

**UNIVERSITY OF GHANA
COLLEGE OF HUMANITIES**

**FINANCIAL FREEDOM, COMPETITION AND BANK PERFORMANCE
IN SUB-SAHARAN AFRICA**

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**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE
STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR
THE AWARD OF DEGREE OF DOCTOR OF PHILOSOPHY IN FINANCE**

DEPARTMENT OF FINANCE

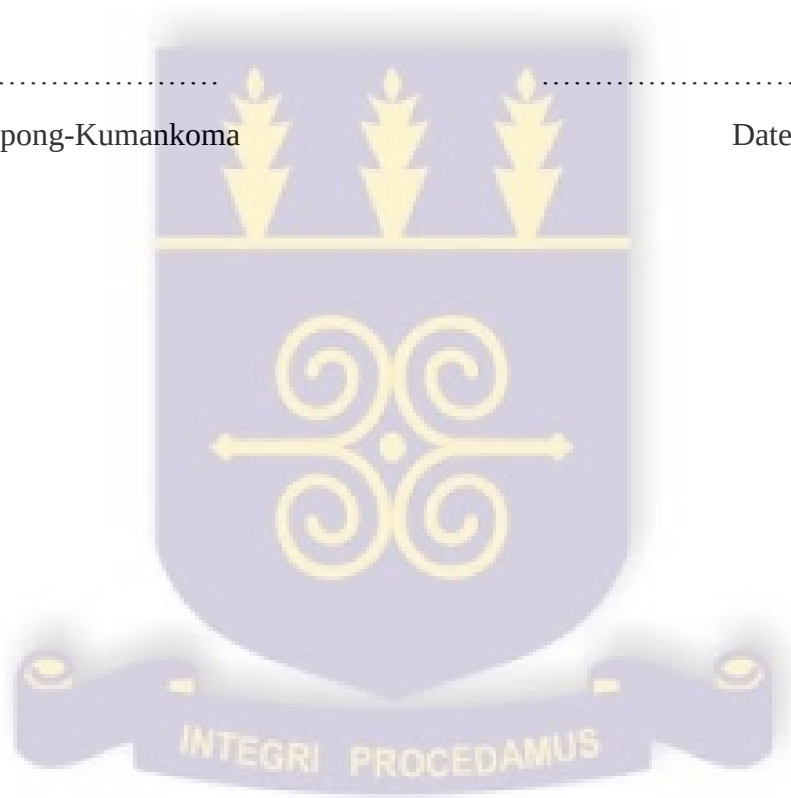
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DECLARATION

I hereby declare that this thesis is my own work produced from research I carried out under supervision. This thesis has not been presented by anyone for any academic award, in this or any other institution. All references made to work done by other people have been duly acknowledged. I am solely responsible for any shortcomings in this work.

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CERTIFICATION

We hereby certify that this thesis was supervised in accordance with procedures laid down by the University.

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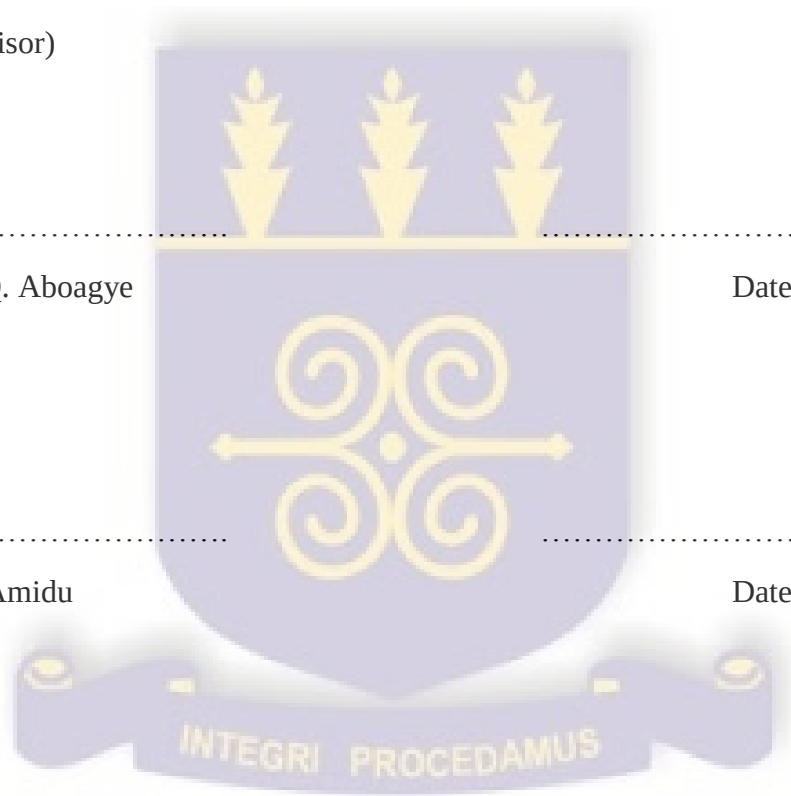
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ACKNOWLEDGEMENTS

I would like to express my appreciation for the financial support provided by the University of Ghana and the Business School to enable me undertake this study.

Many people have also played important roles in the development of this thesis. Special mention should be made of my supervisors, Professor Joshua Yindenaba Abor, Professor A. Q. Q. Aboagye and Dr. Mohammed Amidu, who provided much guidance, encouragement and support throughout the preparation of the thesis. I would forever be grateful for your wonderful show of magnanimity. May the Almighty God, Jehovah reward the way you act.

My colleagues in the Department of Finance have also shown good comradeship during the course of the study. My current Head of Department, Prof. Godfred Bokpin, in particular has shown much interest in getting this work completed, and so have Professor Kofi A. Osei, Dr. Simon K. Harvey, Dr. Charles Andoh and Dr. Vera Fiador. Considerable support have also been received from Dr. Kwaku Ohene-Asare, Dr. Patrick Asuming, Dr. Lord Mensah, Dr. Elikplimi Agbloyor, Mr. Frank Ametefe, Dr. Ibrahim Bedi, Dr. Agyapomaa Gyeke-Dako, Dr. Saint Kuttu, Miss. Esther Laryea, Miss. Sandra Ayiku and Mrs. Josephine Ofosu-Mensah Ababio, for which I am truly grateful.

I am also grateful to Dr. Ebow Turkson and Mr. Solomon Aboagye from the Department of Economics, who provided much needed assistance with the data analysis.

And finally, I very much appreciate the love and understanding shown by my wonderful wife, Beatrice, and my children, Nana Ama Sarpomaa, Maame Akosua and Kwabena Akosa.

ABSTRACT

The inferences of competition for bank stability, profitability and efficiency have been the subject of much debate, yet they remain controversial and inconclusive. Identifying channels through which competition affects bank performance may improve our understanding of the inconsistent findings in the literature. Hence, this thesis analyses the implications of competition and financial freedom for bank performance. The study also examines the determinants of bank profit persistence. Using data from 139 banks in 11 Sub-Saharan African countries over the period, 2006-2012, and the financial (or banking) freedom index from the Heritage Foundation, this study considers whether the degree of freedom in the banking sector affects the relationship between competition and bank performance. The results show a positive relationship between market power and bank stability, profitability and cost efficiency, suggesting that higher market power (or less competition) may improve bank profitability, efficiency, and stability. However, the relationship between market power and bank stability is found to be quadratic, implying that beyond a certain threshold, further increases in market power may damage bank stability. The evidence from this study shows that, the positive effect of market power is stronger on bank profitability, and weaker on bank efficiency with higher levels of financial freedom. We do not find evidence suggesting that financial freedom influences the relationship between competition and bank stability. On the determinants of bank profit persistence, the results of the study show differences across countries. The results of this study suggest that policies that allow banks to maintain some level of market power may be necessary to ensure banking system efficiency and overall stability. Also, while higher financial freedom improves bank profitability, it may be harmful for cost efficiency, especially for banks with higher market power. Thus, policies that ensure some restrictions on banking freedom may still be required to enhance bank efficiency.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The banking sector plays a critical role in every economy. Much of the work of transferring surplus funds to deficit units is carried out through the intermediation function of financial institutions, with banks as the dominant entity across many jurisdictions. A well-functioning banking system is widely recognized as essential to economic growth and development. Even so, reforms, globalization and technological advancement have changed the nature of the banking business over the last few decades. In addition, the 2007-2008 financial crisis that originated mainly in the U.S and spread to other developed countries and some emerging markets, and the recent banking crisis in Europe have re-ignited debate about regulation of the banking sector, and the level of freedom required to encourage innovation and efficiency and also ensure the stability of the financial system.

Indeed, recent decades have witnessed a considerable increase in the number of financial reforms across the globe, in both developed and developing countries. This development has resulted in the liberalization of banking sectors in many countries with higher-income countries being more liberalized than lower-income countries. A major reason for these reforms was to make the financial markets in general, and the banking sector in particular, more competitive (Delis, 2012). A widely accepted view is that competition in the banking sector will engender efficiency in operations, and also enhance general performance of financial institutions. Yet, research has shown

that the relationship between competition and bank performance is very complex, and that the view that competition is unambiguously good may be more naive in banking than in other industries (Claessens & Laeven, 2004). Strong competition may not be best for performance in the financial sector. It is no wonder then, that several years after some of these reforms were initiated, fundamental questions are still being asked about the implications of competition for the performance of the banking sector. For instance, is competition good for the overall stability of the banking sector? Has the opening up of the banking sector to greater competition unambiguously led to greater efficiency in banking operations? Is the high profitability observed in many banking markets driven by improved efficiency, or by exploitation of market power by banks? What factors influence the effects of competition on bank performance?

Finding answers to these questions remain relevant, because despite numerous research on the repercussions of competition for banking sector performance, there is no consensus on the effect of competition on bank stability, profitability or efficiency. A related issue that continues to puzzle researchers is the persistence of bank profits. While economic theory suggests that freedom of entry and exit in competitive markets should whittle away excess profits, this is not observed in the real world of banking. Bank profits continue to persist (Gschwandtner, 2005). So what drives the persistence of bank profits? Are there variations in these influencing factors across different countries?

Nevertheless, profitability in the banking sector is important and could partly explain the stability observed in some banking markets. Highly profitable banks should be able to increase their capital reserve to absorb potential losses and remain resilient to shocks. And as suggested by the European

Central Bank (2010), the question of what is an acceptable level of bank profitability is likely to play a pivotal role in the post-crisis debate among banking executives, investors and regulators, considering the enormous losses in the financial crisis, and the huge government intervention required. Even so, recent events have shown that the most common measure for a bank's performance, which is profitability, may be only part of the story, and that a more comprehensive assessment of bank performance may be warranted (European Central Bank, 2010). Another issue of concern, however, is the fact that higher bank profitability may be achieved at the expense of the rest of the economy, resulting in welfare losses and inefficient allocation of resources.

Also, the need for a stable banking system cannot be overemphasized. Instability in the banking sector is likely to result in the malfunctioning of other sectors of the economy, which depend on the payment system and intermediation functions provided by the banking sector, besides other services. Indeed, frequent bank failures was one of the major reasons for the reforms carried out in the banking sectors in many countries. And since the implementation of the reforms, we have not seen as many bank failures as was witnessed in the 1980s and 1990s. Yet concerns remain about the possibility of bank failures, considering the continued integration of banking systems, and the uncertainty about the effects of policy reforms such as competition on bank stability.

Efficiency in banking operations also has implications for the larger economy. For instance, the ability of banks to reduce costs through the use of modern technology should be beneficial to both their customers and shareholders, in terms of lower prices (and hence greater access to finance), and higher wealth creation.

The theoretical and empirical literature on the relationship between competition and bank performance (efficiency, profitability and stability) is quite extensive, yet it is obvious that more work needs to be done in view of the contrasting and even inconclusive results obtained in several studies. Generally, both the theoretical and empirical literature present ambiguous positions on the competition-stability, competition-profitability and competition-efficiency relationships.

For instance, the theoretical literature on the relationship between competition and bank stability presents no consensus. Two opposing views are theorized in the literature. One view, called the competition–fragility or competition-instability view, and pioneered by the influential work of Keeley (1990), asserts that competition in banking reduces market power (or the ability of banks to price their products/services above marginal cost), decreases profit margins, and results in reduced franchise value that encourages banks to take on greater risks. This position is supported by Hellmann, Murdock and Stiglitz (2000), Besanko and Thakor (1993), Allen and Gale (2000), and Allen and Gale (2004). In contrast, the competition–stability view came out strongly from the work of Boyd and de Nicoló (2005), who argued that competition leads to greater bank stability. They assert that as banking markets become more concentrated (and less competitive), banks tend to show market power by charging higher interest rates to borrowers. This worsens moral hazard incentives and makes it more difficult for borrowers to repay, as they also take on greater risks in search of more profits, and the result is an increase in the possibility of loan default and therefore the risk of bank portfolios. On the other hand, a reduction in interest rates on loans as a result of greater competition would encourage borrowers to seek safer investments, thus minimizing the risk of default and bank portfolio risk. This is also supported by Caminal and Matutes (2002) and Beck, Demirguc-Kunt and Maksimovic (2004), among others.

Also, two competing theories emerged from the industrial organization literature to explain the relationship between market structure and bank profitability. These are the Market Power (MP) and Efficiency Structure (ES) paradigms. These approaches provide different suggestions for the direction of causality between market structure and profitability.

The literature on competition and bank efficiency is related to the hypotheses that explain the relationship between market structure and performance. A special case of the MP hypothesis, the Quiet Life hypothesis, is the focus of this study. The ‘Quiet Life’ hypothesis (QLH), originally proposed by Hicks (1935) suggests that the higher the market power enjoyed by a firm, the lower the effort put forth by managers to improve efficiency, resulting in a negative relationship between market power and efficiency (Berger & Hannan, 1998). As an alternative, the efficient structure hypothesis developed by Demsetz (1973), submits that more efficient banks are better armed to survive competitive pressures and gain market share at the expense of the less efficient ones. Schaeck and Cihak (2008) categorize these hypotheses as ‘competition-efficiency’ and competition-inefficiency hypotheses. Similar to the competition-stability, and competition-profitability relationships, the empirical evidence on competition-efficiency relationship has been inconclusive. And only some recent studies have tried to test the quiet life hypothesis in banking (Coccoresse & Pellicchia, 2010).

Noticeably absent in the banking literature is an examination of the links between economic freedom and bank performance. The limited research in this area is somewhat surprising given the importance of bank lending in promoting economic development and the impact that economic freedom is likely to have on the banking sector (Sufian & Habibullah, 2010). Indeed, as noted by

Hafer (2013), a number of studies have found that financial development and higher levels of economic freedom are associated with (or cause) economic growth. The unanswered question, however, is whether the financial development-economic growth nexus reflects influences of economic freedom operating through the financial system (Hafer, 2013). Sufian and Habibullah (2010) provide new empirical evidence on the positive impact of economic freedom on banks' performance in Malaysia. Chortareas, Girardone, and Ventouri (2013), possibly the first to directly investigate the dynamics between the financial freedom counterparts of the economic freedom index drawn from the Heritage Foundation database and bank efficiency levels, suggest that the higher the degree of an economy's financial freedom, the higher the benefits for banks in terms of cost efficiency. Financial freedom is a measure of the degree of restrictions and controls in the financial sector. When financial institutions operate in a less restricted environment they are more likely to engage in competitive policies, resulting in higher levels of efficiencies. Related studies include Smimou and Karabegovic (2010) who show that changes in economic freedom have a positive impact on equity market returns, and Hafer (2013) who finds that countries with higher levels of initial economic freedom, on average, exhibit greater levels of financial intermediary development in subsequent years.

Chortareas et al. (2013) has noted that studies that consider the effects of economic freedom on bank performance typically treat the freedom index as one of the control variables, and also focus on the aggregate (economic) freedom index and not on the specific financial freedom counterparts, which gives rise to the possibility of misspecification bias. Indeed, since it became available some twenty years ago, several studies have used the financial freedom index (sometimes called banking

freedom) either as control variable or instrumental variable, but hardly is there any focus on its effect on bank performance.

Given the difficulty in understanding the channels between competition and bank stability, our study seeks to assess the effect of financial freedom on the competition-stability relationship. We also seek to provide additional insight into the ambiguous relationship between competition and bank profitability by considering the conditioning effect of financial freedom on this relationship. Further, this study seeks to test the quiet life hypothesis in the developing country context, which is largely ignored in the literature, and also provide new empirical evidence on the impact of financial freedom on the competition-efficiency relationship. In addition, we consider the determinants of bank profit persistence, and differences in determinants of profit persistence among countries. And though yet to be tested in the literature, there is some concern that excessive financial freedom may contribute to financial institutions' propensity to take on greater risks, which in turn may have contributed to the recent global and European crises (Chortareas et al., 2013).

1.2 Statement of the Research Problem

Recent studies that provide evidence for the competition–fragility hypothesis include Diallo (2015), Fungacova and Weill (2013), Berger, Klapper and Turk-Ariss (2009) and Beck, Demirguc-Kunt and Levine (2006). They obtain similar findings, suggesting that increased competition may undermine bank stability. On the other hand, gains in market power will increase the stability and reduce the risk for the banking system. In contrast, a number of studies have found support for the

hypothesis that competition enhances bank stability. For example, Boyd and de Nicoló (2005), Uhde and Heimeshoff (2009), Schaeck and Cihak (2014) and Schaeck, Cihak and Wolfe (2009).

However, recently, Martinez-Miera and Repullo (2010) questioned the theoretical predictions of Boyd and de Nicoló (2005) by arguing that lower loan rates resulting from greater bank competition also reduces the interest payments from performing loans (which provide a buffer against loan losses) because of imperfect correlation of loan defaults. They conclude that a U-shaped relationship between competition and the risk of bank failure generally obtains. Studies supporting this position are Forssbäck and Shehzad (2014), Beck, de Jonghe, and Schepens (2013), Liu, Molyneux and Wilson (2013), and Jimenez, Lopez, and Saurina (2013).

Empirical research on the impact of competition or market structure on bank interest margins have also produced conflicting results. Studies that have found a positive relationship between market power and net interest margins or a negative relationship between competition and net interest margins include Almarzoqi and Naceur (2015), Hawtrey and Liang (2008), Van Leuvensteijn, Sorensen, Bikker and Rixtel (2013), and Poghosyan (2013). Similarly, for Africa, while Aboagye, Akoena, Antwi-Asare, and Gockel (2008a) found that increases in bank market power (or concentration) significantly increase net interest margin in Ghana, Chirwa and Mlachila (2004) suggest that the observed high spreads in Malawi can be attributed to high monopoly power.

In contrast, Maudos and de Guavara (2004) show that the fall of margins in the European banking system is compatible with a relaxation of the competitive conditions (increase in market power and concentration), as this effect has been counteracted by a reduction of interest rate risk, credit

risk, and operating costs. On the other hand, while Kasman, Tunc, Vardar and Okan (2010) found market power to be a vital determinant of bank interest margin in both new and old EU member countries, the effect was opposite for the two groups. Beck and Hesse (2009) also found little evidence for market structure explaining variation in spreads or margins over time for Uganda.

Generally, the empirical evidence on the market structure and bank profitability relationship have been mixed. While some have found support for the Market Power (MP) hypothesis, other studies find no evidence of market structure or market power having an effect on bank profitability. Instead, some have found that the level of bank profitability is explained by efficiency, thus supporting the Efficiency Structure (ES) paradigm. Support for the MP hypothesis has been found by Tregenna (2009), Jeon and Miller (2002), Mirzaei, Moore and Liu (2013) and Fu and Heffernan (2009). In contrast, some studies report that the MP argument is not held in the banking industry. Examples are Seelanatha (2010) and Chortareas, Garza-Garcia and Girardone (2011). Instead, these studies suggest that efficiency seems to be the main driving force of increased bank profitability.

Similar to the competition-stability, and competition-profitability relationships, the empirical evidence on competition-efficiency relationship has been inconsistent. Surprisingly, the quiet life hypothesis (QLH) in particular, has received relatively little attention in the empirical literature, and only some recent studies have tried to test the QLH in banking (Coccoresse & Pellicchia, 2010). Moreover, the few studies in this area have largely centered on developed economies. However, given the differences in levels of efficiency and institutional arrangements between developed markets and developing markets (Eldomiaty, 2007), we cannot assume that the results obtained

will necessarily apply to developing economies. Hence, studies in developing countries should enhance our understanding of this important issue in banking. Those reporting evidence of the quiet life hypothesis include Berger and Hannan (1998), Delis and Tsionas (2009), and Coccoresse and Pellicchia (2010). In contrast, Weill (2004), Koetter, Kolari and Spierdijk (2012), Casu and Girardone (2006), Maudos and de Guavara (2007), Casu and Girardone (2009), and Williams (2012) provide support for a negative relationship between competition and efficiency in banking (a rejection of the QLH).

Even so, Williams (2012) has noted that the contrast in the empirical evidence may be attributable to the simultaneous relationship between competition (market power) and bank efficiency, which is usually ignored in empirical investigations. The interdependence between competition and bank efficiency implies the possibility of reverse causality. The efficient structure hypothesis, for instance, suggests that efficiency may be driving market power (Turk-Ariss, 2010). The problem is demonstrated further by the empirical evidence that shows that the quiet life hypothesis is usually accepted in studies that do not control for simultaneity (Berger & Hannan, 1998), whilst it is rejected in studies that account for the problem (Maudos & de Guevara, 2007; Koetter et al., 2012). As noted by Koetter et al. (2012), with the exception of Maudos and de Guevara (2007), Koetter and Poghosyan (2009), and Delis and Tsionas (2009), virtually all studies on market power and efficiency ignore the simultaneous relation between them. This points to a potential gap in the literature, which our study seeks to fill, given the seeming dependence of the outcome on whether or not simultaneity is taken into consideration.

Contestable markets theory and the new industrial organization literature also highlight the influence of potential and actual competition on profitability. The Persistence of Profit (POP) theory proposed by Mueller (1977), asserts that entry into and exit from an industry are sufficiently free to abolish any abnormal profit quickly, and that the profit rates of all the firms in an industry tend to converge towards the same long-run average value. However, this theory does not seem to find enough empirical support (Gschwandtner, 2005). Besides, while there is an extensive empirical Persistence of Profit (POP) literature based on manufacturing data, only a handful of studies investigate POP in banking (Goddard, Liu, Molyneux & Wilson, 2013), and in only a few countries (Goddard, Liu, Molyneux, & Wilson, 2011). Indeed, even fewer still consider the determinants of profit persistence where they exist. Also, previous studies have generally ignored differences in determinants of profit persistence across countries.

Chortareas et al. (2013) has also noted that studies that consider the effects of economic freedom on bank performance typically treat the freedom index as one of the control variables, and also focus on the aggregate (economic) freedom index and not on the specific financial freedom counterparts, which gives rise to the possibility of misspecification bias.

Moreover, most of the above-mentioned studies on competition and bank performance have concentrated on the developed economies, particularly the U.S and European banking markets. Of course, some studies have covered our broad areas of interest in contexts similar to our own. For the competition-stability relationship, studies similar to ours include Tabak, Fazio, and Cajueiro (2012) for Latin American countries, Turk-Ariss (2010) for developing economies, Amidu (2013) and Amidu and Wolfe (2013a) for emerging and developing countries. On the competition-

profitability nexus, studies in similar context include Beck and Hesse (2009) for Uganda, Perera, Skully, and Chaudrey (2013) for South Asian banks, Al-Muharrami and Matthews (2009) for the Arab Gulf Cooperation Council (GCC) region, Hossain (2012) for Bangladesh, Chortareas, Garza-Garcia, and Girardone (2012) for Latin American banking, Maudos and Solís (2009) for Mexico, Amidu and Wolfe (2013b) for emerging and developing countries, Ahokpossi (2013) for Sub-Saharan Africa, Aboagye et al. (2008a) for Ghana, and Chirwa and Mlachila (2004) for Malawi. In regard to the competition-efficiency relationship, we also have studies such as Turk-Ariss (2010) for the developing economies, Mlambo and Ncube (2011) for South Africa, and Pruteanu-Podpiera, Weill, and Schobert (2008) for Czech banks, among many others. Kouki and Al-Nasser (2014) also recently examined the impact of market power on bank efficiency and stability in Africa. Even so, these studies ignored the potential effect of financial freedom on the competition and bank performance relationships.

1.3 Research Questions

The study provides empirical evidence on competition, financial freedom and bank performance that seeks to answer the following key questions:

- i. What is the relationship between competition, financial freedom and bank stability in Sub-Saharan Africa?
- ii. What is the relationship between competition, financial freedom and bank profitability in Sub-Saharan Africa?
- iii. What is the relationship between competition, financial freedom and bank efficiency in Sub-Saharan Africa?

- iv. What are the determinants of bank profit persistence in different countries in Sub-Saharan Africa?

1.4 Research Hypotheses

Based on the theoretical predictions and the available empirical evidence, as well as the African context, ten main hypotheses related to the research questions above, are developed in this thesis.

Generally, the few studies on the effect of competition on bank stability in emerging and developing countries (Turk-Ariss, 2010; Amidu, 2013; Kouki & Al-Nasser, 2014) suggest that an increase in the degree of market power (or less competition) leads to greater bank stability, and that increased competition may undermine bank stability. Given the similarities in economic and institutional context, we expect a similar result for this study on Sub-Saharan Africa. Hence, this leads to our first hypothesis:

H1: Competition has a negative effect on bank stability.

The effect of financial freedom on bank stability is yet to be tested in the literature, but there are suggestions that excessive financial freedom may contribute to financial institutions' propensity to take on greater risks, which in turn may have contributed to the recent global and European crises (Chortareas et al., 2013). One could expect that higher financial freedom (or less restrictions in the banking sector) is likely to open up banking markets and engender greater competition, which could result in instability. Thus we formulate hypotheses 2 and 3 below:

H2: Financial freedom has a negative effect on bank stability.

H3: The effect of competition on bank stability increases with financial freedom.

Even though the empirical evidence on the market structure and bank profitability relationship presents no consensus, we expect that in the highly profitable developing country context, increasing competition is likely to result in reduced profits, as more banks compete for essentially the same customers. Our fourth hypothesis is thus formulated as:

H4: Competition has a negative effect on bank profitability.

On the other hand, higher financial freedom may allow banks to explore new markets and activities, resulting in advantages from economies of scale or scope, and better management of variability in earnings across product lines, thus increasing their profit potential (Goddard et al., 2011). This leads us to the following hypothesis:

H5: Financial freedom has a positive effect on bank profitability.

Also, the negative effect of competition on bank profitability may be enhanced by the existence of higher financial freedom, but this is yet to be tested in the banking literature. In harmony with our expectation we suggest the following hypothesis:

H6: The effect of competition on bank profitability increases with financial freedom.

The empirical evidence on competition-efficiency relationship has been inconsistent, but since we measure competition and efficiency using the same framework, we expect to find a negative relationship between competition and bank efficiency (a rejection of the QLH), just like previous studies that followed a similar approach (see Koetter et al., 2012). Our hypothesis is:

H7: Competition has a negative relationship with bank efficiency.

The effect of financial freedom on bank efficiency has only recently been tested in the banking literature and found to be positive (Chortareas et al., 2013; Lin, Doan & Doong, 2016). We anticipate a similar finding, and thus hypothesize as:

H8: Financial freedom has a positive effect on bank efficiency.

Further, we test whether financial freedom moderates the effects of competition on bank efficiency, which has so far not received attention in the literature. Our hypothesis is:

H9: The effect of competition on bank efficiency increases with financial freedom.

Finally, given the peculiar characteristics of individual economies, coupled with the regulatory and institutional environments, we anticipate that different factors account for bank profit persistence in various countries, leading us to the following hypothesis:

H10: Determinants of bank profit persistence vary across countries.

1.5 Objectives of the Study

The main objective of this study is to examine the effects of competition and financial freedom on bank performance. Specifically, the study seeks to:

- i. evaluate the effects of competition and financial freedom on bank stability.
- ii. ascertain the effects of competition and financial freedom on bank profitability.
- iii. assess the effects of competition and financial freedom on bank efficiency.
- iv. examine the determinants of bank profit persistence.

1.6 Significance of the Study

This study enhances our understanding of the ambiguous relationship between competition and bank performance, by considering the potential effect of financial freedom on this relationship. It differs from most of the other studies in the literature in the following ways: First, we assess the impact of financial freedom on the competition-efficiency, competition-profitability, and competition-stability relationships (which is new in the literature). Second, we carry out a joint-estimation of competition and efficiency using the same model. Although very necessary, given the close relationship between competition and efficiency, only a handful of studies have jointly estimated competition and bank efficiency using the same framework (see Koetter et al., 2012 for the few exceptions). Most studies estimate competition and efficiency separately, and then assess their relationship. This approach confounds our understanding of the relationship between competition and bank efficiency. Thus using a common framework in this study should result in a more appropriate policy response. Third, we test the quiet life hypothesis which has received very little attention in banking as noted by Coccoresse and Pellicchia (2010), especially in developing countries. Policy makers often take the view that promoting competition or reducing bank market

power will enhance efficiency, but that may not necessarily be the case in the SSA region, given the differences in institutional arrangements between developed and developing economies. Fourth, we test for a non-linear relationship between competition and bank stability (a new development in the literature following the theoretical work of Martinez-Miera and Repullo, 2010). Fifth, we assess the determinants of bank profit persistence and variations across countries, which is largely ignored in the literature. Sixth, we provide a more comprehensive assessment of bank performance by considering bank efficiency, profitability and stability together. Most studies consider only one or two of these at a time which does not provide a complete picture.

The Sub-Saharan African (SSA) banking markets serve as a fertile ground for a study of the relationship between competition and bank performance. Generally, banking markets in this region are less competitive compared to other regions of the world. African banks are also well-capitalized, quite liquid, more profitable and fairly stable (Beck & Cull, 2013; Honohan & Beck, 2007; Moyo, Nandwa, Oduor, & Simpasa, 2014; Beck, Maimbo, Faye, & Triki, 2011). Competitive conditions continue to improve with the gradual relaxation of remaining restrictions on banking activities as pertains in the developed markets in the Western world. For instance, the index of financial freedom developed by the Heritage Foundation (2015) which gives an indication of the freedom with which banks conduct their activities clear of government intervention and control, has increased in many of these countries over the last decade (with an average of 51 by 2012).

But as competition gets more intense in SSA banking markets along with greater financial freedom, how will bank efficiency be affected? Will banks in these markets continue to be

profitable, well-capitalized and stable? Or are we likely to witness bank crises again, as experiences from the developed markets suggest, especially given the poor institutional environment in these areas? Will the comparatively high net interest margins decline or increase? Our study contributes significantly to the literature by addressing some of the issues raised above and other related matters.

1.7 Scope of the Study

This thesis is limited to a discussion of the effects of competition and financial freedom on bank cost efficiency, profitability and stability over the 7-year period from 2006 to 2012. The study period was largely influenced by the availability of banking data in the Bankscope database, which was the main source of data for the study. Our goal was to use as much data as possible, but we focused on the dominant financial institution, commercial banks, and specialized financial institutions whose nature and operations are akin to that of commercial banks. We excluded other financial institutions such as investment banks since their sphere of activities are dissimilar.

Our initial sample comprised of banks in all SSA countries, but due to data limitations, especially inadequate data points at the country level required for some of the regression estimates, we settled on data from 139 banks operating in 11 countries in SSA. Also, banks with less than three consecutive years of observations were excluded. Besides, some banks did not have values needed for some of the key variables used in the study and had to be excluded. The final sample is an unbalanced panel with 700 bank-year observations. Even so, the results should generally reflect the situation of the banking industry in this region, and may be applicable to other developing

countries as well, given that our sample comprise most of the largest banking markets in SSA (www.eiu.com).

1.8 Structure of the Thesis

This thesis has been organized into five chapters. Chapter one provides a general introduction to the thesis, including background of the study, the problem statement, research questions, research hypotheses, research objectives, significance and scope of the study. In chapter two, we review the relevant theoretical and empirical literature related to competition and bank efficiency, profitability and stability. Chapter three covers the various methodologies employed to assess the relationships of interest, while chapter four deals with the analysis and discussion of the results obtained. Chapter five concludes the thesis with a summary of the findings, contributions of the study, conclusions and policy recommendations, as well as limitations and suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews relevant literature on the broad areas of competition, economic freedom and bank performance. Section 2.2 begins with a review of the theoretical framework, methods of measuring competitive conditions, and general determinants of competition in banking markets. Section 2.3 gives an overview of the bank stability literature, drawing on both the theoretical and empirical literature, as well as the more recent works aimed at addressing the ambiguity of the competition-stability relationship. Section 2.4 deals with the bank profitability literature, while section 2.5 provides literature on bank efficiency. Both sections begin with an overview of the theoretical literature, before considering the empirical evidence. We review bank profit persistence literature in section 2.6, and economic freedom and bank performance literature in section 2.7. In section 2.8, we provide a brief overview of the African banking sector. The chapter concludes with a summary and gaps in the literature in section 2.9. We focus particularly on recent empirical studies on areas closely related to our research objectives: effect of financial freedom and competition on bank stability; effect of financial freedom and competition on bank profitability; effect of financial freedom and competition on bank efficiency; as well as the determinants of bank profit persistence.

2.2 Theoretical Framework and Determinants of Bank Competition

The seminal work of Klein (1971) provides the conventional framework for examining the competitive behavior of banks. Klein (1971) considers a bank as a monopolistic firm engaged principally in two activities: taking deposits and making loans. Thus the cost function of the intermediation services of a bank could be represented as:

$$C = f(D, L), \quad (2.1)$$

where D refers to the volume of deposits and L represents the volume of loans produced by the bank. The monopoly model of Klein (1971) assumes that the banking firm operates in an environment characterized by imperfect competition in both the deposit and credit markets. This implies that the bank has monopoly power to set prices (interest rates) in at least one of the markets where it operates, usually the credit market. According to Klein (1971), the monopoly power of the bank explains its scale of operations, its asset and liability structure, as well as its decisions on interest rates on assets (loans) and liabilities (deposits). Thus, in this model, the spread of a banking firm is basically a reflection of its ability to charge a price that is higher than its marginal cost of production in both the loan and deposit markets.

As shown by Oreiro and de Paula (2010), in a context where r is the inter-bank market rate; r_L is the interest rate charged on loans produced by the bank; r_D is the interest rate paid on deposits with the bank; α is the reserve requirements as a proportion of the bank's deposits; ε_L is the interest elasticity of loan demand; ε_D is the interest elasticity of deposit supply; C_L is the marginal cost of loan services; and C_D is the marginal cost of deposits services, and supposing that the banking firm

is risk neutral and that its behaviour is aimed at maximizing profits, then the optimal interest margin on loans and deposits is given by:

$$\frac{1}{\varepsilon_L^*} = \frac{r_L^* - (r + C_L)}{r_L^*} \quad (2.2)$$

$$\frac{1}{\varepsilon_D^*} = \frac{r(1 - \alpha) - C_D - r_D^*}{r_D^*} \quad (2.3)$$

Equations (2.2) and (2.3) suggest that a banking firm that operates in a monopolistically competitive environment prices its loans and deposit services in such a way that the Lerner indices are equal to the inverse of the interest elasticity of the loan demand and deposit supply functions. This implies that the greater the sensitivity of loan demand and deposit supply functions to interest rate changes, the smaller the bank's margin in both loan and deposit taking services, and, hence the smaller the bank margin. However, if the banking firm faces an oligopolistic market structure in granting loans and taking deposits, then the optimal interest margin on loans and deposits is given by:

$$\frac{s}{\varepsilon_L^*} = \frac{r_L^* - (r + C_L)}{r_L^*} \quad (2.4)$$

$$\frac{s}{\varepsilon_D^*} = \frac{r(1 - \alpha) - C_D - r_D^*}{r_D^*}, \quad (2.5)$$

where s is the market share of the n th bank. Equations (2.4) and (2.5) show the bank interest margin on loan supply and deposit taking as a growing function of its market share. This is understood to mean that a reduction in the number of banking firms due to mergers or acquisitions results in increased banking market concentration and thus interest margins. Thus a banking firm's interest margin is a growing function of the banking sector market structure (da Silva, Oreiro, de Paula & Sobreira, 2007).

The Klein (1971) monopoly model has been criticized for assuming (for the sake of simplicity) that interest rate changes reflect the key risk faced by banks, and for its inability to capture the hedging behavior of banks adequately (Ho & Saunders, 1981). Consequently, Ho and Saunders (1981) proposed a 'dealership model' to explain bank profitability.

The Ho and Saunders (1981) model considers a bank as a risk-averse dealer between the users and suppliers of funds. Given that the arrival of deposits and loans are not synchronized, the bank has to set interest rates on loans and deposits in such a way as to compensate it for providing immediate liquidity service at the risk of losing money, as a result of exposure to changes in money market interest rates (i.e. interest rate risk).

Suppose a new deposit (loan) is contracted at a long-term interest rate r_D (r_L). If this deposit (loan) arrives earlier than a new loan (deposit), the bank will have to invest (borrow) the funds at the short-term money market rate r . In providing these services, the bank faces a reinvestment (refinancing) risk at the end of the decision period should the short-term rate, r , fall (rise). Hence,

the bank will transfer these financial costs which arise from the uncertainty in the provision of deposit and loan operations to economic agents.

As a result, each bank participating in the market will set a loan and deposit interest rate, r_D (and r_L) that reflects these financial costs as follows:

$$r_D = r - a; \quad r_L = r + b, \quad (2.6)$$

where a and b represent the financial costs related to the provision of deposits and loans respectively, and r is the expected money market interest rate. Thus, the net interest spread is:

$$r_L - r_D = (a + b) \quad (2.7)$$

Maudos and de Guevara (2004), extended the Ho and Saunders (1981) model by explicitly taking into account, banks' operating costs, and used a direct measure of the degree of competition, the Lerner index in addition to the degree of concentration of the market (the Herfindahl index). They postulate that, given the initial wealth of the bank as the difference between its assets and liabilities, and incorporating the production costs associated with intermediation (which are assumed to be a function of the deposits and loans), the final wealth of the bank will be:

$$E[U(W)] = U(W^*) + U'(W^*)E[W-W^*] + \frac{1}{2}U''(W^*)E[W-W^*]^2 \quad (2.8)$$

This assumes that banks are maximizers of expected utility, and that a bank's utility function, U , is approximated using the Taylor expansion around the expected level of wealth. It is also assumed that the bank's utility function is continuous and doubly differentiable such that $U' > 0$ and $U'' < 0$, so that the bank is risk averse.

Hence, the optimal interest margin is determined principally by the following:

- The competitive structure of the markets
- Average operating costs
- Degree of risk aversion
- Volatility of money market interest rates
- Credit risk
- The covariance or interaction between interest rate risk and credit risk
- The average size of the credit and deposit operations

The subsequent sections discuss further extensions on the theoretical literature on competitive behavior of banks, and its implications for performance.

The main drivers of competition identified in the literature include size, default risk, diversification, efficiency, equity, concentration, market share, ownership, monetary policy, inflation, and financial depth (Aboagye, Akoena, Antwi-Asare & Gockel, 2008b; De Guevara & Maudos, 2007; De Guevara, Maudos, & Pérez, 2005). For instance, De Guevara et al. (2005) have shown that bank size has a positive and significant effect on market power. Larger banks enjoy greater market power due to either cost advantages or to their capacity to impose higher prices.

Mirzaei and Moore (2014) report that banks located in countries with good-quality institutional development face greater competition for emerging and developing economies, whereas inter-industry competition from insurance industries, together with financial freedom, seem to be the main drivers in increasing competition amongst developed economies. Chortareas et al. (2013) also suggest that an open and transparent banking environment facilitates access to financing and encourages competition to provide efficient financial intermediation between households and firms, as well as between investors and entrepreneurs.

Similarly, Claessens and Laeven (2004) find that banking systems with greater foreign bank entry and fewer entry and activity restrictions tend to be more competitive. But they find no evidence that the competitiveness measure negatively relates to banking system concentration. On the contrary, they find some evidence that more concentrated banking systems are more competitive. Their findings confirm that contestability determines effective competition especially by allowing (foreign) bank entry and reducing activity restrictions on banks. The results on the lack of importance of market structure suggest that competition policy in the financial sector is more complicated than perhaps previously thought. Hence, they posit that developing proper competitiveness tests and methodologies will remain an important area of research and policy focus. Again, Casu and Girardone (2006) suggest that the degree of concentration is not necessarily related to the degree of competition in EU banking markets. They also find little evidence that more efficient banking systems are also more competitive.

2.3 Bank Stability

This section covers a review of the theoretical and empirical bank stability literature with a focus on the competition-stability relationship.

2.3.1 Theoretical Review of Bank Competition-Stability Relationship

The theoretical literature on the relationship between competition and bank stability presents no consensus. Two opposing views are theorized in the literature. One view, called the competition–fragility or competition-instability view, and pioneered by the influential work of Keeley (1990), asserts that competition in banking reduces market power of banks, decreases profit margins, and results in reduced franchise value that encourages banks to take on greater risks. Using U.S. data to illustrate his model, Keeley (1990) finds that the increased competition and deregulation that followed the relaxation of state branching restrictions in the U.S. in the 1980s, eroded monopoly rents and resulted in an increase of bank failures. On the other hand, higher market (or monopoly) power in the banking market leads to greater stability because the greater lending opportunities, higher profits, higher capital ratios and charter values of incumbent banks, put them in a better position to survive demand-side and supply-side shocks, which in turn provides a dis-incentive for excessive risk-taking (Keeley, 1990; Allen & Gale, 2000, 2004; Carletti, 2008).

Hellmann et al. (2000) makes a similar argument, stating that financial liberalization increases the potential scope for gambling by banks, since it often leads to intense competition among banks, at the same time that banks gain greater freedom to allocate assets and set interest rates. They point out that in a dynamic economy, capital requirements may not be as powerful as previously thought, because in addition to a one-period capital-at-risk effect that minimizes the incentive to gamble,

there is a future-franchise-value effect that increases the incentives to gamble. Further, Besanko and Thakor (1993) used a theoretical model to show that lending rates decrease and borrowing rates increase as more banks enter the market and each tries to differentiate itself from the competition. This results in a reduction in bank margins and charter values giving banks greater incentives to gamble or take on greater risk.

In addition, Allen and Gale (2000) and Allen and Gale (2004) suggest that greater competition in banking reduces incentives to properly screen borrowers and increases the risk of fragility, since banks earn less informational rent from their relationships with borrowers. Allen and Gale (2000) also show that a small number of large institutions in a concentrated banking system makes for more stability and resilience to shocks, since banks are easier to monitor and supervisors are less burdened.

In contrast, the competition–stability view came out strongly from the work of Boyd and de Nicoló (2005), who argued that competition leads to greater bank stability. They assert that as banking markets become more concentrated (and less competitive), banks tend to show market power by charging higher interest rates to borrowers. This worsens moral hazard incentives and makes it more difficult for borrowers to repay, as they also take on greater risks in search of more profits, and the result is an increase in the possibility of loan default and therefore the risk of bank portfolios. On the other hand, a reduction in interest rates on loans as a result of greater competition would encourage borrowers to seek safer investments, thus minimizing the risk of default and bank portfolio risk. Similarly, while Caminal and Matutes (2002) show that banks with more market power (in less competitive markets), have to contend with monitoring costs and are more likely to

create risky loan portfolios, Beck, Demirguc-Kunt, and Maksimovic (2004) state that both greater concentration in banking markets and higher competition are more conducive to bank stability.

Recently, Martinez-Miera and Repullo (2010) questioned the theoretical predictions of Boyd and de Nicoló (2005) by arguing that lower loan rates resulting from greater bank competition also reduces the interest payments from performing loans (which provide a buffer against loan losses) because of imperfect correlation of loan defaults. According to Martinez-Miera and Repullo (2010), in addition to the risk-shifting effect in the Boyd and de Nicoló (2005) model, there is also a margin effect that goes in the opposite direction, so that the final effect on the risk of bank failure is in principle ambiguous. They show that the risk-shifting effect tends to dominate in monopolistic markets, whereas the margin effect dominates in competitive markets, so a U-shaped relationship between competition and the risk of bank failure generally obtains.

2.3.2 Empirical Evidence on Competition-Stability Relationship

Similar to the conflicting theoretical predictions of the competition and bank stability relationship, empirical evidence in support of the competition–fragility or competition–stability views is also inconclusive.

Recent studies that provide evidence for the competition–fragility hypothesis include Beck et al. (2006) who show that crises are less likely in economies with more concentrated banking systems even after controlling for differences in commercial bank regulatory policies, national institutions affecting competition, macroeconomic conditions, and shocks to the economy. Berger et al. (2009)

also find evidence consistent with the traditional “competition-fragility” view that banks with a higher degree of market power in developed nations also have less overall risk exposure.

Besides, Turk-Ariss (2010) finds that an increase in the degree of market power (less competition) leads to greater bank stability, and suggests that increased competition may undermine bank stability, and may have significant repercussions for stressed banking systems in developing economies. Amidu (2013) also suggests that the relatively low insolvency risk among banks in emerging and developing countries during 2000–2007 could be attributed to the high degree of market power and the use of internally generated funds. Similarly, Fungacova and Weill (2013) find that increase in bank competition could undermine financial stability in the case of Russian banks, for the period 2001–2007. For Africa, Kouki and Al-Nasser (2014) argue that gains in market power will increase the stability and reduce the risk for the banking system.

More recently, Diallo (2015) reports that bank competition is detrimental to bank stability, and also shortens the survival time of banking systems, using data from 145 countries over the period 1997–2010, and three measures of bank competition, namely the Boone indicator, the conventional Lerner and the adjusted Lerner indices.

In contrast, a number of studies have found support for the hypothesis that competition enhances bank stability. For example, Uhde and Heimeshoff (2009) find that Eastern European banking markets which exhibit a lower level of competitive pressure are more prone to financial fragility, and that national banking market concentration has a negative impact on European banks’ financial soundness.

Also, using the Panzar and Rosse (1987) H-statistic as a measure of competition for 45 countries, Schaeck et al. (2009) find that more competitive banking systems are less prone to experience a systemic crisis and exhibit increased time to crisis. Again, with a sample of European Banks, Schaeck and Cihak (2014) report that competition is stability-enhancing, and that the stability-enhancing effect of competition is greater for healthy banks than for fragile ones.

2.3.3 Is There a Transmission Mechanism Between Competition and Stability?

The results of some other recent studies suggest that the relationship between competition and bank stability is not straightforward and may actually depend on other factors previously ignored in the literature. For instance, Agoraki, Delis, and Pasiouras (2011) investigate whether regulations have an independent effect on bank risk-taking or whether their effect is channeled through the market power possessed by banks. Using data from the Central and Eastern European banking sectors over the period 1998–2005, the empirical results suggest that higher activity restrictions in combination with more market power reduce both credit risk and the risk of default, while official supervisory power has only a direct impact on bank risk. Overall, it appears that ignoring the interactions between regulations and market power leads to erroneous inferences about the impact of regulations on both credit risk and overall solvency risk. They contend that this provides stimulus for a more disaggregate analysis of the impact of bank regulations on risk-taking activities. In particular, it would be interesting to analyze which of the elements used to compose the regulatory indices are the most relevant in explaining bank risk. Also, another possible area for future research could be to provide a more detailed analysis of the different country-specific institutional characteristics that may affect bank risk and how these characteristics are affected by

the competitive conditions in the banking sector or of other industries that were involved in the recent financial turmoil, such as the insurance industry.

Tabak et al. (2012) also corroborate the conclusions of Martinez-Miera and Repullo (2010) in finding that competition affects risk-taking behaviour in a non-linear way in Latin American countries as both high and low competition levels enhance financial stability, with the opposite effect for average competition. In addition, bank size and capitalization are found to be essential factors in explaining this relationship. On the one hand, the larger a bank is, the more it benefits from competition. On the other hand, a greater capital ratio is advantageous for banks that operate in collusive markets, while capitalization only enhances the stability of larger banks under high and average competition.

Likewise, Liu et al. (2013) find evidence pointing to the fact that an inverted U-shaped relationship exists between regional bank competition and stability, using regional data to examine bank stability in 10 European countries over the period 2000-2008, thus providing support for the argument for a U-shaped relationship between competition and the risk of bank failure proposed by Martinez-Miera and Repullo (2010). Jimenez et al. (2013) also tested this hypothesis using data from the Spanish banking system and find support for this non-linear relationship using standard measures of market concentration in both the loan and deposit markets. However, when direct measures of market power, such as Lerner indices, are used, the empirical results are more supportive of the original franchise value hypothesis, but only in the loan market. They argue that the overall results highlight the empirical relevance of the Martinez-Miera and Repullo model, even though further analysis across other banking markets is needed.

Using a sample of 978 banks in 55 emerging and developing countries over 2000–2007, Amidu and Wolfe (2013a) report that competition increases bank stability as diversification across and within both interest and non-interest income generating activities of banks increases. Their analysis identifies revenue diversification as a channel through which competition affects bank insolvency risk in emerging countries.

Further, Beck et al. (2013) document large cross-country variation in the relationship between bank competition and bank stability, and show that an increase in competition will have a larger impact on banks' fragility in countries with stricter activity restrictions, lower systemic fragility, better developed stock exchanges, more generous deposit insurance and more effective systems of credit information sharing.

Fu, Lin, and Molyneux (2014) also suggest that greater concentration in Asian banking markets nurtures financial fragility and that lower pricing power also induces bank risk exposure. In other words, the findings provide support for a neutral view of the competition-stability nexus, indicating that the competition-stability and competition-fragility theories can simultaneously apply to Asia Pacific banking markets.

Forssbäck and Shehzad (2014) also investigate the relationship between market power and risk for a large panel of banks worldwide and find that both loan and deposit market power have a stable, monotonically negative effect on risk, irrespective of risk measure. The effect is larger for asset risk, and is independent of charter value and capital ratios. However, the effect on default

risk tends to decrease in the quality of banking regulation, whereas the conditioning effects of deposit insurance protection are mixed.

2.4 Bank Profitability

This section reviews the literature on bank profitability, including some basic theoretical concepts, empirical evidence on the competition-profitability relationship, and general determinants of profitability. However, we have separate discussions for bank profitability in general, and net interest margins in particular.

2.4.1 Theoretical Review of Determinants of Bank Profitability

A number of other extensions have been made to the basic Ho and Saunders (1981) model. As explained in Almarzoqi and Naceur (2015), some simplifying assumptions of the Ho and Saunders (1981) model have since been relaxed. For example, Allen (1988) provides for heterogeneity in the model (since banks offer different types of deposit and loan services), and show that pure interest margins may be reduced as a result of diversification of bank services and products. This approach deals with the cross-elasticities of demand between bank products and services. McShane and Sharpe (1985) replaced the volatility of the deposit or loan rates, as in Ho and Saunders (1981), with a more relevant variable, the volatility of the money market interest rate. Angbazo (1997) also extended the Ho and Saunders (1981) model by incorporating credit risk and its interaction with interest rate risk. Wong (1997) derived an alternative model to explain the bank's optimal net interest spread in which banks are assumed to set the deposit and loan rate simultaneously. More recently, Carbo and Rodriguez (2007) further developed the model of Ho

and Saunders (1981) by including both traditional and non-traditional activities in order to study the effect of specialization on bank spreads, using a multi-output model for European banking.

Besides the monopoly theory of Klein (1971) and the dealership model of Ho and Saunders (1981), two other competing theories explaining the relationship between market structure and bank profitability emerged from the industrial organization literature, specifically the Concentration-Profit Theory proposed by Bain (1951). The theory as applied to banking, asserts that higher concentration in banking markets results in collusion among banks who take advantage of their market power to set higher prices and gain substantial profits. However, Demsetz (1973) proposed an alternative explanation for the market structure-profitability relationship (the Efficient-Structure-Hypothesis).

Thus, as explained by Tregenna (2009), the traditional literature falls into two broad approaches: the Market Power (MP) and Efficiency Structure (ES) paradigms. These approaches provide different suggestions for the direction of causality between concentration and profitability. For the MP hypothesis, the direction of causality runs from market structure to behaviour, and then performance. In other words, a concentrated structure promotes the use of market power in ways that may enhance banks' profitability. In contrast, the ES hypothesis perceives causality as running from individual firms' efficiency to their market share and profitability.

Further, within the MP paradigm, two different approaches emerge in the literature: the Structure-Conduct Performance (SCP) hypothesis, and the Relative Market Power (RMP) hypothesis. The SCP hypothesis asserts that concentration in a banking market gives rise to potential market power

by banks which allows them to set prices that are less favorable to consumers (lower deposit rates, higher loan rates) which may then increase their profitability. A related theory is the relative-market-power hypothesis (RMP), which posits that only firms with large market shares and well-differentiated products are able to exercise market power in pricing their products and earn supernormal profits (Shepherd, 1982). Thus, whereas the SCP hypothesis would predict generic benefits to banks arising from higher concentration, the RMP hypothesis sees any benefits as accruing to individual banks based on their own market share. According to the latter approach, only large banks can influence prices and increase profits (Tregenna, 2009).

Again, within the ES paradigm there are also two theories that explain the positive relationship between profits and either concentration or market share: the X-efficiency (ESX) and Scale-Efficiency (ESS) hypotheses. The X-efficiency version of the Efficient-Structure hypothesis (ESX) asserts that firms with superior management or production technologies have lower costs and therefore higher profits. Such firms tend to gain larger market shares, which may manifest in higher levels of market concentration, but without any causal relationship from concentration to profitability. The scale efficiency approach within the ES paradigm emphasizes economies of scale rather than differences in management or production technology. Larger firms can obtain lower unit costs and higher profits through economies of scale. Again, as these firms have higher market shares, which may manifest in higher concentration, there may be an apparent—yet spurious—relationship between concentration and profitability. Thus, according to the ES approaches, a positive correlation between concentration and profitability need not indicate a causal relationship, especially not through market power (Tregenna, 2009).

The two market-power (MP) hypotheses have radically contrasting implications from the two efficient-structure (ES) hypotheses for merger and antitrust policy. To the extent that the MP hypotheses are correct, mergers may be motivated by desires to set prices that are less favorable to consumers, which would decrease total consumer plus producer surplus. But to the extent that the ES hypotheses are correct, these mergers may be motivated by efficiency considerations that would increase total surplus. Thus, advocates of the MP hypotheses tend to see antitrust enforcement as socially beneficial, while ES advocates tend to see policies that inhibit mergers as socially costly (Berger, 1995).

In a distinguished contribution to this literature, Berger (1995) entered the debate on the profit-structure relationship in banking very strongly, by adding direct measures of both X-efficiency and scale efficiency to the empirical analysis, in order to test all four hypotheses, in a single specification. Using 30 separate cross-sectional datasets, he regressed profits against measures of concentration, market share, X-efficiency, and scale efficiency. He also regressed concentration and market share against the efficiency variables to test the necessary condition of the ES hypotheses that efficiency affects market structure. The empirical results provide some support for the RMP and partial support for the X-efficiency version of the ES hypothesis (ESX). However, support for the other necessary condition of ESX, that X-efficiency is positively related to concentration or market share so that it can explain the positive profit-structure relationship, is much weaker.

While some prior studies did control for scale efficiency, they generally did not control for X-efficiency, and so were unable to distinguish whether the profit-structure relationship observed

reflected superior management or greater market power of firms with large market shares. Prior studies also did not test whether efficiency has the predicted efficient-structure effects on market structure (Berger, 1995).

2.4.2 Empirical Evidence on Determinants of Bank Net Interest Margins

Empirical research on the impact of competition or market structure on bank interest margins have produced conflicting results. As noted by Saunders and Schumacher (2000), the effect of market structure on bank spreads appears to vary across countries. The more segmented or restricted the banking system, in terms of geographic restrictions on branching and universality of banking services, the larger appears to be the monopoly power of existing banks and the higher their spreads. Other studies that have found a positive relationship between market power and net interest margins or a negative relationship between competition and net interest margins include Almarzoqi and Naceur (2015) for Caucasus and Central Asia, Hawtrey and Liang (2008) for OECD countries, Hossain (2012) for Bangladesh, Chortareas et al. (2012) for Latin American banking, Van Leuvensteijn et al. (2013) for euro area banks, and Maudos and Solís (2009) for Mexico.

In addition, Amidu and Wolfe (2013b) found that the high net-interest margins of banks in emerging and developing countries can be explained by the degree of market power. Poghosyan (2013) also analyze factors driving persistently higher financial intermediation costs in 48 low-income countries-LICs (including some countries in Sub-Saharan Africa), relative to 67 emerging market-EM country comparators (including some countries in Northern and Southern Africa) for the period 1996–2010. Overall, he finds that concentrated market structures and lack of

competition in LICs banking systems and institutional weaknesses constitute the key impediments preventing financial intermediation costs from declining. The results provide strong evidence that policies aimed at fostering banking competition and strengthening institutional frameworks can reduce intermediation costs in LICs.

For Africa, Ahokpossi (2013) examined the determinants of bank interest margins using a sample of 456 banks in 41 Sub-Saharan African (SSA) countries. The results show that market concentration is positively associated with interest margins, but the impact depends on the level of efficiency of each bank. In particular, compared to inefficient banks, efficient ones increase their margins more in concentrated markets. This indicates that policies that promote competition and reduce market concentration would help lower interest margins in SSA. Similarly, while Aboagye et al. (2008a) found that increases in bank market power (or concentration) significantly increase net interest margin in Ghana, Chirwa and Mlachila (2004) suggest that the observed high spreads in Malawi can be attributed to high monopoly power.

In contrast, Maudos and de Guavara (2004) analyze the interest margin in the principal European banking sectors (Germany, France, the United Kingdom, Italy and Spain) in the period 1993–2000 using a panel of 15,888 observations, and identifying the fundamental elements affecting this margin. They followed the methodology developed in the original study by Ho and Saunders (1981) and later extensions, but widened it to take banks' operating costs explicitly into account. The results show that the fall of margins in the European banking system is compatible with a relaxation of the competitive conditions (increase in market power and concentration), as this effect has been counteracted by a reduction of interest rate risk, credit risk, and operating costs.

On the other hand, while Kasman et al. (2010) found market power to be a vital determinant of bank interest margin in both new and old EU member countries, the effect was opposite for the two groups. They suggest that the apparent difference might be the fact that increases in the degree of concentration in the old member countries influenced by the process of mergers and acquisitions triggered an upward pressure on the competition, thus narrowing the interest margins. Beck and Hesse (2009) also found little evidence for market structure explaining variation in spreads or margins over time for Uganda.

The empirical literature on the relationship between bank size and interest margins presents contrasting results. Among those reporting a positive relationship are Almarzoqi and Naceur (2015), Aboagye et al. (2008a), and Maudos and Solis (2009). On the contrary, Kasman et al. (2010) Fungacova and Poghosyan (2011), and Maudos and de Guevara (2004) suggest a negative relationship between bank size and interest margins.

Most studies have reported a positive relationship between credit risk and interest margins indicating that banks charge additional risk premiums to compensate for credit risk (Naceur & Omran, 2011; Hossain, 2012; Chortareas et al., 2012a; Amidu & Wolfe, 2013b; Ahokposi, 2013). However, similar to Fungacova and Poghosyan (2011), Almarzoqi and Naceur (2015) found a negative correlation between credit risk and interest margins, and considers that as being reflective of inadequate interest spreads (mispricing of risks) to compensate for provisions for non-performing loans.

Likewise, with regard to risk aversion (or capitalization), most empirical findings report a positive effect on net interest margins. Among others, Saunders and Schumacher (2000), Aboagye et al. (2008a), Hawtrey and Liang (2008), and Fungacova and Poghosyan (2011) found that the level of capitalization has a positive and significant impact on bank interest margins, suggesting an important policy trade-off between assuring bank solvency—high capital-to-asset ratios—and lowering the cost of financial services to consumers—low net interest margins. It appears that as banks deploy higher equity, they charge their customers more so as to earn enough to service the higher expected returns of shareholders (Aboagye et al., 2008a).

Kasman et al. (2010) report that managerial efficiency (measured by the ratio of operating cost to income) is negatively and significantly related to net interest margins, implying that higher managerial efficiency stimulates banks to offer higher deposit rates and lower loan rates to their clients. Angbazo (1997), Maudos and de Guevara (2004), Hawtrey and Liang (2008), and Claey's and Venet (2008) report similar findings, but Gischer and Juttner (2003) suggest that improved quality of management should narrow down the interest margin due to efficiency. Almarzoqi and Naceur (2015) note that more recent studies find that banks with well-developed non-interest income sources have lower net interest margins, suggesting that banks may tend to offer loans with small or even negative margins to attract clients and compensate with higher fees. In contrast, Chiorazzo, Milani, and Salvini (2008) and Elsas, Hackethal, and Holzhauser (2010) assert that revenue diversification enhances bank profitability via higher margins from non-interest businesses. Nguyen (2012) also found that net interest margin is not always inversely related to diversification.

Naceur and Omran (2011) suggest that macroeconomic and financial development indicators have no significant impact on net interest margins, except for inflation. On the other hand, regulatory and institutional variables seem to have an impact on bank performance. Likewise, Ahokposi (2013) found inflation to be positively related to interest margins, but there is no conclusive evidence that economic growth has any impact on margins. However, as pointed out by Ahokposi (2013), there is a dearth of research on interest margins in Sub-Saharan African (SSA).

2.4.3 Empirical Evidence on Determinants of Bank Profitability

A sound and profitable banking sector is better able to withstand negative shocks and contribute to the stability of the financial system. Therefore, the determinants of bank profitability have attracted the interest of academic research as well as of bank management, financial markets and bank supervisors (Athanasoglou, Brissimis, & Delis, 2008). Most recent studies on the relationship between bank competition and profitability test the SCP and/or the ES hypotheses. Generally, the results have been mixed. While some have found support for the SCP, other studies find no evidence of market structure or market power having an effect on bank profitability. Instead, some have found that the level of bank profitability is explained by efficiency. Of course, even when market structure or market power is found to affect profitability, the outcome is not always the same. In some cases profitability is positively affected by market structure, while the effect is negative in other situations.

For instance, Tregenna (2009) analyses the effects of structure on bank profitability in the U.S from 1994 to 2005. He found evidence that market concentration increases bank profitability. This holds even when the largest banks are excluded from the sample, suggesting that the relationship

between concentration and profitability acts in a generalized structural way and that the higher profits arising from concentration are at the expense of the rest of the economy. The analysis points to various policy implications relevant to the current crisis, in particular in terms of the legitimacy of expectations of the restoration of pre-crisis profit rates and the need for much stronger regulation of the banking sector, especially in terms of the structure of the sector, pricing behaviour and use of profits. Closely related to this is Fu and Heffernan (2009), who investigate the relationship between market structure and performance in China's banking system from 1985 to 2002, a period when this sector was subject to gradual but notable reform. Their results lend some support to the relative market-power hypothesis in the early period.

Similarly, Perera et al. (2013) find that even though increasing competition (arguably driven by on-going deregulation and liberalization of the financial services industries) exerts negative pressure on bank profitability, high levels of industry concentration still allows South Asian banks to earn higher profits. And for the Arab Gulf Cooperation Council (GCC) region, Al-Muharrami and Matthews (2009) find that the performance in banking industry is best explained by the mainstream SCP hypothesis. Also, Jeon and Miller (2002) examined the evidence, if any, of the relationship between several measures of bank concentration at the state level (in the U.S) and the average performance of banks within that state. They find a robust positive correlation between bank concentration in a state and the average return on equity within that state. Moreover, the linkage appears to run from increasing bank concentration to increasing bank profitability, and not the reverse. Those observations, they conclude, imply that the market power, rather than the efficient-structure, hypotheses holds for the U.S. banking industry during the last quarter of the

20th century. They suggest that bank regulators need to monitor the consolidation process within the banking industry to head off the accumulation of monopoly power.

Mirzaei et al. (2013) empirically investigate the effects of market structure on profitability of 1,929 banks in 40 emerging economies (Eastern Europe and Middle East) and advanced economies (Western Europe) over 1999–2008 by incorporating the traditional Structure-Conduct-Performance (SCP) and Relative-Market-Power (RMP) hypotheses. They observe that a greater market share leads to higher bank profitability being biased toward the RMP hypothesis in advanced economies, yet neither of the hypotheses is supported for profitability in emerging economies. The evidence also highlights that profitability increase with increased interest margin revenues in a less competitive environment for emerging markets. In addition, Goddard, Molyneux, and Wilson (2004) find some evidence of a positive association between concentration and profitability, but little evidence of a link between bank-level x-inefficiency and profitability.

In contrast, Seelanatha (2010) suggest that the traditional SCP argument is not held in the banking industry in Sri Lanka, and that bank profitability does not depend on either market concentration or market power of individual firms but on the level of efficiency of the banking units. Likewise, Chortareas et al. (2011) suggest that despite the significant rise in takeovers from foreign banks and the increase in market concentration, banks' profits do not seem to be explained by greater market power in Latin America. Instead, efficiency (particularly scale efficiency) seems to be the main driving force of increased profitability for most countries. The key implication is that policies aimed at removing the remaining barriers to competition should be expected to benefit the banking system without being detrimental to consumers.

And while Flamini, Schumacher and McDonald (2009) assert that bank profits are high in Sub-Saharan Africa (SSA) compared to other regions, they do not obtain conclusive results as to whether market power influences bank returns.

In regard to other determinants of bank profitability, Athanasoglou et al. (2008) show that bank capital is important in explaining bank profitability, while increased exposure to credit risk and high operating expenses lowers profits, showing that cost decisions of bank management are instrumental in influencing bank performance. Similarly, Liu and Wilson (2010) find evidence that well capitalized, efficient banks, with lower credit risks tend to outperform less capitalized, less efficient counterparts with higher credit risks in Japan. Perera et al. (2013) also reveal that well-capitalized banks and those with relatively more efficient production processes in South Asia are the more profitable. On the contrary, Goddard et al. (2004) and Goddard et al. (2013) show that banks that maintain high capital-assets ratios tend to record relatively low profitability among some European Union countries, suggesting that the opportunity cost of holding high levels of capital tends to depress shareholder returns.

Perera et al. (2013) report that South Asian banks seem to experience economies of scale as bank size is positively associated with profitability. This is similar to Flamini et al. (2009) who found that higher returns on assets are associated with larger bank size in Sub-Saharan Africa (SSA), but in contrast with what Athanasoglou et al. (2008) found on size in Greece.

On the effect of diversification, Goddard et al. (2013) provide consistent evidence that more highly diversified banks outperform their more highly focused counterparts, similar to what Flamini et al. (2009) found for SSA. Also, Chiorazzo et al. (2008) and Elsas et al. (2010) assert that revenue diversification enhances bank profitability via higher margins from non-interest businesses. However, other previous studies (e.g. Stiroh & Rumble, 2006) show that greater diversification of the banking business does not necessarily translate into an improvement of the bank's profitability. In fact, such diversification may be detrimental to profitability.

Other studies highlight the important role of environmental factors. For instance, with 795 individual banks in 39 countries covering the period 1999–2006, Lee, Hsieh, and Dai (2012) report that a lower level of economic development of the host country enhances the positive effects of foreign bank ownership on the income, profit and cost of domestic banks. And Liu and Wilson (2010) find that Gross Domestic Product (GDP) growth and the extent of stock market development play an important role in determining the profitability of Japanese banks. Perera et al. (2013) indicate that slack legal systems in South Asian countries (leading to inferior contract enforcement) positively affect profits as banks probably require higher risk premiums on their loan contracts. Naceur and Omran (2011) examine the influence of bank regulation and financial and institutional development on commercial bank profitability across a broad selection of Middle East and North Africa (MENA) countries. The empirical results suggest that regulatory and institutional variables seem to have an impact on bank performance.

2.5 Bank Competition and Efficiency

In this section, we review the theoretical literature and empirical evidence on the relationship between competition or market power and bank efficiency. The literature on this issue is related to the hypotheses that explain the relationship between market structure and performance. Our focus is on the Quiet Life hypothesis (QLH), which is considered as a special case of one of the market structure and performance hypotheses, the market power hypothesis (Maudos & de Guevara, 2007).

2.5.1 Theoretical Review of Bank Competition-Efficiency Relationship

As discussed under section 2.4.1, there are two main theories explaining the relationship between market structure and performance. These are the Market Power (MP) and Efficiency Structure (ES) hypotheses. These theories provide different suggestions for the direction of causality between concentration and profitability. For the MP hypothesis, the direction of causality runs from market structure to behaviour, and then performance. In other words, a concentrated structure promotes the use of market power in ways that may enhance banks' profitability. In contrast, the ES hypothesis perceives causality as running from individual firms' efficiency to their market share and profitability, asserting that the most efficient banks obtain both greater profitability and market shares and, as a consequence, the market becomes more concentrated. Hence, the positive relationship observed between concentration and profitability is actually spurious and simply reflects the relationship between superior efficiency, market share and concentration (Maudos & de Guevara, 2007). Subsequently, Berger (1995) divided this hypothesis into the X-efficiency and scale efficiency hypotheses.

In addition, within the MP paradigm, two different approaches emerge in the literature: the Structure–Conduct Performance (SCP) hypothesis, and the Relative Market Power (RMP) hypothesis. The SCP hypothesis asserts that concentration in a banking market gives rise to potential market power by banks which allows them to set prices that are less favorable to consumers (lower deposit rates, higher loan rates) which may then increase their profitability. A related theory is the relative-market-power hypothesis (RMP), which posits that only firms with large market shares and well-differentiated products are able to exercise market power in pricing their products and earn supernormal profits (Shepherd, 1982). Thus, whereas the SCP hypothesis would predict generic benefits to banks arising from higher concentration, the RMP hypothesis sees any benefits as accruing to individual banks based on their own market share. According to the latter approach, only large banks can influence prices and increase profits (Tregenna, 2009).

A special case of the market power hypothesis, is the ‘Quiet Life’ hypothesis (QLH), originally proposed by Hicks (1935). This hypothesis suggests that the higher the market power enjoyed by a firm, the lower the effort put forth by managers to improve efficiency, resulting in a negative relationship between market power and efficiency. Berger and Hannan (1998) summarize the reasons that may explain the influence of market structure, as a proxy for market power, on efficiency. First, according to the quiet life hypothesis, if banks that compete in a market with higher concentration can set prices above marginal costs, managers do not have incentives to work as hard to keep costs under control. In other words, monopoly power allows managers to relax their efforts. Second, market power may allow managers to pursue objectives other than profit maximization. Third, in a non-competitive market, managers may apply resources to obtain and maintain market power, raising costs and reducing efficiency. And fourth, if banks enjoy market

power, incompetent managers can survive without willfully shirking work efforts (Maudos & de Guevara, 2007).

As an alternative, the efficient structure hypothesis submits that more efficient banks are better armed to survive competitive pressures and gain market share at the expense of the less efficient ones (Demsetz, 1973). Thus, while the quiet life hypothesis posits a negative relationship between market power and bank efficiency, the relationship is positive should the efficient structure hypothesis prevail.

Schaeck and Cihak (2008) categorize these hypotheses as ‘competition-efficiency’ and competition-inefficiency hypotheses. Under the ‘competition-efficiency’ hypothesis, an adaptation from the efficient structure hypothesis postulated by Demsetz (1973), increases in competition lead to increases in bank efficiency. An exogenous shock such as deregulation, forces banks to minimize costs, offer services at lower prices, while compelling them to increase profits at the same time through changes in output strategy. In such a scenario, efficient banks (those with superior management and production technologies that translate into higher profits) will increase in size and market share at the expense of less efficient banks, leading to higher market concentration. On the other hand, in contrast, uncompetitive markets allow bank managers to enjoy a ‘quiet life’ whereby costs are not kept under control, leading to lower levels of efficiency. Under this hypothesis, we can expect competition to bring about higher bank efficiency. (Schaeck & Cihak, 2008).

The alternative, the Competition-Inefficiency' hypothesis suggests that competition leads to a decline in bank efficiency. According to Schaeck and Cihak (2008), higher competition is likely to be associated with less stable, shorter relationships between customers and banks as customers tend to switch to other banks in more competitive environments. This situation worsens information asymmetry problems that require additional resources for screening and monitoring borrowers. Also, banks are likely to reduce efforts at building relationships with borrowers in competitive markets, since such relationships may have shorter durations, resulting in less reusability and value of information. Consequently, banks incur higher costs in retaining old and attracting new customers through investments in technology and marketing efforts. Thus, this alternative hypothesis implies that competition decreases bank efficiency.

2.5.2 Empirical Evidence on Competition-Efficiency Relationship

Similar to the competition-stability, and competition-profitability relationships, the empirical evidence on the competition-efficiency relationship has been inconsistent. Indeed, only some recent studies have tried to test the quiet life hypothesis in banking (Coccoresse & Pellicchia, 2010).

Berger and Hannan (1998) report evidence of the quiet life hypothesis for the U.S regional banking markets. Likewise, Delis and Tsionas (2009) provide an empirical framework for the joint estimation of efficiency and market power of individual banks. The model is applied to the EMU and U.S banking industries and the findings suggest that most banks are characterized by moderately competitive behavior. In addition, a clear negative relationship is identified between the level of market power and efficiency of individual banks, a result in line with the theory underlying the quiet life hypothesis of Hicks (1935). Besides, Coccoresse and Pellicchia (2010)

test the quiet life hypothesis (QLH) using data on the Italian banking industry. They estimate bank-level cost efficiency scores and Lerner indices, and then use the estimated market power measures, as well as a vector of control variables, to explain cost efficiency. The empirical evidence supports the QLH, although the impact of market power on efficiency is not particularly remarkable in magnitude. For the developing economies context, Turk-Ariss (2010) investigates how different degrees of market power affect bank efficiency, and show that market power leads to significant cost efficiency losses.

In contrast, Weill (2004) provides support for a negative relationship between competition and efficiency in banking (a rejection of the QLH), for a sample of EU countries, using the Rosse-Panzar H-Statistic to measure competition, and stochastic frontier approach to obtain the efficiency scores. Similarly, Casu and Girardone (2006) found that the most efficient EU banking systems are also the least competitive, suggesting that the pro-competitive deregulation of the EU banking markets might have led to increased market power for the most efficient banks, therefore lowering the pressures initially resulting from increased competition.

Further, Maudos and de Guavara (2007) show the existence of a positive relationship between market power and cost X-efficiency in the EU banking industry, allowing a rejection of the so-called quiet life hypothesis. They also show that the welfare gains associated with a reduction of market power are greater than the loss of bank cost efficiency, showing the importance of economic policy measures aimed at removing the barriers to outside competition. They conclude that the discrepancy of their results from previous ones obtained for the U.S banking industry show the need for additional empirical evidence referring to other banking sectors, because there are

hardly any studies that estimate the costs of market power, whether in terms of social welfare or in terms of bank cost efficiency.

With the use of quarterly data for Czech banks, Pruteanu-Podpiera et al. (2008) estimate the effects of banking competition in the Czech Republic. They found negative causality only running from competition to efficiency. They therefore reject the intuitive ‘quiet life’ hypothesis and indicate a negative relationship between competition and efficiency in banking. Somewhat similar results on the relationship between competition and efficiency were found by Casu and Girardone (2009) in the banking sectors of five EU countries by using Granger-type causality test estimations. They found positive causation between market power and efficiency, but the causality running from efficiency to competition was weak. This does not support Hick's (1935) quiet life hypothesis as they indicate that an increase in banks' monopoly power (market power) does not translate into a decrease in cost efficiency. However, they could not conclude that a rejection of the quiet life hypothesis in turn supports the efficient structure paradigm, as the results of the reverse causality running from efficiency to competition do not suggest that increases in efficiency foster market power.

Poshakhwale and Qian (2011) examine the relationship between industry competition, productive efficiency and economic growth in Egypt by employing an endogenous growth model. Their findings suggest that industry competition measures are negatively affecting the cost efficiency measure in the long run. They posit that this may be because cost efficiency for established banks in their sample may have declined over time due to reduced operational scale caused by the arrival of more competitors as a result of financial reforms. However, Andries and Capraru (2012)

investigating the relationship between competition and efficiency in EU 27 banking systems as a whole using Granger-type causality tests rejected the efficient structure hypothesis, but their findings provide little or no evidence to support or reject the “quiet life” hypothesis.

However, as noted by Williams (2012), the contrast in the empirical evidence may be attributable to the simultaneous relationship between competition (or market power) and bank efficiency. In econometric models, simultaneity creates a concurrent correlation between the regressors and the error term, which if not controlled for leads to inconsistent estimates. The interdependence between competition and bank efficiency implies the possibility of reverse causality. The efficient structure hypothesis, for instance, suggests that efficiency may be driving market power (Turk-Ariss, 2010). The problem is demonstrated further by the empirical evidence that shows that the quiet life hypothesis is usually accepted in studies that do not control for simultaneity (Berger & Hannan, 1998), whilst it is rejected in studies that account for the problem (Maudos & de Guevara, 2007; Koetter et al., 2012).

Williams (2012) also examines the relationship between bank efficiency and market power to test the quiet life hypothesis for a sample of 419 Latin American commercial banks between 1985 and 2010. He draws the efficiencies from the stochastic frontier function model that treats unobserved heterogeneity, whilst conventional Lerner indices and the efficiency-adjusted Lerner index are used as the proxy for market power. From the results, the quiet life hypothesis is firmly rejected after various robustness checks. The evidence suggests that bank restructuring has promoted competition at the expense of market power and yielded efficiency gains at banks under conditions of monopolistic competition.

2.6 Bank Profit Persistence

This section provides a brief review of the theoretical background of profit persistence, and the empirical evidence on the determinants of bank profit persistence.

2.6.1 Theoretical Background on Profit Persistence

Contestable markets theory and the new industrial organization literature highlight the influence of potential and actual competition on profitability. The Persistence of Profit (POP) theory proposed by Mueller (1977), asserts that entry into and exit from an industry are sufficiently free to abolish any abnormal profit quickly, and that the profit rates of all the firms in an industry tend to converge towards the same long-run average value. However, some incumbent firms may have the ability to prevent imitation, or hinder entry. In that case, surplus profits would tend to persist from year to year, creating differences in firm-level long-run average profit rates. The degree of first-order autocorrelation in firm- or industry-level time-series profit data provides an indication of the speed at which competition eliminates any above- or below-average profits that are earned in the short run (Goddard et al., 2013).

Although the competitive process should eliminate differences in profits between different firms/industries in the long run, this does not seem to be what is observed in the real world. The theory states that if a firm has excess profits, competitors will enter the market to offer similar products at lower prices until the profitability in the market equals the competitive rate. On the other hand, if firms have profits below average, some investors will move to other markets with higher profits until at least normal profits are obtained. However, this theory does not seem to find enough empirical support, because profits seem to persist from year to year (Gschwandtner, 2005).

According to Berger, Bonime, Covitz, and Hancock (2000), upward shifts in industry profit persistence imply one or more of the following possibilities: (1) product markets have become less competitive; (2) the banking industry has become more opaque, and/or (3) the banking industry has become more sensitive to regional/macroeconomic shocks.

Also, from an antitrust, regulatory and supervisory point of view, a dynamic model of bank profitability gives an indication of the effectiveness of competition in forcing the adjustment or convergence of profits (above or below the norm) towards their long-run equilibrium levels. This may be helpful to regulators, in particular, in distinguishing between situations in which a competitive equilibrium is likely to be achieved rapidly without regulatory intervention, and situations in which regulatory intervention may be required in order to achieve a competitive ideal (Goddard et al., 2011).

2.6.2 Empirical Evidence on Determinants of Bank Profit Persistence

There is an extensive empirical Persistence of Profit (POP) literature based on manufacturing data, but only a handful of studies investigate POP in banking (Goddard et al., 2013). Indeed, even fewer still consider the determinants of profit persistence where they exist. As explained by Jiang and Kattuman (2010), the fundamental notion is that intense competition will quickly evaporate any short run excess profit enjoyed by any company, and force each to revert to its own ‘normal’ level of profitability, as determined by its command over various strategic resources.

Berger et al. (2000) investigate how banking market competition, informational opacity, and sensitivity to shocks have changed over the last three decades by examining the persistence of

firm-level rents. The analysis suggests that different processes underlie persistence at the high and low ends of the performance distribution. They find that impediments to competition and informational opacity continue to be strong determinants of persistence; that the reduction in geographic regulatory restrictions had little effect on competitiveness; and that persistence remains sensitive to regional/macroeconomic shocks. The findings also suggest reasons for the recent record profitability of the industry.

Using dynamic panel regressions based on vector autoregressive (VAR) model, Goddard et al. (2004) estimate growth and profit equations for a sample of commercial, savings, and co-operative banks from five major European Union countries during the mid-1990s. The persistence of profit appears higher for savings and co-operative banks than for commercial banks. Stephan and Tsapin (2008) also studied the persistence of profit and its determinants in emerging markets. They applied Markov chain analysis, dynamic panel GMM estimation, and quantile regression techniques to a panel of approximately 3,000 Ukrainian companies. The empirical results show a moderate level of profit persistence, as well as a relatively low speed of adjustment to the steady-state profit level, thus providing no support for the hypothesis that there is a lower persistence of profits in emerging markets due to more intense competition.

Further, to account for profit persistence, Athanasoglou et al. (2008) apply a GMM technique to a panel of Greek banks over the period 1985–2001. The estimation results show that profitability persists to a moderate extent, indicating that departures from perfectly competitive market structures may not be that large. Flamini et al. (2009) also find moderate persistence in profitability in Sub-Saharan Africa (SSA) banks, but they do not test for determinants of profit persistence.

Goddard et al. (2011) examine the intensity of competition in 65 national banking industries. The persistence of bank profit appears to be weaker for banks in developing countries than for those in developed countries. The empirical evidence suggests that the persistence of bank profit is negatively related to the rate of growth in GDP per capita, suggesting that the business opportunities afforded by higher economic growth tend to enhance competition and weaken the ability of incumbent banks to sustain abnormal profits. On the other hand, the persistence of bank profit is positively related to the size of legal entry barriers, in accordance with the view that actual or potential entry is a key determinant of the intensity of competition. There is an association between several institutional and external governance covariates and the persistence of bank profit: persistence tends to be weaker, and competition stronger, in countries where businesses and individuals are afforded more freedom from government interference, where the level of institutional development is advanced, and where the protection of property rights is relatively strong. Their study, however, included only a few African countries.

Gschwandtner (2012) analyzed and compared profit persistence during the periods 1950–66, 1967–83 and 1984–99 in the U.S. The results point towards a constant increase of competition after the opening of the U.S economy to international competition in the 1960–80s. Key determinants of profit persistence seem to be the firm's and industry size, industry growth, and more recently risk, advertising and exports. Perera et al. (2013) also found profit persistence in selected South Asian banks over 1992-2007, but they did not ascertain the factors driving profit persistence of these banks.

Similarly, Chronopoulos, Liu, McMillan, and Wilson (2013) examine the determinants of profitability for a large sample of U.S banks over the period 1984-2010. They specifically assess the extent to which short-run profits persist, and whether such persistence is affected by changes in regulation and the recent financial crisis. Using system GMM estimation, the findings suggest that the competitive process reduces positions of abnormal profitability, albeit this is not immediate. There is also evidence that changes in regulation enacted during the 1990s affected both the level and persistence of bank profitability. The financial crisis of 2007-2010 appears to have resulted in an increase in the persistence of bank profitability.

Goddard et al. (2013) examine the determinants and convergence of bank profitability in eight European Union member countries, between 1992 and 2007, using a dynamic panel model. They also found evidence of persistence of excess profit from one year to the next. The persistence of profit was lower in 1999–2007 than it was in 1992–98 in all eight countries. This finding is consistent with the hypothesis of an increase in the intensity of bank competition as a result of an increase in the integration of EU financial markets following the introduction of the euro in 1999, and the implementation of the Financial Services Action Plan.

2.7 Economic Freedom and Bank Performance

There are two major measurements of economic freedom, the Economic Freedom of the World Index produced by the Fraser Institute (Gwartney, Lawson & Hall, 2014) and the Economic Freedom Index constructed by the Heritage Foundation (Heritage Foundation, 2015) in collaboration with the Wall Street Journal. The Fraser Institute's annual report on Economic Freedom of the World (EFW) provides information about the degree of economic freedom in up

to 152 countries of the world. The EFW index is an annual composite measure at country level, encompassing the size of government, the legal structure and security of property rights, access to sound money, freedom to engage in international trade, and the regulation of credit, labor and business (Gwartney et al., 2014). The composite index falls within a range of 1 to 10, with greater numbers indicating greater level of economic freedom in a country.

The Heritage Foundation's Index of Economic Freedom (EF) covers over 180 countries around the world, ranking them with an economic freedom score based on 10 measures of economic openness, regulatory efficiency, the rule of law, and competitiveness. The basic principles of economic freedom emphasized in the Index are individual empowerment, equitable treatment, and the promotion of competition (Heritage Foundation, 2015). The index measures the ability of individuals to exercise their fundamental right to control their own labor and property. In an economically free society, individuals have the freedom to work, produce, consume, and invest in any way they please. Also, in such societies, governments allow labor, capital, and goods to move freely, and desist from coercion or restriction of liberty beyond the extent needed to protect and maintain liberty itself (Heritage Foundation, 2015).

This Heritage Foundation's Index of Economic Freedom is a composite measure of a country's overall economic freedom based on 10 different factors. It comprises of Financial Freedom, Business Freedom, Property Rights, Monetary Freedom, Investment Freedom, Freedom from Corruption, Labor Freedom, Trade Freedom, Fiscal Freedom and Government Spending (Size). The index takes values in a scale from 0 to 100, with scores approaching 100 representing higher levels of freedom. Similarly, the higher the score on a factor, the lower the level of government

interference in the economy. The overall score for each country is derived as the average of these ten economic freedoms, with equal weighting to each category.

Financial freedom, one of Heritage Foundation's ten measures of economic freedom, is a measure of banking efficiency as well as a measure of independence from government control and interference in the financial sector. State ownership of banks and other financial institutions such as insurers and capital markets reduces competition and generally lowers the level of available services (Heritage Foundation, 2015).

In an ideal banking and financing environment where a minimum level of government interference exists, independent central bank supervision and regulation of financial institutions are limited to enforcing contractual obligations and preventing fraud. Credit is allocated on market terms, and the government does not own financial institutions. Financial institutions provide various types of financial services to individuals and companies, and banks are free to extend credit, accept deposits, and conduct operations in foreign currencies. Foreign financial institutions operate freely and are treated the same as domestic institutions (Heritage Foundation, 2015).

Carow and Kane (2002) review and extend event-study evidence about the distribution of the benefits and costs of relaxing long-standing geographic and product-line restrictions on U.S. financial institutions. The evidence indicates that the new financial freedoms may have redistributed rather than created value. And using data on over 1,400 banks across 72 countries while controlling for bank-specific characteristics, Demirgüç-Kunt, Laeven, and Levine (2004)

indicates that tighter regulations on bank entry, restrictions on bank activities, and regulations that inhibit the freedom of bankers to conduct their business boost bank net interest margins.

Boubakri, Cosset, Fischer, and Guedhami (2005) examine the post-privatization performance of 81 banks from 22 developing countries. The results suggest that on average, banks chosen for privatization have a lower economic efficiency, and a lower solvency than banks kept under government ownership. They observe that in the post-privatization period, profitability increases but, depending on the type of owner, efficiency, risk exposure and capitalization may worsen or improve. However, over time, privatization yields significant improvements in economic efficiency and credit risk exposure.

Brissimis, Delis, and Papanikolaou (2008) examine the relationship between banking sector reform and bank performance – measured in terms of efficiency, total factor productivity growth and net interest margin, with bank panel data from ten newly acceded EU countries. The results indicate that both banking sector reform and competition exert a positive impact on bank efficiency, while the effect of reform on total factor productivity growth is significant only toward the end of the reform process. They suggest that a possible area for future research could be to provide a more detailed analysis of the different country-specific institutional characteristics that may affect bank performance and, more broadly, financial stability in emerging markets.

Pasiouras, Tanna, and Zopounidis (2009) use stochastic frontier analysis to provide international evidence on the impact of the regulatory and supervision framework on bank efficiency. The dataset consists of 2,853 observations from 615 publicly quoted commercial banks operating in 74

countries during the period 2000–2004. They investigate the impact of regulations related to the three pillars of Basel II (i.e. capital adequacy requirements, official supervisory power, and market discipline mechanisms), as well as restrictions on bank activities, on cost and profit efficiency of banks, while controlling for other country-specific characteristics. The results suggest that banking regulations that enhance market discipline and empower the supervisory power of the authorities increase both cost and profit efficiency of banks.

Hakenes and Schnabel (2011) show that capital regulation may destabilize the banking sector through its effect on banking competition. The ambiguous effect of competition on banks' risk-taking translates into an ambiguous effect of capital regulation. A stabilizing effect of capital regulation tends to obtain in those situations where competition has a destabilizing effect (i.e., the “charter value effect” dominates), and vice versa. Thus, they suggest that capital regulation may not be suited in all circumstances to prevent excessive risk-taking in banking. Stricter capital requirements attenuate competition for loans, implying higher loan rates, and hence higher risk-taking by firms.

Delis, Molyneux, and Pasiouras (2011) examine the relationship between the regulatory and supervision framework, and the productivity of banks in 22 European countries over the period 1999–2009. The results indicate that regulations and incentives that promote private monitoring (PMON) have a positive impact on productivity. Restrictions on banks' activities relating to their involvement in securities, insurance, real estate, and ownership of nonfinancial firms also have a positive impact. They contend that future research regarding the impact of regulations on bank performance and productivity growth may benefit from focusing on the structure and risks facing

the banking industry or individual banks. In addition, an interesting question concerns whether government policies that restrict diversification substitute or complement the effects on PMON or other elements of bank regulation. They suggest that this can be achieved by examining the interplay between the forms of regulation examined separately in their study.

Hassan, Sanchez, Ngene, and Ashraf (2012) examine the impact of foreign bank entry, among others, on the domestic banking sector. They find that the degree of openness of the market to foreign bank entry positively impact domestic banking system operating efficiency, capitalization, risk management, long-term soundness, financial performance as well as economic and financial development. However, foreign bank entry is associated with reduced profit margins and increased operating costs of domestic banks in countries with less developed capital markets.

More recently, Chortareas, Girardone and Ventouri (2012) investigated the dynamics between key regulatory and supervisory policies and various aspects of commercial bank efficiency and performance for a sample of 22 EU countries over 2000–2008. The results show that strengthening capital restrictions and official supervisory powers can improve the efficient operations of banks. Evidence also indicates that interventionist supervisory and regulatory policies such as private sector monitoring and restricting bank activities can result in higher bank inefficiency levels. The evidence produced suggests that the beneficial effects of capital restrictions and official supervisory powers on bank efficiency are more pronounced in countries with higher quality institutions. The emerging challenge, though, is to consider which specific aspects of regulatory and supervisory policies affect bank performance and how their implementation and effectiveness is related to the broader institutional framework.

Ding, Wu, and Chang (2013) examine the dynamic changes in bank performance before and after government intervention during the global financial crisis that started from 2007 onwards. Using data collected from Bloomberg for banks of five major Asian economies over the eleven-quarter period from 4th quarter of 2007 to 2nd quarter of 2010, they find that, on average, the bank performance in terms of solvency, credit risk, and profitability improves after government intervention. Moreover, the influence of government intervention on bank performance depends on the evaluative financial indicator, the economy, and whether banks are internationalized.

Barth, Caprio, and Levine (2013) examine whether bank regulation, supervision and monitoring enhance or impede bank operating efficiency. Based on an un-balanced panel analysis of 4,050 banks observations in 72 countries over the period 1999–2007, they find that tighter restrictions on bank activities are negatively associated with bank efficiency, while greater capital regulation stringency is marginally and positively associated with bank efficiency. They also find that a strengthening of official supervisory power is positively associated with bank efficiency only in countries with independent supervisory authorities. Moreover, independence coupled with a more experienced supervisory authority tends to enhance bank efficiency. Finally, market-based monitoring of banks in terms of more financial transparency is positively associated with bank efficiency.

In contrast, Gaganis and Pasiouras (2013) find that central bank independence has a negative impact on bank profit efficiency. Using a large sample of nearly 4,000 commercial banks operating in almost 80 countries over the period 2000–2006, and relying on stochastic frontier techniques, the results also show that efficiency decreases as the number of the financial sectors that are

supervised by the central bank increases. Additionally, banks operating in countries with greater unification of supervisory authorities are less profit efficient. These results could have important policy implications, as there is an on-going debate covering all aspects of the institutional design of supervision. Nevertheless, in all the cases there is a long list of pros and cons, and as a result the theoretical analysis of the potential effects of alternative supervisory regimes remains inconclusive.

Noticeably absent in the banking literature is an examination of the links between economic freedom and bank performance. The limited research in this area is somewhat surprising given the importance of bank lending in promoting economic development and the impact that economic freedom is likely to have on the banking sector (Sufian & Habibullah, 2010). Indeed, as noted by Hafer (2013), a number of studies have found that financial development and higher levels of economic freedom are associated with (or cause) economic growth. The unanswered question, however, is whether the financial development-economic growth nexus reflects influences of economic freedom operating through the financial system (Hafer, 2013).

Sufian and Habibullah (2010) provide new empirical evidence on the impact of economic freedom on banks' performance. The empirical analysis is confined to the Malaysian banking sector during the period of 1999–2007. They find that overall economic freedom and business freedom exerts positive impacts, implying that higher (lower) freedom on the activities that banks can undertake and entrepreneurs to start businesses increases (reduces) banks' profitability. The empirical findings seem to suggest that corruption has a corrosive impact on Malaysian banks' profitability. Interestingly, though, the impact of monetary freedom is negative implying that higher (lower)

monetary policy independence reduces (increases) banks profitability, providing support for the importance of government intervention in determining the profitability of banks operating in the Malaysian banking sector. They suggest that future research could include more variables such as taxation and regulation indicators, exchange rates as well as indicators of the quality of the offered services.

Smimou and Karabegovic (2010) examine the relationship between economic freedom index and equity market returns for the Middle East and North Africa (MENA) markets. The evidence shows that changes in economic freedom have a positive impact on equity market returns, which are not explained by business-cycle control variables related to expected returns, and that legal structure and security of property rights have the most significant impact. Hafer (2013) also finds that countries with higher levels of initial economic freedom, on average, exhibit greater levels of financial intermediary development in subsequent years. And if greater financial intermediary development engenders faster economic growth, the results of this study explain, at least partially, the observed link between economic freedom and economic growth.

Further, cost inefficiency scores for banks in ten new EU member countries of Central and Eastern Europe are estimated by Mamatzakis, Kalyvas, and Piesse (2013), using stochastic frontier analysis for the period 2000-2010. These are then employed in both static and dynamic panels to estimate the impact of regulation on bank specific inefficiency in the transition economies. Using the Fraser Index of Economic Freedom, they find that, among all the indices of economic freedom, the composite regulation index that includes regulation in credit, labour and business is the one that has more importance for the banking sector as it exerts a negative and statistically significant

impact on bank inefficiency. By decomposing the regulation index, into its three components (credit, business and labour regulation) they find that strict labour regulation is associated with higher bank inefficiency while certain aspects of credit regulation such as foreign ownership and competition as well as private ownership are significantly associated with decreased bank inefficiency. The dynamic panel-VAR results using impulse response functions and variance decomposition support the validity of these results further.

Interestingly, Chortareas et al. (2013), possibly the first to directly investigate the dynamics between the financial freedom counterparts of the economic freedom index drawn from the Heritage Foundation database and bank efficiency levels, suggest that the higher the degree of an economy's financial freedom, the higher the benefits for banks in terms of cost advantages and overall efficiency. Relying on a large sample of commercial banks operating in the 27 European Union member states over 2001-2009, and using Data Envelopment Analysis (DEA) and a truncated regression model combined with bootstrapped confidence intervals, they also show that the effects of financial freedom on bank efficiency tend to be more pronounced in countries with freer political systems in which governments formulate and implement sound policies and higher quality governance. A further challenge that emerges is to consider whether “excessive” financial freedom may contribute to financial institutions' propensity to take on greater risks, which was beyond the scope of their work.

Lin et al. (2016) also examine how financial freedom moderates the effect of changes in bank ownership on cost efficiency in twelve Asian developing countries during the period 2003–2012. Using the stochastic frontier method for estimating bank efficiency scores, they report that foreign

presence improves bank efficiency, mainly in countries with high financial freedom. Additionally, they find evidence that increased government (domestic) ownership of banks seems to enhance (hamper) bank efficiency in economies with more financial freedom following the financial crisis.

2.8 Overview of the Banking Sector in Africa

This section provides a brief overview of the banking sector in Africa. We consider developments in the sector over the past 30 years or so, focusing on banking sector reforms, market structure and performance.

2.8.1 Banking Systems in Africa

Banks are the most important institutions of the financial system in sub-Saharan Africa (SSA). However, in many countries, other financial structures (such as bond and stock markets) are either underdeveloped or almost nonexistent (Kablan, 2010). Credit to the private sector as a percentage of gross domestic product (GDP) stands at 16% and 19% respectively in the West and East African sub-regions, whilst the Southern and North African sub-regions record approximately 55% and 45% respectively (Fosu, 2013). Only one-third of countries in the region have stock markets, which are mostly small and illiquid. Corporate bond markets are almost non-existing in most countries, with many countries even having very shallow government bond markets if at all (Mu, Phelps, & Stotsky, 2013).

Many African countries suffered banking crises in the 1980s and 1990s. Indeed, at the peak of regional financial distress (about 1995), as many as 27 African countries suffered from banking crises, with 20 of them being systemic (Laeven & Valencia, 2008). While the usual ingredients of

banking crises –macroeconomic boom and bust cycles and bad private banking – were also present in banking crises in Sub-Saharan Africa, it appears that government failures were the leading cause. For example, in many countries, such as Mozambique, Tanzania, Uganda, and Zambia, large government-owned banks had to be rescued and sold (Beck, Fuchs & Uy, 2009).

Banking in Africa has undergone dramatic changes over the past 20 years. While dominated by government-owned banks in the 1980s and subject to restrictive regulation – including interest rate ceilings and credit quotas – financial liberalization, institutional and regulatory upgrades and globalization have changed the face of financial systems across the region. Today, most countries have deeper and more stable financial systems, though challenges of concentration and limited competition, high costs, short maturities, and limited inclusion persist (Beck & Cull, 2013). Recent reforms in the banking sector have led to the liberalization of interest rates and credit markets. For instance, interest rate controls, particularly in Kenya, Ghana and Tanzania, and directed credit in Uganda, have been replaced with open market operations.

Although there is still strong government presence in African banking sectors (e.g. Algeria and Tunisia), a significant degree of success has been achieved in privatizing banks in a number of countries including Morocco, Kenya, Tanzania, Uganda, Rwanda and Zambia (Allen, Otchere & Senbet, 2011). These reforms have led to significant growth in the number of banks in many African countries, with a significant increase in the degree of cross-border banking as well. But with domestic credit to the private sector averaging about 32% of GDP, financial intermediation remains relatively low in a number of African countries. This feature of the banking sectors is coupled with strong government ownership and traditional banking activities. The poor

performance of the banking sector, especially record high levels of problem loans in the 1980s, led to significant financial sector reforms in many countries (Fosu, 2013).

There is an increasing realization among policy makers and other stakeholders among African countries that deepening and broadening the financial sector is critical for increasing growth rates and reducing poverty and thus making progress towards the Millennium Development Goals, yet there is still significant debate about how to proceed. The controversies on financial sector reform focuses on two issues: the role of government in the financial sector and how African financial systems (and the economies in general) should adapt to increasing globalization. Debates on both issues have changed dramatically over the past decades. The approach of governments replacing markets was seen as necessary in the 1960s and 70s, changed into an almost laissez-faire approach focusing on liberalization and privatization in the 1980s and 90s, before the pendulum went back towards a more active, albeit different, role for government during the last decade (Beck et al., 2009).

Even so, many of the non-orthodox policies successfully implemented in East Asia have not worked in Sub-Saharan Africa. Financial repression and industrial policies have had little or no positive impact on financial and economic development in Sub-Saharan Africa. Instead, financial repression has inhibited savings and resulted in mis-allocation of credit. The interference in credit allocation and government ownership of banks have led to large losses and distorted credit markets and resource allocation, with harmful consequences for economic growth and equity (Beck et al., 2009).

Of course, most African countries have opened their financial systems up to foreign bank entry, yet capital account restrictions are still in place in many countries, although often more de-jure than de-facto (Beck et al., 2009). Generally, though, the North African financial systems are dominated by government-owned financial institutions to a much larger extent than are systems in Sub-Saharan Africa, where foreign-owned banks now dominate the banking system, while governments dominate in other segments of the financial system, such as the pension sector and the bond market (Beck et al., 2011).

2.8.2 African Banking Market Structure and Performance

The ownership structure of Africa's banking systems has undergone substantial changes over the past decades, with a larger number of countries now dominated by foreign banks and only few banking systems with mainly government-owned banks, a result of the privatization wave in Africa in the 1980s and 1990s. While foreign bank penetration has increased from already high levels over the past decade, the composition of the foreign bank population has changed substantially. Previously dominated by European banks, banks from emerging markets and – critically – from inside Africa have gained importance over the past years. For example, after the end of Apartheid, several South African banks, most notably Standard Bank and ABSA, started expanding through the continent. Also, two West African banks – Ecobank and Bank of Africa – have expanded throughout Sub-Saharan Africa. Similarly, Moroccan banks have started to expand to the South. Finally, and as a result of the recent consolidation wave in Nigeria, Nigerian banks started expanding throughout West Africa, but increasingly also throughout the rest of the continent. (Beck & Cull, 2013).

However, in spite of the record levels of new entry and foreign banks penetration, very high levels of concentration still characterize African banking sectors. For instance, Fosu (2013) found that during 2002-2009, the average Herfindahl–Hirschman Index (HHI) was as high as 2059, whilst the five-bank concentration ratio stood at 77.29% for the whole African region. Nonetheless, it was observed that banking market concentration assumed a downward trend across all the sub-regions in Africa over the past few years. The HHI showed a dramatic and consistent downward trend in all sub-regional banking sectors except West Africa, where the trend was found to be moderate. The five-bank concentration ratios, also showed a similar trend. Similarly, Beck et al. (2011) reports that Africa’s banking systems are mostly concentrated, with a few banks sharing the small universe of clients. Besides, standard indicators of competition show significant market power among banks across the region.

Of course, high interest rate spreads have accompanied greater concentration and lower competitiveness in African banking markets. While the share of the five largest banks was 81 percent in the median African country in 2011, it was 64 percent outside Africa (Beck & Cull, 2013). Greater concentration can also partly explain the lower degree of competition within African banking system. The median Lerner index, which is the mark-up between marginal revenue and costs, is 30 percent in the median African country, while it is 25 percent outside Africa. However, Beck and Cull (2013) notes that the correlation between concentration and the Lerner index of market power is relatively low within Africa, at only 11 percent, suggesting that market structure is only one, and maybe not the most important determinant of the lack of competition within African banking markets.

In a recent study, Fosu (2013) using both the static and dynamic versions of the Panzar–Rosse model, reports that banks in African sub-regional markets can be described as monopolistically competitive. In particular, the findings suggest that, with the exception of North Africa, African banks exhibit higher competition at interest-generating activities compared to total banking activities. Further, it was observed that the degree of competition in African banking markets is comparable to that existing in other emerging markets.

Even so, Beck et al. (2011) notes that competition remains an important area for government action. Allowing competition within the banking system and from outside the banking system will foster the necessary financial innovation to push the financial system toward the frontier and exploit the possibilities that new methodologies, products, and technologies can offer. An increased focus on competition, however, has critical repercussions on regulation and government policy in general. It entails a sophisticated approach that has to balance (1) the need for innovation, (2) the need to avoid market dominance by new players that rapidly gain market shares in new products, and (3) the need to reduce the risks of fragility.

Beck et al. (2009) suggests that the write-down of bad loans has led to a shrinking of the financial systems in some countries, but overall financial intermediation has improved in many countries. But in spite of these progresses, Africa's financial systems are still characterized by their shallowness, by their high costs, exemplified in high interest rate spreads, and by limited access to finance. While an increase in interest spreads was to be expected after liberalization, their continued high level in most countries of the region has turned into a serious concern for policy makers.

Beck et al. (2011) report that African banking is very expensive as reflected by high interest spreads and margins. The high interest rate spreads and margins are driven by diseconomies of scale, risk, and lack of competition, as documented by cross-country and individual country studies. Decompositions of interest rate spreads and margins point to high overhead costs as the main driver. These high overhead costs can be explained to a large extent by the scale diseconomies suffered by African banks. However, they also reflect the generally high costs of doing business that affect banks and that include deficient energy and road infrastructure, as well as a lack of reliable credit information and infrastructure.

Beck and Cull (2013) argue that, while there are many reasons why spreads and margins are higher in Africa, one important reason is higher operating costs. For instance, in a recent decade, Beck and Cull (2013) report that overhead costs in the median African financial system stood at 5.5 percent of total assets, while they were 3.4 percent outside Africa. On the other hand, African banks are also more profitable than banks outside Africa. The return on assets (ROA) stood at 2.1 percent in the median African country, while it was 1.5 percent outside Africa. Net interest margins in the median African country stood at 5.9 percent in 2011, while they stood at 4.7 percent outside Africa. Similarly, the interest rate spread between lending and deposit rate was 10.3 percent in Africa and 8.2 percent outside. Thus, generally, while being more profitable, African banks are less efficient and operate in less competitive environments (Beck & Cull, 2013).

According to Honohan and Beck (2007), the high spread between deposit and lending interest rates provides dis-incentives for both savings and lending and is driven mainly by the absence of scale economies and very high risks due to weak and underdeveloped contractual frameworks and

economic and political volatility. Indeed, as noted by Senbet and Otchere (2006), savings mobilization and credit allocation have generally not improved by as much as expected, after years of reforms. Again, Honohan and Beck (2007) observe that in spite of high costs and high risks, banks in Africa are very profitable. In fact, subsidiaries of foreign banks in Sub-Saharan Africa have higher returns on assets and equity than subsidiaries of the same banks in other regions of the world, perhaps due to lack of competition.

In terms of stability, African financial systems have made some progress. Beck et al. (2011) indicates, that while in 1995, a third of all countries on the continent were suffering from a systemic banking crisis, fragility has subsided across the continent. Today, most African banking systems are stable and well capitalized and have a good level of liquidity. Nevertheless, there is still hidden or silent fragility in several Central and West African countries. Systemic distress is concentrated in state-owned banks, and a number of small locally owned banks face liquidity problems because of their dependence on the public sector and wholesale funding (Beck et al., 2011).

Further, Beck and Cull (2013) opine that while shallow, Africa's banking systems have also proven stable and resilient over the past years. The shallowness of Africa's banking systems appears to have helped them weather the Global Financial Crisis of 2008 better than some other regions of the world, with the impact of the crisis on Africa mostly working through real sector channels, such as lower demand for export goods, or through lower foreign direct investment. According to Beck and Cull (2013), the limited integration with global financial markets and exposure to "toxic" assets explains why financial institutions across the Africa region largely evaded the direct impact of the global financial crisis.

Greater stability is also illustrated in the aggregate balance sheet indicators of African banks. In 2011, the capital to risk-weighted asset ratio was 19 percent in the median African country, compared to 17 percent outside Africa. On the systemic level, Africa has suffered few banking crises since the bout of systemic fragility in the 1980s and 90s (Laeven & Valencia, 2012). However, as highlighted by Moyo et al. (2014), recent global evidence has shown that deregulation of the banking industry can sometimes have the unintended effect of destabilizing the financial system, contributing to macroeconomic instability and, in some cases leading to a reversal of economic growth. A conspicuous feature of structural financial sector reforms is enhanced competition in the banking industry, with the attendant stability-fragility trade-off. According to Moyo et al. (2014), compared to other economies, Sub-Saharan Africa (SSA) financial system is broadly bank-based and weakly contestable, therefore, any systemic bank failures would have serious contagious ramifications in these economies. They argue that bank-specific, macroeconomic and institutional factors are important in predicting episodes of bank distress in SSA.

2.9 Chapter Summary and Gaps in the Literature

The theoretical and empirical literature present ambiguous positions on the competition-stability, competition-profitability and competition-efficiency relationships. For instance, the theoretical literature on the relationship between competition and bank stability presents no consensus. Two opposing views are theorized in the literature. One view, called the competition-fragility or competition-instability view, and pioneered by the influential work of Keeley (1990), asserts that competition in banking results in greater risks. Recent studies that provide evidence for this include Beck et al. (2006), Amidu (2013), Turk-Ariss (2010) and Diallo (2015). In contrast, the

competition–stability view came out strongly from the work of Boyd and de Nicoló (2005), who argued that competition leads to greater bank stability. Among others, Uhde and Heimeshoff (2009), and Schaeck and Cihak (2014) provide support for this hypothesis. The results of some other recent studies suggest that the relationship between competition and bank stability is not straightforward and may actually depend on other factors previously ignored in the literature.

Also, two competing theories explaining the relationship between market structure and bank profitability are the Market Power (MP) and Efficiency Structure (ES) paradigms. While some have found support for the MP hypothesis (Fu & Heffernan, 2009; Tregenna, 2009; Perera et al., 2013; Mirzaei et al., 2013), other studies find that the level of bank profitability is explained by efficiency, and not by market power (Seelanatha, 2010; Chortareas et al, 2011).

A special case of the MP hypothesis, is the ‘Quiet Life’ hypothesis (QLH), which suggests that the higher the market power enjoyed by a firm, the lower the effort put forth by managers to improve efficiency (Hicks, 1935). Again, the empirical evidence on the competition-efficiency relationship has been inconsistent. Those reporting evidence of the QLH include Delis and Tsionas (2009), Coccoresse and Pellicchia (2010), and Turk-Ariss (2010). In contrast, Weill (2004), Casu and Girardone (2006), Maudos and de Guavara (2007), and Williams (2012) provide evidence rejecting the QLH.

Contestable markets theory and the new industrial organization literature also highlight the influence of potential and actual competition on profitability. The Persistence of Profit (POP) theory (Mueller, 1977), asserts that entry into and exit from an industry are sufficiently free to

abolish any abnormal profit quickly, and that the profit rates of all the firms in an industry tend to converge towards the same long-run average value. However, this theory does not seem to find enough empirical support (Gschwandtner, 2005). Besides, while there is an extensive empirical POP literature based on manufacturing data, only a handful of studies investigate POP in banking (Goddard et al., 2013). Indeed, even fewer still consider the determinants of profit persistence where they exist.

Given the difficulty in understanding the channels between competition and bank stability, our study seeks to assess the effect of financial freedom on the competition-stability relationship. We also aim to provide additional insight into the ambiguous relationship between competition and bank profitability by considering the conditioning effect of financial freedom on this relationship. Further, this study seeks to test the QLH in the developing country context, which is largely ignored in the literature, and also provide new empirical evidence on the impact of financial freedom on the competition-efficiency relationship. And finally, we assess differences in the determinants of bank profit persistence among countries, a relatively unexplored area in banking.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

In this chapter, we present the various methodologies employed in carrying out the analyses required to achieve our study objectives. We begin with the research design and sampling, as well as the models and proxies used to measure competition and bank performance (stability, profitability and efficiency), and also describe the financial freedom and economic freedom indices. Next, we outline the estimation methods for assessing the effects of financial/economic freedom on the competition-stability, competition-profitability and competition-efficiency relationships. We also consider the control variables which typically affect these relationships. And finally, we consider the model for bank profit persistence and its determinants.

3.2 Research Design

The key research questions for this study encompass determining whether or not financial freedom moderates the effects of competition on bank stability, profitability and efficiency; and what different factors account for bank profit persistence in sub-Saharan Africa (SSA). Generally, addressing these issues called for quantitative data and analytical techniques. The research strategy was to obtain secondary data from financial statements of banks in this region, and to carry out various analyses on the relationships of interest. The analytical techniques used were similar to those common in the literature and could be relied upon to obtain valid conclusions on the research problem and questions. For instance, we follow Koetter, Kolari, and Spierdijk (2008) in modelling the underlying cost structure of the banking sector. This model allows us to estimate competition

(bank market power) and cost efficiency using the same framework. Koetter et al. (2008) used a similar model in assessing U. S. bank cost efficiency. Our approach in estimating the competition-stability, competition-profitability and competition-efficiency relationships are similar to Liu et al. (2013), Dietrich and Wanzenried (2014), and Coccorese and Pellecchia (2010), respectively. We also, adapted Goddard et al. (2013) in assessing the determinants of bank profit persistence.

The source of most of the banking data is the Bankscope database, which reports published financial statements from banks across the globe. The data has been standardized into a common format to facilitate comparison across countries and therefore suitable for a cross-country study. Unconsolidated financial accounts (income statement and balance sheet) available for the 7-year period from 2006 to 2012 were used. The financial freedom and economic freedom variables were obtained from the Heritage Foundation's indices produced in collaboration with the Wall Street Journal annually since 1995. This data is available on the Heritage Foundation Website (www.heritage.org). The macroeconomic data, domestic credit to the private sector as a percentage of GDP, and GDP per capita are from the World Development Indicators produced by the World Bank, and available on the Website of the World Bank.

Data extracted from the income statements and balance sheets of the banks include interest expenses, deposits and money market funds, personnel costs, total assets, other operating expenses and total income. Table 3.1 below provides details of the number of banks from each country used for the study.

Table 3.1: Number of Banks for Each Country

COUNTRY	2006	2007	2008	2009	2010	2011	2012
ETHIOPIA	0	0	2	5	8	7	7
GHANA	2	12	16	19	21	21	16
KENYA	2	6	22	24	27	27	25
MALAWI	0	0	4	4	5	5	4
MAURITIUS	6	7	9	9	10	9	7
MOZAMBIQUE	0	0	6	7	8	8	7
NAMIBIA	3	4	4	4	4	3	3
SOUTH AFRICA	11	14	15	15	16	12	12
TANZANIA	10	11	13	12	13	13	11
UGANDA	0	5	9	12	13	13	12
ZAMBIA	0	2	7	7	11	11	11
TOTAL	34	61	107	118	136	129	115

Source: Compilation from Bankscope database

3.3 Population of Study

All banks operating in sub-Saharan African countries for the period of 2006-2012 constituted the population for the study. Our goal was to use as much data as possible in order to allow for generalization of our results. We focused on the dominant financial institution, commercial banks, and specialized financial institutions whose nature and operations are akin to that of commercial banks. We excluded other financial institutions such as investment banks since their sphere of activities are dissimilar.

3.4 Sampling Technique and Sample Size

Our initial sample comprised of banks in all Sub-Saharan African countries, but due to data limitations, especially inadequate data points at the country level required for some of the regression estimates, we settled on data from 139 banks operating in 11 countries in Sub-Saharan Africa. Also, banks with less than three consecutive years of observations were excluded. Besides,

some banks did not have values needed for some of the key variables used in the study and had to be excluded.

The final sample is an unbalanced panel with 700 bank-year observations. Countries included in the study are Ethiopia, Ghana, Kenya, Malawi, Mauritius, Mozambique, Namibia, South Africa, Tanzania, Uganda and Zambia. According to the Economic Intelligence Unit (www.eiu.com), our sample comprise most of the largest banking markets in Sub-Saharan Africa, with the exception of Nigeria and Angola which could not be included for the reasons stated above.

3.5 Measuring Bank Competition

As explained in Weill (2013), the number of different tools used to measure bank competition can be categorized into traditional Industrial Organization (IO) and new empirical IO approaches. The traditional approach uses tests of market structure to assess bank competition based on the Structure-Conduct-Performance (SCP) model that states that greater concentration leads to less competitive bank behavior, which in turn leads to greater profitability of the bank. With this model, concentration indices (market share of the largest banks or the Herfindahl-Hirschman index) are used to measure competition.

On the other hand, the new empirical IO approach uses non-structural tests to overcome the problems with competition measures in the traditional IO approach, such as the use of indirect proxies (market structure or market shares) to conjecture the degree of competition. The non-structural measures such as the Lerner index and the Panzar–Rosse (1987) model measure bank conduct directly, rather than inferring the competitive conduct of banks through the analysis of

market structure. The Lerner index provides an individual measure of market power at the bank level, while the Panzar–Rosse model produces an aggregate measure of competition. Other approaches used to assess the competitiveness of the banking sector in the literature are the Persistence of Profitability (POP) model, the Conjectural Variation (CV) approach, and more recently the Boone (2008) indicator.

In this study, we use a direct measure of bank competition (market power), the Lerner index. This allows us to measure competition and bank efficiency using the same framework, and thus obtain better insight into the closely related issues of bank competition and efficiency. Most previous studies assessing these relationships use different models to measure competition and efficiency and thereby fail to take into account the simultaneous relationship between them (Koetter et al., 2012). Also, given that other key variables used to test the relationship between competition and bank performance are obtained at the bank level, it is best to use Lerner index which is estimated at the bank level, unlike other competing proxies for bank competition. For instance, the Panzar–Rosse (1987) model which has also been a popular measure of competition in banking markets produces an aggregate measure of competition at the industry level. The Lerner index is the mark-up of price over marginal costs, with higher values denoting higher pricing power and less competitive market conditions.

Similar to Berger et al. (2009) and Turk-Ariss (2010), we measure bank competition using the Lerner indicator of market power defined as:

$$Lerner_{it} = (P_{TA,it} - MC_{TA,it}) / P_{TA,it} , \quad (3.1)$$

where $P_{TA,it}$ refers to the price of total assets (calculated as the ratio of total revenues to total assets) and $MC_{TA,it}$ is the marginal cost of producing an additional unit of output. As is common in the literature, and similar to Koetter et al. (2008), we use the following translogarithmic function to model the underlying cost structure of the banking sector:

$$\begin{aligned} \ln TOC_{it} = & \beta_0 + \beta_1 \ln TA_{it} + \frac{\beta_2}{2} (\ln TA_{it})^2 + \sum_{k=1}^3 \lambda_k \ln W_{k,it} + \sum_{k=1}^3 \phi_k \ln TA_{it} \ln W_{k,it} + \\ & \sum_{k=1}^3 \sum_{j=1}^3 \delta_{ij} \ln W_{k,it} \ln W_{j,it} + \sum_{j=1}^3 (\delta_j / 2) (\ln W_{j,it})^2 + \sum_{k=1}^2 \eta_k trend^k + \\ & \sum_{j=1}^3 \vartheta_j \ln W_{j,it} trend + \varphi \ln TA_{it} trend + \varepsilon_{it} \quad , \end{aligned} \quad (3.2)$$

where $\ln TOC$ represents the natural logarithm of bank's total costs (financial and operating costs) and $\ln TA$ is a proxy for bank output measured as total assets. W_1 , W_2 and W_3 are the prices of funds, labour and physical capital, respectively. They are respectively calculated as the ratio of interest expenses to total deposits and money market funds, personnel expenses to total assets, and other operating expenses (excluding personnel expenses) to total assets. It should be noted that, scaling over total employees, instead of total assets is a better proxy for the price of labour, but the latter was chosen because the number of employees is not available for many observations. *Trend* is a time trend which captures movements in the cost function over time or technical change. We also scale the input prices and TOC by W_3 in order to ensure homogeneity of degree one in input prices of the cost function. As an alternative to the translogarithmic functional form used in this

study, the Fourier flexible form has been found to produce results similar to the translogarithmic form (Berger & Mester, 1997).

The marginal cost, $MC_{TA,it}$ is then derived from the translogarithmic cost function by taking the first derivative with respect to the output (total assets) for each bank in the sample as follows:

$$MC_{it} = \frac{TOC_{it}}{TA_{it}} \left[\beta_1 + \beta_2 \ln TA_{it} + \sum_{k=1}^3 \phi_k \ln W_{k,it} + \phi trend_{it} \right] \quad (3.3)$$

The Lerner index computed from equation (3.1) is basically the conventional Lerner index. However, as noted by Turk-Ariss (2010), this approach is likely to result in biased estimates because of a bank's ability to exercise some form of monopoly power in the deposit market which enables it to obtain funds cheaply. He argues that usually when pricing their loans, managers of banks endeavor to cover their cost of funds, and charge a premium to reflect their exercise of market power, in addition to charging a risk premium for the uncertainty of repayment. Hence, to obtain a “raw” or “clean” proxy of pricing power that is not distorted by market power which had previously originated in the deposit market while raising funds, cost of funds should be excluded to produce a funding-adjusted Lerner index. To check the robustness of our results, we estimate another version of the Lerner index by including only two inputs, the price of labor and the price of physical capital to obtain the funding-adjusted Lerner index using the same model.

3.6 Measurement of Bank Performance

European Central Bank (2010) has noted that there are a multitude of measures used to assess bank performance, with each group of stakeholders having its own focus of interest. They assert that, among the large set of performance measures for banks used by academics and practitioners alike, a distinction can be made between traditional, economic and market-based measures of performance. The traditional performance measures they identified are similar to those applied in other industries, with Return on Assets (ROA), Return on Equity (ROE) or Cost-to-Income (CTI) ratio as the most widely used. In addition, they observe that, given the importance of the intermediation function for banks, Net Interest Margin (NIM) is typically monitored. In this study, we focus on some of these traditional measures of bank performance – NIM and ROA.

The economic measures of performance mainly focus on efficiency as a central element of performance, but generally have high levels of information requirements. The most popular one is the economic value added (EVA) developed by Stern, Stewart and Chew (1995). EVA measures whether a company generates an economic rate of return higher than the cost of invested capital in order to increase the market value of the company. Another economic measure is RAROC (risk-adjusted return on capital), but it is difficult to calculate without having access to internal data (European Central Bank, 2010).

The most commonly used market-based measures of performance include: the total share return-the ratio of dividends and increase in the stock value over the market stock price; the price-earnings ratio-the ratio of the financial results of the company over its share price; and the price-to-book value-which relates the market value of stockholders' equity to its book value (European Central Bank, 2010).

Other popular measures of bank performance in the literature include bank efficiency, stability, and asset quality. In addition to the profitability measures mentioned above, our study also measures bank performance as bank stability (insolvency risk and asset quality) and bank cost efficiency.

3.6.1 Measurement of Bank Stability

As in Beck et al. (2013) and others (Turk-Ariss, 2010; Berger et al., 2009), we measure bank stability or risk by the Z-score. The Z-score is the most popular measure of bank stability or insolvency risk in the literature. The Z-score combines profitability, leverage, and volatility of bank returns in a single measure of overall risk or stability. It is measured by the ratio below:

$$Z - score_{it} = (ROA_{it} + E / TA_{it}) / \sigma_{ROA, it} \quad (3.4)$$

Here, ROA is return on assets, E/TA refers to the bank equity to total assets ratio and σ_{ROA} represents the standard deviation of return on assets. We use a three-year rolling time window to obtain values of standard deviation of ROA, just like Beck et al. (2013). This approach allows for time variation in the denominator of the Z-score, and also avoids suggesting that the Z-scores are solely driven by variation in the levels of capital and profitability. And given the unbalanced nature of our panel dataset, it would be appropriate to avoid computing the denominator over different window lengths for different banks. The Z-score indicates the number of standard deviations by which profitability would have to fall from the mean before wiping out bank capitalization, with larger values reflecting greater bank stability and less bank risk potential. However, in order to reduce scale bias, we use the natural logarithm of the Z-score in the empirical estimation.

The Z-score increases with higher profitability and capitalization levels, and decreases with volatile earnings as indicated by a higher standard deviation of return on assets. However, since it is difficult to assess and capture bank stability using a single measure, as noted by Turk-Ariss (2010), the sensitivity of the results is also checked using bank asset quality. We measure bank asset quality using the ratio of loan loss reserves to total assets as a proxy.

3.6.2 Measurement of Bank Profitability

We measure bank profitability using two alternative measures that are commonly used in the bank performance literature - the Net Interest Margin (NIM) and the Return on Average Assets (ROAA). The NIM is used to assess how a bank generates income from its main function of intermediation. It is the ratio of net interest income (interest income minus interest expense) to total assets. The ROAA is measured as the bank's net income for the year divided by average total assets, and indicates the bank's ability to earn income on its investments in assets.

3.6.3 Measurement of Bank Efficiency

In recent years, methods employed to measure efficiency of banks are basically parametric (econometric) and non-parametric (linear programming-based) in nature. Stochastic Frontier Analysis (SFA) and the Distribution Free Approach (DFA) are commonly used types of the parametric method. On the other hand, most studies employing the non-parametric approach use the DEA (Data Envelopment Analysis) method. The DEA approach involves the application of mathematical programming to observed data in order to locate the frontier which can be used to evaluate the efficiency of each of the organizations responsible for the observed output and input quantities. The organizations responsible for the observed output and input quantities are referred

to as the decision making units (DMUs). DEA assigns an efficiency score to each DMU by comparing the efficiency score of each unit with that of its peers. DEA produces a frontier of best performers which is used as a yardstick to measure the efficiency of individual firms. Firms lying on the frontier are considered efficient and those not on the frontier are viewed as inefficient. To date the question of which method is the best is still not clear. However, we use the SFA to measure the cost efficiency of banks in Sub-Saharan Africa because, unlike the DEA, it separates random error from inefficiency, and is also less sensitive to outliers.

Again, there is a long standing debate in the literature about what constitutes inputs and outputs for financial institutions. We follow the intermediation approach proposed by Sealey and Lindley (1977) to determine bank inputs and outputs for this study. The intermediation approach views financial institutions as intermediaries between savers and borrowers, and considers total loans and securities (or other earning assets) as outputs, whereas deposits and labour are defined as inputs. Other common definitions include the operating approach, the value added approach and the production approach.

The SFA approach, first proposed independently by Aigner, Lovell, and Schmidt (1977), and Meeusen and van den Broeck (1977), is based on the economics concepts of cost minimization and profit maximization. However, this study focuses on the cost minimization problem of banks, and hence, cost efficiency. A bank is considered inefficient if it incurs more cost than the best practice bank among its peers.

The SFA considers the observed inefficiency of a bank as a combination of the inefficiency specific to the bank and a random error, and tries to extricate the two components by making categorical assumptions about the underlying inefficiency process. Whilst the random error is usually assumed to be a normally distributed variable which can affect the overall inefficiency in either direction, the inefficiency term is assumed to be only one-sided (a truncated or half-normal distribution), and can thus affect the overall inefficiency from one direction. For a cost frontier of banks the inefficiency element should be non-negative, as they operate on or above the minimum cost. As is common in the literature, and similar to Koetter et al. (2008), we use the same framework (translogarithmic function) as the one used in the estimation of competition, to model the underlying cost structure of the banking sector.

As noted by Andrieş and Căpraru (2012), restrictions concerning the function of the stochastic frontier are more flexible when a functional form of the translog-type production function is applied than when a Cobb-Douglas-type form is applied. The translogarithm form does not impose the assumption of constant elasticity of the production function or of elasticity of substitution between inputs. Moreover, the translogarithm form allows the data to indicate the real value of the curvature of the function rather than impose prior assumptions regarding its value. In order to take into account the close relationship between competition and bank efficiency, the model used to estimate the cost efficiency scores as stated below, is basically the same as the one used to estimate competition (equation 3.2).

$$\begin{aligned}
\ln TOC_{it} = & \beta_0 + \beta_1 \ln TA_{it} + \frac{\beta_2}{2} (\ln TA_{it})^2 + \sum_{k=1}^3 \lambda_k \ln W_{k,it} + \sum_{k=1}^3 \phi_k \ln TA_{it} \ln W_{k,it} + \\
& \sum_{k=1}^3 \sum_{j=1}^3 \delta_{ij} \ln W_{k,it} \ln W_{j,it} + \sum_{j=1}^3 (\delta_j/2) (\ln W_{j,it})^2 + \sum_{k=1}^2 \eta_k trend^k + \\
& \sum_{j=1}^3 \varsigma_j \ln W_{j,it} trend + \wp \ln TA_{it} trend + v_{it} + u_{it}
\end{aligned} \tag{3.5}$$

The variables are as previously defined for equation (3.2). However, here the standard cost function is modified with the assumption that the error term has two components, so that $\varepsilon_{it} = v_{it} + u_{it}$ with v_{it} representing the random error and u_{it} being the inefficiency part. The inefficiency term is derived conditional on the estimate of the composite error term. The random error component (v_{it}) is symmetric and captures the random variation of the cost frontier across banks. The other part, u_{it} is a one-sided variable that accounts for inefficiency relative to the cost frontier. The time-specific effect is implied in the *trend*. The maximum likelihood technique is used to estimate the cost frontier function, with inefficiency derived from the residuals of the regression, under the assumption that both components of the composite error term are independently distributed (Maudos & de Guevara, 2007). Equation (3.5) is estimated separately for each country to derive individual bank efficiency scores in the Battese and Coelli (1992) framework, which allows us to estimate time-varying bank cost efficiency scores.

3.7 The Economic Freedom Index

There are two major measurements of economic freedom, the Economic Freedom of the World Index produced by the Fraser Institute (Gwartney et al., 2014) and the Economic Freedom Index constructed by the Heritage Foundation (Heritage Foundation, 2015) in collaboration with the Wall

Street Journal. As noted by Chortareas et al. (2013), both indices are highly credible and their results are compatible in general. Even though the Economic Freedom of the World Index has been used extensively in the literature, we use the Heritage Foundation's Index of Economic Freedom for this study because one of its components, the Financial Freedom Index captures the issues of interest (Chortareas et al., 2013).

Financial freedom, one of Heritage Foundation's ten measures of economic freedom, is a measure of banking efficiency as well as a freedom from restrictions or government control and interference in the financial sector. State ownership of banks and other financial institutions such as insurers and capital markets reduces competition and generally lowers the level of available services (Heritage Foundation, 2015).

The Financial Freedom Index scores an economy's financial freedom by looking into the following five broad areas:

- The extent of government regulation of financial services,
- The degree of state intervention in banks and other financial firms through direct and indirect ownership,
- The extent of financial and capital market development,
- Government influence on the allocation of credit, and
- Openness to foreign competition.

These five areas are considered to assess an economy's overall level of financial freedom that ensures easy and effective access to financing opportunities for people and businesses in the

economy. An overall score on a scale of 0 to 100 is given to an economy's financial freedom through deductions from the ideal score of 100, which reflects negligible government interference. A score of 50 indicates the existence of considerable government interference in credit allocation, and significant restrictions on the ability of financial institutions (especially foreign institutions) to offer financial services. Economies scoring below 50 are considered to have repressive policies with strong or extensive government control over the central bank and credit allocation.

3.8 Estimating Effect of Competition and Financial Freedom on Bank Stability

Our empirical model below, which investigates how competition and financial freedom impact bank stability is similar to Liu et al. (2013).

$$Risk_{it} = \lambda Risk_{it-1} + \alpha_1 Lerner_{it} + \alpha_2 Lerner_{it}^2 + \alpha_3 Freedom_{it} + \alpha_4 Lerner_{it} * Freedom_{it} + \sum_{n=1}^4 \omega_n X_{it}^n + \xi_{it} \quad , \quad (3.6)$$

where, $\xi_{it} = \kappa_i + \gamma_t + \varrho_{it}$ and the subscripts i , and t represent bank i , at year t , respectively. $Risk_{it}$ is our measure of bank stability and $Risk_{it-1}$ is the observation on the same bank in the same country in the previous year. As explained earlier, the main bank stability measure we used for this study is the natural logarithm of Z-score ($Risk$). However, we also use bank asset quality as an alternative risk measure in view of the difficulty in measuring bank risk with a single measure. $Lerner$ represents the conventional Lerner index or the funding-adjusted Lerner index, and is our measure of competition. Following the findings of Martinez-Miera and Repullo (2010), we include a quadratic term, $Lerner^2$ to account for a possible non-linear relationship between competition and bank stability. $Freedom$ is the degree of financial freedom or economic freedom.

Financial Freedom is a broad indicator for the openness of a banking system, capturing whether foreign banks are allowed to operate freely, whether difficulties are faced when setting up domestic banks, and whether the government influences the allocation of credit, with larger values signifying more freedom (Berger et al., 2009; Demirguc-Kunt, Laeven, & Levine, 2004; Chortareas et al., 2011).

Economic Freedom is a composite measure of a country's overall economic freedom based on 10 different factors. It comprises of Financial Freedom, Business Freedom, Property Rights, Monetary Freedom, Investment Freedom, Freedom from Corruption, Labor Freedom, Trade Freedom, Fiscal Freedom and Government Size. The index takes values in a scale from 0 to 100, with scores approaching 100 representing higher levels of freedom. Similarly, the higher the score on a factor, the lower the level of government interference in the economy. *Lerner*Freedom* is the interaction between competition and the freedom variables. The variable X_{it} is a vector representing control variables. The error term, ξ_{it} has three components: the unobserved time-invariant bank-specific effect (κ_i), the unobserved time effects (γ_t), and the random error (ϱ_{it}). This is a two-way error component regression model, where $\kappa_i \sim \text{IIN}(0, \sigma_\kappa^2)$ and independent of $\varrho_{it} \sim \text{IIN}(0, \sigma_\mu^2)$.

In line with the existing literature on the factors that influence bank stability, we control for a number of variables, including *Capitalization* (ratio of equity to total assets), *Credit risk* (ratio of total loans to total assets), *Diversification* (ratio of non-interest income to total income), and *Financial development* (domestic credit to the private sector as a percentage of GDP). Most previous research on bank capital and risk suggest a negative relationship, as the more capital a

bank holds, the more stable it is thought to be. Since lending is one of the most risky areas of banking business, *Credit risk* is expected to associate negatively with bank stability. The greater a bank's loans exposure the higher is the probability of default, and hence the lower is the stability (Liu et al., 2013). It is generally expected that *Diversification* will enhance bank stability, yet recent studies suggest that more diversified banks are less stable compared to their less diversified counterparts (Beck et al., 2009). We anticipate that higher levels of *Financial development* would be associated with greater stability as banks gain more experience over time.

3.9 Modelling Competition, Financial Freedom and Bank Profitability

We specify a dynamic model to determine the effect of competition and financial freedom on bank profitability as shown below. As highlighted by Berger et al. (2000), bank profits tend to persist over time, as a result of impediments to market competition, informational opacity and/or sensitivity to regional/macroeconomic shocks, to the extent that these are serially correlated. Consequently, we specify a dynamic model which includes the first lag of the dependent variable among the regressors. This approach follows several studies on bank profitability such as Athanasoglou et al. (2008), Garcia-Herrero, Gavila, and Santabarbara (2009), Trujillo-Ponce (2013) and Dietrich and Wanzenried (2014).

$$\begin{aligned}
 Perf_{it} = & \Phi Perf_{it-1} + \rho_1 Lerner_{it} + \rho_2 Freedom_{it} \\
 & + \rho_3 Lerner_{it} * Freedom_{it} + \sum_{n=1}^8 \theta_n Z_{it}^n + \epsilon_{it} \quad , \quad (3.7)
 \end{aligned}$$

where, $\epsilon_{it} = \psi_i + \zeta_t + \varphi_{it}$ and the subscripts i , and t represent bank i at year t , respectively. $Perf_{it}$ is our measure of bank profitability and $Perf_{it-1}$ is the observation on the same bank in the same country in the previous year. We use two measures for bank profitability, Net Interest Margin

(NIM) and Return on Average Assets (ROAA). *Lerner* represents the conventional Lerner index or the funding-adjusted Lerner index, and is our measure of competition. *Freedom* is the degree of financial freedom or economic freedom, and *Lerner*Freedom* is the interaction between competition and the freedom variables. The variable X_{it} is a vector representing control variables. The error term, ϵ_{it} has three components: the unobserved time-invariant bank-specific effect (Ψ_i), the unobserved time effects (ζ_t), and the random error (φ_{it}). This is a two-way error component regression model, where $\Psi_i \sim \text{IIN}(0, \sigma_\psi^2)$ and independent of $\varphi_{it} \sim \text{IIN}(0, \sigma_\mu^2)$.

We control for a number of variables that generally affect the relationship between competition and bank profitability. These include bank-specific and country-level characteristics. The bank-level variables are *Cost to income* (ratio of non-interest operating expenses to operating income), *Bank size* (natural logarithm of total assets), *Capitalization* (ratio of equity to total assets), *Credit risk* (ratio of total loans to total assets), and *Diversification* (ratio of non-interest income to total income). The country-level variables are *Concentration* (Hirschman-Herfindahl Index-the sum of the squares of the market share of assets of each bank), *Financial development* (domestic credit to the private sector as a percentage of GDP), and *Economic development* (natural logarithm of per capita GDP).

The operating efficiency of banks is known to be an important determinant of bank profitability. In this study, we use the *Cost to income* ratio as a proxy for efficiency. Banks with high operating efficiency are usually able to maintain a lower cost to income ratio, which enhances profits. Hence, we expect a negative relationship between *Cost to income* and bank profitability. Of course, if the benefits of improvements in efficiency are shared with customers in the form of lower loan rates

and/or higher deposit rates, then the expected increase in profitability may not materialize (Goddard et al., 2013). On the other hand, banks that bear higher operating costs may charge higher margins (if the competition allows), to balance their higher transformation costs, which implies a positive relationship between *Cost to income* and bank profitability (Maudos & de Guevara, 2004; Peria & Mody, 2004; Hawtrey & Liang, 2008).

The relationship between *Bank size* and profitability is quite ambiguous. Smirlock (1985) argues that a growing bank size is positively related to bank profitability. Since larger banks are in a better position to realize economies of scale and reduce the cost of gathering and processing information, bank size should be positively associated with its performance (Demirguç-Kunt & Huizinga, 1999; Dietrich & Wanzenried, 2011). However, extremely large banks might show a negative relationship between size and profitability. This is due to agency costs, the overhead of bureaucratic processes, and other costs related to managing large firms (e.g. Stiroh & Rumble, 2006; Pasiouras & Kosmidou, 2007). On the other hand, Athanasoglou et al. (2008) find that size is not significant in explaining bank profitability. They suggest that this may be because small-sized banks usually try to grow faster, even at the expense of their profitability. In addition, newly established banks are not particularly profitable (if at all profitable) in their first years of operation, as they place greater emphasis on increasing their market share, rather than on improving profitability.

In line with the general literature, we measure bank *Capitalization* with the ratio of equity to total assets. Highly capitalized banks have a reduced need for external funds, and might be able to reduce their funding costs, which should positively affect their profitability. Besides,

Athanasoglou et al. (2008) explain that the positive relationship between capital and bank profitability could be attributed to the ability of banks with sound capitalization to pursue business opportunities more effectively, and also because such banks have more time and flexibility to deal with problems arising from unexpected losses. Claey's and Vennet (2008) also suggest that when a bank holds capital in excess of the regulatory minimum, two positive effects on the interest margin can be distinguished. Since the bank has free capital it can increase its portfolio of risky assets in the form of loans or securities, and if market conditions allow the bank to make additional loans with a beneficial return/risk profile, this will usually increase the interest margin. Moreover, since capital is considered to be the most expensive form of liabilities in terms of expected return, holding capital above the regulatory minimum is a credible signal of creditworthiness on the part of the bank. And when depositors exert depositor market discipline, this may enable the bank to lower its deposit funding costs and, hence, increase its interest margin.

However, if we consider the conventional risk-return hypothesis, we have to expect banks with lower capital ratios (which makes them more risky) to have higher returns in comparison to better-capitalized financial institutions (Dietrich & Wanzenried, 2011). Hence, we have no specific expectation as to the direction of the relationship between *Capitalization* and bank profitability. The ratio of total loans to total assets is used as a proxy for *Credit risk*. An increased exposure to credit risk may be associated with decreased bank profitability. We thus generally expect a negative effect of this variable on bank returns (Dietrich & Wanzenried, 2014). As suggested by Dietrich and Wanzenried (2011), the negative relationship between credit risk and bank profits might be a reflection of exposure to high-risk loans, resulting in loan losses that lower the returns of the affected banks. On the other hand, banks that make risky loans may also be obliged to hold

a higher amount of provisions. And in order to compensate for the higher risk of default, they may charge higher margins, leading to a positive relationship (Maudos & de Guevara, 2004).

In recent times, an increasing proportion of bank income have been generated from non-interest activities, such as payment and other commission-based services, investment banking and insurance underwriting, among others. We measure *Diversification* as the ratio of non-interest income to total income. Chiorazzo et al. (2008) and Elsas et al. (2010) assert that revenue diversification enhances bank profitability via higher margins from non-interest businesses. However, other previous studies (e.g. Stiroh & Rumble, 2006) show that greater diversification of the banking business does not necessarily translate into an improvement of the bank's profitability. In fact, such diversification may be detrimental to profitability. Nguyen (2012) also found that net interest margin is not always inversely related to diversification.

Our proxy for banking market *Concentration* is the Hirschman-Herfindahl Index (HHI). It is measured as the sum of the squares of the market share of assets of each bank in the industry. The Structure–Conduct–Performance (SCP) hypothesis suggests that higher concentration in banking markets has a positive impact on bank profitability, because collusion among banks may result in higher rates on loans and lower interest rates on deposits. However, if concentration is the result of tougher competition in the banking industry, this would suggest a negative relationship between performance and market concentration (Boone & Weigand, 2000). Consequently, the overall effect of market concentration on bank performance is uncertain.

We control for the level of *Financial development* and *Economic development* using domestic credit to the private sector as a percentage of GDP, and the natural logarithm of per capita GDP, respectively. The existing literature shows that GDP per capita could be expected to have a positive impact on bank performance (Bashir, 2003). On the other hand, we anticipate that higher levels of financial development would be associated with lower profits, since there may be little room for new business, as a result of higher competition.

3.10 Modelling Effect of Financial Freedom on Bank Competition

Two important econometric concerns might arise when modelling sources of bank competition. These are the dynamic nature of bank competition and the potential endogeneity of some of the explanatory variables (Delis, 2012). Berger et al. (2000) suggest the presence of informational opacity, networking, and relationship-lending even in developed banking systems, all of which might cause bank rents and market power to persist. We thus include the lagged dependent variable among the regressors in our econometric model, to account for this type of persistence. The empirical model follows Delis (2012) and is specified as:

$$\text{Competition}_{it} = \theta \text{Competition}_{it-1} + \tau \text{Freedom}_{it} + \sum_{n=1}^6 \partial_n K_{it}^n + \omega_{it}, \quad (3.8)$$

where $\omega_{it} = w_i + x_t + y_{it}$ and the subscripts i , and t represent bank i at year t , respectively. Competition_{it} refers to bank market power (Lerner index), our proxy for bank competition and $\text{Competition}_{it-1}$ is the observation on the same bank in the same country in the previous year. We use two measures for competition, the conventional Lerner index and the funding-adjusted Lerner index. *Freedom* is the degree of financial freedom or economic freedom. The vector

variable K_{it} represents control variables that typically explain competitive conditions in banking markets. The error term, ω_{it} has three components: the unobserved time-invariant bank-specific effect (w_i), the unobserved time effects (x_t), and the random error (y_{it}). This is a two-way error component regression model, where $w_i \sim \text{IIN}(0, \sigma_w^2)$ and independent of $y_{it} \sim \text{IIN}(0, \sigma_\mu^2)$.

The main drivers of market power identified in the literature include size, default risk, diversification, efficiency, equity, concentration, market share, ownership, monetary policy, inflation, and financial depth (Aboagye et al., 2008b; De Guevara and Maudos, 2007; De Guevara et al., 2005). We follow a similar empirical approximation, but also test for the effect of financial freedom and economic freedom in order to take account of the broader environment within which banking activity takes place in a country. An open and transparent banking environment facilitates access to financing and encourages competition to provide efficient financial intermediation between households and firms, as well as between investors and entrepreneurs (Chortareas et al., 2013).

We control for bank *Capitalization* (ratio of equity to total assets), *Diversification* (ratio of non-interest income to total income), *Bank size* (natural logarithm of total assets), *Market share* (ratio of a bank's assets to total national industry assets), *Financial development* (domestic credit to the private sector as a percentage of GDP), and *Economic development* (natural logarithm of per capita GDP). As suggested by Delis (2012), well-capitalized and larger banks may be able to set higher margins or gain access to cheaper sources of funds due to scale economies, informational asymmetries, and moral hazard issues. Also, De Guevara et al. (2005) have shown that bank size has a positive and significant effect on market power. Larger banks enjoy greater market power

due to either cost advantages or to their capacity to impose higher prices. While one would expect higher market share and activity diversification to impact market power positively, improvements in financial development and economic development are likely to stifle the exercise of market power by individual banks.

3.11 Estimating Effect of Competition and Financial Freedom on Bank Efficiency

In line with Turk-Ariss (2010) and Coccoresse and Pellecchia (2010), we investigate the implications of the degree of financial freedom and bank market power on cost efficiency using the Tobit model, the most widely adopted approach in the bank efficiency literature. Bank cost efficiency scores are ranged between 0 and 1, hence Tobit models are more appropriate since they better fit models where the dependent variable is derived from a first-stage regression, as Greene (2005) posits.

We follow a two-stage approach, where bank cost efficiency scores and Lerner index of market power are obtained from a first-stage regression by means of a common stochastic frontier model, as previously explained. Then in the second-stage, we used the freedom variables and the estimated market power measures, as well as a number of control variables to explain cost efficiency. We are thus able to test both the quite life hypothesis, and the conditioning effect of financial freedom on the competition-efficiency relationship, which is known to be complex (Casu & Girardone, 2006).

The extended model is:

$$\begin{aligned} CostEff_{it} = & \Omega_1 Lerner_{it} + \Omega_2 Freedom_{it} + \Omega_3 Lerner_{it} * Freedom_{it} + \Omega_4 lnHHIa_{it} + \Omega_5 EQTA_{it} \\ & + \Omega_6 ROAA_{it} + \Omega_7 Domcrps_{it} + \Omega_8 lngdppc_{it} + \varepsilon_{it} \end{aligned} \quad (3.9)$$

where *lnHHIa* represents banking market concentration. *EQTA* is the ratio of bank equity to total assets while *ROAA* represents bank profitability. We account for the effect of financial and economic development with *Domcrps* (domestic credit to the private sector as a percentage of GDP) and *lngdppc* (natural logarithm of GDP per capita), respectively.

The main independent variables of interest are the *Freedom* variables, representing financial freedom or economic freedom, and the *Lerner* which measures the degree of bank market power. Two specifications of the Lerner index are used, the conventional Lerner index and the funding-adjusted Lerner index (to account for market power arising in the deposit market). The funding-adjusted Lerner measure also better account for the inter-relatedness between market power and bank efficiency, thereby addressing endogeneity concerns (Turk-Ariss, 2010). The Lerner index is the mark-up of price over marginal costs, with higher values denoting higher pricing power and less competitive market conditions, and lower values signifying greater competition and lesser pricing power. We prefer to use the Lerner index as our measure of the degree of market power (or competition) compared to other traditional measures of market structure because it is observed at the bank level, just like the bank cost efficiency scores to which they are related. For example, unlike the Lerner index, concentration ratios and the Panza Rosse H-statistic are estimated at the country level.

Following the literature on the determinants of bank efficiency, we control for a number of influencing factors. According to Demirgüç-Kunt and Levine (2000), the empirical evidence on the links between banking market *Concentration* and bank efficiency is not unambiguously positive or negative. While some argue that concentration strengthens market power and thereby stifles competition and efficiency (structure-conduct-performance hypothesis), others assert that economies of scale result in bank mergers and acquisitions, so increased concentration goes hand-in-hand with efficiency improvements (efficient-structure hypothesis). Hence, we could expect either a positive or a negative relationship between concentration and bank efficiency.

According to Chortareas et al. (2012), many studies have highlighted the important role of *Capitalization* in preventing bank failure, and in protecting customers or whole economies from negative shocks. However, regulation may impede the efficient operation of banks. For example, changes in capital regulations may compel banks to engage in riskier ventures or invest in ways that seek to circumvent regulations, which could eventually affect their efficiency. Rules on bank capital requirements may not reflect the risks involved, but this could inadvertently encourage banks to hold either too much or too little capital. While inadequate capital increases the risk of bank failure, too much capital, on the other hand, inflicts needless costs on banks and their customers with negative repercussions for the efficiency of the banking system.

Higher bank *Profitability* may also have varying effects on bank efficiency. Banks earning higher profits may be in a position to acquire more efficient technology and management capacity to improve efficiency, but higher profits also have the tendency to induce wastefulness. Hence, we could expect the relationship between bank profits and efficiency to be either positive or negative.

Since the macroeconomic environment is likely to have implications for bank efficiency levels, we also control for *Financial development* (domestic credit to the private sector as a percentage of GDP) and *Economic development* (natural logarithm of per capita GDP). These variables should capture the cyclical conditions of the macroeconomic environment, and the effect of operating in different economic environments, since demand for financial products depends to a large extent on the level of economic activity (Chortareas et al., 2012).

3.12 Estimating the Determinants of Bank Profit Persistence

In line with Goddard et al. (2004) and Goddard et al. (2013), the following empirical model is used to estimate the determinants of bank profit persistence:

$$\pi_{it} = \kappa_i + \lambda_1 \pi_{it-1} + \delta_1 \text{Economic freedom}_t + T_1 x_{it} + T_2 m_t + \upsilon_{it} \quad (3.10)$$

where π_{it} denotes the normalized profit rate of bank i , in year t . Return on Average Equity (ROAE) is the profit rate measure, and is measured by the ratio of net income after tax to total equity. The profit rate is normalized by expressing π_{it} as a deviation from the cross-sectional industry mean profit rate in year t . The main variable of interest in the above model is *Economic freedom*, which assesses the effect of general liberty to engage in business and other economic transactions on bank profit persistence (or intensity of competition). We could not use financial freedom as in the other models, because of limited variations at the country level over the study period.

- x_{it} denotes a vector of bank-specific variables;
- m_t denotes a vector of country-specific variables;
- κ_i is an individual effect for bank i ;

- λ_l is the coefficient reflecting bank profit persistence;
- γ_1 and γ_2 are vectors of coefficients;
- $\hat{v}_{it}$ is the error term, which decomposes as $\hat{v}_{it} = x_t + z_{it}$.

The model is estimated separately for each country. The coefficient of the lagged dependent variable, λ_l measures the speed of adjustment of short-run profits to the competitive norm. If it is high, then short-run profits are persistent and competition is thought to be weak. On the other hand, if it is small, or close to zero, then short-run profits are quickly eroded and competition is considered to be strong or fierce. The motivation for the specification of a dynamic profit equation containing a partial adjustment mechanism (lagged dependent variable) is drawn from the Persistence of Profit (POP) literature. Banks usually earn excess profits either through the exploitation of market power of incumbency, or because incumbent banks are more efficient or innovative in the production or distribution of financial services. Over time, entry encourages competition, and eventually erodes any excess profit (Goddard et al., 2013).

The other explanatory variables that typically influence banking market competition and comprise the vectors x_{it} and m_t are defined as follows:

Equity = ratio of equity to total assets.

Bank size = natural logarithm of total assets.

Credit risk = ratio of gross loans to total assets.

Market Share = bank share of total assets of the banking market

Concentration = sum of square of market share of bank assets.

Financial development = ratio of credit to the private sector to GDP

As suggested by Delis (2012), well-capitalized and larger banks may be able to set higher margins or gain access to cheaper sources of funds due to scale economies, informational asymmetries, and moral hazard issues. However, as with the general literature on bank profitability and competition, the effect of size on profit persistence may not always be in one direction. While one would expect higher market share to impact profit persistence positively, the effect of lending specialization (or credit risk) is quite uncertain. Again, the relationship between banking market concentration on one hand, and profitability and competition on the other hand, has been rather ambiguous in the literature.

Goddard et al. (2011), suggest a positive relationship between GDP growth and profit persistence, on the back of increased business opportunities for banks, which might help banks to sustain positions of excess profitability. On the other hand, the availability of abundant business opportunities might tend to strengthen competition between banks, in which case a negative relationship would be expected between GDP growth and profit persistence. We expect similar results for the relationship between financial development and bank profit persistence.

3.13 Method of Data Analysis

We estimate most of the regressions based on the system Generalized Method of Moments (GMM) estimator (Arellano & Bover, 1995). This method is used to estimate the effects of *Competition* and *Financial Freedom* on *Bank Stability*, the effects of *Competition* and *Financial Freedom* on

Bank Profitability, the sources of bank *Market Power*, and the determinants of bank *Profit Persistence*. We used this dynamic panel model to deal with possible endogeneity of some of the variables used in the estimations, and to account for persistence of bank risk, profitability and market power. The model includes the first lag of the dependent variable as part of the covariates, and unobserved individual bank effects. Hence, the standard fixed effects or random effects estimators would be inconsistent, since by construction, the individual bank effects are correlated with the lagged dependent variable. To address these issues, Arellano and Bond (1991) use a Generalized Method of Moments (GMM) estimator for such models, popularly known as the difference GMM. In the difference GMM model, lagged exogenous variables in levels are used as instruments for the first differenced, lagged dependent variable. However, Arellano and Bover (1995) and Blundell and Bond (1998) have shown that these lagged variables may provide little information about the first differences. Consequently, Blundell and Bond (1998) expanded the work of Arellano and Bover (1995) to develop a system estimator that exploits additional moment conditions on both first-differences and levels, with lagged first-differences of the series employed as instruments in the levels equation. The system GMM estimator reduces potential bias in finite samples as well as asymptotic imprecision associated with the difference estimator (Blundell & Bond, 1998).

Even so, the consistency of the system GMM estimator depends on two key assumptions: that the error term is not autocorrelated, and that the instruments used are valid. The presence of first-order autocorrelation in the differenced residuals does not imply that the estimates are inconsistent. But, the presence of second-order autocorrelation suggests that the estimates are inconsistent. We test the hypothesis of no autocorrelation in the error term and report the results together with the main

results. We also use the Hansen test of over-identifying restrictions to examine the validity of the instruments. The Hansen test analyses the sample analogue of the moment conditions used in the estimation procedure to determine the validity of the instruments (Liu et al., 2013).

We estimate equation (3.6), which evaluates the effect of competition and financial freedom on bank stability, using the two-step system GMM estimator with Windmeijer-corrected standard errors, small-sample adjustments, and orthogonal deviations (Windmeijer, 2005). The difference and system GMM estimators have one-step and two-step variants. The two-step system GMM uses residuals from the one-step estimates and is asymptotically more efficient than the one-step.

One of the main problems in assessing the determinants of bank profitability is the potentially endogenous character of some of the factors. For example, banks that are more profitable may have more resources to increase their equity, and may also find it easier to increase their customer base through successful advertising and, thereby, enhance profitability. Indeed, causality could even go in the opposite direction; that is, higher bank profitability could lead to more employees and less efficiency (Garcia-Herrero et al., 2009).

Besides, there are heterogeneity concerns since some features of banks that affect profitability are unobserved and difficult to measure or identify in an equation. If the impact of such characteristics are not taken into account, there could be correlations between some of the coefficients of the explanatory variables and the error terms that bias these coefficients (Trujillo-Ponce, 2013). To address these concerns, as well as the persistence of bank profitability, we use the system GMM estimator developed for dynamic panel models by Arellano and Bover (1995) and Blundell and Bond (1998), to ascertain the effect of competition and financial freedom on bank profitability.

Thus, equation (3.7) is estimated using the two-step system GMM estimator with Windmeijer-corrected standard errors, small-sample adjustments, and orthogonal deviations (Windmeijer (2005)). The same procedure is used to estimate equation (3.8), the sources of bank market power, for similar reasons.

However, since bank efficiency scores are ranged between 0 and 1, a different estimation technique was used for equation (3.9), to assess the effect of competition and financial freedom on bank cost efficiency. Tobit models are more appropriate in this case since they better fit models where the dependent variable is derived from a first-stage regression (Greene, 2005). Again, since the cost efficiency scores and market power indices are obtained from the same model, we take into account endogeneity arising from simultaneity by estimating an instrumental variable Tobit model, in addition to the traditional Tobit specifications. Indeed, the efficient-structure hypothesis suggests a causal relationship going from efficiency to market power. Hence, in our econometric models the variable *Lerner* could be endogenous. This gives further reasons why an instrumental variables version of the above model is warranted. We use a Wald test of exogeneity to confirm the possibility of endogeneity (Coccoresse & Pellecchia, 2010).

Equation (3.10) is also a linear dynamic panel regression model. We estimated separate regressions for each country. However, due to data limitations in using the system GMM with requirements for instruments, it was estimated for only five of the eleven countries. This estimator is designed for large N-small T panels, as in our study. Accordingly, we estimate (3.10) using the two-step system GMM estimator, including both lagged differences and levels of the explanatory variables as instruments. The system GMM estimator reduces potential biases in finite samples, and

asymptotic imprecision associated with the difference estimator (Blundell & Bond, 1998). Two specification tests are reported. The first is a Sargan test of overidentifying restrictions, which examines the validity of the instruments by analyzing the sample analogue of the moment conditions used in the estimation procedure. The second test examines the hypothesis of no autocorrelation in the disturbance term. The presence of first-order autocorrelation in the differenced residuals does not imply that the estimates are inconsistent, but the presence of second-order autocorrelation implies that the estimates are inconsistent. We thus report only the second-order autocorrelation test results.

3.14 Chapter Summary

This chapter provides the methodological framework for the study. We outline the measurement approaches for the key variables used in the estimations. We measure bank competition using the Lerner index of market power to overcome the limitations of the traditional approach of using indirect proxies such as banking market concentration or market shares of banks to infer competitive conditions. We prefer to use the Lerner index because, unlike the other popular measure of bank competition, the Panza-Rosse framework, which is an industry level measure, the Lerner index measures bank market power (as a proxy for competition) at the bank level. Another advantage of using the Lerner index is that it allows us to measure competition and bank efficiency using the same framework, and thus obtain better insight into the closely related issues of bank competition and efficiency. Most previous studies assessing these relationships use different models to measure competition and efficiency and thereby fail to take into account the simultaneous relationship between them (Koetter et al., 2012). The Lerner index is the mark-up of

price over marginal costs, with higher values denoting higher pricing power and less competitive market conditions.

We use a translogarithmic function to model the underlying cost structure of the banking sector. In addition to the conventional Lerner index, we also estimate the funding-adjusted Lerner index from the same model by excluding the price of funds. This is to ensure robustness of our results and to take into account, concerns that the conventional Lerner index estimates may be biased due to the exercise of market power in the deposit market (Turk-Ariss, 2010). In order to provide a more comprehensive assessment of bank performance, we use three main proxies that are commonly used in the literature to assess bank performance. These are bank stability (Z-score), bank profitability (NIM and ROAA), and bank cost efficiency.

We use Stochastic Frontier Analysis (SFA) to measure the cost efficiency of banks because, unlike the DEA (Data Envelopment Analysis), which is also commonly used, it separates random error from inefficiency, and is also less sensitive to outliers. A bank is considered inefficient if it incurs more cost than the best practice bank among its peers. The cost function is estimated separately for each country to derive individual bank efficiency scores in the Battese and Coelli (1992) framework, which allows us to estimate time-varying bank cost efficiency scores.

With regards to our measure of economic freedom, we considered the Economic Freedom of the World Index produced by the Fraser Institute (Gwartney et al., 2014) and the Economic Freedom Index constructed by the Heritage Foundation (Heritage Foundation, 2015) in collaboration with the Wall Street Journal. As noted by Chortareas et al. (2013), both indices are highly credible and

their results are usually similar, but we settled on the Heritage Foundation's Index of Economic Freedom for this study because one of its ten components, the Financial (Banking) Freedom Index captures the issues of interest. The financial freedom index measures the degree of government control and interference in the financial sector. It is measured on a scale of 0 to 100 through deductions from the ideal score of 100, which reflects insignificant government interference.

We estimate several regressions based on the system Generalized Method of Moments (GMM) estimator (Arellano & Bover, 1995). This method is used to estimate the effects of *Competition* and *Financial Freedom* on *Bank Stability*, the effects of *Competition* and *Financial Freedom* on *Bank Profitability*, the sources of bank *Market Power*, and the determinants of bank *Profit Persistence*. This dynamic panel data model takes into account the persistence of bank stability, bank profitability and bank market power, as well as concerns about potential endogeneity among some of the variables. Following the findings of Martinez-Miera and Repullo (2010), we include a quadratic term, $Lerner^2$ to account for a possible non-linear relationship between competition and bank stability. We also include an interaction term in the regressions to test the potential effect of the degree of financial freedom on the ambiguous relationship between competition and bank stability, as well as between competition and profitability.

We estimate the regressions using the two-step system GMM estimator with Windmeijer-corrected standard errors, small-sample adjustments, and orthogonal deviations (Windmeijer, 2005). The consistency of the system GMM estimator depends on the assumptions that the error term is not autocorrelated, and that the instruments used are valid. We test the hypothesis of no autocorrelation

in the error term and report the results together with the main results. We also use the Hansen test of over-identifying restrictions to examine the validity of the instruments.

In line with the existing literature on the factors that influence bank stability, we control for *Capitalization* (ratio of equity to total assets), *Credit risk* (ratio of total loans to total assets), *Diversification* (ratio of non-interest income to total income), and *Financial development*. With regards to the profitability model, we control for *Cost to income* (ratio of non-interest operating expenses to operating income), *Bank size* (natural logarithm of total assets), *Capitalization*, *Credit risk*, *Diversification*, *Concentration* (Hirschman-Herfindahl Index-the sum of the squares of the market share of assets of each bank), *Financial development* and *Economic development*. In the competition model, our main focus is on the effect of financial freedom on competition or market power, but we control for *Capitalization*, *Diversification*, *Bank size*, *Market share* (ratio of a bank's assets to total national industry assets), *Financial development*, and *Economic development*.

In line with Goddard et al. (2013), we estimate the determinants of bank profit persistence using the two-step system GMM estimator. However, unlike the previous models described above for bank stability, profitability and competition, which were cross-country regressions, the profit persistence model is estimated separately for each country. And due to data limitations in using the system GMM with requirements for instruments, it was estimated for only five of the eleven countries. Our dependent variable is the normalized profit rate of bank i , in year t . Return on average equity (ROAE) is the profit rate measure, which is normalized by expressing it as a deviation from the cross-sectional industry mean profit rate in year t . We control for other explanatory variables that typically influence banking market competition and profitability. These

are *Capitalization, Bank size, Credit risk, Market Share, Concentration, and Financial development*.

In line with Turk-Ariss (2010) and Coccoresse and Pellecchia (2010), we investigate the implications of the degree of financial freedom and bank market power on cost efficiency using the Tobit model, the most widely adopted approach in the bank efficiency literature. Bank cost efficiency scores are ranged between 0 and 1, hence Tobit models are more appropriate since they better fit models where the dependent variable is derived from a first-stage regression, as Greene (2005) posits. We test for both the quite life hypothesis, and the conditioning effect of financial freedom on the competition-efficiency relationship, which is known to be complex (Casu & Girardone, 2006). And in line with the bank efficiency literature, we control for banking market *Concentration, Capitalization, Profitability (ROAA), Financial development and Economic development*. Since the cost efficiency scores and market power indices are obtained from the same model, we take into account endogeneity arising from simultaneity by estimating an instrumental variable Tobit model, in addition to the traditional Tobit specifications.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents results of our analysis, findings and discussions in the light of the literature. We begin with some descriptive statistics of key variables used in our estimations in section 4.2. Section 4.3 evaluates the effect of competition and economic freedom on bank risk (stability and bank asset quality). In section 4.4, we assess the relationship between competition, economic freedom and bank profitability (net interest margins and return on assets). Section 4.5 focuses on the competition-efficiency relationship, and the conditioning effect of economic freedom on this relationship. We also present the determinants of bank competition and bank cost efficiency estimates. Section 4.6 discusses the extent to which bank profits persist, and what drives profit persistence.

4.2 Descriptive Statistics

A summary of descriptive statistics for the key variables are presented in Table 4.1. The values in Table 4.1 represent mean country values. The financial freedom index (Financial freedom) constructed by the Heritage Foundation in collaboration with The Wall Street Journal measures the degree of independence of the financial sector from government control and interference (Heritage Foundation, 2015). The index has been published annually since 1995, and has been used in several studies, usually as a control variable or instrumental variable. Among the countries in Sub-Saharan Africa included in this study, Mauritius (64.3) has the highest degree of financial freedom while supervision of the financial sector in Ethiopia (20.0) is considered repressive.

Table 4.1: Summary Descriptive Statistics

Country	Financial freedom	Economic freedom	Z-score	Asset Quality	ROAA	ROAE	NIM
Ethiopia	20.0	51.8	114.56	0.038	0.030	0.266	0.032
Ghana	55.7	58.4	23.37	0.036	0.021	0.169	0.066
Kenya	50.0	58.5	46.46	0.024	0.024	0.196	0.057
Malawi	50.0	54.5	24.24	0.012	0.034	0.236	0.062
Mauritius	64.3	73.3	39.08	0.023	0.011	0.106	0.026
Mozambique	50.0	56.2	23.52	0.024	0.018	0.142	0.080
Namibia	47.1	62.1	128.95	0.012	0.019	0.210	0.047
South Africa	58.6	63.2	41.53	0.028	0.023	0.156	0.044
Tanzania	52.9	57.5	64.60	0.018	0.014	0.143	0.053
Uganda	63.3	62.7	43.47	0.013	0.022	0.108	0.073
Zambia	50.0	57.5	16.18	0.039	0.002	0.055	0.073
AVERAGE	51.1	59.6	47.43	0.024	0.020	0.162	0.056

Country	Conv. Lerner	Adjusted Lerner	Cost/ income	Equity/ Assets	Credit risk	NIITI	PTA	OETA	Financial Development
Ethiopia	0.530	0.608	0.306	0.154	0.532	0.416	0.010	0.010	0.252
Ghana	0.219	0.240	0.650	0.136	0.466	0.270	0.030	0.039	0.147
Kenya	0.291	0.323	0.596	0.140	0.537	0.256	0.027	0.027	0.307
Malawi	0.688	0.576	0.692	0.140	0.464	0.491	0.042	0.070	0.166
Mauritius	0.057	N/A	0.599	0.120	0.574	0.167	0.010	0.010	0.853
Mozambique	0.226	0.168	0.720	0.150	0.478	0.315	0.038	0.058	0.238
Namibia	0.234	0.240	0.591	0.100	0.771	0.217	0.020	0.021	0.486
South Africa	0.253	0.194	0.616	0.157	0.660	0.268	0.024	0.027	1.541
Tanzania	0.263	0.214	0.657	0.119	0.461	0.313	0.027	0.033	0.159
Uganda	0.113	0.108	0.788	0.162	0.492	0.289	0.035	0.048	0.145
Zambia	0.058	0.080	0.895	0.105	0.490	0.376	0.050	0.050	0.138
AVERAGE	0.267	0.275	0.646	0.135	0.539	0.307	0.029	0.036	0.403

Financial freedom and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation (2015). They are scaled from 0 to 100 with higher values indicating greater freedom. The *Z-score* is defined as the return on assets plus the equity to total assets ratio, scaled by the standard deviation of the return on assets. *Asset quality*, is measured by the ratio of loan loss reserves to total assets. *ROAA* is Return on Average Assets (the ratio of net income to average total assets). *ROAE* is Return on Average Equity (ratio of net income to average total equity). Net Interest Margin (*NIM*) is defined as the ratio of the net interest income to total assets as a measure of spread. The degree of market power is proxied by the *Lerner index* or the price mark-up over marginal cost, with higher scores indicating a higher degree of pricing power. Two variants of the Lerner index are reported: a conventional Lerner and a funding-adjusted Lerner. *Cost to income* ratio is measured by the ratio of non-interest operating expenses to operating income. *Equity/Assets* is the bank total equity to asset ratio (Capitalization). *Credit risk* is measured as total loans to total assets. *NIITI* represents Diversification which is measured as the ratio of non interest income to total income. *PTA* is defined by personnel to total assets while *OETA* is defined by other operating expenses to total assets. *Financial development* is measured as domestic credit to private sector as a percentage of GDP.

The average index of financial freedom (51.1) indicates that the countries in Sub-Saharan Africa included in this study portray significant restrictions on banking activities and the provision of other financial services for the study period (2006-2012). This may have adverse implications for the efficient operation of banks in this region.

The economic freedom index (Economic freedom) measures the ability of individuals to exercise their fundamental right to control their own labor and property. In an economically free society, individuals have the freedom to work, produce, consume, and invest in any way they please. Also, in such societies, governments allow labor, capital, and goods to move freely, and desist from coercion or restriction of liberty beyond the extent needed to protect and maintain liberty itself (Heritage Foundation, 2015). The average level of economic freedom (59.6) signifies a reasonable level of liberty to own and employ capital in these countries. Again, Mauritius (73.3) and Ethiopia (51.8) have the highest and lowest levels of economic freedom, respectively.

The results show that banks in Namibia and Ethiopia appear to be the most stable with mean stability scores (Z-score) of 128.95 and 114.56, respectively, while the most unstable banks are found in Zambia (16.18), Ghana (23.37) and Mozambique (23.52). Asset quality is poorest in Zambia (0.039), Ghana (0.036) and Ethiopia (0.038). This means that in general, banks in Zambia and Ghana face more risk than those in the other countries. Average profitability for the period are about 2.0% for ROAA, 16.2% for ROAE and 5.6% for NIM. Generally, the most profitable banks are in Ethiopia, Kenya and Malawi, while banks in Mozambique, Zambia, and Uganda earn the highest margins on their intermediation activities. Banks in Zambia, Mauritius and Tanzania make the least profit, while those in Mauritius, Ethiopia and South Africa earn the lowest margins.

Market power, represented as Conventional Lerner index and Funding-adjusted index in Table 4.1 show a moderate level in most of the countries, averaging 0.267 and 0.275, respectively. The funding-adjusted Lerner is slightly higher than the conventional Lerner on average, suggesting little underestimation with the conventional Lerner index, but there are considerable differences in the two indices among the countries. Banks enjoy significantly higher monopoly power in Ethiopia and Malawi, with those in Mauritius, Zambia and Uganda having the least power in pricing their products and services. This means that banking markets in Mauritius, Zambia and Uganda are the most competitive, while those in Ethiopia and Malawi face little competition.

Almost two-thirds of bank income is expended on cost averagely (Cost to income ratio of 64.6%). This gives an indication of the level of operating efficiency. Differences in operating efficiency are not very large, except for Ethiopian banks (30.6%) which appear to be significantly more efficient than the rest, with the most inefficient banks operating in Zambia, Uganda and Mozambique. With an average of about 13.5% capitalization ratio, banks in Sub-Saharan Africa appear to be generally well-capitalized beyond the level recommended by Basel III (8%). The highest capitalization levels are observed in Uganda, South Africa and Ethiopia, with the least capitalized banks operating in Zambia and Namibia.

On average, about 54% of banking assets in these Sub-Saharan African countries are devoted to lending activities (Credit risk), with the highest level of specialization in lending occurring in Namibia (77%) and South Africa (66%). On the other hand, banks in Tanzania (46.1%), Malawi (46.4%) and Ghana (46.6%) devote much less to lending. A significant portion of bank income is

earned from non-interest activities (NIITI) in Malawi (49.1%) and Ethiopia (41.9%). On the other hand, the least diversified banks are in Mauritius (16.7%) and Namibia (21.7%).

Staff costs, measured as personnel costs to total assets (PTA), are lowest in Ethiopia and Mauritius, just about 1% of total assets, and highest in Zambia (5.0%), Malawi (4.2%) and Mozambique (3.8%). The average is about 2.9%. Similarly, other operating costs to total assets (OETA), are lowest for banks in Ethiopia and Mauritius, just about 1% of total assets, and highest in Malawi (7.0%), Mozambique (5.8%) and Zambia (5.0%). Domestic credit to the private sector as a percentage of GDP (Financial development) is significantly higher in the more developed markets in the region, South Africa (154.1%) and Mauritius (85.3%). Countries giving the least amount of credit to the private sector are Zambia (13.8%), Uganda (14.5%) and Ghana (14.7%).

4.3 Competition, Economic Freedom and Bank Risk

In this section, we analyze the effect of competition (measured as funding-adjusted and conventional Lerner indices of market power) and economic freedom on bank risk (stability or insolvency risk and bank asset quality).

4.3.1 Competition, Freedom and Bank Stability

The results on the effects of bank competition and economic freedom on bank stability are presented in Tables 4.2 and 4.3 (based on equation 3.6). The tables report various estimations for two main models. Table 4.2 shows the results using the conventional Lerner index, while Table 4.3 show those for the funding-adjusted Lerner model.

Table 4.2: Effect of Competition and Freedom on Bank Stability (Conventional Lerner)

Dependent variable: lnzscore	Model 1	Model 2	Model 3	Model 4	Model 5
lnzscore _{t-1}	0.3707*** (0.0724)	0.3853*** (0.0719)	0.3956*** (0.0755)	0.3811*** (0.0722)	0.3899*** (0.0761)
Lerner	2.0973*** (0.6644)	2.0137*** (0.6580)	2.1411*** (0.6543)	3.6608* (2.0340)	6.9220 (4.6648)
Lerner-squared	-1.5518** (0.7777)	-1.5065* (0.7812)	-1.4730* (0.7983)	-1.6230* (0.8325)	-1.8040* (0.9475)
Financial freedom		-0.0081 (0.0083)		0.0022 (0.0142)	
Economic freedom			0.0252* (0.0129)		0.0342** (0.0141)
Conv. Lerner* Fin. Freedom				-0.0301 (0.0335)	
Conv. Lerner* Econ. freedom					-0.0798 (0.0746)
Capitalization	-0.3122 (1.6634)	-0.7096 (1.7112)	0.0807 (1.5841)	-0.5361 (1.7124)	0.1583 (1.6091)
Credit risk	0.0603 (0.3227)	-0.0983 (0.3158)	0.1381 (0.3097)	-0.1069 (0.3212)	0.0870 (0.3169)
Diversification	-1.0007** (0.4442)	-1.2620*** (0.4222)	-0.8169* (0.4229)	-1.2450*** (0.4198)	-0.8094* (0.4197)
Financial development	0.1754* (0.1035)	0.2297* (0.1177)	0.0548 (0.1058)	0.2109* (0.1153)	0.0911 (0.1181)
Constant	1.8528*** (0.3726)	2.4376*** (0.5644)	0.1564 (0.9173)	1.8787** (0.8555)	-0.3597 (0.9951)
Marginal effect of Lerner	1.3250	1.2639	1.4081	1.2371	1.2113
No. of observations	549	549	549	549	549
No. of instruments	52	53	53	54	54
F-test	8.10***	9.00***	8.48***	8.46***	7.91***
AR(2)	0.44	0.50	0.47	0.50	0.44
P-value	(0.657)	(0.618)	(0.638)	(0.618)	(0.659)
Hansen	42.88	42.56	42.5	42.22	42.14
P-value	(0.308)	(0.321)	(0.323)	(0.334)	(0.337)

The dependent variable bank stability is measured by the natural log of the *zscore*. The degree of market power is proxied by the *Conventional Lerner Index* or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. The *Marginal effect* of Lerner on *zscore* (obtained as the partial derivatives evaluated at the sample means) indicates the overall impact where the quadratic term is also significant. *Financial freedom* and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values, indicating greater freedom. *Capitalization* is the bank total equity to asset ratio. *Credit risk* is measured as total loans to total assets. *Diversification*, measured as the ratio of non interest income to total income, measures the exposure of a bank to non-interest-generating income. *Financial development* is measured as domestic credit to private sector as a percentage of GDP. All the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

Table 4.3: Effect of Competition and Freedom on Bank Stability (Adjusted Lerner)

Dependent variable: lnzscore	Model 1	Model 2	Model 3	Model 4	Model 5
lnzscore _{t-1}	0.4613*** (0.0872)	0.4384*** (0.0913)	0.4692*** (0.0853)	0.4372*** (0.0942)	0.4903*** (0.0867)
Adjusted Lerner	1.9143*** (0.5221)	1.9467*** (0.5296)	1.8761*** (0.5176)	1.8584 (1.7808)	20.9613*** (7.3742)
Adjusted Lerner-squared	-1.4897* (0.7870)	-1.6850** (0.7775)	-1.4611* (0.8066)	-1.6794** (0.7992)	-2.1113** (0.9360)
Financial freedom		-0.0176** (0.0073)		-0.0184 (0.0175)	
Economic freedom			-0.0070 (0.0244)		0.1169** (0.0570)
Lerner * Fin. freedom				0.0013 (0.0322)	
Lerner * Econ. freedom					-0.3236*** (0.1239)
Capitalization	1.6520 (1.2174)	1.7383 (1.2153)	1.5401 (1.2545)	1.7712 (1.2158)	1.8077 (1.3621)
Credit risk	-0.2567 (0.3070)	-0.4504 (0.3142)	-0.2666 (0.3160)	-0.4661 (0.3074)	-0.2976 (0.3186)
Diversification	-0.9286** (0.4013)	-1.2954*** (0.4109)	-0.9602** (0.4328)	-1.2943*** (0.4176)	-1.0200** (0.4262)
Financial development	0.2137*** (0.0705)	0.3170*** (0.08950)	0.2381* (0.1253)	0.3227*** (0.1094)	-0.0137 (0.1768)
Constant	1.4393*** (0.3804)	2.5854*** (0.6161)	1.8251 (1.5299)	2.6371** (1.0975)	-5.3774 (3.3637)
Marginal effect of Lerner	1.119	1.0391	1.0891	1.0243	0.7206
No. of observations	504	504	504	504	504
No. of instruments	52	53	53	54	54
F-test	14.68***	15.43***	14.39***	14.85***	15.57***
AR(2)	0.56	0.51	0.57	0.51	0.67
P-value	(0.575)	(0.607)	(0.565)	(0.613)	(0.503)
Hansen	38.74	37.92	39.8	38.41	37.99
P-value	(0.481)	(0.519)	(0.434)	(0.497)	(0.516)

The dependent variable bank stability is measured by the natural log of the *zscore*. The degree of market power is proxied by the *Funding Adjusted Lerner* Index or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. The *Marginal effect* of Lerner on *zscore* (obtained as the partial derivatives evaluated at the sample means) indicates the overall impact where the quadratic term is also significant. *Financial freedom* and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values, indicating greater freedom. *Capitalization* is the bank total equity to asset ratio. *Credit risk* is measured as total loans to total assets. *Diversification*, measured as the ratio of non interest income to total income, measures the exposure of a bank to non-interest-generating income. *Financial development* is measured as domestic credit to private sector as a percentage of GDP. All the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

All the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations (Windmeijer, 2005). This dynamic panel data model takes into consideration the fact that the level of bank stability in one period depends to some extent on its previous level. And the significantly positive coefficient of the lagged dependent variable ($\ln zscore_{t-1}$) in all the estimations shows the validity of this assumption. The results of the robustness tests indicates that the model seems to fit the panel data reasonably well. The F-test shows overall goodness of fit, the Hansen test for the validity of the over-identifying restrictions in the GMM estimation is accepted for all the specifications, and the presence of second-order autocorrelation in the errors is also rejected by the test for AR (2).

The results of the study show that higher bank market power (both funding-adjusted Lerner and conventional Lerner indices) is significantly and positively associated with greater bank stability (measured by the natural logarithm of z-score- $\ln zscore$). This suggests that when banks have the ability to price their products in a monopolistic fashion (because of less competition), it translates into less likelihood of the banks becoming insolvent, and rather makes banks more sound. This is in line with recent studies in developing countries and emerging economies such as Amidu (2013) and Turk-Ariss (2010). The evidence (which confirms the first Hypothesis for our study) also supports the competition-fragility or competition-instability hypothesis. As postulated by Keeley (1990), higher market (or monopoly) power in the banking market leads to greater stability because the greater lending opportunities, higher profits, higher capital ratios and charter values of incumbent banks, put them in a better position to survive demand-side and supply-side shocks, which in turn provides a dis-incentive for excessive risk-taking.

However, to unravel the ambiguous relationship between competition and bank stability, some recent studies suggest the need to allow for a nonlinear relationship (Martinez-Miera & Repullo, 2010). Similar to Liu et al. (2013) for European banks, we test this possibility in our model and find evidence that indeed, there is a non-linear relationship between competition and bank stability. Whereas *Lerner* (market power) shows a mostly positive and significant relationship with bank stability, the quadratic form (*Lerner-squared*) is consistently negatively and significantly related with bank stability (*lnzscore*). However, to determine the overall impact of market power on bank stability, we took partial derivatives of *zscore* with respect to *Lerner* and evaluated the resulting expressions at the sample means. For example, in Column (1) of Table 4.2, the *marginal effect* of 1.3250 is obtained from $\partial(zscore)/\partial(Lerner) = \alpha_1 + 2\alpha_2 Lerner$, which is then evaluated at the sample means, where α_1 and α_2 are the estimated coefficients. This indicates an overall positive impact of market power on bank stability.

According to Martinez-Miera and Repullo (2010) lower loan rates resulting from greater bank competition also reduces the interest payments from performing loans (which provide a buffer against loan losses) because of imperfect correlation of loan defaults. Thus, in addition to the risk-shifting effect in the Boyd and de Nicoló (2005) model, there is also a margin effect that goes in the opposite direction, so that the final effect on the risk of bank failure is in principle ambiguous. The risk-shifting effect tends to dominate in monopolistic markets (where concentration is high), whereas the margin effect dominates in competitive markets, so a non-linear relationship between competition and the risk of bank failure generally obtains (Martinez-Miera & Repullo, 2010).

The direct effect of *financial freedom* appears to be negative, but insignificant in the conventional Lerner model, showing that banks operating in environments with greater financial freedom generally tend to be less stable or more risky. But we are unable to obtain conclusive evidence for Hypothesis 2, that financial freedom has a negative effect on bank stability. Also, we did not find any concrete evidence of the possible conditional effect of financial freedom on the competition-stability relationship (a rejection of Hypothesis 3, which suggests that the effect of competition on bank stability increases with financial freedom). This indicates that, though yet to be tested, concerns that “excessive” financial freedom may contribute to financial institutions’ propensity to take on greater risks, which in turn may have contributed to the recent global and European crises as suggested by Chortareas et al. (2013), may not be applicable in the developing country context. *Economic freedom* by itself appears not to have a clear relationship, but its interaction with market power ($Lerner * Economic\ freedom$) indicates a negative effect of higher market power on bank stability in countries with higher economic freedom, though insignificant in the conventional Lerner model.

With respect to the control variables, we find that the relationship between bank capitalization, measured as total equity to total assets and stability is mostly negative in the conventional model and positive in the funding-adjusted model, though insignificant in both cases. A similarly insignificant relationship with bank stability is found for credit risk, the ratio of total loans to total assets, except that in this case it is mostly negative in the funding adjusted model and positive in the conventional Lerner model. On the other hand, diversification enters the regression with a strong negative and significant relationship with bank stability in all the estimations, denoting that highly diversified banks are more risky and unstable. This is in contrast with Kohler (2015) for

EU countries who found that banks can improve their stability by increasing their share of non-interest income, and Amidu and Wolfe (2013) for emerging and developing countries. The results of the study suggest that banks tend to be more risky when they get involved in non-traditional business activities. Domestic credit to the private sector as a percentage of GDP (Financial development) has a significantly positive relationship with bank stability in most of the models, meaning that increases in the amount of bank credit to the private sector makes banks less risky and more stable.

4.3.2 Competition, Freedom and Bank Asset Quality

In view of the difficulty in assessing bank risk with a single measure, we carry out similar regressions on bank asset quality as an alternative to Z-score, the more popular measure of overall bank risk or stability. Our measure of bank asset quality is the ratio of loan loss reserves to total assets. Tables 4.4 and 4.5 present the results for the evaluation of bank asset quality using the conventional and funding-adjusted Lerner models respectively. As with the bank stability estimations, all the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations. The significantly positive coefficient of the lagged dependent variable ($\text{Asset quality}_{t-1}$) in all the estimations shows the suitability of this dynamic panel data model. The level of quality of bank assets tends to persist over time. The results of the robustness tests indicates that the model seems to fit the panel data reasonably well. The F-test shows overall goodness of fit, the Hansen test for the validity of the over-identifying restrictions in the GMM estimation is accepted for all the specifications, and the presence of second-order autocorrelation in the errors is also rejected by the test for AR (2).

Table 4.4: Effects of Competition and Freedom on Asset Quality (Conventional Lerner)

Dependent variable: Asset quality	Model 1	Model 2	Model 3	Model 4	Model 5
Asset quality $t-1$	0.8956*** (0.0819)	0.8884*** (0.0818)	0.8953*** (0.0808)	0.8881*** (0.0812)	0.8895*** (0.0820)
Lerner	-0.0070** (0.0030)	-0.0068** (0.0034)	-0.0075** (0.0033)	-0.0114 (0.0135)	-0.0246 (0.0442)
Lerner-squared	0.0120*** (0.0031)	0.0123*** (0.0036)	0.0114*** (0.0032)	0.0123*** (0.0035)	0.0116*** (0.0033)
Financial freedom		0.0001 (0.0001)		0.0000 (0.0001)	
Economic freedom			-0.0001 (0.0001)		-0.0001 (0.0001)
Conv. Lerner*Fin. freedom				0.0001 (0.0003)	
Conv. Lerner* Econ. freedom					0.0003 (0.0008)
Capitalization	0.0012 (0.0375)	0.0033 (0.0353)	0.0025 (0.0341)	0.0027 (0.0363)	0.0019 (0.0357)
Credit risk	0.0151** (0.0068)	0.0156** (0.0069)	0.0152** (0.0066)	0.0155** (0.0068)	0.0151** (0.0063)
Diversification	-0.0063 (0.0060)	-0.0046 (0.0058)	-0.0078 (0.0061)	-0.0045 (0.0059)	-0.0076 (0.0062)
Financial development	-0.0033** (0.0015)	-0.0039** (0.0016)	-0.0029* (0.0016)	-0.0038** (0.0016)	-0.0030* (0.0017)
Constant	0.0002 (0.0052)	-0.0101* (0.0056)	0.0067 (0.0077)	-0.0084 (0.0074)	0.0091 (0.0092)
Marginal effect of Lerner	-0.0013	-0.0009	-0.0021	0.0520	-0.0010
No. of observations	561	561	561	561	561
No. of instruments	52	53	53	54	54
F-test	27.33***	24.44***	25.11***	23.031***	24.40***
AR(2)	-1.14	-1.15	-1.14	-1.14	-1.13
P-value	(0.255)	(0.252)	(0.253)	(0.256)	(0.257)
Hansen	47.13	47.06	48.37	46.63	48.58
P-value	(0.174)	(0.176)	(0.144)	(0.187)	(0.140)

The dependent variable-*Asset quality*, is measured by the ratio of loan loss reserves to total assets. The degree of market power is proxied by the *Conventional Lerner* Index or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. The *Marginal effect* of Lerner on *Asset quality* (obtained as the partial derivatives evaluated at the sample means) indicates the overall impact where the quadratic term is also significant. *Financial freedom* and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values, indicating greater freedom. *Capitalization* is the bank total equity to asset ratio. *Credit risk* is measured as total loans to total assets. *Diversification*, measured as the ratio of non interest income to total income, measures the exposure of a bank to non-interest-generating income. *Financial development* is measured as domestic credit to private sector as a percentage of GDP. All the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

Table 4.5: Effects of Competition and Freedom on Asset Quality (Adjusted Lerner)

Dependent variable: Asset Quality	Model 1	Model 2	Model 3	Model 4	Model 5
Asset quality _{t-1}	0.8929*** (0.0619)	0.8862*** (0.0598)	0.8983*** (0.0553)	0.8860*** (0.0599)	0.8972*** (0.0544)
Adjusted Lerner	-0.0062** (0.0027)	-0.0055* (0.0031)	-0.0067** (0.0029)	-0.0030 (0.0207)	-0.0518 (0.0626)
Adjusted Lerner-squared	0.0131*** (0.0037)	0.0136*** (0.0042)	0.0129*** (0.0036)	0.0136*** (0.0042)	0.0131*** (0.0028)
Financial freedom		0.0001 (0.0001)		0.0002 (0.0002)	
Economic freedom			-0.0002 (0.0003)		-0.0005 (0.0005)
Adjusted Lerner* Fin. freedom				0.0000 (0.0004)	
Adjusted Lerner* Econ. freedom					0.0008 (0.0011)
Capitalization	-0.0126 (0.0321)	-0.0169 (0.0320)	-0.0106 (0.0324)	-0.0174 (0.0329)	-0.0094 (0.0339)
Credit risk	0.0142** (0.0057)	0.0140** (0.0057)	0.0141** (0.0055)	0.0140** (0.0057)	0.0143** (0.0058)
Diversification	-0.0082 (0.0071)	-0.0060 (0.0069)	-0.0091 (0.0073)	-0.0060 (0.0069)	-0.0079 (0.0075)
Financial development	-0.0036** (0.0015)	-0.0042*** (0.0016)	-0.0032** (0.0015)	-0.0042** (0.0018)	-0.0024 (0.0018)
Constant	0.0030 (0.0045)	-0.0039 (0.0051)	0.0076 (0.0155)	-0.0050 (0.0103)	0.0297 (0.0294)
Marginal effect of Lerner	0.0005	0.0014	-0.0001	0.0039	0.0021
No. of observations	516	516	516	516	516
No. of instruments	52	53	53	54	54
F-test	41.16***	36.87***	41.86***	34.65***	48.40***
AR(2)	-1.25	-1.25	-1.25	-1.26	-1.22
P-value	(0.212)	(0.208)	(0.210)	(0.206)	(0.221)
Hansen	44.87	43.51	44.38	43.72	41.84
P-value	(0.239)	(0.285)	(0.255)	(0.278)	(0.349)

The dependent variable-*Asset quality*, is measured by the ratio of loan loss reserves to total assets. The degree of market power is proxied by the *Funding-adjusted Lerner* Index or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. The *Marginal effect* of Lerner on *Asset quality* (obtained as the partial derivatives evaluated at the sample means) indicates the overall impact where the quadratic term is also significant. *Financial freedom* and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values, indicating greater freedom. *Capitalization* is the bank total equity to asset ratio. *Credit risk* is measured as total loans to total assets. *Diversification*, measured as the ratio of non interest income to total income, measures the exposure of a bank to non-interest-generating income. *Financial development* is measured as domestic credit to private sector as a percentage of GDP. All the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

Generally, the results show that the coefficient of market power is negatively and significantly associated with the bank asset quality measure (in both funding-adjusted Lerner and conventional Lerner models), suggesting that as banks gain more pricing power, their asset quality improves. This also means that increased competition in the banking market results in greater risk-taking by banks. However, similar to the case of bank stability, we find evidence for a non-linear relationship between competition and bank risk-taking. Whereas *Lerner* (market power) shows a mostly negative and significant relationship with the bank asset quality measure, its quadratic form (*Lerner-squared*) is consistently positive and significantly related with bank asset quality. Similar to the bank stability analysis, we determine the overall impact of market power on bank asset quality, by taking the partial derivatives of *Asset quality* with respect to *Lerner* and evaluating the resulting expressions at the sample means. The results appear to indicate an overall negative relationship between market power and the asset quality measure (ratio of loan loss reserves to total assets), suggesting that higher market power generally improves bank asset quality.

While financial freedom shows a positive but insignificant relationship in both models, economic freedom has a negative and insignificant relationship with the quality of bank assets. This may suggest that when government involvement in the banking sector is limited, banks may be tempted to take on greater risk, but freedom in other aspects of business improves the quality of bank loans somewhat. The interaction terms for financial freedom and market power and economic freedom and market power are positive but insignificant in both models, denoting that while greater market power and higher freedoms may have the propensity to lead to deteriorating bank asset quality, the effect is not that important.

With regards to the control variables, we find that the relationship between bank capitalization, measured as total equity to total assets, and bank asset quality is mostly positive in the conventional model and negative in the funding-adjusted model, though insignificant in both cases. This is the reverse of what we found with bank stability. However, here we find a statistically significant and positive relationship between the credit risk measure and bank asset quality in all the estimations, an indication of higher risk-taking and deteriorating asset quality with increased lending. Further, unlike the case of bank stability, diversification into non-traditional banking activities does not seem to be an important determinant of bank asset quality or risk-taking. The coefficient of diversification is negative throughout the regressions but insignificant in all cases, which shows that although engaging in other activities may tend to minimize bank risk-taking, its effect is not significant.

The level of financial development appears to have a significantly positive influence on bank asset quality, as the coefficient of domestic credit to the private sector as a percentage of GDP shows up significantly negative in almost all the regressions. It appears that asset quality is likely to improve as banks gain more experience in the market.

4.4 Competition, Economic Freedom and Bank Profitability

This section evaluates the effect of competition and economic freedom on bank profitability. We discuss factors that explain net interest margins and return on assets in Sub-Saharan Africa banking markets, with a particular interest in the role of financial and economic freedom. As with the risk models, two specifications of the Lerner index are used for the estimations, the conventional Lerner and the funding-adjusted Lerner.

Table 4.6: Effects of Competition and Freedom on Bank NIM (Conventional Lerner)

Dependent variable: NIM	Model 1	Model 2	Model 3	Model 4	Model 5
NIM _{t-1}	0.5836*** (0.0560)	0.5619*** (0.0622)	0.5759*** (0.0552)	0.5765*** (0.0532)	0.5764*** (0.0490)
Lerner	0.0145*** (0.0053)	0.0202*** (0.0061)	0.0172*** (0.0062)	-0.0438* (0.0250)	-0.1759*** (0.0612)
Financial freedom		0.0004*** (0.0001)		0.0000 (0.0001)	
Economic freedom			0.0004 (0.0002)		0.0000 (0.0002)
Conv. Lerner* Fin. freedom				0.0012** (0.0005)	
Conv. Lerner* Econ. freedom					0.0033*** (0.0010)
Concentration	-0.0031* (0.0017)	-0.0009 (0.0015)	-0.0037** (0.0018)	0.0014 (0.0017)	-0.0011 (0.0018)
Cost to income	-0.0028 (0.0044)	-0.0015 (0.0042)	-0.0012 (0.0048)	-0.0040 (0.0039)	-0.0034 (0.0047)
Bank size	-0.0007 (0.0008)	-0.0004 (0.0007)	-0.0005 (0.0007)	-0.0003 (0.0007)	-0.0006 (0.0007)
Capitalization	0.0239 (0.0333)	0.0172 (0.0336)	0.0221 (0.0334)	0.0123 (0.0326)	0.0078 (0.0318)
Credit risk	0.0154*** (0.0056)	0.0195*** (0.0054)	0.0158*** (0.0055)	0.0186*** (0.0051)	0.0165*** (0.0054)
Diversification	-0.0215*** (0.0070)	-0.0197*** (0.0075)	-0.0202*** (0.0070)	0.0205*** (0.0071)	-0.0200*** (0.0073)
Financial development	-0.0050* (0.0026)	-0.0056** (0.0026)	-0.0042 (0.0028)	-0.0061** (0.0025)	-0.0048 (0.0033)
Economic development	-0.0027** (0.0013)	-0.0053*** (0.0014)	-0.0043** (0.0018)	-0.0049*** (0.0013)	-0.0054*** (0.0019)
Constant	0.0652*** (0.0194)	0.0397** (0.0187)	0.0548*** (0.0198)	0.0437** (0.0187)	0.0681*** (0.0211)
No. of observations	561	561	561	561	561
No. of instruments	54	55	55	56	56
F-test	42.97***	62.99***	41.62***	60.31***	60.26***
AR(2)	1.21	1.27	1.15	1.25	1.11
P-value	(0.225)	(0.203)	(0.251)	(0.212)	(0.269)
Hansen	40.23	40.32	39.95	41.46	38.87
P-value	(0.372)	(0.368)	(0.384)	(0.322)	(0.430)

The dependent variable *Net Interest Margin* (NIM) is defined as the ratio of the net interest income to total assets as a measure of spread. The degree of market power is proxied by the *Conventional Lerner* Index or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *Financial freedom* and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values, indicating greater freedom. *Concentration* is measured by natural logarithm of HHI, measured as the sum of the squares of the market share of assets of each bank. *Cost to income* ratio is measured by the ratio of non-interest operating expenses to operating income. *Bank size* is the natural logarithm of total assets. *Capitalization* is the bank total equity to asset ratio. *Credit risk* is total loans to total assets. *Diversification*, is measured as the ratio of non interest income to total income. *Financial development* is measured as domestic credit to private sector as a percentage of GDP. *Economic development* is the natural logarithm of GDP per capita. All the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

Table 4.7: Effects of Competition and Freedom on Bank NIM (Adjusted Lerner)

Dependent variable: NIM	Model 1	Model 2	Model 3	Model 4	Model 5
NIM _{t-1}	0.5974*** (0.0520)	0.5876*** (0.0530)	0.5940*** (0.0528)	0.5901*** (0.0512)	0.5832*** (0.0511)
Funding-Adjusted Lerner	0.0113* (0.0066)	0.0136** (0.0060)	0.0129** (0.0058)	-0.0077 (0.0251)	-0.0724 (0.0825)
Financial freedom		0.0005*** (0.0001)		0.0003 (0.0002)	
Economic freedom			0.0013*** (0.0004)		0.0008 (0.0007)
Lerner * Fin. freedom				0.0004 (0.0005)	
Lerner * Econ. freedom					0.0015 (0.0014)
Concentration	-0.0013 (0.0019)	0.0025 (0.0019)	-0.0003 (0.0020)	0.0027 (0.0020)	0.0002 (0.0021)
Cost to income	-0.0039 (0.0057)	-0.0062 (0.0046)	-0.0054 (0.0048)	-0.0066 (0.0048)	-0.0053 (0.0053)
Bank Size	-0.0013* (0.0008)	-0.0013* (0.0007)	-0.0014* (0.0007)	-0.0013* (0.0007)	-0.0016** (0.0007)
Capitalization	0.0152 (0.0310)	0.0028 (0.0337)	0.0042 (0.0327)	0.0037 (0.0326)	0.0015 (0.0321)
Credit risk	0.0146** (0.0057)	0.0192*** (0.0052)	0.0165*** (0.0059)	0.0187*** (0.0052)	0.0173*** (0.0060)
Diversification	-0.0238*** (0.0078)	-0.0215*** (0.0078)	-0.0205** (0.0081)	-0.0210*** (0.0078)	-0.0197** (0.0083)
Financial development	-0.0071** (0.0034)	-0.0090*** (0.0031)	-0.0076* (0.0039)	-0.0080** (0.0035)	-0.0066 (0.0041)
Economic development	-0.0007 (0.0018)	-0.0023 (0.0014)	-0.0034 (0.0021)	-0.0026 (0.0016)	-0.0037* (0.0021)
Constant	0.0433 (0.0223)*	0.0017 (0.0204)	-0.0197 (0.0292)	0.0102 (0.0259)	0.0087 (0.0446)
No. of observations	516	516	516	516	516
No. of instruments	54	55	55	56	56
F-test	45.84***	63.89***	58.00***	61.09***	61.47***
AR(2)	1.27	1.41	1.10	1.39	1.1
P-value	(0.204)	(0.159)	(0.271)	(0.165)	(0.269)
Hansen	40.41	43.73	43.36	44.10	42.31
P-value	(0.364)	(0.241)	(0.253)	(0.229)	(0.290)

The dependent variable *Net Interest Margin* (NIM) is defined as the ratio of the net interest income to total assets as a measure of spread. The degree of market power is proxied by the *Funding-adjusted Lerner* Index or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *Financial freedom* and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values, indicating greater freedom. *Concentration* is measured by natural logarithm of HHI, measured as the sum of the squares of the market share of assets of each bank. *Cost to income* ratio is measured by the ratio of non-interest operating expenses to operating income. *Bank size* is the natural logarithm of total assets. *Capitalization* is the bank total equity to asset ratio. *Credit risk* is total loans to total assets. *Diversification*, is measured as the ratio of non interest income to total income. *Financial development* is measured as domestic credit to private sector as a percentage of GDP. *Economic development* is the natural logarithm of GDP per capita. All the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

4.4.1 Competition, Freedom and Bank Net Interest Margins

Tables 4.6 and 4.7 show the effects of competition and freedom on bank Net Interest Margins (NIM) (based on equation 3.7). Table 4.6 presents the results of the conventional Lerner model while Table 4.7 provides that of the funding-adjusted Lerner. All the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations. This dynamic panel data model accounts for the role of the previous values of the dependent variable or bank profit persistence, as reflected in the significantly positive coefficient of the lagged dependent variable (NIM_{t-1}) in all the estimations. The results of the robustness tests indicates that the model seems to fit the panel data reasonably well. The F-test shows overall goodness of fit, the Hansen test for the validity of the over-identifying restrictions in the GMM estimation is accepted for all the specifications, and the presence of second-order autocorrelation in the errors is also rejected by the test for AR (2).

The positive and significant coefficients of *Lerner* (market power) in most of the estimations (both conventional Lerner and funding-adjusted Lerner models), reveal that market power in the banking market is significantly and positively related to NIM. This indicates that banks earn higher margins on loans, as banks gain more market power or the market becomes less competitive. This is consistent with what Amidu and Wolfe (2013) reported for emerging and developing countries, as well as that of Hawtrey and Liang (2008) for OECD countries. The result also confirms our expectation that banks with market power can charge a higher loan rate and offer a lower deposit rate (Hawtrey and Liang, 2008).

Financial freedom has a positive and significant coefficient in both models, an indication that less intervention by government in the banking sector boosts bank margins. Similarly, economic freedom is positively related to NIM (but insignificant in the conventional Lerner model), suggesting that higher levels of freedom to carry out general business activities may enhance banks' ability to generate higher margins. This confirms the findings of Sufian and Habibullah (2010) who provide new empirical evidence on the positive impact of economic freedom on banks' performance. There is some indication that the impact of competition on bank margins is sensitive to the level of financial and economic freedom prevailing in an economy. This is seen in the positive coefficients of the interaction terms (*Lerner*Financial freedom* and *Lerner*Economic freedom*) in both models, though insignificant in the funding-adjusted model. We also find that the sign on Lerner changes to negative when interacted with the freedom variables. It appears that the positive effect of market power on bank margins is stronger for banks operating in countries with higher levels of freedom. In other words, as competition intensifies, margins of banks in freer countries are likely to reduce faster than those in areas with more restrictions.

An analysis of the control variables show that, while not very important, banking market concentration is negatively related to bank margins, meaning that banks in highly concentrated markets may have the tendency to earn lower margins. Our measure of bank operating efficiency, the ratio of non-interest operating cost to operating income (Cost to income) enters the regression with a negative but insignificant coefficient in all the regressions. The higher the level of this ratio, the less efficient a bank is. The results show that banks with higher margins are usually those who have higher levels of operating efficiency.

Similarly, bank size is negatively related to NIM in all the estimations, indicating that as banks get larger their margins tend to dwindle. This is possibly explained by the higher cost involved in raising more funds. However, this is significant only in the funding-adjusted Lerner model. The coefficient of bank capitalization is positive but insignificant in all the estimations, a suggestion that highly capitalized banks may tend to have higher margins, likely because of their ability to engage in more intermediation activities on the back of their higher level of available funds.

Credit risk (ratio of loans to total assets) appears to be an important determinant of bank margins. Higher credit risk associates with higher bank margins. The coefficient is significantly positive in all the estimations. Thus, as banks use a higher proportion of their assets to lend, they thereby increase their level of margins relative to assets, ostensibly as a result of additional risk premium charges. This is consistent with Naceur and Omran (2011), Hossain (2012), Chortareas et al. (2012), Amidu and Wolfe (2013) and Ahokpossi (2013). Our measure of diversification, non-interest income to total income (Diversification), shows up negative and significant in all the estimations, implying that banks that engage in other activities earn lower margins, as they lose focus on their core activity. It is also possible that diversified banks may demand lower spreads for loans in order to gain higher income from non-interest activities, because they consider the two sources of income as substitutes for each other (Kalluci, 2010).

Both domestic credit to the private sector as a percentage of GDP (Financial development), and per capita GDP (Economic development) have a negative and significant coefficient in most of the regressions, denoting that banks operating in countries with higher levels of financial and economic development earn reduced margins.

4.4.2 Competition, Freedom and Bank Return on Assets

In this section, we present the results for the effects of competition and freedom on an alternative measure of bank profitability-Return on Average Assets (ROAA). Again, as shown by the highly significant coefficients of the lagged dependent variable ($ROAA_{t-1}$) in Tables 4.8 and 4.9, bank profits tend to persist from year to year. And as with the NIM models, all the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations. The results of the robustness tests indicates that the model seems to fit the panel data reasonably well. The F-test shows overall goodness of fit, the Hansen test for the validity of the over-identifying restrictions in the GMM estimation is accepted for all the specifications, and the presence of second-order autocorrelation in the errors is also rejected by the test for AR (2).

The coefficient of market power (*Lerner*) is generally positive, but significant only in the conventional Lerner model, suggesting that in less competitive markets (higher bank market power) banks generally earn higher returns on their assets. This means that as competition increases, bank returns on assets could be expected to go down (Hypothesis 4). Similar to the results for NIM, *financial freedom* has a positive and significant coefficient in both the conventional and funding-adjusted Lerner models, meaning that banks operating in countries where government intervention in the banking sector is minimal earn higher returns on their assets. Thus as expected for Hypothesis 5, financial freedom has a positive effect on bank profitability. Again, *economic freedom* is positively related to ROAA (but insignificant in the conventional Lerner model), denoting that higher levels of freedom to carry out general business activities may translate into higher bank profits.

Table 4.8: Effects of Competition and Freedom on Bank ROAA (Conventional Lerner)

Dependent variable: ROAA	Model 1	Model 2	Model 3	Model 4	Model 5
ROAA _{t-1}	0.1796*** (0.0561)	0.1826*** (0.0572)	0.1806*** (0.0586)	0.1700*** (0.0548)	0.1778*** (0.0534)
Lerner	0.0341*** (0.0072)	0.0354*** (0.0075)	0.0353*** (0.0082)	-0.0315 (0.0232)	-0.1881*** (0.0572)
Financial freedom		0.0002** (0.0001)		-0.0001 (0.0001)	
Economic freedom			0.0003 (0.0002)		-0.0001 (0.0002)
Conv. Lerner* Fin. freedom				0.0012*** (0.0004)	
Conv. Lerner* Econ. freedom					0.0038*** (0.0010)
Concentration	-0.0049*** (0.0018)	-0.0042** (0.0017)	-0.0053*** (0.0019)	-0.0015 (0.0017)	-0.0020 (0.0019)
Cost to income	-0.0389*** (0.0074)	-0.0392*** (0.0076)	-0.0384*** (0.0082)	-0.0421*** (0.0078)	-0.0407*** (0.0079)
Size	-0.0002 (0.0007)	-0.0002 (0.0006)	-0.0002 (0.0007)	0.0000 (0.0007)	-0.0001 (0.0007)
Capitalization	0.0660** (0.0332)	0.0621* (0.0315)	0.0665** (0.0304)	0.0629* (0.0343)	0.0557 (0.0343)
Credit risk	-0.0061 (0.0065)	-0.0033 (0.0062)	-0.0036 (0.0060)	-0.0036 (0.0062)	-0.0010 (0.0061)
Diversification	0.0267*** (0.0088)	0.0289*** (0.0088)	0.0289*** (0.0084)	0.0281*** (0.0081)	0.0307*** (0.0077)
Financial development	-0.0032 (0.0025)	-0.0036 (0.0025)	-0.0028 (0.0025)	-0.0043* (0.0024)	-0.0045 (0.0027)
Economic development	0.0031** (0.0013)	0.0021 (0.0015)	0.0020 (0.0018)	0.0019 (0.0012)	0.0006 (0.0016)
Constant	0.0390** (0.0175)	0.0270 (0.0162)	0.0283 (0.0180)	0.0301* (0.0169)	0.0367* (0.0200)
No. of observations	561	561	561	561	561
No. of instruments	54	55	55	56	56
F-test	46.57***	54.97***	46.12***	47.33***	50.90***
AR(2)	-0.93	-0.87	-0.92	-0.84	-0.86
P-value	(0.355)	(0.386)	(0.360)	(0.400)	(0.387)
Hansen	37.06	36.25	36.48	34.21	33.13
P-value	(0.513)	(0.550)	(0.540)	(0.646)	(0.694)

The dependent variable *ROAA* is the ratio of net income to average total assets. The degree of market power is proxied by the *Conventional Lerner* Index or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *Financial freedom* and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values, indicating greater freedom. *Concentration* is measured by natural logarithm of HHI, measured as the sum of the squares of the market share of assets of each bank. *Cost to income* ratio is measured by the ratio of non-interest operating expenses to operating income. *Bank size* is the natural logarithm of total assets. *Capitalization* is the bank total equity to asset ratio. *Credit risk* is total loans to total assets. *Diversification*, is measured as the ratio of non interest income to total income. *Financial development* is measured as domestic credit to private sector as a percentage of GDP. *Economic development* is the natural logarithm of GDP per capita. All the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

Table 4.9: Effects of Competition and Freedom on Bank ROAA (Adjusted Lerner)

Dependent variable: ROAA	Model 1	Model 2	Model 3	Model 4	Model 5
ROAA _{t-1}	0.1547*** (0.0538)	0.1621*** (0.0529)	0.1658*** (0.0529)	0.1501*** (0.0564)	0.1528*** (0.0571)
Funding-Adjusted Lerner	0.0218 (0.0137)	0.0217 (0.0140)	0.0228 (0.0138)	-0.0462 (0.0284)	-0.2176** (0.0996)
Financial freedom		0.0003*** (0.0001)		-0.0003 (0.0002)	
Economic freedom			0.0009** (0.0004)		-0.0005 (0.0008)
Lerner * Fin. freedom				0.0013** (0.0005)	
Lerner * Econ. freedom					0.0041** (0.0018)
Concentration	-0.0042** (0.0020)	-0.0024 (0.0019)	-0.0041** (0.0019)	-0.0012 (0.0019)	-0.0022 (0.0020)
Cost to income	-0.0566*** (0.0124)	-0.0577*** (0.0125)	-0.0560*** (0.0120)	-0.0596*** (0.0138)	-0.0552*** (0.0124)
Size	-0.0017* (0.0009)	-0.0016* (0.0009)	-0.0016* (0.0008)	-0.0016 (0.0010)	-0.0019* (0.0011)
Capitalization	0.0488 (0.0310)	0.0441 (0.0306)	0.0486 (0.0300)	0.0483 (0.0316)	0.0439 (0.0310)
Credit risk	-0.0029 (0.0069)	-0.0011 (0.0065)	-0.0023 (0.0065)	-0.0014 (0.0063)	-0.0004 (0.0067)
Diversification	0.0260** (0.0099)	0.0285*** (0.0096)	0.0277*** (0.0093)	0.0293*** (0.0100)	0.0310*** (0.0095)
Financial development	-0.0021 (0.0027)	-0.0035 (0.0027)	-0.0022 (0.0026)	-0.0014 (0.0032)	-0.0001 (0.0034)
Economic development	0.0040*** (0.0012)	0.0033*** (0.0012)	0.0022 (0.0014)	0.0025** (0.0012)	0.0018 (0.0013)
Constant	0.0521** (0.0205)	0.0279 (0.0205)	0.0105 (0.0219)	0.0530** (0.0238)	0.0815** (0.0403)
No. of observations	516	516	516	516	516
No. of instruments	54	55	55	56	56
F-test	54.82***	66.54***	63.98***	43.08***	42.63***
AR(2)	-0.77 (0.439)	-0.69 (0.491)	-0.75 (0.456)	-0.67 (0.506)	-0.66 (0.507)
Hansen	39.95 (0.384)	37.06 (0.513)	37.51 (0.492)	39.62 (0.398)	38.86 (0.431)

The dependent variable *ROAA* is the ratio of net income to average total assets. The degree of market power is proxied by the *Funding-adjusted Lerner* Index or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *Financial freedom* and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values, indicating greater freedom. *Concentration* is measured by natural logarithm of HHI, measured as the sum of the squares of the market share of assets of each bank. *Cost to income* ratio is measured by the ratio of non-interest operating expenses to operating income. *Bank size* is the natural logarithm of total assets. *Capitalization* is the bank total equity to asset ratio. *Credit risk* is total loans to total assets. *Diversification*, is measured as the ratio of non interest income to total income. *Financial development* is measured as domestic credit to private sector as a percentage of GDP. *Economic development* is the natural logarithm of GDP per capita. All the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

The outcome for ROAA when Lerner is interacted with the freedom variables is similar to what we found with NIM, confirming our submission that the impact of competition on bank profits is sensitive to the level of financial and economic freedom prevailing in an economy. The coefficients of the interaction terms (*Lerner*Financial freedom* and *Lerner*Economic freedom*) are significantly positive in both models. Again, we find that the sign on Lerner changes to negative when interacted with the freedom variables, thus affirming that financial and economic freedom have a conditioning effect on the impact of competition on bank profits. This suggests that banks with higher market power operating in countries with higher freedom for banking activities are more profitable than their counterparts in countries with greater restrictions on banking activities. Again, this is in harmony with Hypothesis 6, that the effect of competition on bank profitability increases with financial freedom.

The results show that, in highly concentrated markets, bank profits are likely to be lower as indicated by the negative coefficient for Concentration, except that this is not significant in some cases. This is inconsistent with the Structure-Conduct-Hypothesis which suggests that concentration enables banks to collude and earn higher profits. Unlike the case of NIM (which showed an insignificant relationship), bank operating efficiency (Cost to income) shows a significantly negative relationship with ROAA in all the estimations, signifying that, as expected, banks that are able to control costs more effectively earn higher profits, and those that are inefficient have reduced profits. This result is also in line with previous empirical literature which suggests that efficiency is a more important determinant of profitability than concentration (Berger, 1995). There is some indication that increasing bank size is associated with lower profits but this is seen only in the funding-adjusted Lerner model, as was the case with NIM. In addition,

as in the NIM estimations, bank capitalization is positively related to profits (ROAA), and significantly so in the conventional Lerner model, an indication that highly capitalized banks have the tendency to earn higher returns. Similarly, higher credit risk seems to associate with lower bank profits, as seen in the negative coefficients for credit risk in all the regressions, except that unlike that of NIM, the coefficients are not statistically significant.

Contrary to the NIM results (which were negative), the diversification variable has a significantly positive coefficient. This means that diversification is an important determinant of bank return on assets, and that banks that engage in other activities outside their core business earn significantly higher returns than those not engaging in similar activities. As suggested by Goddard et al. (2013), this might be attributable to synergies between core and related activities, thus enabling diversified banks to gain and maintain a competitive advantage over their less diversified counterparts. Another plausible explanation for the positive effect of diversification on bank profitability may be the limited losses associated with non-traditional banking activities, compared to the generally huge losses on loans in some of these economies. The finding is consistent with Chiorazzo et al. (2008) and Elsas et al. (2010) but contrary to Stiroh and Rumble (2006).

The level of financial development is largely insignificant in determining bank return on assets, contrary to what we found for NIM, but the negative coefficients show that higher levels of domestic credit to the private sector have the tendency to dampen bank returns. Also, contrary to NIM, bank returns seems to have a positive relationship with the level of economic development. Increase in economic development may enhance the ability of borrowers to service loans, resulting in reduced loan losses and hence greater bank profitability.

4.5 Competition, Economic Freedom and Bank Efficiency

In this section, we evaluate the relationship between competition and bank cost efficiency. We begin with an investigation of the factors that drive bank market power. This is followed by an assessment of the relationship between market power and bank cost efficiency, with particular interest in how financial and economic freedoms affect this relationship.

4.5.1 Sources of Bank Market Power in Sub-Saharan Africa

This section identifies factors that explain bank market power in Sub-Saharan Africa. Separate models were estimated for the funding-adjusted Lerner index and the conventional Lerner index, which are direct measures of market power (or competition) at the bank level. Again, the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations, and the statistically significant coefficients of the lagged dependent variable testifies to the suitability of this approach. The results of the robustness tests indicates that the model seems to fit the panel data reasonably well. The F-test shows overall goodness of fit, the Hansen test for the validity of the over-identifying restrictions in the GMM estimation is accepted for all the specifications, and the presence of second-order autocorrelation in the errors is also rejected by the test for AR (2).

The regression results presented in Table 4.10 (obtained from estimation of equation 3.8) show that financial freedom has a negative relationship with market power, but this is not significant in the funding-adjusted Lerner model.

Table 4.10: Sources of Bank Market Power

Dependent variable: Lerner	Conventional Lerner		Funding-Adjusted Lerner	
Lerner _{t-1}	0.2460*** (0.0775)	0.2437*** (0.0769)	0.2407*** (0.0599)	0.2344*** (0.0640)
Financial freedom	-0.0023** (0.0010)		-0.0022 (0.0013)	
Economic freedom		-0.0088** (0.0040)		-0.0100 (0.0087)
Capitalization	0.8848*** (0.2940)	0.8718** (0.3344)	0.8775** (0.3571)	1.0036** (0.4043)
Diversification	0.2830*** (0.0699)	0.2665*** (0.0704)	0.3871*** (0.1055)	0.3679*** (0.1056)
Bank Size	0.0087 (0.0145)	0.0038 (0.0134)	0.0550*** (0.0168)	0.0581*** (0.0173)
Financial development	0.0733 (0.0534)	0.0642 (0.0461)	-0.0314 (0.0453)	-0.0311 (0.0475)
Market share	0.0052*** (0.0019)	0.0060*** (0.0014)	0.0008 (0.0010)	0.0011 (0.0013)
Economic development	-0.0591*** (0.0221)	-0.0320 (0.0284)	-0.0542** (0.0217)	-0.0411 (0.0316)
Constant	0.4038** (0.1733)	0.6498*** (0.2004)	0.1441 (0.1703)	0.5300 (0.3891)
No. of observations	561	561	516	516
No. of instruments	52	52	52	52
F-test	14.34***	12.72***	12.442***	10.12***
AR(2)	-1.28	-1.29	-1.25	-1.17
P-value	(0.199)	(0.197)	(0.211)	(0.241)
Hansen	43.31	39.04	41.44	40.41
P-value	(0.255)	(0.423)	(0.323)	(0.365)

The dependent variable is the *Lerner Index* or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. The degree of market power is proxied by the Lerner Index. *Financial freedom* and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values indicating greater freedom. *Capitalization* is the bank total equity to total asset ratio. *Diversification*, measured as the ratio of non interest income to total income, measures the exposure of a bank to non-interest-generating income. *Bank size* is measured as the natural logarithm of total assets. Financial development is measured as domestic credit to private sector as a percentage of GDP. Economic development is measured as measured as the natural logarithm of GDP per capita. All the regressions were estimated with the Windmeijer-corrected standard error version of the two-step system GMM model, with small-sample adjustments and orthogonal deviations. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

This suggests that banks that operate in countries with more financial freedom (less government control over financial institutions) tend to have lower pricing power, likely as a result of fewer restrictions in establishing new banks even by foreign investors, thus leading to greater competition. Economic freedom also shows a negative coefficient, signifying a positive effect of

higher economic freedom on competitive conditions in the banking sector, except that the effect is not significant in the funding-adjusted Lerner model. This compares with Mirzaei and Moore (2014) who report that banks located in countries with good-quality institutional development face greater competition for emerging and developing economies, whereas inter-industry competition from insurance industries, together with financial freedom, seem to be the main drivers in increasing competition amongst developed economies.

We find a highly significant positive coefficient for equity to total assets (Capitalization) for both the funding-adjusted Lerner and conventional Lerner, suggesting that banks with higher levels of capital exercise greater market power. A similar result is found for bank size but this may not be very important as indicated by the insignificant coefficient in the conventional Lerner model. At any rate, as noted by Delis (2012), well-capitalized and larger banks may be able to set higher margins or access funds from cheaper sources due to scale economies, informational asymmetries, and moral hazard issues. Aboagye et al. (2008b) also found that increases in bank size translate into greater market power for Ghana.

Diversification shows up as one of the most important sources of bank market power. The coefficient is positive and highly significant. Clearly, increases in income from other activities put banks in a good position to exercise monopoly power in pricing their services, thereby reducing the level of competition in the market. It may be that well-diversified banks with high income from non-traditional banking activities are able to limit the pressure to lend at lower rates or pay higher rates on deposits, thereby wielding higher power in the market. Market share of banks seems to have a similar effect except that in this case, the coefficient of the funding-adjusted Lerner model

is rather insignificant. While the effect of per capita GDP (Economic development) is negative and significant in the models including financial freedom (signifying perhaps a latent effect of this variable on its impact), domestic credit to the private sector as a percentage of GDP (financial development) is rather indeterminate, with opposite signs in the two models. This suggests that increases in economic development diminishes the pricing power of banks as consumers also become more powerful.

4.5.2 Competition, Freedom and Bank Efficiency

We begin this section with a brief review of the cost efficiency estimates in Table 4.11 (based on equation 3.5). This is followed by an analysis of the conditioning effect of financial and economic freedom on the competition-efficiency relationship. The cost efficiency estimates are the observed level of costs per bank relative to an efficient frontier or what an efficient bank's costs would be. The estimates were derived using the stochastic frontier approach. The mean efficiency estimates per country for the period 2006-2012 were obtained from separate frontiers for each country, and thus not directly comparable across countries. Even so, higher efficiency scores indicate better cost efficiency at the country level.

The results show significant differences in cost efficiency among banks in Malawi, South Africa and Mauritius. On the other hand, most banks in Uganda, Ethiopia and Namibia are virtually at par in terms of cost efficiency. Generally, these cost efficiency estimates are in line with what has previously been reported in the literature, and reveal potential for considerable cost savings for some banks in Sub-Saharan Africa, especially among those operating in Malawi, South Africa, Mauritius and Ghana.

Table 4.11: Bank Cost Efficiency Estimates

Country	Mean	Std. Dev	Min	Max
Ethiopia	0.98	0.02	0.92	1.00
Ghana	0.86	0.07	0.66	0.98
Kenya	0.96	0.01	0.93	0.99
Malawi	0.73	0.24	0.24	1.00
Mauritius	0.81	0.13	0.52	0.99
Mozambique	0.92	0.04	0.84	0.98
Namibia	0.97	0.01	0.95	0.99
South Africa	0.59	0.15	0.38	0.96
Tanzania	0.91	0.06	0.7	0.98
Uganda	1.00	0.01	0.98	1.00
Zambia	0.95	0.05	0.79	0.99

Tables 4.12 and 4.13 present the Tobit regression results of the impact of competition and financial/economic freedom on bank cost efficiency using the funding-adjusted Lerner and conventional Lerner indices, respectively (based on equation 3.9). Bank cost efficiency scores are ranged between 0 and 1, hence Tobit models are more appropriate in this case since they better fit models where the dependent variable is derived from a first-stage regression (Greene, 2005). However, to take into account possible endogeneity of the market power measure and bank efficiency, we also use instrumental variable Tobit regression to check the robustness of our results. The results are reported in Tables 4.14 and 4.15. Given the general similarity in the results for the traditional Tobit and instrumental variable Tobit regressions, we present a common analysis below. We find evidence that rejects the quiet life hypothesis. The independent effect of bank market power on cost efficiency is consistently positive and significant in all the estimations. This means that banks with higher market power are the most cost efficient, contrary to the quiet life hypothesis that banks become inefficient as they gain more market power and settle for a quiet life with no incentive to reduce costs. This shows that competition has a negative relationship with bank efficiency, as predicted by our Hypothesis 7.

Table 4.12: Effects of Competition and Freedom on Cost Efficiency (Conventional Lerner)

Tobit regression

Dependent variable:	Model 1	Model 2	Model 3	Model 4	Model 5
Cost Efficiency					
Lerner	0.0676* (0.0390)	0.0183 (0.0337)	-0.0536* (0.0303)	-0.8211*** (0.2016)	-2.9205*** (0.8358)
Financial freedom		-0.0067*** (0.0008)		-0.0120*** (0.0018)	
Economic freedom			-0.0298*** (0.0020)		-0.0363*** (0.0025)
Lerner*Fin. freedom				0.0152*** (0.0041)	
Lerner*Econ. freedom					0.0478*** (0.0149)
Concentration	-0.1542*** (0.0155)	-0.1754*** (0.0145)	-0.1088*** (0.0128)	-0.1493*** (0.0145)	-0.0633*** (0.0147)
Capitalization	0.1865** (0.0846)	0.2233*** (0.0845)	0.2631*** (0.0813)	0.2184** (0.0858)	0.2079** (0.0826)
Profitability	-0.4499 (0.3577)	-0.1472 (0.3467)	0.2706 (0.3310)	0.0340 (0.4364)	0.4686 (0.5294)
Financial development	0.0630* (0.0377)	0.0565* (0.0340)	-0.0316 (0.0295)	0.0453 (0.0333)	-0.0593** (0.0299)
Economic development	-0.1918*** (0.0192)	-0.1630*** (0.0182)	-0.0576*** (0.0179)	-0.1586 (0.0180)	-0.0631*** (0.0160)
Constant	3.2584 (0.2130)	3.5716 (0.1873)	3.8027*** (0.1464)	3.6474 (0.1750)	3.9294*** (0.1307)
F-test	133.36***	127.93***	245.47***	126.19***	270.77***
Log pseudolikelihood	235.29	272.86	359.34	288.55	404.37
No. of observations	700	700	700	700	700

The dependent variable *Cost efficiency* is the estimated bank cost efficiency scores. The degree of market power is proxied by the *Conventional Lerner* Index or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *Financial freedom* and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values, indicating greater freedom. *Concentration* is measured by natural logarithm of HHI, measured as the sum of the squares of the market share of assets of each bank. *Capitalization* is the bank total equity to asset ratio. *Profitability* is measured as the return on average assets. *Financial development* is measured as domestic credit to private sector as a percentage of GDP. *Economic development* is measured as measured as the natural logarithm of GDP per capita. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

Table 4.13: Effects of Competition and Freedom on Cost Efficiency (Adjusted Lerner)

Tobit regression

Dependent variable:	Model 1	Model 2	Model 3	Model 4	Model 5
Cost efficiency					
Funding-Adjusted Lerner	0.0622* (0.0339)	0.0459 (0.0303)	0.0739** (0.0363)	0.2437** (0.0989)	0.8909*** (0.2582)
Financial freedom		-0.0026*** (0.0004)		-0.0010 (0.0009)	
Economic freedom			0.0060*** (0.0017)		0.0109*** (0.0024)
Lerner*Financial freedom				-0.0035** (0.0017)	
Lerner*Economic freedom					-0.0133*** (0.0042)
Concentration	-0.0171 (0.0109)	-0.0313*** (0.0111)	-0.0117 (0.01020)	-0.0343*** (0.0116)	-0.0175 (0.0106)
Capitalization	0.2823*** (0.0723)	0.2910*** (0.0727)	0.2707*** (0.0708)	0.2965*** (0.0726)	0.2927*** (0.0700)
Profitability	-0.7527** (0.3434)	-0.6323** (0.3212)	-0.8253** (0.3556)	-0.7271** (0.2992)	-1.0238*** (0.3011)
Financial development	-0.2317*** (0.0185)	-0.2240*** (0.0173)	-0.2404*** (0.0179)	-0.2284*** (0.0176)	-0.2481*** (0.0181)
Economic development	0.0000 (0.0085)	0.0041 (0.0078)	-0.0088 (0.0083)	0.0065 (0.0080)	-0.0058 (0.0082)
Constant	1.0580*** (0.1029)	1.2665*** (0.1036)	0.7293*** (0.1174)	1.1876*** (0.1006)	0.4579*** (0.1422)
F-test	109.11***	105.42***	110.87***	94.75***	96.50***
Log pseudolikelihood	555.81	569.32	561.13	571.84	568.25
No. of observations	643	643	643	643	643

The dependent variable *Cost efficiency* is the estimated bank cost efficiency scores. The degree of market power is proxied by the *Funding-adjusted Lerner* Index or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *Financial freedom* and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values, indicating greater freedom. *Concentration* is measured by natural logarithm of HHI, measured as the sum of the squares of the market share of assets of each bank. *Capitalization* is the bank total equity to asset ratio. *Profitability* is measured as the return on average assets. *Financial development* is measured as domestic credit to private sector as a percentage of GDP. *Economic development* is measured as measured as the natural logarithm of GDP per capita. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

Table 4.14: Effects of Competition and Freedom on Cost Efficiency (IV with Conv. Lerner)

Instrumental variable Tobit regression

Dependent variable:	Model 1	Model 2	Model 3	Model 4	Model 5
Cost efficiency					
Lerner	1.4810*** (0.5010)	1.4175** (0.6414)	1.2894** (0.5984)	3.5486** (1.4818)	8.1913** (3.2543)
Financial freedom		-0.0010 (0.0029)		0.0152* (0.0090)	
Economic freedom			-0.0100 (0.0094)		-0.0098 (0.0078)
Lerner*Fin. freedom				-0.0607** (0.0262)	
Lerner*Econ. freedom					-0.1360** (0.0550)
Concentration	-0.2237*** (0.0358)	-0.2240*** (0.0341)	-0.2011*** (0.0481)	-0.2859*** (0.0489)	-0.2446*** (0.0521)
Capitalization	0.9039** (0.3859)	0.8807** (0.4252)	0.8528** (0.3813)	0.3302** (0.1607)	0.4610*** (0.1583)
Profitability	-12.7602** (4.98820)	-12.2260** (6.1418)	-11.2039** (5.6887)	-2.4717** (1.2514)	-1.0871 (1.2123)
Financial development	-0.0411 (0.0542)	-0.0379 (0.0568)	-0.0615 (0.0447)	0.0887* (0.0479)	0.0451 (0.0522)
Economic development	-0.1031*** (0.0364)	-0.1024*** (0.0344)	-0.0678** (0.0324)	-0.1724*** (0.0255)	-0.0426 (0.0273)
Constant	3.0086*** (0.2637)	3.0645*** (0.3156)	3.2172*** (0.3166)	3.2023*** (0.2979)	3.4021*** (0.2891)
Wald-test	481.56***	435.60***	707.28***	540.88***	775.25***
Log pseudolikelihood	393.01	607.72	533.65	1566.03	2264.23
No. of observations	700	700	700	700	700
Test of Exogeneity	8.23***	4.86**	5.16**	9.08***	10.37***

The dependent variable *Cost efficiency* is the estimated bank cost efficiency scores. The degree of market power is proxied by the *Conventional Lerner Index* or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *Financial freedom* and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values, indicating greater freedom. *Concentration* is measured by natural logarithm of HHI, measured as the sum of the squares of the market share of assets of each bank. *Capitalization* is the bank total equity to asset ratio. *Profitability* is measured as the return on average assets. *Financial development* is measured as domestic credit to private sector as a percentage of GDP. *Economic development* is measured as measured as the natural logarithm of GDP per capita. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

Table 4.15: Effects of Competition and Freedom on Cost Efficiency (IV with Adj. Lerner)
Instrumental variable Tobit regression

Dependent variable:	Model 1	Model 2	Model 3	Model 4	Model 5
Cost efficiency					
Funding-Adjusted Lerner	0.2094*** (0.0484)	0.1849*** (0.0516)	0.2232*** (0.0510)	1.3693*** (0.4858)	3.7340** (1.7540)
Financial freedom		-0.0017*** (0.0006)		0.0076** (0.0038)	
Economic freedom			0.0097*** (0.0024)		0.0280*** (0.0104)
Lerner*Fin. freedom				-0.0226*** (0.0083)	
Lerner*Econ. freedom					-0.0593** (0.0290)
Concentration	-0.0224** (0.0102)	-0.0315*** (0.0110)	-0.0135 (0.0099)	-0.0506*** (0.0121)	-0.0376** (0.0152)
Capitalization	0.3904*** (0.0860)	0.3864*** (0.0862)	0.3679*** (0.0811)	0.3510*** (0.0978)	0.3788*** (0.1054)
Profitability	-2.2537*** (0.5879)	-2.0346*** (0.6046)	-2.3189*** (0.6091)	-1.6079*** (0.5767)	-1.8683*** (0.6229)
Financial development	-0.2279*** (0.0186)	-0.2230*** (0.0177)	-0.2422*** (0.0178)	-0.2526*** (0.0227)	-0.2749*** (0.0254)
Economic development	0.0030 (0.0088)	0.0055 (0.0084)	-0.0114 (0.0092)	0.0205* (0.0114)	0.0045 (0.0109)
Constant	1.0549*** (0.1026)	1.1967*** (0.1111)	0.5228*** (0.1508)	0.7348*** (0.2452)	-0.5030 (0.5941)
Wald-test	638.33***	713.61***	737.56***	652.14***	645.17***
Log pseudolikelihood	569.42	590.22	589.90	1684.96	2244.04
No. of observations	643	643	643	643	643
Test of Exogeneity	8.54***	7.01***	7.40***	5.14**	2.41

The dependent variable *Cost efficiency* is the estimated bank cost efficiency scores. The degree of market power is proxied by the *Funding-adjusted Lerner* Index or the price mark-up over marginal cost, with the higher scores indicating a higher degree of pricing power. *Financial freedom* and *Economic freedom* are from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values, indicating greater freedom. *Concentration* is measured by natural logarithm of HHI, measured as the sum of the squares of the market share of assets of each bank. *Capitalization* is the bank total equity to asset ratio. *Profitability* is measured as the return on average assets. *Financial development* is measured as domestic credit to private sector as a percentage of GDP. *Economic development* is measured as measured as the natural logarithm of GDP per capita. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

Our results differ from what Turk-Ariss (2010) found for developing countries, but in line with Casu and Girardone (2009) for some EU countries, and Koetter et al. (2012) for the U.S. This gives some indication that efficiency may be driving the gain of market power by banks in Sub-Saharan Africa, as suggested by the efficient-structure hypothesis, but we cannot reach a definite conclusion that the rejection of the quite life hypothesis, implies acceptance of the efficient-structure hypothesis since we did not test for the effect of efficiency on bank market power.

Also, as noted by Maudos and de Guevara (2007), market power allows banks to enjoy greater profits, which may motivate them to behave prudently. In turn, their prudent behavior may lead to the selection of less risky activities with lower costs of monitoring, thereby increasing cost efficiency. Again, banks that enjoy greater market power are not under much pressure to increase the quality of banking services (less availability of means of payment, worse attention to customers, etc.), thus reducing operating cost and increasing their cost efficiency.

Surprisingly, the direct effect of financial freedom on bank efficiency is largely negative and significantly related to cost efficiency, a rejection of our Hypothesis 8. This gives an indication that less restrictions or government interference in the banking sector is associated with lower bank cost efficiency. Our results reveal that some level of restrictions and controls in the economy may be beneficial in enhancing bank efficiency in the developing country context. This suggests that policies that constrain banks' degree of financial freedom may result in efficient allocation of resources. However, another plausible explanation for the negative effect of financial freedom on bank efficiency could be the higher costs banks may incur in an effort to obtain resources (human capital, technology and physical capital) in order to beat the competition, as more banks enter the

market with greater freedom. At any rate, high government borrowing from the banking sector in Sub-Saharan Africa may partly explain this finding, as banks are able to earn high returns from investment in risk-free government securities at low cost, thereby enhancing their efficiency. On the contrary, Chortareas et al. (2013) found that for the EU banking market, the higher the degree of an economy's financial freedom, the higher the benefits for banks in terms of cost advantages and overall efficiency. Our results show that the direct effect of economic freedom appears indeterminate as the signs change between the funding-adjusted and conventional Lerner models.

Given the ambiguous relationship between competition and efficiency (Casu & Girardone, 2006), we sought to determine if the impact of market power on efficiency depends on the institutional environment. When interacted with the freedom variables, we find that the coefficient of the interaction term is mostly negative and significant (except in the Tobit model with conventional Lerner where it is significantly positive). It appears that the positive effect of market power on bank cost efficiency is weakened for banks operating in countries with higher financial and economic freedom, a rejection of Hypothesis 9. Put differently, the results suggests that, a combination of weak competitive conditions and higher financial freedom in Sub-Saharan African economies lead to lower bank cost efficiency.

With regards to the control variables, we find that banking market concentration has a significantly negative coefficient in most of the specifications, suggesting that bank efficiency reduces as the market becomes more concentrated. This indicates that policies that encourage mergers and acquisitions in Sub-Saharan African banking markets may not be helpful for efficient resource allocation. It appears that concentration may not be important in explaining the market power of

banks in Sub-Saharan African banking markets. Indeed, the different results obtained for the effect of market power and concentration on cost efficiency indicates the existence of a low relationship between competition and concentration, highlighting the limitations of using market concentration measures as proxy variables for competition (Maudos & de Guevara, 2007).

On the other hand, the coefficient of the capitalization ratio is positive and significant in all the estimations, indicating that highly capitalized banks are more cost efficient. It may be that highly capitalized banks see the need to minimize cost in order to obtain reasonable returns on shareholders' funds. Bank profitability (ROAA) shows a mostly negative and significant association with cost efficiency. This means that more profitable banks are less efficient, possibly because of the tendency to become wasteful with higher profits. More profitable banks may also hire more staff and pay higher wages leading to increased operating costs.

The impact of domestic credit to the private sector as a percentage of GDP (Financial development) on bank cost efficiency is rather uncertain, as it is mostly negative and significant in the funding-adjusted models, but largely positive when significant in the conventional Lerner models. Per capita GDP (Economic development) reveals a similarly mixed results with the conventional Lerner models showing a mostly negatively significant relationship with cost efficiency, and the funding-adjusted models having a generally positive but insignificant relationship.

4.6 Bank Profit Persistence in Sub-Saharan Africa

The estimation results for bank profit persistence by country are reported in Table 4.16 (based on equation 3.10). The dependent variable (eROAE) is the normalized profit rate or excess profit. This is measured as the yearly return on average equity per bank minus the mean return on average equity in the country of operation in each year. The persistence of bank profits is estimated for only five of the countries due to data limitations in using the system GMM with requirements for instrumental variables.

Although there are large differences among the countries in terms of the magnitudes, the persistence coefficients ($eROAE_{t-1}$) are significantly different from zero in most of the estimations. The range of persistence coefficients is from a low of 0.170 in Kenya to 0.511 in South Africa. This suggests that the intensity of competition in the banking sector is much stronger in Kenya and Tanzania (0.181) than in South Africa. However, the level of intensity in competition appear to be similar in Ghana (0.437) and Mauritius (0.482). The coefficients on concentration reveal that banking market concentration contributes positively to bank profit persistence in Ghana, Kenya and Tanzania, although it is not significant in Tanzania. This is consistent with what Goddard et al. (2011) found for some advanced and developing countries. On the other hand, market concentration translates into less profit persistence in South Africa significantly, and in Mauritius insignificantly.

While economic freedom associates positively with profit persistence in Tanzania, Kenya and Mauritius, its effect is negative in Ghana and South Africa, although it is not very important in Mauritius and South Africa. The capitalization ratio coefficient is positive in all the countries

except Mauritius. However, its effect is not significant in Tanzania and South Africa. Bank size has a positive and significant relationship with excess profit in Mauritius and Kenya and a negative relationship in the other countries.

Table 4.16: Determinants of Bank Profit Persistence

Dependent variable: Excess Profit (eROAE)	Tanzania	South Africa	Mauritius	Kenya	Ghana
eROAE _{t-1}	0.1809*	0.5111***	0.4821***	0.1697***	0.4374***
Concentration	0.0594	-1.9368***	-0.0201	0.1646***	0.9632***
Economic freedom	0.0422*	-0.0001	0.0039	0.0098*	-0.0426***
Capitalization	0.2905	0.5692	-0.9764**	0.6252***	0.8701***
Bank Size	-0.0215	-0.0136	0.1103*	0.0949***	-0.0756**
Credit risk	-0.0522	0.0063	-0.5351	-0.2144***	-0.1583
Market share	0.0142**	0.0056	-0.0032	-0.0098*	0.0097
Financial development	5.2103**	-0.0539	-0.0389	0.0099	-42.3897***
Constant	-3.7053	15.0694***	-0.3204	-2.1642***	2.8658***
AR (2)	0.2745 (0.7837)	-0.1994 (0.8420)	0.7610 (0.4467)	-1.1472 (0.2513)	.09934 (0.9209)
Sargan test	3.2675 (1.0000)	6.8210 (0.9951)	4.2567 (0.9998)	11.2795 (0.9141)	12.56364 (0.8601)
Wald	112.86***	222.69***	1459.15***	308.68***	3829.06***

The dependent variable *eROAE* is measured as the yearly return on average equity per bank minus the mean return on average equity. *Concentration* is measured by the natural logarithm of HHI, measured as the sum of the squares of the market share of assets of each bank. *Economic freedom* is from the Economic Freedom Indicators of Heritage Foundation. They are scaled from 0 to 100 with higher values indicating greater freedom. *Capitalization* is the bank total equity to asset ratio. *Bank size* is measured as the natural logarithm of total assets. *Credit risk* is measured as total loans to total assets. *Market share* is measured as ratio of bank assets to total market assets. *Financial development* is measured as domestic credit to private sector as a percentage of GDP. Robust standard errors are in parentheses. ***, **, and * show 1%, 5% and 10% levels of significance, respectively.

It appears that having a higher proportion of bank assets in loans (lending specialization) has the tendency to translate into less profit persistence on average in all the countries except in South

Africa. Market share is positively related to excess profit in Tanzania, South Africa and Ghana, and negatively related to it in Kenya and Mauritius.

Domestic credit to the private sector, is an important determinant of excess profit in Tanzania and Ghana except that the effect is positive in Tanzania and negative in Ghana. Mauritius and South Africa show a negative but insignificant effect whilst the effect in Kenya is also positive but insignificant.

The above results confirm Hypothesis 10, which refers to variations in the determinants of bank profit persistence across countries.

4.7 Chapter Summary

This chapter presents the results of our analysis, beginning with a summary of the descriptive statistics for the key variables used in the study. The mean country values show that among the countries in Sub-Saharan Africa included in this study, Mauritius has the highest degree of financial freedom while supervision of the financial sector in Ethiopia may be considered repressive, according to the Heritage Foundation's index of financial freedom. Generally, however, countries in Sub-Saharan Africa seems to portray significant influence and interference of government in the financial sector (with average financial freedom of 51.1). The average level of economic freedom (59.6) signifies a reasonable level of liberty to own and employ capital in these countries, with Mauritius and Ethiopia, again, having the highest and lowest levels of economic freedom, respectively.

The results of the z-score estimates show that banks in Namibia and Ethiopia appear to be the most stable, while the most unstable banks are found in Zambia, Ghana and Mozambique. Asset quality is poorest in Zambia, Ghana and Ethiopia. This means that in general, banks in Zambia and Ghana face more risk than those in the other countries. Sub-Saharan African banks appear quite profitable with about 2.0% for Return on Average Assets (ROAA), 16.2% for Return on Average Equity (ROAE) and 5.6% for Net Interest Margin (NIM). This compares with what Beck and Cull (2013) report for the Africa region and higher than profits for banks outside Africa (ROAA of 1.5%), according to Beck and Cull (2013).

Market power, represented as Conventional Lerner index and Funding-adjusted index show a moderate level in most of the countries, averaging 0.267 and 0.275, respectively. The funding-adjusted Lerner is slightly higher than the conventional Lerner on average, suggesting little underestimation with the conventional Lerner index, but there are considerable differences in the two indices among the countries. The level of bank market power observed is consistent with what Fosu (2013) found for Africa using both the static and dynamic versions of the Panzar–Rosse (1987) model. This suggests that intermediation activities in banking markets in Sub-Saharan Africa are quite competitive and comparable to that of other emerging markets (Fosu, 2013). This indicates that the ability of banks in this region to price their products and services above the marginal cost is limited. This may be because of higher banking costs in Africa, generally reflective of the high cost of doing business, and high loan losses due to serious information asymmetry problems. Indeed, we found average cost to income ratio to be high (64.6%), indicating poor operating efficiency among banks in this region. Staff costs and other operating expenses are quite high, averaging about 2.9% and 3.6% of total assets, respectively. This suggests that policies

aimed at improving infrastructure and reducing information asymmetry problems, as well as general prices of products, such as stable macroeconomic conditions could reduce intermediation costs in these countries. This could in turn encourage savings, enhance financial inclusion, improve access to finance and promote economic growth and development.

However, with an average of about 13.5% capitalization ratio, banks in Sub-Saharan Africa appear to be generally well-capitalized beyond the level recommended by Basel III (8%), and may partly explain the reasonable stability found in the banking markets in this region (average z-score of 47.43). Nevertheless, Beck et al. (2011) warns that there is still veiled or silent fragility in several Central and West African countries, especially in state-owned banks, and small locally owned banks. On average, about 54% of banking assets in these Sub-Saharan African countries are devoted to lending activities with the highest level of specialization in lending occurring in the more developed markets in Namibia, South Africa and Mauritius. Again, this underscores the need for appropriate policies to improve contractual frameworks to enhance efficiency in credit allocation. A significant portion of bank income (about 30% on average) is earned from non-interest activities. This may have serious negative repercussions for bank stability and may require policies that could limit bank risk-taking to avert potential bank failures. Diversification may be good for bank profitability but the uncertainty associated with income from non-traditional banking activities may make it quite risky especially for banks in this region who are largely financed by demand deposits.

However, domestic credit to the private sector as a percentage of GDP is generally low, at about 40.3% average, except for the more developed markets in the region, South Africa (154.1%) and Mauritius (85.3%) where it was quite significant.

One objective of this study is to examine the effects of competition and financial freedom on bank stability or insolvency risk. The regressions were estimated using system GMM. The results show that higher bank market power is significantly and positively associated with greater bank stability (measured by the natural logarithm of z-score). This suggests that when banks have the ability to price their products in a monopolistic fashion (because of less competition), it translates into less likelihood of the banks becoming insolvent, and rather makes banks more sound (Amidu, 2013; Turk-Ariss, 2010). The evidence also supports the competition-fragility or competition-instability hypothesis postulated by Keeley (1990), and indicates that policies aimed at maintaining some level of bank market (or monopoly) power may be required to sustain bank stability in this region. The study also found evidence for a non-linear relationship between competition and bank stability (Martinez-Miera & Repullo, 2010). This should inform competition policies in Sub-Saharan African countries which have generally sought to open up their banking markets to increasing competition. The idea that competition is good may be more naive in banking than in other industries (Claessens & Laeven, 2004).

We did not find any concrete evidence of the possible conditional effect of financial freedom on the competition-stability relationship. This indicates that, though yet to be tested, concerns that too much financial freedom may contribute to financial institutions' tendency to take on greater risks,

which may have contributed to the recent global and European crises as suggested by Chortareas et al. (2013), may not be applicable in the developing country context.

With respect to the control variables, we find that diversification (non-interest income to total income) has a negative relationship with bank stability, denoting that highly diversified banks are more risky and unstable. The results suggests that banks tend to be more risky when they get involved in non-traditional business activities. This should be of concern to policy makers given the increasing trend of involvement of banks in non-traditional activities. Financial development also has a significantly positive relationship with bank stability, meaning that increases in the amount of bank credit to the private sector tend to make banks less risky and more stable.

In view of the difficulty in assessing bank risk with a single measure, we carry out similar regressions on bank asset quality as an alternative to z-score, the more popular measure of overall bank risk or stability. Our measure of bank asset quality is the ratio of loan loss reserves to total assets. The results show that market power is negatively associated with the bank asset quality measure, suggesting that as banks gain more pricing power, their asset quality improves. This also means that increased competition in the banking market results in greater risk-taking by banks. However, similar to the case of bank stability, we find evidence for a non-linear relationship between competition and bank risk-taking. This again indicates the need for policies that allow banks to retain some measure of pricing power in order to reduce risk-taking. Financial freedom did not show any significant effect on the quality of bank assets.

With regards to the control variables, we find that the credit risk measure (loans to total assets) is positively related to bank asset quality, an indication of higher risk-taking and deteriorating asset quality with increased lending. The level of financial development appears to have a significantly positive influence on bank asset quality, suggesting that asset quality is likely to improve as banks gain more experience in the market.

A second objective of the study is to ascertain the effects of competition and financial freedom on bank profitability. The regressions were estimated using system GMM. The results reveal a positive relationship between market power and bank Net Interest Margins (NIM), similar to Amidu and Wolfe (2013), confirming our expectation that banks with market power can charge a higher loan rate and offer a lower deposit rate, thus earning higher margins (Hawtrey & Liang, 2008). Both financial freedom and economic freedom show a positive relationship with NIM, an indication that less intervention by government in the banking sector boosts bank margins. There is some indication that the impact of competition on bank margins is sensitive to the level of financial and economic freedom prevailing in an economy. This is seen in the positive coefficients of their interaction terms. It appears that the positive effect of market power on bank margins is stronger for banks operating in countries with higher levels of freedom.

An analysis of the control variables show that, credit risk appears to be an important determinant of bank margins. Higher credit risk associates with higher bank margins, ostensibly as a result of additional risk premium charges (Amidu & Wolfe, 2013; Ahokposi, 2013). Diversification shows a negative relationship with NIM, implying that banks that engage in other activities earn lower margins, as they lose focus on their core activity, or charge lower spreads for loans in order to gain

higher income from non-interest activities (Kalluci, 2010). Both financial development (domestic credit to the private sector as a percentage of GDP) and economic development (per capita GDP), appear to have a negative impact on NIM, denoting that banks operating in countries with higher levels of financial and economic development earn reduced margins. However, banking market concentration, operating efficiency, bank size, and the level of capitalization do not appear to be important determinants of bank net interest margins in Sub-Saharan Africa.

Furthermore, similar to the results for NIM, market power is positively related to overall bank profitability (Return on Average Assets-ROAA), suggesting that in less competitive markets (higher bank market power) banks generally earn higher returns on their assets. Also, both financial freedom and economic freedom show a positive impact on bank profits. We find evidence affirming that financial and economic freedom have conditioning effects on the impact of market power (or competition) on bank profits. The outcome for ROAA when the market power variable (Lerner) is interacted with the freedom variables confirms this. This suggests that banks with higher market power operating in countries with higher freedom for banking activities are more profitable than their counterparts in countries with greater restrictions on banking activities. Thus policies aimed at reducing bank intermediation costs should consider measures to control bank market power in order to avoid abuse of market power at the expense of the larger economy.

An analysis of the control variables show that bank profits are likely to be lower in highly concentrated markets. This is inconsistent with the Structure-Conduct-Performance hypothesis which suggests that concentration enables banks to collude and earn higher profits. On the other hand, bank operating efficiency (cost to income) shows a significantly negative relationship with

ROAA, signifying that, as expected, banks that are able to control costs more effectively earn higher profits. This is in line with empirical literature which suggests that efficiency is a more important determinant of profitability than concentration (Berger, 1995). Contrary to the NIM results (which were negative), the diversification variable has a significantly positive coefficient. This means that diversification is an important determinant of bank return on assets, and that banks that engage in other activities outside their core business earn significantly higher returns than those not engaging in similar activities (Goddard et al., 2013). One plausible explanation for the positive effect of diversification on bank profitability may be the limited losses associated with non-traditional banking activities, compared to the generally huge losses on loans in some of these economies. However, bank size, capitalization, credit risk, financial development and economic development do not appear to be important determinants of overall bank profitability.

A third objective of this study is to assess the effects of competition and financial freedom on bank efficiency. We first considered the relationship between financial freedom and competition, and found that higher freedom generally increases competition (and reduces bank market power). This suggests that banks that operate in countries with more financial freedom (less government control over financial institutions) tend to have lower pricing power, likely as a result of fewer restrictions in establishing new banks even by foreign investors, thus leading to greater competition (Mirzaei & Moore, 2014). Other important determinants of market power are capitalization, diversification and market share, suggesting that well-diversified and highly capitalized banks, with higher market shares exercise greater market power. This gives an indication that policies targeted at controlling bank market power should aim at limited government involvement in the banking sector, and some restrictions on non-traditional banking activities.

We estimated bank cost efficiency scores by constructing separate frontiers for each country, and thus they are not directly comparable across countries. The results reveal potential for considerable cost savings for some banks in Sub-Saharan Africa, especially among those operating in Malawi, South Africa, Mauritius and Ghana. Subsequently, we used Tobit regression to assess the impact of competition and financial freedom on bank cost efficiency. However, to take into account possible endogeneity of the market power measure and bank efficiency, we also used instrumental variable Tobit regression to check the robustness of our results. We present a common analysis for the two approaches given the general similarity in the results. The results show that banks with higher market power are the most cost efficient, contrary to the quiet life hypothesis which suggests that banks become inefficient as they gain more market power and settle for a quiet life with no incentive to reduce costs. Banks with market power may not be under pressure to improve the quality of their services, and may also be motivated to behave prudently as they enjoy greater profits (Maudos & de Guevara, 2007).

Surprisingly, the direct effect of financial freedom on bank efficiency is largely negative and significantly related to cost efficiency. Our results reveal that some level of restrictions and controls in the economy may be beneficial in enhancing bank efficiency in the developing country context. This suggests that policies that constrain banks' degree of financial freedom may result in efficient allocation of resources. On the contrary, Chortareas et al. (2013) found that for the EU banking market, the higher the degree of an economy's financial freedom, the higher the benefits for banks in terms of cost advantages and overall efficiency. Given the ambiguous relationship between competition and efficiency (Casu & Girardone, 2006), we sought to determine if the impact of market power on efficiency depends on the institutional environment. The results

indicate that the positive effect of market power on bank cost efficiency is weakened for banks operating in countries with higher financial and economic freedom.

With regards to the control variables, we find that higher banking market concentration and higher profitability associate with lower bank cost efficiency. This indicates that policies that encourage mergers and acquisitions in Sub-Saharan African banking markets may not be helpful for efficient resource allocation. Also, limiting bank profitability may motivate banks to avoid wastage and improve efficiency. On the other hand, highly capitalized banks appear to be more cost efficient, perhaps due to the need to minimize cost in order to obtain reasonable returns on shareholders' funds.

A fourth objective of this study is to examine the determinants of bank profit persistence. The persistence of bank profits is estimated for only five of the countries due to data limitations in using the system GMM with requirements for instrumental variables. The dependent variable is the normalized profit rate or excess profit. This is measured as the yearly return on average equity per bank minus the mean return on average equity in the country of operation in each year. The range of persistence coefficients is from a low of 0.170 in Kenya to 0.511 in South Africa. This suggests that the intensity of competition in the banking sector is much stronger in Kenya and Tanzania (0.181) than in South Africa. However, the level of intensity in competition appear to be similar in Ghana (0.437) and Mauritius (0.482). Banking market concentration contributes positively to bank profit persistence in Ghana and Kenya, but negatively to profit persistence in South Africa. Also, while economic freedom associates positively with profit persistence in Tanzania, and Kenya, its effect is negative in Ghana and insignificant in the other countries.

The level of capitalization has a positive effect on profit persistent in Kenya and Ghana and a negative effect in Mauritius. But bank size has a positive relationship with excess profit in Mauritius and Kenya and a negative relationship in Ghana.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This thesis analyzed the effects of competition and financial freedom on bank stability, the effects of competition and financial freedom on bank profitability (net interest margins and return on assets), and the effects of competition and financial freedom on bank efficiency. We also assessed the determinants of bank profit persistence, and the sources of bank market power. In this final chapter, we present a summary of findings, contributions of the study, conclusions, policy recommendations, as well as limitations of the study and suggestions for further research.

5.2 Summary of Findings

The results of our analysis show that Mauritius and Ethiopia have the highest and lowest degree of financial freedom, respectively, among the countries in Sub-Saharan Africa included in this study. Generally, we find a significant influence and interference of government in the financial sector, but a reasonable level of liberty to own and employ capital in these countries. The results show that, generally, banks in this region are very profitable, well-capitalized and quite stable. The levels of bank market power observed also indicate that banking markets in Sub-Saharan Africa are quite competitive and comparable to those of other emerging markets. This indicates that the ability of banks in this region to price their products and services above the marginal cost is limited. This may be because of higher banking costs in Africa, generally reflective of the high cost of doing business, and high loan losses due to serious information asymmetry problems. Indeed, we find poor operating efficiency among banks in this region, with high staff costs and other operating

expenses. This suggests that policies aimed at improving infrastructure and reducing information asymmetry problems, as well as general prices of products, such as stable macroeconomic conditions could reduce intermediation costs in these countries. This could in turn encourage savings, enhance financial inclusion, improve access to finance and promote economic growth and development.

Furthermore, the percentage of banking assets devoted to lending activities is relatively low compared to other regions of the world. This underscores the need for appropriate policies to improve contractual frameworks to enhance efficiency in credit allocation. On the other hand, a significant portion of bank income is earned from non-interest activities. This may have serious negative repercussions for bank stability and may require policies that could limit bank risk-taking to avert potential bank failures. Domestic credit to the private sector as a percentage of GDP is generally low, and calls for appropriate policies to engender bank lending activities, such as improvements in measures to address information asymmetry and moral hazard problems.

The regression results show that higher bank market power (or less competition) is significantly and positively associated with greater bank stability. This suggests that when banks have the ability to price their products in a monopolistic fashion (because of less competition), it translates into less likelihood of the banks becoming insolvent, and rather makes banks more sound. We also find a non-linear relationship between competition and bank stability, but we did not find any concrete evidence of the possible conditional effect of financial freedom on the competition-stability relationship. This indicates that, though yet to be tested, concerns that excessive financial freedom may contribute to banks' propensity to take on greater risks, which in turn may have contributed

to the recent global and European crises may not be applicable in the developing country context. With regards to the control variables, diversification shows a strong negative and significant relationship with bank stability in all the estimations, denoting that highly diversified banks are more risky and unstable. On the other hand, financial development has a significantly positive relationship with bank stability, implying that increases in the amount of bank credit to the private sector makes banks less risky and more stable.

In view of the difficulty in assessing bank risk with a single measure, we carry out similar regressions on bank asset quality, as an alternative to z-score, the more popular measure of overall bank risk or stability. Generally, the results show that the coefficient of market power is negatively and significantly associated with the bank asset quality measure, suggesting that as banks gain more pricing power, their asset quality improves. This also indicates that increased competition in the banking market results in greater risk-taking by banks. However, similar to the case of bank stability, we find evidence for a non-linear relationship between competition and bank risk-taking, but financial freedom did not show any significant effect on the quality of bank assets. With regards to the control variables, we find that the credit risk measure is positively related to bank asset quality, an indication of higher risk-taking and deteriorating asset quality with increased lending. The level of financial development appears to have a significantly positive influence on bank asset quality, suggesting that asset quality is likely to improve as banks gain more experience in the market.

A second objective of the study is to ascertain the effects of competition and financial freedom on bank profitability. The results reveal a positive relationship between market power and bank net

interest margins, indicating that banks with market power charge a higher loan rate and offer a lower deposit rate. Both financial freedom and economic freedom show a positive relationship with NIM, suggesting that less intervention by government in the banking sector boosts bank margins. It also appears that the positive effect of market power on bank margins is stronger for banks operating in countries with higher levels of freedom. An analysis of the control variables show that higher credit risk associates with higher bank margins, ostensibly as a result of additional risk premium charges. Also, diversification shows a negative relationship with NIM, implying that banks that engage in other activities earn lower margins, as they lose focus on their core activity. Both financial development and economic development appear to have a negative impact on NIM, denoting that banks operating in countries with higher levels of financial and economic development earn reduced margins. However, banking market concentration, operating efficiency, bank size, and the level of capitalization do not appear to be important determinants of bank net interest margins in Sub-Saharan Africa.

Furthermore, similar to the results for NIM, market power is positively related to overall bank profitability (ROAA), suggesting that in less competitive markets banks generally earn higher returns on their assets. Also, both financial freedom and economic freedom show a positive impact on bank profits. We find evidence affirming that financial and economic freedom have conditioning effects on the impact of market power (or competition) on bank profits. It appears that banks with higher market power operating in countries with higher freedom for banking activities are more profitable than their counterparts in countries with greater restrictions on banking activities. An analysis of the control variables show that bank profits are likely to be lower in highly concentrated markets. This is inconsistent with the Structure-Conduct-Performance

hypothesis which suggests that concentration enables banks to collude and earn higher profits. On the other hand, the bank operating efficiency measure shows a significantly negative relationship with ROAA, signifying that, as expected, banks that are able to control costs more effectively earn higher profits. Contrary to the NIM results, the diversification variable has a significantly positive coefficient. This means that diversification is an important determinant of bank return on assets, and that banks that engage in other activities outside their core business earn significantly higher returns than those not engaging in similar activities. However, bank size, capitalization, credit risk, financial development and economic development do not appear to be important determinants of overall bank profitability.

The study identified the sources of bank market power in Sub-Saharan Africa to be capitalization, diversification, and market share. On the other hand, financial freedom, economic freedom and economic development appear to dampen bank market power. This suggests that banks that operate in countries with greater freedom tend to have lower pricing power, likely as a result of fewer restrictions in establishing new banks even by foreign investors, thus leading to greater competition.

With regards to the competition and bank efficiency relationship, we find evidence that rejects the quiet life hypothesis. The independent effect of bank market power on cost efficiency is consistently positive and significant in all the estimations. This means that banks with higher market power are the most cost efficient, contrary to the quiet life hypothesis that banks become inefficient as they gain more market power and settle for a quiet life with no incentive to reduce costs. Surprisingly, the direct effect of financial freedom on bank efficiency is largely negative

and significantly related to cost efficiency. This gives an indication that less government interference in the banking sector is associated with lower bank cost efficiency. However, another plausible explanation for the negative effect of financial freedom on bank efficiency could be the higher costs banks may incur in an effort to obtain resources (human capital, technology and physical capital) in order to beat the competition, as more banks enter the market with greater freedom. Given the ambiguous relationship between competition and efficiency, we sought to determine if the impact of market power on efficiency depends on the institutional environment, by interacting the Lerner index with the freedom variables. It appears that the positive effect of market power on bank cost efficiency is weakened for banks operating in countries with higher financial and economic freedom.

With regards to the control variables, we find that generally, banking market concentration has a negative effect on cost efficiency, suggesting that bank efficiency reduces as the market becomes more concentrated. The different results obtained for the effect of market power and concentration on cost efficiency indicates the existence of a low relationship between competition and concentration, highlighting the limitations of using market concentration measures as proxy variables for competition. On the other hand, the coefficient of the capitalization ratio is positive and significant in all the estimations, indicating that highly capitalized banks are more cost efficient. Bank profitability (ROAA) shows a mostly negative and significant association with cost efficiency. This means that more profitable banks are less efficient, possibly because of the tendency to become wasteful with higher profits.

The persistence of bank profits is estimated for only five of the countries due to data limitations in using the system GMM with requirements for instrumental variables. The level of profit

persistence observed suggests that the intensity of competition in the banking sector is much stronger in Kenya and Tanzania than in South Africa. Banking market concentration contributes positively to bank profit persistence in Ghana and Kenya, but translates into less profit persistence in South Africa. Also, economic freedom associates positively with profit persistence in Tanzania, and Kenya, but its effect is negative in Ghana. The level of capitalization has a positive effect on profit persistent in Kenya and Ghana and a negative effect in Mauritius. But bank size has a positive relationship with excess profit in Mauritius and Kenya and a negative relationship in Ghana.

5.3 Contributions of the Study

This study has made important contributions to the competition and bank performance literature. First, our analysis of the effect of financial freedom on the relationship between competition and bank efficiency has shown that higher degrees of freedom has a detrimental impact on bank efficiency. This is new in the literature, and should assist policy makers in designing appropriate policies for banking markets in Sub-Saharan Africa. For example, policies that ensure some level of restrictions in the banking sector may still be required to enhance bank efficiency.

Second, our use of the same model in estimating bank market power and cost efficiency is another significant contribution to the literature. Although very necessary, given the close relationship between competition and efficiency, only a handful of studies have jointly estimated competition and bank efficiency using the same framework. Most previous studies estimate competition and efficiency separately, and then assess their relationship. Third, our test results which rejects the quiet life hypothesis which has received very little attention in banking shows that for banks in

Sub-Saharan Africa, the gain of market power is not a disincentive to controlling costs. Again, this has implications for policy on consumer welfare.

Fourth, our confirmation of the existence of a non-linear relationship between market power and bank stability adds to the scant literature on this relatively new development in the literature. Most previous studies assume a linear relationship between competition and bank stability which may have resulted in poor policy prescriptions in the past. And by testing the effect of financial freedom on the relationship between competition and bank stability (which has not received any attention in the literature), we obviate concerns that excessive financial freedom may contribute to banks' propensity to take on greater risks.

Fifth, whereas other studies use mostly market structure indicators (concentration indices and market share) as a proxy for market power in testing the Structure-Conduct-Performance (SCP) hypothesis, we used a direct measure of market power at the bank level, the Lerner index and find support for the SCP hypothesis. This provides a more accurate assessment of the effect of bank market power. Sixth, we assess the effect of financial freedom on the relationship between competition and bank profitability, and show that higher freedom for banks enhances their margins and overall profitability. This has not been the focus of other studies and should help determine appropriate policy measures to ensure that banks do not earn higher profits at the expense of the rest of the economy. We also assess the determinants of bank profit persistence and variations across countries, which is largely ignored in the literature. And finally, we provide a more comprehensive assessment of bank performance by considering bank efficiency, profitability and

stability together, adding to the scant literature on competition and bank performance in the developing countries context.

5.4 Conclusions

Based on the results of the study, we can draw some conclusions. There is evidence of the competition-fragility hypothesis in Sub-Saharan Africa banking. Greater competition may generally result in bank insolvency. However, the relationship between competition and bank stability in Sub-Saharan Africa is found to be non-linear, implying that beyond a setting threshold, increases in market power may also be damaging to bank stability. It is clear from the results that higher financial freedom for banks improves their profitability, but is harmful for cost efficiency, especially for banks with higher market power. On the other hand, financial freedom does not affect bank stability.

Higher level of banking system concentration is clearly harmful to bank profitability and efficiency in Sub-Saharan Africa. Again, higher bank equity seems to improve bank efficiency. It may be that bank managers are more concerned about controlling costs when bank capital is high, in order to earn reasonable returns for shareholders. While helpful for improving bank profitability, the results show that high diversification exposes banks to greater risk. Banking costs in Sub-Saharan Africa also appear high, which may be attributable to information asymmetry problems, and poor infrastructure such as lack of access to adequate electricity, technology and roads. On the determinants, we can conclude that there are significant variations in the factors influencing bank profit persistence in different countries, which calls for different policy responses.

5.5 Policy Recommendations

The results of the study have important policy repercussions. Policy makers usually take the view that opening up banking markets to greater competition may lead to higher efficiency, as it reduces the monopoly power of banks and challenge them to be innovative. However, our results have shown that allowing banks to maintain some level of market power may be necessary to ensure banking system efficiency and overall stability. Hence, caution is needed in implementing policies that will flood the market and eliminate pricing power of banks. Of course, the fact that higher financial freedom associates with greater bank margins and overall profitability suggests that banks may be earning part of their income at the expense of the rest of the economy which needs to be controlled. It would appear that policy measures to minimize bank market power moderately may be well placed. Also, given that higher financial freedom improves bank profitability but harms cost efficiency, especially for banks with higher market power, policies that ensure some level of restrictions in the banking sector may improve bank efficiency.

Higher level of banking system concentration is clearly harmful to bank profitability and efficiency in Sub-Saharan Africa. Hence, measures that have been taken to reduce the level of concentration in banking markets in the region should be continued to enhance bank performance. Again, higher bank equity seems to improve bank efficiency. This indicates that policies that require banks to hold higher capital may be helpful in this region. It may be that bank managers are more concerned about controlling costs when bank capital is high, in order to earn reasonable returns for shareholders. However, policies that allow banks to engage in non-traditional activities need to be carefully crafted. While helpful for improving bank profitability, the results show that high diversification exposes banks to greater risk. Banking costs in Sub-Saharan Africa appear high,

which may be attributable to information asymmetry problems, and poor infrastructure such as lack of access to adequate electricity, technology and roads. Thus, policy measures need to be put in place to address lack of transparency in the financial behavior of borrowers, and banking operations to reduce costs and improve efficiency. Investments in infrastructure also needs to be accelerated to provide adequate resources at reasonable cost to improve consumer welfare.

5.6 Limitations and Suggestions for Further Research

While providing useful results, this study is subject to some limitations. Inadequate data to cover the whole Sub-Saharan Africa region, particularly some of the larger banking markets such as Nigeria and Angola is one of the limitations of the study. Future studies should explore the possibility of obtaining complete data to ensure general applicability of the results. Of course, most of the important banking markets in the region, in terms of assets, were covered in the study. Another limitation is the use of a single measure of bank competition. It would be useful for future studies to consider the use of other measures of competition such as the newly introduced Boone indicator, or the Panza-Rosse H-statistic to confirm our findings.

In addition, future studies could consider the feedback effect of efficiency on bank competition. The close relationship between competition and efficiency suggest possible reverse causality, yet most studies assess the effect of competition on bank efficiency, without considering whether efficiency in turn engenders competitive conditions in banking markets. And for effective and specific policy prescriptions, it may be more helpful if the relations of interest in this study could be replicated at the country level, instead of the cross-country approach used for this research.

REFERENCES

- Aboagye, A. Q. Q., Akoena, S. K., Antwi-asare, T., & Gockel, A. F. (2008). Explaining interest rate spreads in Ghana. *African Development Review*, 20(3), 378-399.
- Aboagye, A. Q. Q., Akoena, S. K., Antwi-asare, T., & Gockel, A. F. (2008). Explaining the market power of Ghanaian banks. *South African Journal of Economics*, 76(4), 569-585.
- Agoraki, M. E. K., Delis, M. D., & Pasiouras, F. (2011). Regulations, competition and bank risk-taking in transition countries. *Journal of Financial Stability*, 7(1), 38-48.
- Ahokpossi, M. C. (2013). Determinants of bank interest margins in sub-Saharan Africa. (No. 13-34). International Monetary Fund.
- Aigner, D.J., Lovell, C.A.K., & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics*, 6, 21-37.
- Allen, F., & Gale, D. (2000). Financial contagion. *Journal of Political Economy*, 108, 1–33.
- Allen, F., & Gale, D. (2004). Competition and financial stability. *Journal of Money, Credit, and Banking*, 36, 453–480.
- Allen, L. (1988). The determinants of bank interest margins: A Note. *Journal of Financial and Quantitative Analysis*, 23, 231-235.
- Allen, F., Otchere, I., & Senbet, L. W. (2011). African financial systems : A review. *Journal of Advanced Research*, 1(2), 79–113.
- Almarzoqi, R., & Naceur, S. B. (2015). Determinants of bank interest margins in the Caucasus and central Asia. International Monetary Fund WP/15/87.
- Al-Muharrami, S., & Matthews, K. (2009). Market power versus efficient-structure in Arab GCC banking. *Applied Financial Economics*, 19(18), 1487-1496.

- Amidu, M. (2013). The effects of the structure of banking market and funding strategy on risk and return. *International Review of Financial Analysis*, 28, 143–155.
- Amidu, M., & Wolfe, S. (2013). Does bank competition and diversification lead to greater stability? Evidence from emerging markets. *Review of Development Finance*, 3, 152–166.
- Amidu, M., & Wolfe, S. (2013). The impact of market power and funding strategy on bank-interest margins. *The European Journal of Finance*, 19(9), 888-908.
- Andries, A. M., & Căpraru, B. (2012). Competition and efficiency in EU27 banking systems. *Baltic Journal of Economics*, 12(1), 41-60.
- Angbazo, L. (1997). Commercial bank net-interest margin, default risk, interest rate risk and off-balance sheet banking. *Journal of Banking and Finance*, 21, 55-87.
- Arellano, M. & Bover, O. (1995). Another look at the instrumental variable estimation of error component models. *Journal of Econometrics*, 68, 29–51.
- Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, 58, 277–297.
- Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money*, 18(2), 121-136.
- Bain, J. S. (1951). Relation of profit rate to industry concentration: American manufacturing, 1936-1940. *The Quarterly Journal of Economics*, 65(3), 293-324.
- Barth, J., Caprio, G., & Levine, R. (2013). Bank regulation and supervision in 180 countries from 1999 to 2011. *Journal of Financial Economic Policy*, 5(2), 111-219.
- Bashir, A-H. M. (2003). Determinants of profitability in Islamic banks: some evidence from the Middle East. *Islamic Economic Studies*, 11(1), 31–57.

- Battese, G., & Coelli, T. (1992). Frontier production functions, technical efficiency and panel data: with application to paddy farmers in India. *Journal of Productivity Analysis*, 3, 153–169.
- Beck, T., & Cull, R. (2013). Banking in Africa. Policy Research Working Paper 6684. The World Bank Development Research Group, Finance and Private Sector Development.
- Beck, T., & Hesse, H. (2009). Why are interest spreads so high in Uganda? *Journal of Development Economics*, 88(2), 192-204.
- Beck, T., De Jonghe, O., & Schepens, G. (2013). Bank competition and stability: cross-country heterogeneity. *Journal of Financial Intermediation*, 22, 218–244.
- Beck, T., Demirgüç-Kunt, A., & Levine, R. (2006). Bank concentration, competition, and crises: first results. *Journal of Banking & Finance*, 30(5), 1581–1603.
- Beck, T., Demirgüç-Kunt, A., & Maksimovic, V. (2004). Bank competition and access to finance: international evidence. *Journal of Money, Credit and Banking*, 36, 627–648.
- Beck, T., Fuchs, M., & Uy, M. (2009). Making finance work for Africa – the role of governments in a global world in crisis. Regional economic outlook: sub-Saharan Africa. International Monetary Fund.
- Beck, T., Maimbo, S. M., Faye, I., & Triki, T. (2011). Making finance work for Africa-financing Africa: through the crisis and beyond. ADB WP.
- Berger, A. N. (1995). The profit-structure relationship in banking-tests of market-power and efficient-structure hypotheses. *Journal of Money, Credit and Banking*, 27(2), 404-431.
- Berger, A. N., Bonime, S. D., Covitz, D. M., & Hancock, D. (2000). Why are bank profits so persistent? The roles of product market competition, informational opacity, and regional/macroeconomic shocks. *Journal of Banking & Finance*, 24(7), 1203-1235.

- Berger, A.N., & Hannan, T.H. (1998). The efficiency cost of market power in the banking industry: a test of the ‘quiet life’ and related hypotheses. *Review of Economics and Statistics*, 8(3), 454–465.
- Berger, A. N., Klapper, L. F., & Turk-Ariss, R. (2009). Bank competition and financial stability. *Journal of Financial Services Research*, 35(2), 99–118.
- Berger, A.N., & Mester, L.J. (1997). Inside the black box: what explains differences in the efficiencies of financial institutions? *Journal of Banking & Finance* 21(7), 895–947.
- Besanko, D., & Thakor, A. (1993). Relationship banking, deposit insurance and bank portfolio. In C. Mayer & X. Vives (Eds.), *Capital markets and financial intermediation* (292–318). Cambridge University Press, Cambridge, UK.
- Blundell, R. W., & Bond, S. R. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143.
- Boone, J. (2008). A new way to measure competition. *The Economic Journal*, 118(531), 1245–1261.
- Boone, J., & Weigand, J. (2000). Measuring competition in the Dutch manufacturing sector: how are cost differentials mapped into profit differentials? CPB Working Paper No. 131, Den Haag.
- Boubakri, N., Cosset, J. C., Fischer, K., & Guedhami, O. (2005). Privatization and bank performance in developing countries. *Journal of Banking & Finance*, 29(8), 2015–2041.
- Boyd, J., & De Nicolo, G. (2005). The theory of bank risk taking and competition revisited. *Journal of Finance*, 60(3), 1329–1343.

- Brissimis, S. N., Delis, M. D., & Papanikolaou, N. I. (2008). Exploring the nexus between banking sector reform and performance: evidence from newly acceded EU countries. *Journal of Banking & Finance*, 32(12), 2674-2683.
- Caminal, R., & Matutes, C. (2002). Market power and bank failures. *International Journal of Industrial Organization* 20, 1341–1361.
- Carbo V. S., & Rodriguez F. F. (2007). The determinants of bank margins in European banking. *Journal of Banking & Finance*, 31(7), 2043-2063.
- Carletti, E. (2008). Competition and regulation in banking. In A.W.A Boot & A. Thakor (Eds.), *Handbook of Financial Intermediation and Banking*. Elsevier, Amsterdam.
- Carow, K. A., & Kane, E. J. (2002). Event-study evidence of the value of relaxing long-standing regulatory restraints on banks, 1970–2000. *The Quarterly Review of Economics and Finance*, 42(3), 439-463.
- Casu, B., & Girardone, C. (2006). Bank competition, concentration and efficiency in the single European market. *The Manchester School*, 74(4), 441-468.
- Casu, B., & Girardone, C. (2009). Testing the relationship between competition and efficiency in banking: a panel data analysis. *Economics Letters*, 105(1), 134-137.
- Chiorazzo, V., Milani, C., & Salvini, F. (2008). Income diversification and bank performance: evidence from Italian banks. *Journal of Financial Services Research*, 33, 181–203.
- Chirwa, E. W., & Mlachila, M. (2004). Financial reforms and interest rate spreads in the commercial banking system in Malawi, IMF staff papers 51(1).
- Chortareas, G. E., Garza-Garcia, J. G., & Girardone, C. (2011). Banking sector performance in Latin America: market power versus efficiency. *Review of Development Economics*, 15(2), 307-325.

- Chortareas, G. E., Garza-García, J. G., & Girardone, C. (2012). Competition, efficiency and interest rate margins in Latin American banking. *International Review of Financial Analysis*, 24, 93-103.
- Chortareas, G. E., Girardone, C., & Ventouri, A. (2012). Bank supervision, regulation, and efficiency: evidence from the European Union. *Journal of Financial Stability*, 8(4), 292-302.
- Chortareas, G. E., Girardone, C., & Ventouri, A. (2013). Financial freedom and bank efficiency: evidence from the European Union. *Journal of Banking & Finance*, 37(4), 1223-1231.
- Chronopoulos, D. K., Liu, H., McMillan, F. J., & Wilson, J. O. (2013). The dynamics of U.S. bank profitability. *The European Journal of Finance*, 21(5), 426-443.
- Claessens, S., & Laeven, L. (2004). What drives bank competition? Some international evidence. *Journal of Money, Credit and Banking*, 36(3), 563-583.
- Claeys, S., & Vennet, V. R. (2008). Determinants of bank interest margins in Central and Eastern Europe: a comparison with the west. *Economic Systems*, 32 (2), 197-216.
- Coccorese, P., & Pellicchia, A. (2010). Testing the ‘quiet life’ hypothesis in the Italian banking industry. *Economic Notes*, 39(3), 173-202.
- Da Silva, G. J. C., Oreiro, J. L., de Paula, L. F., & Sobreira, R. (2007). Macroeconomic determinants of banking spread in Brazil: An empirical evaluation. In *Proceedings of the 35th Brazilian Economics Meeting*.
- De Guevara, J. F., & Maudos, J. (2007). Explanatory factors of market power in the banking system. *The Manchester School*, 75(3), 275-296.
- De Guevara, J. F., Maudos, J. & Pérez, F. (2005). Market power in European banking. *Journal of Financial Services Research*, 27(2), 109–137.

- Delis, M. D. (2012). Bank competition, financial reform, and institutions: the importance of being developed. *Journal of Development Economics*, 97(2), 450-465.
- Delis, M. D., Molyneux, P., & Pasiouras, F. (2011). Regulations and productivity growth in banking: evidence from transition economies. *Journal of Money, Credit and Banking*, 43(4), 735-764.
- Delis, M. D., & Tsionas, E. G. (2009). The joint estimation of bank-level market power and efficiency. *Journal of Banking & Finance*, 33(10), 1842-1850.
- Demirgüç-Kunt, A., & Huizinga, H. (1999). Determinants of commercial bank interest margins and profitability: Some international evidence. *World Bank Economic Review*, 13(2), 379–408.
- Demirgüç-Kunt, A., & Levine, R. (2000). *Bank concentration: cross-country evidence*. World Bank, Mimeo, October.
- Demirgüç-Kunt, A., Laeven, L., & Levine, R. (2004). Regulations, market structure, institutions and the cost of financial intermediation. *Journal of Money, Credit, and Banking*, 36, 593–622.
- Demsetz, H. (1973). Industry structure, market rivalry and public policy, *Journal of Law and Economics*, 16(1), 1-9.
- Diallo, B. (2015). Bank competition and crises revisited: new results. *Economics Letters*, 129, 81–86.
- Dietrich, A., & Wanzenried, G. (2011). Determinants of bank profitability before and during the crisis: evidence from Switzerland. *Journal of International Financial Markets, Institutions and Money*, 21(3), 307–327.

- Dietrich, A., & Wanzenried, G. (2014). The determinants of commercial banking profitability in low-, middle-, and high-income countries. *The Quarterly Review of Economics and Finance*, 54(3), 337–354.
- Ding, C. G., Wu, C. H., & Chang, P. L. (2013). The influence of government intervention on the trajectory of bank performance during the global financial crisis: a comparative study among Asian economies. *Journal of Financial Stability*, 9(4), 556-564.
- Eldomiaty, T.I. (2007), Determinants of corporate capital structure: evidence from an emerging economy, *International Journal of Commerce and Management*, 17(1/2), 25-43.
- Elsas, R., Hackethal, A., & Holzhauser, M. (2010). The anatomy of bank diversification. *Journal of Banking and Finance*, 34(6), 1274–1287.
- Estrada, D., Gomez, E., & Orozco, I. (2006). Determinants of interest margins in Columbia. Banco Dela Republica, Series Borradores de Economia No. 393.
- European Central Bank (2010). Beyond ROE – how to measure bank performance. Appendix to the report on EU banking structures. ECB.
- Flamini, V., Schumacher, L., & McDonald, C. A. (2009). The determinants of commercial bank profitability in sub-Saharan Africa. International Monetary Fund wp/09/15.
- Forssbäck, J., & Shehzad, C. T. (2014). The conditional effects of market power on bank risk—cross-country evidence. *Review of Finance*, 1-42.
- Fosu, S. (2013). Banking competition in Africa: sub-regional comparative studies. *Emerging Markets Review*, 15, 233-254.
- Fu, X. M., & Heffernan, S. (2009). The effects of reform on China’s bank structure and performance. *Journal of Banking & Finance*, 33(1), 39-52.

- Fu, X. M., Lin, Y. R., & Molyneux, P. (2014). Bank competition and financial stability in Asia Pacific. *Journal of Banking & Finance*, 38(1), 64-77.
- Fungáčová, Z., & Poghosyan, T. (2011). Determinants of bank interest margins in Russia: Does bank ownership matter? *Economic systems*, 35(4), 481-495.
- Fungacova, Z., & Weill, L. (2013). Does competition influence bank failures? Evidence from Russia. *Economics of Transition*, 21(2), 301–322.
- Gaganis, C., & Pasiouras, F. (2013). Financial supervision regimes and bank efficiency: international evidence. *Journal of Banking & Finance*, 37(12), 5463-5475.
- Garcia-Herrero, A., Gavila, S., & Santabarbara, D. (2009). What explains the low profitability of Chinese banks? *Journal of Banking and Finance*, 33(11), 2080–2092.
- Gischer, H., & Juttner, D.J. (2003). Global competition, fee income and interest rate margins of banks. *Kredit and Kapital* 36(3), 368–394.
- Goddard, J., Liu, H., Molyneux, P., & Wilson, J. O. S. (2011). The persistence of bank profit. *Journal of Banking & Finance*, 35(11), 2881-2890.
- Goddard, J., Liu, H., Molyneux, P., & Wilson, J. O. S. (2013). Do bank profits converge? *European Financial Management*, 19(2), 345-365.
- Goddard, J., Molyneux, P., & Wilson, J. O. S. (2004). Dynamics of growth and profitability in banking. *Journal of Money, Credit and Banking*, 36(6) 1069-1090.
- Greene, W. (2005). Reconsidering heterogeneity in panel data estimators of the stochastic frontier model. *Journal of Econometrics*, 126, 269–303.
- Gschwandtner, A. (2005). Profit persistence in the ‘very’ long run: evidence from survivors and exiters. *Applied Economics*, 37, 793–806.

- Gschwandtner, A. (2012). Evolution of profit persistence in the USA: evidence from three periods. *The Manchester School*, 80(2), 172-209.
- Gwartney, J., Lawson, R. & Hall, J. (2014). *Economic freedom of the world: 2014 annual report*, Vancouver: The Fraser Institute.
- Hafer, R. W. (2013). Economic freedom and financial development: international evidence. *Cato Journal*, 33(1), 111-126.
- Hakenes, H., & Schnabel, I. (2011). Capital regulation, bank competition, and financial stability. *Economics Letters*, 113(3), 256-258.
- Hassan, M. K., Sanchez, B., Ngene, G. M., & Ashraf, A. (2012). Financial liberalization and foreign bank entry on the domestic banking performance in MENA countries. *African Development Review*, 24(3), 195-207.
- Hawtrey, K., & Liang, H. (2008). Bank interest margins in OECD countries. *The North American Journal of Economics and Finance*, 19(3), 249-260.
- Hellmann, T., Murdock, K., & Stiglitz, J. (2000). Liberalization, moral hazard in banking, and prudential regulation: Are capital requirements enough? *American Economic Review*, 90, 147–165.
- Heritage Foundation (2015). Index of economic freedom. The Heritage Foundation. Retrieved from <http://www.heritage.org/index>.
- Hicks, J. (1935). The theory of monopoly. *Econometrica*, 3, 1–20.
- Ho, T.S., & Saunders, A. (1981). The determinants of bank interest margins: theory and empirical evidence. *Journal of Financial and Quantitative Analysis*, 16, 581–600.
- Honohan, P., & Beck, T. (2007). Making finance work for Africa. The World Bank.

- Hossain, M. (2012). Financial reforms and persistently high bank interest spreads in Bangladesh: pitfalls in institutional development? *Journal of Asian Economics*, 23(4), 395-408.
- Jeon, Y. and Miller, S. M., (2002). Bank concentration and performance. Economics Working Papers, Paper 200225, University of Connecticut.
- Jiang, N., & Kattuman, P. A. (2010). Intensity of competition in china: profitability dynamics of Chinese listed companies. *Asia Pacific Business Review*, 16(3), 461-481.
- Jimenez, G., Lopez, J. A., & Saurina, J. (2013). How does competition affect bank risk-taking? *Journal of Financial Stability*, 9, 185– 195.
- Kablan, A. S. (2010). Banking efficiency and financial development in sub-Saharan Africa (No. 10/136). International Monetary Fund.
- Kalluci, I. (2010). Determinants of net interest margin in the Albanian banking system. Working Paper Series, April, Bank of Albania.
- Kasman, A., Tunc, G., Vardar, G., & Okan, B. (2010). Consolidation and commercial bank net interest margins: evidence from the old and new European Union members and candidate countries. *Economic Modelling*, 27, 648–655.
- Keeley, M. (1990). Deposit insurance, risk, and market power in banking. *American Economic Review*, 80, 1183–200.
- Klein, M.A. (1971). A theory of the banking firm. *Journal of Money, Credit, and Banking*, 3, 205-218.
- Koetter, M., Kolari, J., & Spierdijk, L. (2008). Efficient competition? Testing the “quiet life” of U.S. banks with adjusted Lerner indices. Working Paper, Groningen University.

- Koetter, M., Kolari, J., & Spierdijk, L. (2012). Enjoying the quiet life under deregulation? Evidence from adjusted Lerner indices for U.S. Banks. *Review of Economics and Statistics*, 94 (2), 462–480.
- Koetter, M., & Poghosyan, T. (2009). The identification of technology regimes in banking: Implications for the market power-fragility nexus, *Journal of Banking & Finance* 33(8), 1413–1422.
- Kohler, M., (2015). Which banks are more risky? The impact of business models on bank stability. *Journal of Financial Stability*, 16, 195–212.
- Kouki, I., & Al-Nasser, A. (2014). The implication of banking competition: evidence from African countries. *Research in International Business & Finance*. Retrieved from <http://dx.doi.org/10.1016/j.ribaf.2014.09.009>.
- Laeven, M. L., & Valencia, F. (2008). The use of blanket guarantees in banking crises (No. 8-250). International Monetary Fund.
- Laeven, L., & Valencia, F. (2012). The use of blanket guarantees in banking crises. *Journal of International Money and Finance*, 31(5), 1220-1248.
- Lee, C. C., Hsieh, M. F., & Dai, H. W. (2012). How does foreign bank ownership in the banking sector affect domestic bank behavior? A dynamic panel data analysis. *Bulletin of Economic Research*, 64(1), 86-108.
- Lin, K., Doan, A. T., & Doong, S. (2016). Changes in ownership structure and bank efficiency in Asian developing countries: The role of financial freedom. *International Review of Economics & Finance*, 43, 19–34.
- Liu, H., & Wilson, J. O. (2010). The profitability of banks in Japan. *Applied Financial Economics*, 20(24), 1851-1866.

- Liu, H., Molyneux, P., & Wilson, J. O. (2013). Competition and stability in European banking: a regional analysis. *The Manchester School*, 81(2), 176–201.
- Mamatzakis, E., Kalyvas, A. N., & Piesse, J. (2013). Does regulation in credit, labour and business matter for bank performance in the EU-10 Economies? *International Journal of the Economics of Business*, 20(3), 341–385.
- Martinez-Miera, D., & Repullo, R. (2010). Does competition reduce the risk of bank failure? *Review of Financial Studies*, 23, 3638–3664.
- Maudos, J., & de Guevara, J. F. (2007). The cost of market power in banking: Social welfare loss vs. Cost inefficiency. *Journal of Banking & Finance*, 31(7), 2103–2125.
- Maudos, J., & de Guevara, J. F. (2004). Factors explaining the interest margin in the banking sectors of the European Union. *Journal of Banking & Finance*, 28(9), 2259–2281.
- Maudos, J., & Solis, L. (2009). The determinants of net interest income in the Mexican banking system: an integrated model. *Journal of Banking & Finance*, 33(8), 1920–1931.
- McShane, R.W., & Sharpe, I.G. (1985). A time series-cross-section analysis of the determinants of Australian trading bank loan-deposit interest margins: 1962–1981. *Journal of Banking and Finance* 9, 115–136.
- Meeusen, W., van den Broeck, J. (1977). Efficiency estimation from Cobb-Douglas production functions with composed error. *International Economic Review*, 18, 435–444.
- Mirzaei, A., Moore, T., & Liu, G. (2013). Does market structure matter on banks’ profitability and stability? Emerging vs. Advanced economies. *Journal of Banking & Finance*, 37(8), 2920–2937.

- Mirzaei, A., & Moore, T. (2014). What are the driving forces of bank competition across different income groups of countries ? *Journal of International Financial Markets, Institutions & Money*, 32, 38–71.
- Mlambo, K., & Ncube, M. (2011). Competition and efficiency in the banking sector in South Africa. *African Development Review*, 23(1), 4-15.
- Moyo, J., Nandwa, B., Oduor, J., & Simpasa, A. (2014). Financial sector reforms, competition and banking system stability in sub-Saharan Africa. *New Perspectives*.
- Mu, Y., Phelps, P., & Stotsky, J. G. (2013). Bond markets in Africa. *Review of Development Finance*, 3, 121–135.
- Mueller, D.C. (1977). The persistence of profits above the norm. *Economica*, 44, 369–80.
- Naceur, S. B., & Omran, M. (2011). The effects of bank regulations, competition, and financial reforms on banks' performance. *Emerging Markets Review*, 12(1), 1-20.
- Nguyen, J. (2012). The relationship between net interest margin and noninterest income using a system estimation approach. *Journal of Banking & Finance*, 36, 2429–2437.
- Oreiro, J. L., & de Paula, L. F. (2010). Macroeconomic determinants of bank spread in Latin America: a recent analysis with special focus on Brazil. *International Review of Applied Economics*, 24(5), 573-590.
- Panzar, J. C., & Rosse, J. N. (1987). Testing for "monopoly" equilibrium. *The Journal of Industrial Economics*, 443-456.
- Pasiouras, F., & Kosmidou, K. (2007). Factors influencing the profitability of domestic and foreign commercial banks in the European Union. *Research in International Business and Finance*, 21 222–237.

- Pasiouras, F., Tanna, S., & Zopounidis, C. (2009). The impact of banking regulations on banks' cost and profit efficiency: cross-country evidence. *International Review of Financial Analysis*, 18(5), 294-302.
- Perera, S., Skully, M., & Chaudrey, Z. (2013). Determinants of commercial bank profitability: South Asian evidence. *Asian Journal of Finance & Accounting*, 5(1), 365-380.
- Peria, M. S. M., & Mody, A. (2004). How foreign participation and market concentration impact bank spreads: evidence from Latin America. *Journal of Money, Credit and Banking*, 36(3), 511-537.
- Poghosyan, T. (2013). Financial intermediation costs in low income countries: the role of regulatory, institutional, and macroeconomic factors. *Economic Systems*, 37(1), 92-110.
- Poshakwale, S. S., & Qian, B. (2011). Competitiveness and efficiency of the banking sector and economic growth in Egypt. *African Development Review*, 23(1), 99-120.
- Pruteanu-Podpiera, A., Weill, L., & Schobert, F. (2008). Banking competition and efficiency: a micro-data analysis on the Czech banking industry. *Comparative Economic Studies*, 50(2), 253-273.
- Saunders, A., & Schumacher, L. (2000). The determinants of bank interest rate margins: an international study. *Journal of International Money and Finance*, 19(6), 813-832.
- Schaeck, K., & Čihák, M. (2008). How does competition affect efficiency and soundness in banking? New empirical evidence. ECB working paper no. 932.
- Schaeck, K., Čihák, M., & Wolfe, S. (2009). Are competitive banking systems more stable? *Journal of Money, Credit and Banking*, 41(4), 711-734.
- Schaeck, K., & Čihák, M. (2014). Competition, efficiency, and stability in banking. *Financial Management*, 43(1), 215 – 241.

- Sealey, C., & Lindley, J. T. (1977). Inputs, outputs and a theory of production and cost at depository financial institutions. *Journal of Finance*, 32(4), 1251–1266.
- Seelanatha, L. (2010). Market structure, efficiency and performance of banking industry in Sri-Lanka. *Banks and Bank Systems*, 5(1), 20-31.
- Senbet, L. W., & Otchere, I. (2006). Financial sector reforms in Africa: Perspectives on issues and policies, Annual World Bank Conference on Development Economics, St. Petersburg, Russia.
- Shepherd, W. G. (1982). Economies of scale and monopoly profits. In John V. Craven (Eds), *Industrial organization, antitrust, public policy*, Boston, Mass.: Kluwer Nijhoff.
- Smimou, K., & Karabegovic, A. (2010). On the relationship between economic freedom and equity returns in the emerging markets: evidence from the Middle East and North Africa (MENA) stock markets. *Emerging Markets Review*, 11(2), 119-151.
- Smirlock, M. (1985). Evidence on the (non) relationship between concentration and profitability in banking. *Journal of Money, Credit, and Banking*, 17 (1), 69–83.
- Stephan, A., & Tsapin, A. (2008). Persistence and determinants of firm profit in emerging markets. *Applied Economics Quarterly*, 54(4), 231-253.
- Stern, J. M., Stewart, G. B., & Chew, D. H. (1995). The EVA® financial management system. *Journal of Applied Corporate Finance*, 8(2), 32-46.
- Stiroh, K. J., & Rumble, A. (2006). The dark side of diversification: the case of U. S. financial holding companies. *Journal of Banking and Finance*, 30(8), 2131–2161.
- Sufian, F., & Habibullah, M. S. (2010). Does economic freedom foster banks' performance? Panel evidence from Malaysia. *Journal of Contemporary Accounting & Economics*, 6(2), 77-91.

- Tabak, B. M., Fazio, D. M., & Cajueiro, D. O. (2012). The relationship between banking market competition and risk-taking: do size and capitalization matter? *Journal of Banking & Finance* 36(12), 3366–3381.
- Tregenna, F. (2009). The fat years: the structure and profitability of the U. S banking sector in the pre-crisis period. *Cambridge Journal of Economics*, 33(4), 609-632.
- Trujillo-Ponce, A. (2013). What determines the profitability of banks? Evidence from Spain. *Journal of Accounting and Finance*, 53, 561–586.
- Turk-Ariss, R. (2010). On the implications of market power in banking: evidence from developing countries. *Journal of Banking & Finance*, 34(4), 765-775.
- Uhde, A., & Heimeshoff, U. (2009). Consolidation in banking and financial stability in Europe: empirical evidence. *Journal of Banking & Finance*, 33(7), 1299-1311.
- Van Leuvensteijn, M., Sørensen, C. K., Bikker, J. A., & Van Rixtel, A. A. (2013). Impact of bank competition on the interest rate pass-through in the Euro area. *Applied Economics*, 45(11), 1359-1380.
- Weill, L. (2004). On the relationship between competition and efficiency in the EU banking sectors. *Kredit und Kapital*, 37 (3) 329-352.
- Weill, L. (2013). Bank competition in the EU: How has it evolved? *International Financial Markets Institutions and Money*, 26, 100– 112.
- Williams, J. (2012). Efficiency and market power in Latin American Banking. *Journal of Financial Stability*, 8(4), 263-276.
- Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two step GMM estimators. *Journal of Econometrics*, 126(1), 25–51.

Wong, K. (1997). On the determinants of bank interest margins under credit and interest rate risks.
Journal of Banking and Finance, 21, 251-71.