the inverse of the concentration ratio, the Lerner index, and the Boone indicator are used. Thus an increase of the value of the indices is associated with an increase in the level of competition. The net impact of bank competition on credit availability is given by the sign of coefficient β . If $\beta > 0$ more competition induces less financing constraints in line with the *market power hypothesis*. By contrast, $\beta < 0$ confirms the *information hypothesis* arguing that competition hinders access to finance.

The firm-level variables control for observable firm-level heterogeneity. They include the size and age of the firm, the top manager's years of experience in the

⁵A way to overcome this issue would be to proxy the degree of competition for local markets. Employing detailed data on China, [Chong et al. \(2013\)](#) proxy the level of competition in local markets by structure of local markets. However, data requirements associated with this approach are strong. Moreover this approach suffers from limitations associated with the structural approach.

⁶In a non-linear model, including fixed-effects is "technically" possible without removing time-invariant variables. However, this method biases estimated coefficients because of the incidental parameters problem ([Wooldridge, 2010](#)). The "fixed-effects" conditional logit model cannot be implemented because it induces a drop of "invariant" variables (all country characteristics including competition here). To test the robustness, I also run a pooled probit model with standard errors clustered at the country level. Results are largely unchanged and often reinforce the conclusion.

firm's sector, and the share of assets held by the largest owner. They also consider dummy variables capturing whether the firm is an exporter, foreign-owned, or government-owned and if the firm was audited in the past year, belongs to a larger firm, is privately held or is listed. Industry dummies are included to control for unobservable characteristics shared by firms in the same sector.

A crucial issue concerns the identification of the net impact of competition. The coefficient associated to competition is biased if this variable captures other characteristics. To overcome the omitted variable issue, country-level characteristics correlated with credit availability and bank competition are included as control variables. The level of economic and financial development are taken into account by adding the logarithm of real GDP per capita and the ratio of domestic credit to GDP. The macroeconomic conditions are captured by the real growth and the inflation rate. The measure of institutional development developed by Kaufmann et al. (2010) is added. Furthermore, the depth of credit information and the strength of legal rights are often advanced to explain differences in both access to finance and competition. I employ the measure of creditors' protection and depth of credit information calculated by Doing Business for each country to control for both. Finally, for judging the potential impact of the current financial crisis, a dummy variable taking value 1 if the survey was implemented between 2009 and 2011 is added. All country-level variables (competition measures included) are measured with one lag. All variables and summary statistics are presented in the Appendix (pages 187-189).

7.3 Results

7.3.1 Baseline results

This section presents the results of the empirical test of the link between competition and credit availability. Four different proxies of competition are used: the share of assets held by the three largest banks, the Lerner index, the Panzar-Rosse H-statistic, and the Boone indicator. The country pairwise correlations, reported in the Appendix, show that measures of competition are highly correlated with the share of firms that are financially constrained. The proxies for competition are also highly correlated with other country characteristics highlighting the importance of controlling for other country characteristics.

Table 7.2 presents the baseline results using a random effect probit estimator. The first column reports the results of estimation including only firm-level variables. The second column provides the results for a regression without banking sector competition variables. In the following columns, the four different proxies for competition (CR3, Lerner index, Panzar-Rosse H-statistic, and Boone indicator) are included sequentially. The Wald tests show the presence of unobservable country heterogeneity.⁷

⁷The pooled probit models provide, however, close results regarding the impact of competition proxies both in terms of size and significance.

Table 7.2: Interbank competition and credit availability

	Measure of competition					
	None	None	CR3	Lerner	Boone	H-stat
<i>Firm-level variables</i>						
ln(Firm size)	0.0586*** (17.64)	0.0531*** (18.15)	0.0532*** (18.15)	0.0491*** (15.92)	0.0530*** (18.21)	0.0519*** (15.29)
ln(Age)	0.0070† (1.53)	0.0060† (1.48)	0.0061† (1.48)	0.0065† (1.49)	0.0060† (1.47)	0.0036 (0.73)
ln(Exp)	-0.0013 (-0.28)	-0.0015 (-0.37)	-0.0015 (-0.36)	-0.0027 (-0.58)	-0.0015 (-0.37)	-0.0068 (-1.30)
Largest ow.	-0.0000 (-0.38)	-0.0000 (-0.43)	-0.0000 (-0.43)	-0.0001 (-1.06)	-0.0001 (-0.49)	-0.0002† (-1.60)
For.-owned	0.0393*** (3.85)	0.0367*** (4.00)	0.0366*** (3.98)	0.0354*** (3.48)	0.0365*** (4.00)	0.0202* (1.67)
Gov.-owned	-0.0576† (-1.47)	-0.0497 (-1.40)	-0.0500 (-1.41)	-0.0469 (-1.23)	-0.0466 (-1.32)	-0.0666† (-1.49)
Exporter	0.0104 (1.12)	0.0087 (1.04)	0.0088 (1.05)	0.0119 (1.39)	0.0088 (1.05)	0.0147† (1.60)
Subsidiary	0.0499*** (5.56)	0.0449*** (5.56)	0.0449*** (5.55)	0.0439*** (5.10)	0.0444*** (5.52)	0.0398*** (4.06)
Audited	0.0530*** (7.90)	0.0476*** (7.88)	0.0477*** (7.87)	0.0382*** (5.95)	0.0474*** (7.87)	0.0279*** (3.85)
Publicly listed	0.0057 (0.37)	0.0055 (0.40)	0.0056 (0.41)	0.0040 (0.28)	0.0059 (0.43)	0.0047 (0.29)
Privately held	0.0429*** (5.59)	0.0384*** (5.50)	0.0386*** (5.51)	0.0329*** (4.49)	0.0382*** (5.49)	0.0274*** (3.23)
Crisis	-0.0501* (-1.80)	-0.0565** (-2.43)	-0.0586** (2.47)	-0.0788*** (-3.03)	-0.0487** (-2.10)	-0.0258* (-1.74)
<i>Country-level variables</i>						
Competition			-0.0003 (-0.51)	0.3043† (1.48)	0.0967* (1.86)	0.1197* (1.86)
Fin. Dev.		0.0005 (0.74)	0.0006 (0.76)	0.0005 (0.67)	0.0005 (0.69)	0.0001 (0.15)
ln(GDPpc)		0.0768*** (3.91)	0.0799*** (3.89)	0.0714*** (3.21)	0.0797*** (4.12)	0.0407† (1.46)
Growth		0.0007 (0.23)	0.0008 (0.23)	-0.0049 (-1.05)	0.0012 (0.37)	0.0000 (0.00)
Inflation		-0.0022* (-1.88)	-0.0022* (-1.90)	-0.0019 (-1.61)	-0.0023*** (-1.99)	-0.0062** (-2.17)
Legal Rights		0.0052 (0.83)	0.0059 (0.92)	0.0114* (1.75)	0.0042 (0.68)	0.0057 (0.81)
Credit Info		0.0041 (0.49)	0.0045 (0.53)	0.0109 (1.22)	0.0012 (0.15)	0.0047 (0.51)
Inst. Dev.		0.0007 (0.02)	-0.0037 (-0.10)	-0.0138 (-0.38)	0.0087 (0.25)	-0.0207 (-0.38)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
# firms	28949	28949	28949	23550	28929	17755
# Countries	70	70	70	51	69	35
LR test	2517.08***	1095.28***	1093.27***	740.62***	1025.29***	338.15***

The dependent variable is a dummy equals to 1 if the firm is not subject to financing rationing. Inverse of CR3, Lerner index and Boone indicator are used in the table. The LR test compares the pooled estimator (probit) with the panel estimator. Under null hypothesis, the panel estimator is not different from the pooled estimator. MEs are reported, and z-statistics are presented in parentheses. Standard errors are adjusted for clustering at the country-level. †, *, **, and *** indicate significance at the 15%, 10%, 5% and 1% respectively.

Results document that banking competition enhances the financing of firms in developing countries. The coefficient associated to the Lerner index is positive but not significant at the usual thresholds (it is significant if the threshold is extended to 15%). Despite the fact that studies often employ it, the Lerner index is not the best measure of competition, as discussed above. I therefore also test the relationship between competition and credit availability by considering two other non-structural measures of competition: the Panzar-Rosse H-statistic and the Boone indicator. The coefficients associated to both proxies of competition are positive and significantly different from zero, indicating that firms face lower credit rationing in countries with more competitive markets. It should be noted that the structure of the market does not explain the access to credit. The coefficient associated to the concentration ratio is not different from zero. These results are in line with [Love and Martinez Peria \(2012\)](#) and confirm the relevance of the *market power hypothesis* in developing countries.

The economic impact of competition is also significant. A one-standard deviation change in the level of interbank competition (Lerner index, Boone indicator or H-statistic) results in a reduction of 2 percentage point in the probability of being rationed. While this may appear to be a small impact, in comparison with other country- and firm-level variables the effect of competition is not insignificant. By comparison, a one standard deviation change in the inflation rate induces a similar change. The fact that a firm is foreign-owned, privately held or has 5 additional employees increases its probability of being constrained by 4 percentage points.

The results for control variables are consistent with expectations. Firms which are larger, foreign-owned, members of a group (subsidiary), audited, and privately held are less likely to suffer from credit rationing. The crisis dummy has a negative coefficient and its economic impact is important insofar as the probability of having credit constraints increases by 5 percentage points following 2009. At the country-level, credit binding is related to the economic environment in which firms operate. Credit rationing is more likely in less economically developed countries and in countries with unstable economic environment (high inflation). The coefficient associated to financial development is positive but not always significant. In particular, when unobservable country characteristics are controlled for, it becomes statistically insignificant.

7.3.2 Robustness checks

Before investigating the channels by which competition affects credit availability, it is useful to test the robustness of the results. Although I control for many country-level variables and use different proxies for competition, other scenarios might explain the positive relationship between competition and credit availability. I will discuss some other potential explanations and show that the results are relatively robust.⁸

⁸I also run additional robustness checks changing the sample (excluding outliers) and the econometric method (employing pooled probit model) without altering my conclusions regarding the role played by competition.

In developing countries, the intensification of competition has been accompanied by the globalization process and the expansion of foreign-ownership of banks. Internationalization of banking systems can exert an impact on credit availability. Some papers document that foreign bank presence is associated with higher access to loans for SMEs (Clarke et al., 2006; Giannetti and Ongena, 2009), while other papers show that foreign banks tend to finance only larger, established and more profitable firms (Berger et al., 2001; Mian, 2006; Detragiache et al., 2008; Gormley, 2010).⁹ Different degrees of competition may merely capture the differences in ownership structure of the banking industry. To test this hypothesis, I include as controls the share of banking assets owned by foreigners. I use the dataset built by Claessens and Van Horen (2013a) to proxy the share of banking assets held by foreigners. These variables are only available for 59 countries. The results reported in the Appendix (page 190) are robust insofar as coefficients associated to competition remain stable in terms of size and significance. The presence of foreign banks tends to play no role on credit availability.

The positive link between competition and access to credit can be explained by financial regulation. Less government interference in the banking system, especially less restrictions on bank activities, may alleviate credit constraints. For instance, in less regulated markets, banks can propose new products more suitable for SME financing. Insofar as competition and financial regulations are correlated, the positive coefficient associated to competition can merely reflect the relationship between financial restrictions and credit availability. To control for this possibility, I include a measure of financial freedom built by the Heritage Foundation. Results highlight that the coefficients associated to competition remain positive and significant.¹⁰

Another potential drawback concerns the measures of competition. The proxies of competition are computed at the country level, while firms borrow locally. Insofar as many banks in developing countries are located in major cities, the degree of competition at the national level tends to reflect the competitive pressure in economic capitals but not the level of competition outside. One might therefore expect that the findings are not valid for firms located outside these cities. The surveys do not provide information about cities where firms are located. However, surveys do give the administrative district in which firms operate. I select a sub-sample of firms located in districts outside economic centers for each country and rerun the model on the sub-sample of firms in remote areas. The main findings are confirmed.

⁹For a review of this question, see: Claessens and Van Horen (2013a,b).

¹⁰Including activity restrictions based on the World Bank Survey of Bank Regulation and Supervision database (Barth et al., 2005) instead of the financial freedom variable does not alter the conclusions. In extending the argument, countries with more competitive banking markets are also countries with less restrictions on economic activities beyond banking. Higher facility to borrow can be driven by more "market-friendly" policies and proxies for competition catch this. However, the impact of competition on credit access remain when different proxies for economic freedom are included such as the Economic freedom variable from Heritage Foundation

7.4 Transmission channels and non-linearities

The baseline set-up shows that competition alleviates credit constraints in developing countries, which is in line with the *market power hypothesis*. In this section, I try to go one step further by investigating by which channels competition plays a role in facilitating access to finance.

7.4.1 Disentangling the impact on borrowers and lenders

Until now, the literature has focused on the lender's decision in order to explain the financing gap. This approach is not directly in line with the data. Recent works on developing countries have shown that the low use of formal credit is mainly explained by borrower discouragement rather than banks' denial decisions (Bigsten et al., 2003; Brown et al., 2011; Cole and Dietrich, 2012). In the data used here, 42% of firms with a need for external funds refused to apply, although only 15% of requests were turned down. An advantage of the database is the possibility of investigating to what extent the low incidence of bank credit in developing countries is the result of low credit demand and/or supply-side constraints and factors influencing both.

7.4.1.1 Impact of bank competition on a firm's decision to apply

Borrower discouragement can be explained by many economic and non-economic factors (Kon and Storey, 2003). Interbank competition can exert an effect on the borrower's decision to apply for a loan. Competition can affect the demand for loans by reducing the costs of credit through its impact on interest rates or on other elements of loan contracts. For instance, Hainz et al. (2013) document that bank competition reduces the presence of collateral, and can therefore increase the demand for loans. In addition, recent contributions (Giné, 2011; Madestam, 2014) show that in a dual system with formal and informal finance, poor borrowers are more likely to access the formal sector when bank competition increases.

To investigate the determinants of the decision of a given firm to apply, it is important to control for firms who do not need external financing. A simple probit model is no longer valid due to the sample selection issue (Heckman, 1979). The probit with sample selection (PSS) model proposed by Van de Ven and Van Praag (1981) is thus employed.¹¹ The PSS model is an extension of the bivariate probit model, which itself is an extension of the univariate probit model. The PSS estimate two probit equations (selection and outcome equations) where error terms follow a bivariate normal distribution. The selection equation is completely observed, but we have only a selected sample for the outcome equation. To my knowledge, the PSS model is only available for pooled estimation (without controlling for country heterogeneity). As a result, the pooled PSS model is used. The relevance of the sample selection problem is tested through a Wald test. Under the null hypothesis,

¹¹A common way to solve the sample selection issue consists of including the inverse of the Mills ratio in a two-step approach. However, Greene (2006) shows that this method is flawed in nonlinear applications.

Table 7.3: Interbank competition and loan applications

	Measure of competition					
	None	None	CR3	Lerner	Boone	Hstat
<i>Firm-level variables</i>						
ln(Firm size)	0.0814*** (12.49)	0.0782*** (12.69)	0.0782*** (12.66)	0.0742*** (10.42)	0.0781*** (12.76)	0.0786*** (18.08)
ln(Age)	-0.0035 (-0.42)	-0.0120† (-1.62)	-0.0120† (-1.64)	-0.0091 (-1.14)	-0.0134* (-1.89)	-0.0207*** (-2.64)
ln(Exp)	0.0365*** (3.84)	0.0151** (2.13)	0.0151** (2.11)	0.0115* (1.77)	0.0131* (1.91)	0.0036 (0.57)
Largest ow.	-0.0002 (-0.61)	-0.0002 (-0.72)	-0.0002 (-0.74)	-0.0002 (-1.00)	-0.0002 (-0.95)	-0.0003† (-1.48)
For.-owned	-0.0544*** (-3.33)	-0.0131 (-1.27)	-0.0126 (-1.21)	-0.0100 (-0.84)	-0.0145 (-1.39)	-0.0096 (-0.81)
Gov.-owned	-0.1076 (-1.40)	-0.0625 (-0.99)	-0.0614 (-0.97)	-0.0527 (-0.70)	-0.0584 (-0.92)	-0.0561 (-0.70)
Exporter	0.0654*** (3.94)	0.0484 (3.36)	0.0483*** (3.36)	0.0471*** (3.39)	0.0476*** (3.30)	0.0460*** (3.79)
Subsidiary	-0.0042 (-0.33)	-0.0063 (-0.45)	-0.0065 (-0.47)	-0.0064 (-0.45)	-0.0048 (-0.35)	-0.0073 (-0.47)
Audited	0.0717*** (4.42)	0.0641*** (4.25)	0.0640*** (4.15)	0.0554*** (3.31)	0.0655*** (4.32)	0.0463*** (4.28)
Publicly listed	0.0734** (2.45)	0.0412† (1.57)	0.0410† (1.56)	0.0049 (0.21)	0.0411† (1.61)	-0.0029 (-0.11)
Privately held	0.1305*** (5.21)	0.0783*** (4.23)	0.0780*** (4.21)	0.0557*** (3.72)	0.0777*** (4.44)	0.0441*** (3.05)
Crisis	0.0328 (0.95)	-0.0084 (-0.26)	-0.0087 (-0.26)	0.0210 (0.66)	0.0006 (0.02)	0.0907*** (2.74)
<i>Country-level variables</i>						
Competition			0.0001 (0.08)	0.0794 (0.38)	0.0974** (2.08)	0.1441** (2.32)
Fin. Dev.		0.0033*** (2.65)	0.0033*** (2.65)	0.0025** (2.16)	0.0032*** (2.66)	0.0009 (0.86)
ln(GDPpc)		0.0504** (2.22)	0.0499** (2.11)	0.0464* (1.72)	0.0543** (2.30)	0.0613* (1.72)
Growth		-0.0004 (-0.09)	-0.0004 (-0.08)	-0.0066 (-1.03)	0.0002 (0.04)	-0.0028 (-0.35)
Inflation		-0.0011 (-1.24)	-0.0011 (-1.21)	-0.0012 (-1.44)	-0.0012 (-1.50)	-0.0116*** (-4.36)
Legal Rights		-0.0077 (-1.08)	-0.0080 (-1.02)	-0.0076 (1.02)	-0.0091 (-1.31)	0.0051 (0.57)
Credit Info		0.0038 (0.44)	0.0040 (0.46)	0.0015 (0.17)	0.0004 (0.05)	-0.0083 (-1.32)
Inst. Dev.		-0.0251 (-0.68)	-0.0242 (-0.61)	-0.0252 (-0.57)	-0.0135 (-0.40)	-0.1499** (-1.93)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
# firms	18238	18238	18238	14572	18225	10978
# Countries	70	70	70	51	69	35
Wald test ($\rho = 0$)	162.71***	70.92***	74.49***	0.57	69.27**	20.75***

The dependent variable is a dummy equals to 1 if the firm with a need for funds applied. Inverse of CR3, Lerner index and Boone indicator are used in the table. Probit with sample selection (PSS) issue is used. The Wald test compares the pooled estimator (probit) with the PSS model. Under null hypothesis, the PSS estimator is not different from the pooled estimator. MEs are reported, and z-statistics are presented in parentheses. Standard errors are adjusted for clustering at the country-level. †, *, ** and *** indicate significance at the 15%, 10%, 5% and 1% respectively.

errors terms of both equations are uncorrelated and therefore the PSS model does not give more information than the simple pooled probit model.

A good identification requires that at least one variable is included in the selection equation and does not appear in the outcome equation. Exclusion variables have to affect the needs for external funds but not directly impact a firm's decision to apply or a bank's willingness to finance. Two variables are used to proxy the need for funds. The proportion of the value of sales paid after the delivery by the customers in the previous year is considered. This variable catches the need of funds for financing working capital. I also add a dummy variable equal to one if the firm submitted an application to obtain a construction permit over the prior two years, approximating the willingness to invest.¹² Finally to allow correlation across the error terms within a specific country, the standard errors are clustered at the country level for each model.

Results show that the likelihood of applying for a loan increases with the level of competition.¹³ Table 7.3 presents the determinants of the decision for a given firm with a need for credit to apply or not. The degree of competition is evaluated by employing four different measures (CR3, Lerner index, Boone indicator, and H-statistic). Coefficients associated to the Boone indicator and H-statistic are positive and significant. As in the previous section, the coefficients associated to the share of assets held by the three largest banks (CR3) and the Lerner index are not significant at the usual thresholds. Firms in more competitive markets may be less reluctant to apply for a loan. An increase in the Boone indicator or Panzar-Rosse H-statistic by one standard deviation will result in between a 2.3 (Boone) and 3.2 (H-statistic) percentage point rise in the probability of applying. By comparison, an increase of one standard deviation in the level of financial development will induce an increase of 7 percentage points. The positive impact of competition on a firm's decision to apply could be justified by different channels such as lower credit costs, less procedural requirements, well-designed products and services, better access to bank branches or a higher probability of being financed.

Control variables give some other interesting insights. Larger, audited, privately held firms and exporters, as well as firms in which the managers have less experience, are less subject to discouragement. The levels of financial and economic development are strongly correlated with a firm's probability of applying for a loan.

¹²Brown et al. (2011) use the share of working capital financed by retained earnings over the past year. However, one may consider this to be a weak exclusion variable. This variable may be directly related to a firm's decision to apply. A larger share of working capital financed by internal finance does not only reflect a larger credit need but also the difficulty of obtaining these funds from other financing sources. One may expect that firms closely linked to banks finance a larger share of their working capital needs through bank financing but are also less discouraged from applying (because they believe that their request will not be denied). It is interesting to underline that the share of working capital financed by banks is used as a measure of access to credit in the literature (Love et al., 2013).

¹³Some robustness checks have been implemented. For instance, simple probit models are run to test the robustness of the set of selection variables used. In addition, the same battery of tests than in the previous section have been implemented (see the Appendix, page 190).

7.4.1.2 Impact of bank competition on a bank's approval decision

If competitive pressure reduces borrower discouragement, competition can also increase the probability of applicants being financed. Insofar as a bank's final decision is only available for applicants, pooled PSS models are used. A good exclusion variable must impact the likelihood that a firm will apply but should not be observed or taken into account by banks. According to the standard theory, physical capital and labor are, at least partially, related (substitutes or complements). The demand for loans is therefore related to the severity of the obstacles in the labor market perceived by the firm. At the same time, it would be surprising if a lender based its decision on this information (if we suppose that a bank could obtain it). The obstacles in the labor market are measured through a firm's assessment of the severity induced by an inadequately educated workforce on the firm's growth.

Results, reported in Table 7.4 indicate that the probability of being rejected is lower in countries with more competitive banking markets. The coefficients associated with the Boone indicator and H-statistic are positive and significant at the usual thresholds. The coefficient associated to the Lerner index is positive and significant at 15 percent. Bank concentration is, however, unrelated to the likelihood of applicants being satisfied. Harsher competition leads to softer loan approval decisions but market structure plays no role.

The economic impact of competition is also significant. An increase of competition by one-standard deviation will raise the probability of being satisfied by one percentage point (for the three non-structural measures of competition). By comparison, an increase of two points in depth information index and legal rights (about one standard deviation) implies an increase in probability of between 1.5 and 2.5 percentage points. The positive effect of competition on a bank's decision to approve or deny is relatively easy to understand. In countries with low levels of competition, a bank can easily turn down an application without cost. By contrast, in competitive markets, the choice to deny implies the risk of losing long-term relationship benefits. Indeed, a denied borrower will contact a rival if it believes that its project is viable. The borrower and rival bank may enter into a long-term relationship and it could be impossible or very costly for outside banks to subsequently attract the firm. Private information may constrain competition in the future (Sharpe, 1990).

Results regarding the control variables are in line with expectations. Banks are less reluctant to finance transparent firms (larger, older, exporter), or firms linked with a larger one. Following the crisis, banks are less willing to finance firms. The probability of obtaining a loan has been reduced by 3 percentage points in the wake of the crisis. Information sharing mechanisms and creditors protection, despite the lack of net impact on credit availability, have a positive effect on the probability of applicants being financed. In other words, uncertainty and opacity play a significant role in explaining a bank's decision to approve or turn down credit requests.

Table 7.4: Interbank competition and bank's approval decision

	Measure of competition					
	None	None	CR3	Lerner	Boone	Hstat
<i>Firm-level variables</i>						
ln(Firm size)	0.0089*** (3.31)	0.0091*** (3.54)	0.0091*** (3.56)	0.0091*** (3.86)	0.0093*** (3.68)	0.0091** (2.04)
ln(Age)	0.0208*** (5.59)	0.0197*** (5.71)	0.0198*** (5.69)	0.0182*** (4.89)	0.0188*** (5.67)	0.0162*** (3.44)
ln(Exp)	0.0064† (1.47)	0.0009 (0.22)	0.0012 (0.28)	0.0019 (0.48)	0.0003 (0.08)	-0.0069 (-1.23)
Largest ow.	-0.0000 (-0.13)	0.0000 (0.19)	0.0000 (0.15)	0.0001 (0.76)	0.0000 (0.08)	-0.0000 (-0.37)
For.-owned	0.0107 (1.16)	0.0197** (2.02)	0.0192** (2.07)	0.0121 (1.17)	0.0190* (1.95)	0.0057 (0.51)
Gov.-owned	-0.0090 (-0.33)	0.0066 (0.29)	0.0054 (0.24)	0.0030 (0.14)	0.0074 (0.33)	-0.0313 (-1.33)
Exporter	-0.0099 (-1.14)	-0.0156* (-1.85)	-0.0156* (-1.85)	-0.0138* (-1.75)	-0.0158* (-1.87)	-0.0098 (-1.32)
Subsidiary	0.0203*** (2.66)	0.0202*** (2.83)	0.0200*** (2.80)	0.0205*** (3.05)	0.0197*** (2.79)	0.0169** (2.42)
Audited	0.0027 (0.38)	-0.0009 (-0.14)	-0.0013 (-0.19)	-0.0079 (-1.21)	-0.0004 (-0.06)	-0.0088 (-1.20)
Publicly listed	0.0146 (1.17)	0.0080 (0.60)	0.0086 (0.64)	0.0182† (1.48)	0.0074 (0.55)	0.0165 (1.31)
Privately held	0.0333*** (3.00)	0.0173** (2.07)	0.0180** (2.10)	0.0209*** (2.73)	0.0174** (2.12)	0.0052 (0.67)
Crisis	-0.0342** (-2.43)	-0.0464*** (-3.37)	-0.0467*** (-3.38)	-0.0630*** (-5.12)	-0.0434*** (-3.14)	-0.0421*** (-3.01)
<i>Country-level variables</i>						
Competition			-0.0002 (-0.50)	0.1242† (1.51)	0.0323** (2.30)	0.0442** (2.04)
Fin. Dev.		0.0002 (0.63)	0.0002 (0.63)	0.0002 (0.60)	0.0002 (0.59)	0.0009* (1.79)
ln(GDPpc)		0.0047 (0.46)	0.0065 (0.54)	0.0035 (0.32)	0.0055 (0.53)	-0.0036 (-0.32)
Growth		0.0001 (0.06)	0.0001 (0.04)	-0.0022 (-0.83)	0.0003 (0.13)	0.0051* (1.79)
Inflation		-0.0007 (-1.20)	-0.0007 (-1.20)	-0.0002 (-0.56)	-0.0007 (-1.32)	-0.0032** (-1.98)
Legal Rights		0.0078*** (2.58)	0.0081** (2.31)	0.0097*** (3.04)	0.0074** (2.46)	0.0066** (1.98)
Credit Info		0.0116*** (3.59)	0.0116*** (3.53)	0.0141*** (4.26)	0.0108*** (3.18)	0.0128*** (4.21)
Inst. Dev.		-0.0101 (-0.59)	-0.0128 (-0.64)	-0.0095 (-0.63)	-0.0071 (-0.41)	-0.0351 (-1.22)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
# firms	10597	10597	10597	9027	10592	7461
# Countries	70	70	70	51	69	35
Wald test ($\rho = 0$)	2.71*	6.42**	5.89**	12.45***	7.76***	1.93

The dependent variable is a dummy equals to 1 if the applicant received a loan (and 0 otherwise). Inverse of CR3, Lerner index and Boone indicator are used in the table. Probit with sample selection (PSS) issue is used. The Wald test compares the pooled estimator (probit) with the PSS model. Under null hypothesis, the PSS estimator is not different from the pooled estimator. MEs are reported, and z-statistics are presented in parentheses. Standard errors are adjusted for clustering at the country-level. †, *, ** and *** indicate significance at the 15%, 10%, 5% and 1% respectively.

Table 7.5: Interbank competition and credit availability, by firm size and age

<i>Panel A: Firm size</i>						
	Boone indicator			H-statistic		
	Small	Medium	Large	Small	Medium	Large
Competition	0.1143* (1.88)	0.1053* (1.94)	0.0533 [†] (1.41)	0.1267* (1.65)	0.1176* (1.92)	0.0878* (1.86)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	15513	5981	7435	8430	3969	5356
# Countries	69	69	69	35	35	35
LR test	616.27***	141.83***	88.51***	204.53***	30.33***	25.90***

<i>Panel B: Firm age</i>						
	Boone indicator			H-statistic		
	Young	Medium	Old	Young	Medium	Old
Competition	0.0758 (1.06)	0.1057* (1.91)	0.1088** (2.43)	0.1087 (1.24)	0.1007* (1.64)	0.1130* (1.78)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes	Yes	Yes
# firms	4772	12795	11362	2405	7914	7436
# Countries	69	69	69	35	35	35
LR test	175.80***	363.01***	274.83***	38.96***	83.51***	111.30***

The dependent variable is a dummy equals to 1 if the firm is not subject to financing rationing. Small-sized firms are less than 20 employees, medium-sized have more than 20 employees but less than 50 and large firms, and large firms have more than 50 employees. Young firms assemble firms operate for less than five years and old firms are firms with more than 15 years of operations. Inverse of Boone indicator is used in the table. The LR test compares the pooled estimator (probit) with the panel estimator. Under null hypothesis, the panel estimator is not different from the pooled estimator. MEs are reported, and z-statistics are presented in parentheses. Standard errors are adjusted for clustering at the country-level. [†], *, ** and *** indicate significance at the 15%, 10%, 5% and 1% respectively.

7.4.2 Relationship lending versus price effect

The previous results document the positive effect of competition on credit availability through its impact on borrowers and lenders. Banking competition can enhance credit availability through increasing relationship lending and/or lowering the interest rate (transaction-based lending technologies). In this sub-section, I try to give some insights about this debate.

Opaque firms are more likely to benefit from an intensification of relationships rather than from lower prices. If banking competition increases credit availability through expanding relationship lending, we can predict that small and young firms will be impacted more than their counterparts (Chong et al., 2013). I therefore investigate the implications of competition on different sub-groups of firms, classifying them according to their size and age. In this section, the attention is focused on the two measures of competition positively related to credit availability: namely the Panzar-Rosse H-statistic and the Boone indicator. The sample is split accord-

Table 7.6: Interbank competition and loan applications, by reasons

	Boone indicator		H-statistic	
	Price	Other	Price	Other
Competition	0.0540* (1.66)	0.0458** (2.22)	0.1308*** (3.43)	.0138 (0.39)
Firm controls				
Industry FE				
Country controls				
# firms	15487	13330	9729	8710
# Countries	69	69	35	35
Wald test ($\rho = 0$)	66.30***	37.04***	38.74***	7.72***

The *Price* variable is a dummy equals to 1 if the applicant received a loan and 0 if the firm refused to apply owing to contract term consideration (e.g. interest rates or collateral requirements). The *Other* variable is a dummy equals to 1 if the applicant received a loan and 0 if the firm refused to apply due to other consideration (e.g. expected that demand will be turned down). Inverse of Boone indicator is used in the table. Probit with sample selection (PSS) issue is used. The Wald test compares the pooled estimator (probit) with the PSS model. Under null hypothesis, the PSS estimator is not different from the pooled estimator. MEs are reported, and z-statistics are presented in parentheses. Standard errors are adjusted for clustering at the country-level. *, **, and *** indicate significance at the 10%, 5% and 1% respectively.

ing to the size and age of firms. Results, reported in Table 7.5 Panel A, suggest that smaller firms are not more (or less) affected by competition than larger ones.¹⁴ However, results reported in Panel B show that competition is beneficial mainly for older firms. Both the coefficients associated to Panzar-Rosse H-statistic and Boone indicator show that the youngest firms (less than five years of operations) do not take advantage of fiercer competition. On the contrary, firms established for more than five years benefit more from harsher competition. This suggests that the beneficial effect of competition is larger for well-established than for newly-established firms. Older firms are more sensitive to changes in prices than to increases in relationships. They are more transparent having more assets and a longer credit history. The findings are more in line with the price channel hypothesis. Fierce competition in credit markets may lower interest rate directly or indirectly by softening terms of the loan (collateral requirements, informal payments, etc.).

In order to provide more insight, I investigate in detail the reasons for the refusal to apply. Under the price effect channel, competitive pressure should increase the loan demand for firms reporting high interest rates, collateral requirements or the necessity to make informal payments to justify their decision. By contrast, the demand for loans for firms reporting another reason (satisfaction probability, procedures, etc.) should be less affected by the degree of competition. I then divide discouraged borrowers into firms that justify their choice by price factors and other firms. I investigate the determinants of applications on each sub-sample using the PSS model. The first dependent variable is a dummy taken the value of one if the

¹⁴Large firms tend to benefit less than SMEs from competition. A possible explanation is the fact that larger firms already have access to finance.

firm applied for a loan and 0 if the firm refused to apply because it considered that the loan terms to be unsatisfactory (other discouraged firms are excluded). The second dependent variable takes the value 0 if the firm refused to apply because they expected to be denied or the procedures were complex. The results are reported in Table 7.6. The coefficient associated to the Boone indicator is always positive. By contrast, the coefficient associated to the H-statistic is only positive when applicants are compared to discouraged firms that report price factors as a barrier to applying. In other words, this finding shows that competitive pressure mainly increases the likelihood of a firm applying by reducing the direct (interest rates) or indirect (collateral requirements or informal payments) costs of credit. This finding tends to confirm the price channel in line with findings on China (Chong et al., 2013).

7.4.3 Non-linearities

Until now, I have focused the attention on the average effect of bank competition. Nonetheless the impact of bank competition might be heterogeneous. Mudd (2013) sheds lights on the non-linear relationship between competition and access to credit. The non-linear relationship has been tested by including the quadratic term of the measures of competition. The results, not reported but available upon request, do not provide support for the existence of non-linear relationship between bank competition and credit availability. The impact of competition can also differ according to the country's characteristics as stated by Love and Martinez Peria (2012). The heterogeneous effect of competition on credit availability has been scrutinized through the inclusion of interaction between the measure of competition and country's characteristics.¹⁵ A graphical approach is employed to analyze the conditional effects.¹⁶ I only report the results for the Panzar-Rosse H-statistic and the Boone indicator in the Appendix (page 191). The conditional marginal effect of competition according to the level of economic development is hard to interpret insofar as both models provide opposite conclusion. However, competition among banks exerts a higher impact in countries with limited level of financial development. This finding is in line with Love and Martinez Peria (2012). They document that the damaging impact of market power is stronger in countries where financial sector is smaller. Indeed, the marginal positive impact of bank competition on credit availability is likely to

¹⁵It is not possible to run estimations on various sub-sample of countries. The degrees of freedom for the competition variables are not in the thousands as the number of observations suggests. There are only 70 countries in the sample and the level of competition is a country-specific variable. Dividing the sample into two (or more) sub-sample induces a sharp loss in degrees of freedom and renders identification complex. As a result, I choose to use a method based on interaction even if this method imposes similar coefficients.

¹⁶While interaction terms are used extensively in nonlinear models, the ways to interpret and test hypotheses about interactions terms remain unclear. Ai and Norton (2003) have proposed an approach to analyzing interaction effects in nonlinear models. Greene (2010) has recently underlined the limits of the Ai and Norton's approach regarding statistical inference. He argues that the process of statistical testing about partial effects and interaction terms produces uninformative results. He defends that investigating the partial effects through graphical analysis without testing hypotheses is more informative.

be higher in an environment where the cost of finance is high and therefore financial development lower (financial development is commonly associated with reduced cost of finance). This result is consistent with the previous section showing that competition exerts its positive impact through the price channel. The mitigating role played by the strength of legal rights and the depth of credit information have also been tested without revealing significant effect of these variables on the marginal impact of bank competition (results are available upon request).

7.5 Conclusion

Whether competition helps or hinders small firms' access to finance is in itself a much debated question in the economic literature and in policy circles. Despite the policy relevance of this issue, empirical evidence on the effect of interbank competition on access to finance in developing countries is scarce and largely inconclusive. Using surveys on firms in developing economies, this chapter sheds a new light on this debate. A firm is classified as financially rationed only if it expressed a demand for formal funds that was not fulfilled by supply. Furthermore, contrary to existing research, this paper employs several non-structural measures of competition (Lerner index, Boone indicator, or H-statistic) in addition to concentration measures. By confronting the findings from several measures, this paper gives a more complete picture of the role of competition on credit availability.

While the *information hypothesis* predicts that creditors are less likely to finance firms when credit markets are competitive, the evidence from developing countries supports the *market power hypothesis*. Findings, from a sample of almost 30,000 firms in 70 developing countries, show a positive impact of bank competition on credit availability, while bank concentration has no effect. This work also provides some insights about the channels by which competition affects credit availability. In particular, this essay documents that competitive pressure not only leads to less severe loan approval decisions but that it also reduces borrower discouragement. This conclusion is far from anecdotal insofar as the low use of bank credit in developing economies is mainly explained by low demand rather than by high rates of rejection. In addition, the findings tend to show that competition affects credit availability through price effect (lower interest rates) rather than relationship effect (banks invest more in relationship in competitive markets).

The policy implications are twofold. On the one hand, a direct policy implication is to promote competition in credit markets. This may be materialized by developing a large range of pro-competitive measures. The most direct reforms concern the regulation of financial systems by removing existing barriers. However, liberalizing banking sectors may be insufficient insofar as main barriers are non-legal in developing countries (Delis, 2012). This preliminary reforms can be complemented by other measures. For example, developing a pro-competitive environment through the installment of information sharing mechanisms could spur competition in less mature markets. Policymakers should, however, keep in mind that competitive pressure

may be insufficient to provide funds for all firms. A secondary result of this paper documents that banking competition enhances credit availability more by reducing prices than by increasing relationship lending. Consequently, competition in banking is usefulness for the most opaque firms or sectors. In order to provide financing to these firms, direct interventions could be certainly most effective.

Policymakers should also be aware that the low use of credit is mainly driven by borrower discouragement. The evidence suggests that a significant portion of discouraged firms would be successful in obtaining credit if only they would apply. Acting on the demand-side is thus crucial if policymakers expect to raise the share of financing of firms by formal financial institutions. Academics should examine in more detail the reasons for borrower discouragement to help the design of effective policies. Discouragement can be justified by both economic and non-economic factors and by both individual and group considerations. Better understanding discouragement in credit markets could be useful in explaining the success and failure of some reforms in these markets. Research investigating the choice of borrowers in the context of developing countries could be therefore welcomed.

Another strand of research could investigate the role of competition on the quality of credit. While this chapter examines credit constraints from the quantity perspective, it would be interesting to investigate how competition (and other macroeconomic factors) affects loan contract terms, including interest rates, collateral requirements, amount and loan maturity. One might expect that the quality of credit affects directly the investment decision and long-term growth of firms. This issue is particularly relevant in low-income countries in which loans are not only expensive but also with short-term maturities and are asset-backed.

General Conclusion

Recent trends in African banking systems, especially the development of new pan-African banking groups might affect the degree of competition in these industries. The issue of competition is reinforced with the emergence of a new paradigm, arguing that competition could be a driver of financial development (Beck et al., 2011b; World Bank, 2013). In spite of its importance for policymakers, very little is known about the real effect of competition in Africa. Contrary to a common belief, an extensive literature documents that fierce competition can be detrimental for development and stability of financial systems (see: Keeley, 1990; Petersen and Rajan, 1995; Hauswald and Marquez, 2006). African banking systems face high levels of uncertainty and opacity that render the implications of bank competition unknown. This dissertation seeks to understand whether competition may enhance, or on the contrary hinder, financial development in Sub-Saharan Africa. Studying the consequences of competition among banks may also improve our knowledge about the behavior of lenders and borrowers in a risky environment.

Main results

Chapter 2 provides an overview of financial systems in Sub-Saharan Africa and motivates the purpose of this dissertation. Although financial systems in Africa have become deeper, more efficient, and more stable over the past several years, some challenges remain. Promoting financial development in Africa requires a large range of policies, including short-term and long-term policies. Competition policy is one of these policies. A deeply rooted belief asserts that competition in the banking sector may help to promote efficiency and financial inclusion, without necessary undermining financial stability (World Bank, 2013).

The review of the literature on the role of competition in banking, presented in Chapter 3, gives a more nuanced picture. Competition can hinder financial sector development, especially in countries with high degree of opacity and uncertainty. Empirical literature focusing on African banking systems is scarce and largely inconclusive. Regarding the relationship between efficiency and competition in Africa, few papers have tested the *Structure-Conduct-Performance* hypothesis with mixed results and no paper has provided test for the *Quiet Life hypothesis*. The literature regarding the relationship between bank competition and credit availability is scant and inconclusive. Only a handful of articles consider developing countries and they rarely include African countries. Finally, only one paper has investigated

the competition - stability nexus, supporting the *competition-stability view* (Moyo et al., 2014). As a result, this dissertation seeks to fill these gaps by providing three empirical essays. In particular, special attention is drawn on the implications of bank competition on efficiency and access to credit.

Before exposing the empirical essays of this thesis, the different measures of competition in banking are discussed in Chapter 4. It is crucial that researchers find precise estimate ways of assessing the level of competition. This chapter presents the strengths and weaknesses of the most-widely used measures of competition in banking industry. This discussion has provided three main results. First, despite their large use, the structural measures are very imperfect proxies of competition. Second, while the Lerner index is a good measure of individual market power, it is not always the best measure of competition. Third, the Panzar-Rosse H-statistic and the Boone indicator provide relevant measures of competition but catch different aspects of competition and assume different hypotheses.

Chapter 5 evaluates the evolution of competition over the last decade in African countries. Commentators often argue that recent changes, especially the expansion of pan-African banking groups, have spurred competition among banks. However, insofar as groups remain relatively small and interact in multiple markets, one might raise concerns about this view. This intuition is indirectly tested by gauging the evolution of competition in a sample of 92 banks in seven West African countries (Benin, Burkina-Faso, Côte d'Ivoire, Mali, Niger, Senegal and Togo). The countries considered provide an excellent foundation for testing the consequences of the development of pan-African banks due to the rapid expansion of regional groups in West Africa. The findings show an increase of competition over the last decade. Except for the Lerner index, the three other non-structural measures of competition (conjectural elasticity, Panzar-Rosse H-statistic and Boone indicator) show an increase in the level of competition since the mid-2000s, a period corresponding to the rapid expansion of cross-border banks in West Africa. The increase of competition raises concerns about its consequences for the functioning of financial systems.

Chapter 6 investigates the implications of market power on efficiency. Economic literature typically associates higher levels of market power with lower efficiency in production and delivery of financial services (*Quiet Life Hypothesis*). However, in banking the relationship between market power and efficiency is more complex. The econometric analysis is based on a two-step procedure. In the first stage, efficiency scores are computed using the stochastic frontier analysis; and in the second stage, the efficiency scores are explained by market power, assessed by the Lerner index, and control variables. The main findings are somewhat counterintuitive. Banks with more market power are able to reduce costs but do no better at maximizing profits than banks with less market power. I formulate a possible explanation. Banks with less market power need to develop a niche market in order to survive. It is difficult for them to compete with their well-established rivals in the transparent firms sector. Therefore they target other segments of the market not already served by their rivals. This includes a large range of niches such as loans to specific sectors (e.g. agriculture) or provisions of new services and products. This strategy of expansion is

risky, albeit viable. This strategy is more costly than serving transparent borrowers but also yields higher revenues. In order to ascertain the validity of the explanation proposed, two indirect tests are carried out. Both give support to the explanation put forth.

Chapter 7 focuses on the consequence of competition on credit availability. Once again, theoretical literature is inconclusive, especially in opaque credit markets. Due to the lack of data, it is impossible to investigate this issue for a sample of African countries. The implications of competition on credit access is then studied on a sample of almost 30,000 firms in 70 developing economies including a large range of low-income countries. A firm is declared as constrained if its demand for loans is not fulfilled by supply due to market frictions. In other words, firms whose requests had been denied by banks and firms who refused to apply in spite of need for external loans are considered as credit constrained. Contrary to existing studies, bank competition is assessed by several non-structural measures (Lerner index, Panzar-Rosse H-statistic and Boone indicator). I have reached three main results. First, firms located in countries with competitive banking markets have a significantly lower probability to be credit constrained. Second, the results show that competition not only leads to less severe loan approval decisions but also reduces borrowers' discouragement. Third, the findings tend to show that competition affects credit availability through price effect (lower interest rates) rather than relationship effect (banks invest more in relationship in competitive markets). Even if the last result must be treated with caution, it indicates that fiercer competition is more favorable for firms that can take advantage of lower prices, namely the established firms.

The general result of this thesis is that increasing competition is beneficial for financial development in Africa. This dissertation sheds light on the behaviors of lenders and borrowers in opaque credit markets. Despite the high level of risks, banks are encouraged to invest more in non-traditional segments of the market when competition in the banking systems increases. Furthermore, the last essay also documents that borrowers are less discouraged to apply in more competitive markets.

Policy implications

The main message of this dissertation is that improving competition among banks is beneficial for the development of financial sectors in Africa. This message is particularly important in the current climate marked by a questioning about the positive effect of competition in finance and governments' interventions in order to restore financial stability that may impede competition in banking. However, competition policy should be complemented by other policies and is limited to provide financial services for "unbankable" population.

Policymakers can play an active role in enhancing banking competition. The state can promote competition through its role of regulator and supervisor of financial systems. The state can directly affect bank competition by promoting policies and practices that facilitate bank entry and exit. Within empirical research there

are several studies that underline the role played by banking regulations and entry of foreign banks to enhance competition (Claessens and Laeven, 2004; Jeon et al., 2011; Mirzaei and Moore, 2014). The threat of entry to the industry forces banks to worry about their ability to exercise market power. Allowing the entry from new reputable market players can be important to maintain contestability and competition. Chapter 5 documents that the entry of new actors has increased competition in West African banking systems. Furthermore, the presence of other financial intermediaries that can provide financing to firms is likely to foster competition in banking sector, because banks will have to compete to provide financial services to firms and households. The state has a role to play here by introducing regulations and practices that foster the entry and operation of nonbank competitors.¹ Claessens (2009) points out that products or intermediaries that offer the same service need to be treated similarly in terms of regulations, taxation or disclosure of information to increase competition.

The state can also play a role in enhancing competition by creating a market-friendly environment. Financial sector liberalization policies are not always conducive for competition in low-income countries and additional measures are required (Delis, 2012). First, implementing policies and infrastructures that improve market contestability beyond regulations will spur competition among banks. The various inputs required for the production and distribution of financial services need to be available, fairly and uniformed prices and be effectively provided to all potential suppliers. In banking, one input plays a crucial role to restrain competition, namely the information about borrowers. Dell'Ariccia et al. (1999) show that private information on borrowers limits competition from outside banks. While sharing of information is beneficial from a social perspective, banks might be reluctant to share their private information (Bruhn et al., 2012). Free flow of credit information among banks should be ensured by the state. Governments could simply put pressures on the financial industry or formulate standards. They can also intervene more directly by forcing providers to share platforms and infrastructure. The policymakers should keep in mind that the architecture of information sharing mechanisms is crucial for the efficiency of the system, as documented in Chapter 2. Furthermore, the state can also shape competition by ensuring customers' access to information and financial literacy. Providing better information to customers and facilitate bank switching can lead to rising competition among financial intermediaries. Finally, the competition policy in industrialized countries is assisted by anti-trust agencies. Indeed, maintaining a competitive environment requires a day-to-day struggle against unfair behavior of firms. Without developing complex anti-trust agencies, facilitating the definition, detection and sanction of uncompetitive behaviors in developing countries could help to spur competition.²

¹Mirzaei and Moore (2014), however, document that these measures are more effective in mature banking systems.

²Improvements in legal, governance and institutional frameworks could also favor competition in the banking industries, as documented by studies regarding the determinants of bank competition

Many of these reforms can be hardly implemented at the national level in Africa due to the limited size of local markets and lack of skilled staff. For instance, installation of anti-trust agencies or effective credit bureaus induces high fixed costs that cannot be recoup in small markets. Reinforcing regional integration can be a way to overcome some obstacles in small African countries. Fixed costs can be shared with the establishing of regional entities. In addition, facilitating regional integration of banking markets may spur competition by render a regional market more attractive for major banks than multiple small national markets with specific regulations. Sy (2014) underlines that governments should act in three dimensions in order to create a single market: (i) elimination of entry barriers; (ii) elimination of discrimination against foreign institutions; and (iii) full regulatory harmonization and capacity building. Several African countries have already advanced in the three dimensions. For instance, financial integration in the WAEMU is well-advanced (Sy, 2007). The *Agrément unique* ensure the absence of cross-border restrictions on banking and other financial services except insurance. In addition, the banking system is under the supervision of a single banking commission and a common regional capital market (*Bourse Régionale des Valeurs Mobilières, BRVM*) has been in place since 1998. Furthermore, the members of the WAEMU have advanced in the harmonization of the commercial legal framework with the *Organisation pour l'Harmonisation du Droit des Affaires en Afrique* (OHADA) and of accounting standards with the development of the *Système Comptable Ouest African* (SYSCOA). However, the experience of West and Central African countries shows that many challenges should be overcome to render the regional financial integration completely effective (Geourjon et al., 2013).

Competition policy is not the be-all and end-all of financial development policies. Chapter 2 documents that competition policy is one of pieces of financial development policies. Competition policy is useful for providing financial services for bankable households and small- and medium-sized enterprises (also called the "missing middle"). However, competitive pressure is certainly less effective to offer financial services to unbankable population (poor households, non-registered enterprises, etc.). Results in Chapter 7 point out that competition alleviates credit constraints by reducing prices. Unfortunately, many firms cannot take advantage of lower prices even if they are registered and have a viable project. Newly-established firms or firms without credit history are often excluded from bank financing for other reasons than prices. Competitive pressure is therefore ineffective to provide funds to riskier firms or sectors (e.g., the agricultural sector in Africa). Private commercial banks might refuse to finance some firms and sectors even if margins continue to be thinning due to difficulty to obtain information and mitigate risks

(Delis, 2012; World Bank, 2013). However, reforms in these areas require profound changes and take time to materialize (cf. Chapter 2).

about these borrowers. Additional reforms should be implemented including certainly more interventionist policies such as credit guarantee programs or dedicated financial institutions. However, the recent history of African countries has underlined the adverse impact of too much interventionism in finance. The benefits and costs of each government interventions should be evaluated. Governments should be mindful of the detrimental consequences of their interventions on bank competition.

Future research

Another field in which states often accept to constrain competition is financial stability. State interventions to prevent or resolve crises may create barriers to enter or exit and then soften competition.³ In trying to mitigate the likelihood and impact of financial crises, governments should be aware of the potentially negative consequences of their actions on bank competition and future bank stability. Contrary to common belief, more competition cannot automatically induce financial instability, in particular in Sub-Saharan Africa. Insofar as mismanagement and loan concentration remain major sources of vulnerabilities in some banks in Africa, competition may stabilize the banking systems. This dissertation tend to show that competitive pressures may force banks to improve their management or to diversify their portfolio of assets. This thesis does not directly investigated the competition-stability nexus in African banking systems. To my knowledge, only one paper has analyzed this issue, given support for the competition-stability view (Moyo et al., 2014). Additional research is then required to analyze the competition-stability nexus in Africa and in low-income countries. In particular, special attention should be dedicated to the channels through which bank competition affects stability (risk-taking, efficiency, diversification, capitalization ratio, etc.).

I also leave for future works three areas of research presented in Chapters 6 and 7. First, future research should investigate factors explaining heterogeneity in the results of studies investigating the relationship between market power and efficiency. While some papers document a positive effect of market power on efficiency, others find the opposite or the absence of impact. The bank- and country-level factors affecting the relationship between market power and efficiency need to be clarified. Second, in the Chapter 7, the implications of competition on credit availability have been analyzed from a quantitative perspective. By affecting the borrower-lender relationship, bank competition might also impact the terms of loan contracts. It would be interesting to analyze how competition affect the loan contract terms (maturity, amount, collateral requirements, choice of currency, etc.). Recent studies has scrutinized the role of competition on specific elements of loan contracts such as collateral requirements (Hainz, 2003; Hainz et al., 2013). More research is needed to know the determinants and interactions of various elements of loan contract as well as their impact on firm's growth in developing economies. Third, Chapter 7

³For instance, some African countries (Nigeria or in the WAEMU) recently increased the minimum capital requirements insofar as many banks are too small. However, this policy induces more concentrated banking markets and risk to soften competition.

documents that the low use of credit is mainly driven by low demand. While some works focus on supply side, more knowledge is required on the demand side. The behavior of (potential) borrowers in a risky environment is largely unknown. Bank credit is only one source of external funds and many firms prefer other sources of financing or mix various types of funds. Improving our knowledge about the behavior of borrowers could help to design effective policies in low-income countries.

Finally, this dissertation has been motivated by recent changes in banking industries in Africa. I made the choice to concentrate the analysis on the competitive aspect because it is certainly the most direct effect of these transformations. However, future research should investigate the consequences of expansion of pan-African banking groups. Commentators often argue that business models of these groups differ from business models of other foreign banks from developed countries by targeting customers initially excluded of the financial systems. Indeed, the expansion of these groups may affect directly the efficiency and the inclusion of financial systems. In addition, the cross-border activities of the pan-African banks raise some questions. The development of these intermediaries can spur the integration of financial systems. Meanwhile, the entry of cross-border banks induces some changes to manage financial stability in Africa. In line with the literature on the consequences of foreign banks, The future challenge for financial authorities will be the supervision of regional groups and the design of resolution frameworks in case of distresses. The increasing cross-border nature of banking was not accompanied by a regulatory and supervision framework at the supranational level. For example, Ecobank is under the supervision of 21 different supervisors in Africa. Regulators and supervisors must adapt their practices and academics can help them.

Appendices

Appendix to Chapter 2

Table A.1: Classification of SSA countries by region and income

Country	Group	GDP	Country	Group	GDP
Central Africa (8)			East Africa (11)		
Cameroon	LMIC	1167	Burundi	LIC	251
CAF	LIC	483	Djibouti	MLIC	NA
Chad	LIC	1035	Eritrea	LIC	504
Congo	LMIC	3164	Ethiopia	LIC	454
DR of Congo	LIC	262	Kenya	LIC	943
Equat. Guinea	HIC	24036	Rwanda	LIC	620
Gabon	UMIC	11257	Somalia	LIC	NA
STP	LMIC	1400	South Sudan	LIC	943
			Sudan	LMIC	1580
			Tanzania	LIC	609
			Uganda	LIC	547
West Africa (16)			Southern Africa (14)		
Benin	LIC	752	Angola	UMIC	5482
Burkina-Faso	LIC	634	Botswana	UMIC	7238
Cape Verde	LMIC	3695	Comoros	LIC	831
Côte d'Ivoire	LMIC	1244	Lesotho	LMIC	1193
Gambia	LIC	512	Madagascar	LIC	447
Ghana	LMIC	1605	Malawi	LIC	268
Guinea	LIC	492	Mauritius	UMIC	8120
Guinea-Bissau	LIC	494	Mozambique	LIC	565
Liberia	LIC	414	Namibia	UMIC	5786
Mali	LIC	694	Seychelles	UMIC	12858
Mauritania	LMIC	1106	South Africa	UMIC	7508
Niger	LIC	395	Swaziland	LMIC	3042
Nigeria	LMIC	1555	Zambia	LMIC	1469
Senegal	LMIC	1023	Zimbabwe	LIC	714
Sierra Leone	LIC	635			
Togo	LIC	574			

Group refers to World bank's income group classification in 2013 (LIC: Low-income country; LMIC: Low-middle income country; UMIC: Upper-middle income country; and HIC: High-income country). GDP refers to GDP per capita in 2012 (current US\$).

Table A.2: Variables included in financial development composite index

Dimension	Description	Variables
Size	Measure the size of financial system	Private credit to GDP Deposit money bank assets to GDP Liquid liabilities to GDP Non-Life Insurance Premium volume to GDP Market capitalization
Access	Measure the access and use of financial services by firms and households	Bank branches per 100,000 adults Percent of firms with a line of credit Share of adults with an account at a formal FI Share of adults saving at a FI in the past year Share of adults borrowing from a formal FI in the past year
Efficiency	Measure the efficiency of banking system	Net interest margin Overhead costs to total assets Cost to income ratio Transformation ratio (bank credit to bank deposits)
Profit & Stability	Measure the performance and stability of banking system	Return on Assets Return on Equity Z-score

Source: Global Finance Development Database. Data for 2011 is employed (when not available 2010 is used). Information from surveys is extracted from most recent World Bank enterprises surveys and Findex surveys (Access dimension). Information on bank branches and firms with a line of credit have been completed by employing data published on the MFW4A and WBES website respectively.

Table A.3: Financial development indicators, by country

Country	Size	Access	Efficiency	Profit & St.	Composite
Angola	1.78	2.62	5.49	3.78	3.42
Benin	1.56	1.86	5.85	3.50	3.19
Botswana	2.06	3.13	5.53	4.98	3.93
Burkina Faso	1.17	1.41	5.30	3.81	2.92
Burundi	1.43	1.13	5.51	3.78	2.96
Cameroon	1.05	1.71	5.56	2.58	2.73
CAR	0.60	0.68	4.74	4.40	2.61
Chad	0.32	1.32	4.44	4.60	2.67
Congo, Dem. Rep.	0.46	0.33	3.28	2.65	1.68
Congo, Rep.	0.60	0.86	5.94		
Cote d'Ivoire	1.85		5.03	3.67	
Eritrea			7.16	2.79	
Ethiopia	1.27		6.32	4.40	
Gabon	1.07	1.20	4.64	2.28	2.30
Gambia, The	1.62		4.70	3.11	
Ghana	1.27	2.37	4.19	3.52	2.84
Guinea	0.48	0.35	5.64	4.23	2.67
Guinea-Bissau	0.48		4.05		
Kenya	3.41	3.40	4.82	4.39	4.00
Lesotho	2.51	1.67	5.16	4.33	3.42
Liberia	0.90	1.84	3.35		
Madagascar	0.90	0.68	5.09	3.60	2.57
Malawi	1.88	2.28	3.85	5.22	3.31
Mali	1.11	1.00	6.28	3.13	2.88
Mauritania	1.35	1.63	6.36	3.69	3.26
Mauritius	6.36	5.99	6.62	3.32	5.57
Mozambique	1.97	2.45	4.12	3.83	3.09
Namibia	3.96		5.44	4.11	
Niger	0.92	0.69	5.94	3.86	2.85
Nigeria	1.73	2.02	4.53	2.79	2.77
Rwanda		3.29		3.28	
Senegal	1.95	0.88	5.42	3.96	3.05
Sierra Leone	0.84	1.82	3.29	3.39	2.34
Somalia					
South Africa	6.39	3.80	6.07	3.12	4.84
Sudan	0.83		5.82	3.83	
Swaziland	2.51	2.96	5.20	4.05	3.68
Tanzania	1.42	1.72	4.85	3.20	2.80
Togo	2.06	1.09	5.70	3.81	3.17
Uganda	1.28	2.23	4.43	4.99	3.23
Zambia	1.40	1.84	4.16	3.60	2.75
Zimbabwe		2.39	3.66	4.06	
SSA	1.70	1.90	5.09	3.73	3.12
Central Africa	0.68	1.02	4.77	3.30	2.40
East Africa	1.61	2.36	5.56	3.83	3.25
Southern Africa	2.88	2.71	5.03	4.00	3.66
West Africa	1.29	1.41	5.04	3.57	2.90
Non-SSA	2.76	3.44	5.65	3.29	3.77
East Asia and Pacific	3.52	4.39	6.26	3.39	4.44
Europe and Central Asia	2.45	3.46	5.31	2.69	3.52
Latin America and the Caribbean	2.72	3.63	5.25	3.66	3.85
Middle East and North Africa	2.96	2.31	6.38	3.75	3.91
South Asia	2.12	2.50	5.64	3.11	3.10

Appendix to Chapter 5

Table B.1: Estimation of translog cost function

Variable	Coef	t-stat
$\ln(y)$	0.340*	(1.86)
$[\ln(y)]^2$	0.042***	(5.98)
$\ln(w_1)$	1.576***	(6.87)
$\ln(w_2)$	0.306	(1.29)
$\ln(w_3)$	-0.882***	(-5.02)
$[\ln(w_1)]^2$	0.000	(0.02)
$[\ln(w_2)]^2$	0.070***	(5.19)
$[\ln(w_3)]^2$	-0.007	(-0.54)
$[\ln(y)][\ln(w_1)]$	-0.112***	(-6.41)
$[\log(y)][\ln(w_2)]$	0.050***	(3.32)
$[\ln(y)][\ln(w_3)]$	0.062***	(4.41)
$[\ln(w_1)][\ln(w_2)]$	-0.038***	(-3.22)
$[\ln(w_1)][\ln(w_3)]$	0.038***	(4.07)
$[\ln(w_2)][\ln(w_3)]$	-0.031***	(-3.32)
T	0.063***	(8.10)
T^2	0.000	(0.50)
$T[\ln(y)]$	-0.005***	(-10.45)
$T[\ln(w_1)]$	0.004**	(2.24)
$T[\ln(w_2)]$	0.005***	(4.40)
$T[\ln(w_3)]$	-0.001	(-1.26)
POP_{jt}	-0.020***	(-4.00)
$GDPpc_{jt}$	-0.000	(-0.29)
Inf_{jt}	0.000	(0.30)
$Growth_{jt}$	-0.002	(-0.35)
Country dummies		
- Levels		Incl.
- Interactions with output		Incl.
- Interactions with input prices		Incl.
F-test		7.61***
Obs.		610
# banks		92

*, ** and *** indicate significance at the 10%, 5% and 1% respectively (t-statistics are reported in parentheses). F-test tests the conjoint significance of the country dummies and their interactions with output and prices.

Table B.2: Evolution of competition over time

	CV model			H-statistic	PR model	
	θ	Tests			Tests	
		$H_0 : \theta = 0$	$H_0 : \theta = 1$		$H_0 : H = 0$	$H_0 : H = 1$
2003	0.266	6.40**	48.55***	0.120	0.32	17.51***
2004	0.667	25.16***	6.24**	0.135	0.78	31.89***
2005	0.566	15.99***	9.41***	0.138	0.45	17.27***
2006	0.778	25.60***	2.08	-0.008	0.00	37.61***
2007	0.753	43.96***	4.74**	0.352	1.55	5.26**
2008	0.353	14.13***	47.59***	0.428	3.72*	6.62**
2009	0.489	16.38***	17.88***	0.607	8.85***	3.70*
Obs.	491			487		
# banks	87			87		
R^2	(0.89)	(0.96)	(0.22)			
AR(1) [p-value]				0.028		
AR(2) [p-value]				0.101		
Hansen test [p-value]				0.413		
# instruments				93		

*, ** and *** indicate significance at the 10%, 5% and 1% respectively. Results are extracted from PR model and CV model. More details are in the text.

Table B.3: Summary of empirical Panzar-Rosse studies on or including SSA countries

Author(s)	Country	Period	# banks (obs.)	H-value (average)	Dependent Variable	Dynamic	Scaled	Data source
Individual country								
Buchs and Mathisen (2005)	Ghana	1998-2003	13 (65)	0.53-0.59	TR, IR	No	Yes	Central bank
Hauer and Peiris (2008)*	Uganda	1999-2004	15 (307)	0.43	TR	No	Yes	Central bank
Kasekende et al. (2009)	Nigeria	1993-2008	na	0.53-0.70	TR	No	Yes	Bankscope
Mwega (2011)	Kenya	1998-2007	43 (349)	0.38	IR/TA	No	Yes	Central bank
Mwenda and Mutoti (2011)	Zambia	1999-2008	11 (440)	0.83	IR	Yes	No	Central bank
Simpasa (2011)	Tanzania	2004-2008	26 (101)	0.66	TR	No	No	Bankscope
Biekepe (2011)	Ghana	2000-2007	17 (119)	0.66	TR, TI	No	Yes	Bankscope
Simpasa (2013)	Zambia	1998-2011	18 (641)	0.46	TR/TA	No	No	Central Bank
Claessens and Laeven (2004)	Kenya	1994-2001	34 (106)	0.58	IR/TA	No	Yes	Bankscope
Schaeck et al. (2009)	Nigeria	1994-2001	42 (186)	0.67	IR/TA	No	Yes	Bankscope
	Kenya	1998-2005	na	0.36	IR/TA	No	No	Bankscope
	Nigeria	1998-2005	na	0.53	IR/TA	No	No	Bankscope
Bikker et al. (2012)	Kenya	1994-2004	38 (187)	0.27-0.44	TR, IR	No	No	Bankscope
	Nigeria	1994-2004	64 (318)	0.24-0.38	TR, IR	No	No	Bankscope
Sanya and Gaertner (2012)	Kenya	2001-2008	29 (na)	0.6	TR/TA	No	Yes	Bankscope
	Rwanda	2001-2009	7 (na)	0.24	TR/TA	No	Yes	Bankscope
	Tanzania	2001-2010	17 (na)	0.56	TR/TA	No	Yes	Bankscope
	Uganda	2001-2011	12 (na)	0.55	TR/TA	No	Yes	Bankscope
Groups of countries								
Saab and Vacher (2007)**	CEMAC (6)	1993-2004	30 (140)	0.27	TR/TA	No	No	Central bank
Fosu (2013)	Southern Africa (13)	2002-2009	152 (487)	0.52	TR, IR	Yes	Yes	Bankscope
	West Africa (14)	2002-2009	145 (427)	0.59	TR, IR	Yes	Yes	Bankscope
	East Africa (6)	2002-2010	99 (375)	0.61	TR, IR	Yes	Yes	Bankscope

IR: Interest revenue; TR: total revenue; TA: Total assets; na: not available (dependent variables are in log)

* The value of H-statistics is 0.31 before liberalization and 0.50 after.

** CEMAC includes Cameroun, Gabon, Equatorial Guinea, Central African Republic, Congo, and Chad. The table considers published studies in referring journals or studies published in IMF working paper series.

Appendix to Chapter 6

Table C.1: Frontier estimations

	Cost equation		Profit equation	
	Coef.	t-stat	Coef.	t-stat
$\ln(y)$	0.442**	(2.48)	-2.095***	(-7.61)
$[\ln(y)]^2$	0.0389***	(5.59)	0.0901***	(8.28)
$\ln(w_1)$	1.590***	(7.22)	0.986	(1.64)
$\ln(w_2)$	0.302	(1.33)	0.259	(0.54)
$\ln(w_3)$	-0.892***	(-5.30)	-0.239	(-0.74)
$[\ln(y)][\ln(w_1)]$	-0.115***	(-6.79)	-0.0435	(-1.04)
$[\ln(y)][\ln(w_2)]$	0.0510***	(3.52)	-0.118***	(-3.82)
$[\ln(y)][\ln(w_3)]$	0.0639***	(4.70)	0.0514**	(2.24)
$[\ln(w_1)]^2$	0.00200	(0.24)	-0.0228	(-0.98)
$[\ln(w_2)]^2$	0.0698***	(5.34)	-0.0404	(-1.36)
$[\ln(w_3)]^2$	0.00120	(0.10)	-0.00275	(-0.13)
$[\ln(w_1)][\ln(w_2)]$	-0.0353***	(-3.05)	0.184**	(2.31)
$[\ln(w_1)][\ln(w_3)]$	0.0333***	(3.65)	-0.0678	(-1.26)
$[\ln(w_2)][\ln(w_3)]$	-0.0345***	(-3.71)	0.0435	(1.05)
T	0.189***	(3.39)	-0.139	(-1.62)
T^2	-0.00191	(-1.00)	0.00282	(0.98)
$T[\ln(y)]$	-0.00564	(-1.55)	0.0102*	(1.76)
$T[\ln(w_1)]$	-0.0187*	(-1.88)	0.0217	(1.31)
$T[\ln(w_2)]$	0.0150*	(1.72)	0.0110	(0.78)
$T[\ln(w_3)]$	-0.00371	(-0.66)	0.0180**	(2.13)
Country dummies				
- Levels		Incl.		Incl.
- Interactions with output		Incl.		Incl.
- Interaction with input prices		Incl.		Incl.
F-test		116.80***		52.39***
σ_u^2		0.033		0.174
σ_v^2		0.028		0.036
$\lambda = \sigma_u/\sigma_v$		1.094		2.197
Obs.		610		595
# banks		92		92

All model are estimated by maximum likelihood estimators. σ_v^2 is the variance of random noise and σ_u^2 is the variance of the efficiency term. λ the ratio of the standard deviation of the inefficiency component to the standard deviation of the idiosyncratic component. F-test tests the conjoint significance of the interactions between country dummies and output and between dummies and input prices. *, ** and *** indicate significance at the 10%, 5% and 1% respectively.

Table C.2: Evolution of market power and efficiency, by country

	2002	2003	2004	2005	2006	2007	2008	2009	Mean
	Lerner								
Benin	0.3964	0.3939	0.3944	0.3534	0.3703	0.3720	0.3490	0.4548	0.3855
Burkina-Faso	0.3643	0.3588	0.3394	0.3640	0.3580	0.3672	0.3480	0.3263	0.3532
Côte d'Ivoire	0.2407	0.2996	0.3068	0.3381	0.3456	0.3224	0.4742	0.3099	0.3296
Mali	0.3185	0.3884	0.3337	0.3632	0.3329	0.3389	0.3463	0.3213	0.3429
Niger	0.3523	0.3718	0.3835	0.4089	0.4204	0.4045	0.4362	0.4124	0.3987
Sénégal	0.3560	0.3013	0.3177	0.3381	0.3505	0.3308	0.3511	0.3026	0.3310
Togo	0.3188	0.3222	0.4038	0.4201	0.3530	0.4582	0.5624	0.4226	0.4076
	Adjusted Lerner								
Benin	0.2717	0.3127	0.2839	0.2973	0.2978	0.3627	0.2813	0.3717	0.3099
Burkina-Faso	0.3215	0.3341	0.2957	0.2223	0.2259	0.3089	0.3908	0.3975	0.3121
Côte d'Ivoire	0.2195	0.2247	0.2665	0.2743	0.3194	0.2960	0.1733	0.2492	0.2529
Mali	0.4029	0.4523	0.3925	0.3733	0.3476	0.2700	0.2459	0.2795	0.3455
Niger	0.4515	0.4887	0.4396	0.4285	0.4138	0.4931	0.4631	0.4535	0.4540
Sénégal	0.2229	0.2586	0.3116	0.2959	0.3265	0.3036	0.3756	0.2710	0.2957
Togo	0.4307	0.4732	0.5166	0.4935	0.4619	0.4707	0.4709	0.5046	0.4777
	Cost Efficiency								
Benin	0.8614	0.8732	0.8714	0.8737	0.8765	0.8839	0.8747	0.8953	0.8763
Burkina-Faso	0.8530	0.8639	0.8554	0.8444	0.8462	0.8720	0.8859	0.8878	0.8636
Côte d'Ivoire	0.8664	0.8607	0.8691	0.8691	0.8821	0.8707	0.8499	0.8518	0.8650
Mali	0.8864	0.9052	0.8909	0.8823	0.8746	0.8466	0.8429	0.8532	0.8728
Niger	0.8187	0.8424	0.8336	0.8516	0.8595	0.8963	0.8993	0.8980	0.8624
Sénégal	0.8453	0.8513	0.8704	0.8655	0.8733	0.8669	0.8831	0.8426	0.8623
Togo	0.8154	0.8274	0.8665	0.8668	0.8719	0.8669	0.8824	0.9005	0.8622
	Profit Efficiency								
Benin	0.8483	0.7877	0.8188	0.7420	0.6859	0.7619	0.6929	0.7422	0.7600
Burkina-Faso	0.8026	0.8203	0.8245	0.7887	0.7738	0.7400	0.5373	0.6501	0.7422
Côte d'Ivoire	0.6520	0.6406	0.7235	0.6689	0.7517	0.7118	0.6998	0.6464	0.6868
Mali	0.7422	0.7690	0.7270	0.7122	0.7750	0.7521	0.7640	0.7691	0.7513
Niger	0.7965	0.7814	0.7953	0.8023	0.7544	0.7402	0.7360	0.7662	0.7715
Sénégal	0.8053	0.8182	0.7928	0.8092	0.8135	0.8156	0.7268	0.7530	0.7918
Togo	0.7067	0.6581	0.7765	0.7198	0.7544	0.7241	0.7931	0.6549	0.7235

Table C.3: Correlations

	Cost Eff.	Profit Eff.	Conv. Lerner	Adj. Lerner	Market Share	Foreign Own.	State Own.	IDI	Branches	LiqRisk	CreditRisk	Equity
Cost Efficiency	1											
Profit Efficiency	0.1362*	1										
Lerner	0.4529*	0.2008*	1									
Adj. Lerner	0.6034*	0.1619*	0.3473*	1								
Market Share	0.1182*	0.0457	0.2730*	-0.0746	1							
Foreign	0.0777	0.1136*	-0.0067	0.0576	-0.1028*	1						
State	-0.1179*	-0.1118*	-0.0303	-0.1372*	0.1388*	-0.5558*	1					
IDI	-0.1500*	0.0097	0.0937*	-0.0119	0.1334*	0.0349	-0.0572	1				
Branches	-0.0607	-0.0149	0.0479	-0.3029*	0.4970*	-0.1351*	0.2105*	0.1355*	1			
LiqRisk	-0.1971*	-0.0628	0.1039*	-0.3293*	0.0266	-0.1456*	0.1306*	-0.0388	0.2045*	1		
CreditRisk	0.0678	0.1690*	-0.0031	0.1148*	-0.2555*	0.2312*	-0.3107*	-0.2308*	-0.1871*	0.0164	1	
E/TA	0.3203*	0.2399*	0.1812*	0.3520*	0.035	-0.011	0.0464	0.059	-0.0087	-0.1993*	0.0789	1

* indicates significance at the 5% level.

Appendix to Chapter 7

Table D.1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
<i>Independent variables</i>					
Credit	28952	0.6813	0.4660	0	1
Need	28952	0.6300	0.4828	0	1
Apply	18238	0.5810	0.4934	0	1
Accepted	10598	0.8504	0.3567	0	1
<i>Dependent variables</i>					
<i>Firm-level variables</i>					
Firm size	28952	77.9750	237.524	0	5000
Age	28952	16.9504	14.9103	0	108
Experience	28952	17.2560	11.1765	0	75
Largest owner	28952	78.2017	26.7016	0	100
Foreign-owned	28952	0.1001	0.3001	0	1
Gov.-owned	28952	0.0057	0.0757	0	1
Exporter	28952	0.1390	0.3460	0	1
Subsidiary	28952	0.1286	0.3348	0	1
Audited	28952	0.4753	0.4993	0	1
Publicly listed	28952	0.0515	0.2211	0	1
Privately held	28952	0.5847	0.4928	0	1
Construction	28952	0.1606	0.3671	0	1
WK	28952	48.5730	39.9079	0	100
Obstacles	28952	1.5163	1.3590	0	4
<i>Country-level variables</i>					
CR3	70	65.4999	19.1019	26.08	100
Lerner	51	0.2482	0.0691	0.12	0.44
Boone	69	-0.0900	0.2376	-1.59	0.54
H-stat	35	0.6500	0.2203	-0.02	0.99
Fin. Dev.	70	30.6170	23.0935	1.56	95.97
GDPpc	70	2647.21	2701.75	92.37	13836
Growth	70	5.7105	3.9012	-4.24	21.71
Inflation	70	10.4114	10.7748	-1.74	80.75
Legal rights	70	5.1285	2.3089	1	10
Credit Info	70	3.1745	2.1629	0	6
Institution Dev.	70	-0.2309	0.6217	-1.61	1.14

Table D.2: Variables description and data source

Variable	Description	Source
<i>Dependent variables</i>		
Credit	Dummy variable equals to 0 if the firm is classified as <i>Discouraged</i> or as <i>Denied</i> and 1 otherwise	WBES ^a
Need	Dummy variable equals to 1 if the firm needed external funds in the last year	WBES
Apply	Dummy variable equals to 1 if the firm needed external funds and applied for loans and 0 if the firm did not apply	WBES
Accepted	Dummy variable equals to 1 if the firm applied for loans and received at least one line of credit and 0 if the firm applied but did not receive a line of credit	WBES
<i>Independent variables</i>		
<i>Interbank competition</i>		
CR3	Share of banking system assets held by the three largest banks	GFDD ^b
Lerner	Value of the Lerner index	GFDD
Boone	Value of the Boone index	GFDD
H-stats	Value of the H-statistics	GFDD
<i>Firm-level control variables</i>		
Firm size	Number of permanent full-time employees	WBES
Age	Age of the firms (in years)	WBES
Exporter	Dummy variable equals to 1 if 10% or more of sales are exported	WBES
Foreign-owned	Dummy variable equals to 1 if 50% or more of the firm is owned by foreign organization	WBES
Government-owned	Dummy variable equals to 1 if 50% or more of the firm is owned by the government	WBES
Experience	Experience in this sector that the top manager has (in years)	WBES
Largest owner	Share of assets held by the largest owner	WBES
Audited	Dummy variable equals to 1 if the firm have its annual financial statement checked and certified by an external auditor	WBES
Subsidiary	Dummy variable equals to 1 if the firm is part of larger firm	WBES
Publicly listed	Dummy variable equals to 1 if the firms is a publicly listed company	WBES
Privately held	Dummy variable equals to 1 if the firms is a limited liability company	WBES
<i>Country-level control variables</i>		
Financial Development	Domestic credit to the private sector to GDP	GFDD
GDPpc	GDP per capita (Constant USD)	WDI ^c
Inflation	Annual change in the GDP deflator	WDI
Growth	Real growth of the GDP	WDI
Credit information	Depth of credit information index is a measure of the coverage, scope and accessibility of credit information available through either a public credit registry or a private credit bureau (0-6)	DB ^d
Legal Rights	The strength of legal rights index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders (0-10)	DB
Institution Dev. Crisis	Composite index of institutional development Dummy variable equals to 1 if year \geq 2009	WGI ^e
<i>Selection variables</i>		
WK	Proportion of goods or services paid for after the delivery	WBES
Construction	Dummy variable equals to 1 if the firm submit an application to obtain a construction-related permit over the last two years	WBES
Obstacles	Firm's assessment of growth obstacle induced by an inadequately educated workforce (ranges from 0 (no obstacle) to 4)	WBES

^aWBES: World Bank Enterprises Surveys; ^bGFDD: Global Financial Development Database; ^cWDI: World Development Indicators ^dDB: Doing Business; ^eWGI: World Governance Indicators

Table D.3: Pairwise correlations

	% of firms		CR3	Lerner	Boone	H-St.	Fin. Dev.	GDPpc	Gr.	Infl.	Legal rights	Credit Info	Inst. Dev.	
	Credit	App.												Acc.
Credit Av.	1.00													
Apply	0.84	1.00												
Accepted	0.80	0.62	1.00											
CR3	0.23	0.31	0.21	1.00										
Lerner	0.20	0.25	0.35	0.09	1.00									
Boone	0.06	0.05	0.04	0.10	1.00									
H-st	0.28	0.34	0.41	-0.02	0.04	1.00								
Fin. Dev.	0.55	0.62	0.36	0.24	0.16	-0.09	0.12	1.00						
GDPpc	0.68	0.67	0.49	0.38	0.19	-0.09	0.22	0.65	1.00					
Growth	-0.10	-0.14	-0.10	-0.08	-0.36	0.02	-0.09	-0.37	-0.34	1.00				
Inflation	-0.38	-0.32	-0.39	-0.16	-0.04	0.05	-0.05	-0.23	-0.32	0.15	1.00			
Legal rights	0.33	0.21	0.23	0.19	0.08	-0.05	-0.09	0.41	0.30	-0.15	-0.07	1.00		
Credit Info.	0.58	0.58	0.42	0.35	0.05	0.07	0.41	0.46	0.72	-0.15	-0.29	0.04	1.00	
Inst. Dev.	0.52	0.56	0.35	0.17	0.14	-0.15	0.01	0.72	0.72	-0.35	-0.24	0.50	0.45	1.00

Pairwise correlations computed at the national level. Inverse of CR3, Lerner index and Boone indicator are used in the table.

Table D.4: Robustness checks

Panel A: Foreign banks ownership

	Dependent variable: Credit availability			Dependent variable: Apply			Dependent variable: Accepted					
	CR3 [1]	Lerner [2]	Boone [3]	H-st. [4]	CR3 [5]	Lerner [6]	Boone [7]	H-st. [8]	CR3 [9]	Lerner [10]	Boone [11]	H-st. [12]
Competition	0.0002 (0.24)	0.1872 (0.85)	0.1070** (2.16)	0.1197* (1.82)	0.0002 (0.24)	0.0600 (0.29)	0.0952** (2.26)	0.1388** (2.24)	0.0002 (0.58)	0.0868 (0.96)	0.0379** (2.44)	0.0419** (2.17)
Foreign bank assets	0.0005 (0.82)	-0.0345 (-0.85)	0.0006 (1.02)	0.0001 (0.10)	-0.0001 (-0.10)	-0.0002 (-0.22)	0.0000 (0.01)	-0.0002 (-0.25)	0.0003 (0.86)	0.0007** (2.08)	0.0003 (0.89)	0.0004 (0.92)
# Firms	26906	23172	26886	17434	16812	14282	16799	10733	10001	8804	9996	7262
# Countries	59	49	58	34	59	49	58	34	59	49	58	34
LR test	900.52***	733.26***	820.53***	336.92***	54.44***	12.76***	52.38***	26.51***	16.36***	17.18***	17.28***	1.38
Wald test ($\rho = 0$)												

Panel B: Financial freedom

	Credit availability			Application for loans			Satisfied or denied?					
	CR3 [1]	Lerner [2]	Boone [3]	H-st. [4]	CR3 [5]	Lerner [6]	Boone [7]	H-st. [8]	CR3 [9]	Lerner [10]	Boone [11]	H-st. [12]
Competition	-0.0004 (-0.48)	0.3509* (1.75)	0.0887* (1.70)	0.1258** (2.26)	0.0002 (0.23)	0.1210 (0.59)	0.0766* (1.79)	0.1432*** (2.79)	-0.0001 (-0.34)	0.1457** (1.86)	0.0261* (1.66)	0.0469** (1.99)
Fin Freedom	0.0012 (1.18)	0.0019* (1.84)	0.0008 (0.84)	0.0033*** (3.36)	0.0023* (1.88)	0.0026* (1.79)	0.0021† (1.61)	0.0042*** (3.30)	0.0011** (2.34)	0.0011** (2.04)	0.0009** (2.08)	0.0009** (1.81)
# Firms	28046	23550	28026	17755	17579	14572	17566	10978	10464	9027	10459	7461
# Countries	68	51	67	35	68	51	67	35	68	51	67	35
LR test	921.20***	611.69***	878.77***	205.94***	79.61***	7.47***	67.95***	28.99***	5.07**	9.38***	6.08**	2.38
Wald test ($\rho = 0$)												

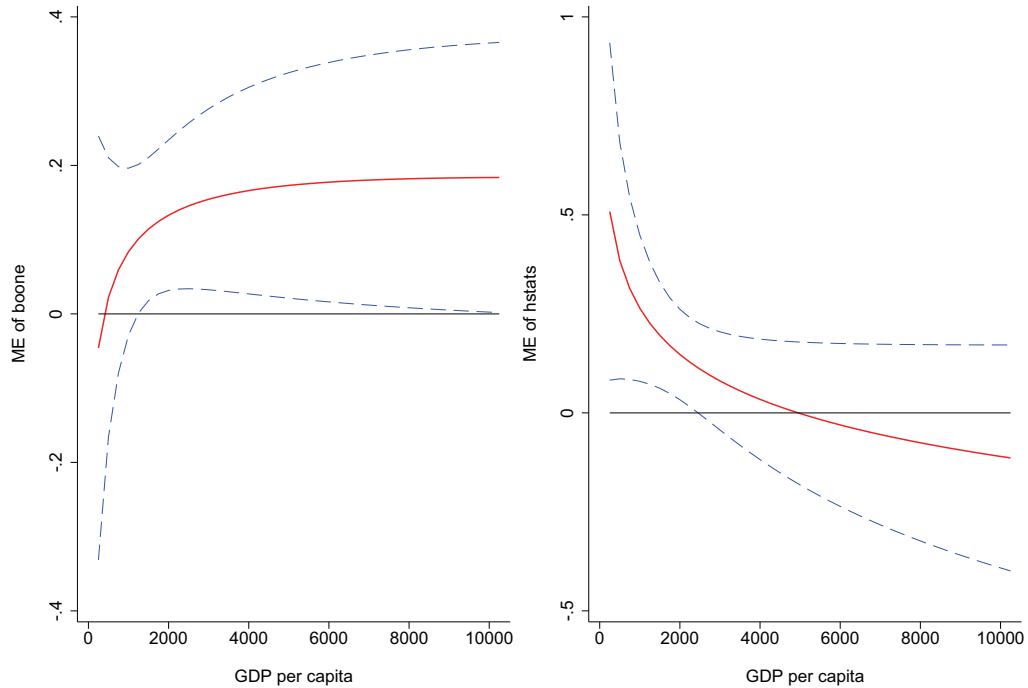
Panel C: Sub-sample on firms in non-economic centers

	Credit availability			Application for loans			Satisfied or denied?					
	CR3 [1]	Lerner [2]	Boone [3]	H-st. [4]	CR3 [5]	Lerner [6]	Boone [7]	H-st. [8]	CR3 [9]	Lerner [10]	Boone [11]	H-st. [12]
Competition	-0.0009 (-1.08)	0.1276 (0.60)	0.0976* (1.77)	0.1504** (2.37)	-0.0006 (-0.56)	-0.1286 (-0.59)	0.0622† (1.60)	0.2015*** (3.86)	-0.0003 (-1.08)	0.0548 (0.58)	-0.0356† (1.54)	0.0852*** (3.37)
# Firms	14341	12016	14332	9708	8982	7471	8975	6154	5539	4852	5535	4252
# Countries	68	51	67	35	68	51	67	35	68	51	67	35
LR test	461.46***	304.87***	455.49***	99.63***	23.93***	0.53	29.96***	52.22***	2.76*	7.42***	3.10*	1.69
Wald test ($\rho = 0$)												

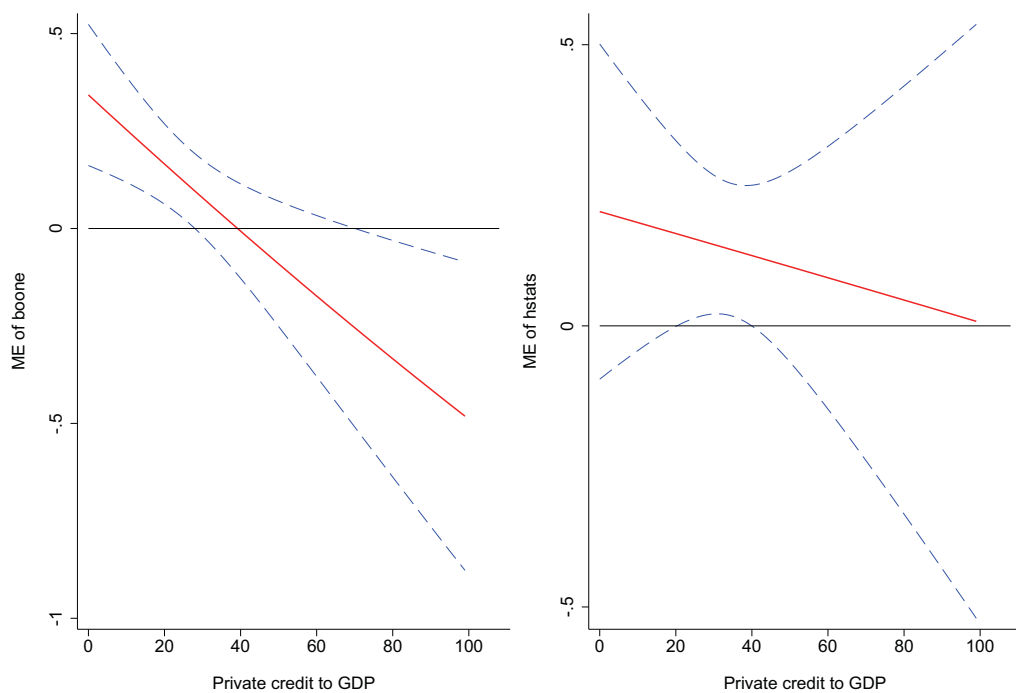
Credit availability is dummy equals to 1 if the firm is not subject to financing rationing. Apply is a dummy equals to 1 if the firm with a need for funds applied. Accepted is a dummy equals to 1 if the applicant received a loan. Inverse of CR3, Lerner index and Boone indicator are used in the table. Models [1]-[4] are estimated by running random-effect probit model. The LR test compares the pooled estimator (probit) with the panel estimator. Under null hypothesis, the panel estimator is not different from the pooled estimator. Models [5]-[12] are estimated by running pooled PSS model. The Wald test compares the pooled estimator (probit) with the PSS model. Under null hypothesis, the PSS estimator is not different from the pooled estimator. All models include firm- and country-level control variables and industry-dummies. MEs are reported, and z-statistics are presented in parentheses. Standard errors are adjusted for clustering at the country-level. †, *, **, and *** indicate significance at the 15%, 10%, 5% and 1% respectively.

Figure D.1: Conditional marginal effect

(a) GDP per capita



(b) Financial development



Note: A graphical approach is employed to analyze the conditional effects. Consider the following probit model: $E[y|x_1, x_2, z] = \text{Prob}(y = 1|x_1, x_2, z) = \Phi(\beta_1 x_1 + \beta_2 x_2 + \beta_{12} x_1 x_2 + \delta z) = \Phi(A)$ where $\Phi(A)$ is the standard normal cdf. The conditional marginal effect is given as follows:

$$ME(x_1|x_2) = \frac{\partial E[y|x_1, x_2, \bar{z}]}{\partial x_1} = (\beta_1 + \beta_{12} x_2) \phi(\beta_1 \bar{x}_1 + \beta_2 x_2 + \beta_{12} \bar{x}_1 x_2 + \delta \bar{z})$$

where $\phi(A)$ is the standard normal pdf. This marginal effect is the one for an hypothetical "average" country. In particular, this effect may differ for countries with lower or higher level of bank competition.

The red line is the value of the marginal effect of competition for each value of the country's characteristic. The confidence interval (dashed blue lines), computed following the delta method, is given as a simple indication.

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