

**COMPETITIVENESS AND EFFICIENCY OF COMMERCIAL BANKS AND  
ECONOMIC GROWTH IN THE FRONTIER ECONOMIES OF AFRICA**

Thesis presented for the  
**Degree of Doctor of Philosophy**  
in the  
Faculty of Commerce, Graduate School of Business  
at the  
University of Cape Town

**by**

**ROLAND MWESIGWA BANYA**

**2017**

**SUPERVISOR: PROFESSOR NICHOLAS BIEKPE**

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

## **DECLARATION**

I, the undersigned, hereby declare that this thesis is submitted by me for the award of a PhD degree at the University of Cape Town, Graduate School of Business. I further declare that this is my own independent work and has not been previously submitted in part or its entirety to any other university.

Signed by candidate

**Roland Banya**

## **ABSTRACT**

Various studies have examined the relationship between competition and efficiency in the banking sector, and others have looked at how this relates to broader economic growth. Goldsmith (1969) and King and Levine (1993), among others, found that financial reform in the banking sector has led to improved efficiency and competition and, thus, led to economic growth. Financial reform in Africa came about because of financial liberalisation that took place during the late 1980s. This reform process was structured to increase competition and efficiency of the financial sector. This has motivated academic inquiry into the assessment and measurement of bank efficiency, bank competition and the impact on economic growth. The literature available indicates a myriad of factors that impact upon bank efficiency and bank competition. A determinant that is scarcely addressed in the literature on Africa, however, is the quality of institutions. Bearing this in mind, the thesis is a group of empirical papers on competition, efficiency and economic growth of the banking sector in Africa. Explicitly, annual firm level data on banks from ten frontier African countries is employed to study different economic theories using various panel data econometric methodologies.

The results highlight that banks in frontier Africa are distinguished by monopolistic competition. Further, the results propose that banking competition can be advantageous to economic growth. In addition, as bank competition rises through the efficiency conduit, this could in due course increase economic growth. Furthermore, we also study the relationship between bank competition and efficiency. We observe a positive relationship between bank competition and both profit and cost efficiency, consequently these findings reject the Quiet Life Hypothesis. We also observe low levels of bank efficiency and competition across the sample. However, the study finds that bank diversification into non-interest producing activities allows frontier African banks to increase their revenue. The study also looks at the quality of institutions and the impact on bank competition. The results indicate that regulatory quality has a positive impact on banking competition. The findings

recommend that to improve economic growth, policy makers should aim at improving competitive and efficient conditions in the banking sector because competitive banking allocates resources in a more efficient way thus spurring economic growth. The focus of these policies should therefore be on bolstering competition, regulatory, supervisory as well as financial liberalisation policies.

## **DEDICATION**

I dedicate this study to God, the Lord of my life, as well as to my dear parents, Mr Steven Banya and Mrs Grace Banya.

## **ACKNOWLEDGEMENTS**

My PhD journey has been an interesting one with periods of triumph as well as uncertainty. At times, it felt like the progress was stagnating or even regressing and this was very disheartening. I am eternally thankful to my Supervisor, Professor Nicholas Biekpe, for the guidance and frank advice that he rendered to me. Prof. Biekpe always gave me timely feedback despite his very busy schedule. I also want to express my heartfelt appreciation to Africagrowth Institute for all the support rendered during my research. In particular I am grateful to Dina, Lydia, Kirk and Banyen.

I want to express my gratitude to all the faculty members at the UCT-Graduate School of Business (GSB) for the support and helpful feedback during my seminar presentation at the school.

I am also so grateful to the following people for their inspiration and help during this journey. In particular, to my brother and friend, Dr. Latif Al Hassan, who set aside time to read my work, as well as the time we spent coding and running regressions. You helped me and encouraged me, and I truly appreciate this. I also want to thank Dr. Sephooko Motelle for the continued reassurance that all is possible by the grace of God.

I want to thank my family in Cape Town and Uganda, for their support through this journey. To Megan, I thank you for the love and encouragement that you have given me over this journey. You are truly a gift from God. I love you! I would also like to thank my sister and brothers for their support, Edson, Olivia, Rodney and Rita. Our lives are intertwined, and my success is your success. You have been my strength and source of joy. I thank you. Finally, I would like to thank my parents for the unwavering support and for the belief that they have had in me. Thank you for the investment that you made into my life: spiritually and emotionally as well as financially, I thank you eternally. Whatever I am is because of the both of you and this work is dedicated to you.

Finally, I would like to give my sincere thanks and praise to the Almighty God for giving me the opportunity to pursue my PhD studies and for guiding and protecting me and enabling me to see this journey through to the end.

## TABLE OF CONTENTS

|   |             |
|---|-------------|
| <b>DECLARATION .....</b>                        | <b>ii</b>   |
| <b>ABSTRACT .....</b>                           | <b>iii</b>  |
| <b>DEDICATION .....</b>                         | <b>v</b>    |
| <b>ACKNOWLEDGEMENTS .....</b>                   | <b>vi</b>   |
| <b>LIST OF TABLES .....</b>                     | <b>xii</b>  |
| <b>LIST OF FIGURES .....</b>                    | <b>xiii</b> |
| <b>LIST OF ACRONYMS AND ABBREVIATIONS .....</b> | <b>xiv</b>  |

### **CHAPTER 1: INTRODUCTION**

|     |   |    |
|-----|---|----|
| 1.1 | Background to the study.....  | 1  |
| 1.2 | Research problem .....  | 5  |
| 1.3 | Justification and motivation for the study .....  | 8  |
| 1.4 | Objectives of the study.....  | 10 |
| 1.5 | Organisation of the study.....  | 11 |
| 1.6 | Measurements of concepts and caveats .....  | 12 |
|     | References .....  | 15 |
|     | Appendix 1.A Description of Frontier African Countries .....  | 20 |
|     | Appendix 1.B Classification of Frontier African Countries by provider .....                             | 20 |
|     | Appendix 1.C Some stylised facts for the banking sectors in Frontier<br>African Countries for 2012..... | 21 |

### **CHAPTER 2: OVERVIEW OF FINANCIAL SYSTEMS IN FRONTIER AFRICAN COUNTRIES**

|     |  |    |
|-----|--|----|
| 2.1 | Introduction.....  | 24 |
| 2.2 | Historical overview.....   | 24 |
| 2.3 | Banking reforms .....  | 26 |
| 2.4 | Regulatory and supervisory reforms.....                              | 27 |
| 2.5 | Payment and settlement reforms.....                                  | 31 |
| 2.6 | Performance of the banking industry in Frontier African countries... | 32 |

|  |    |
|--|----|
| 2.6.1 Profitability indicators.....                          | 33 |
| 2.6.1.1 Return on Equity (ROE).....                          | 33 |
| 2.6.1.2 Return on Assets (ROA).....                          | 33 |
| 2.6.1.3 Solvency Indicator.....                              | 34 |
| 2.6.1.4 Asset Quality Indicator.....                         | 35 |
| 2.6.1.5 Liquidity Indicator.....                             | 36 |
| 2.7 Conclusion.....  | 37 |
| References.....  | 38 |
| Appendix 2.A Implementation of major regulatory reforms..... | 39 |
| Appendix 2.B Payment and settlement systems.....             | 40 |
| Appendix 2.C Return on Equity, Year Trend per Country.....   | 45 |
| Appendix 2.D Return on Assets, Year Trend per Country.....   | 46 |

**CHAPTER 3: BANK COMPETITION AND ECONOMIC GROWTH:  
EMPIRICAL EVIDENCE FROM SELECTED FRONTIER AFRICAN  
COUNTRIES**

|   |    |
|---|----|
| 3.1 Introduction.....   | 41 |
| 3.2 Review of the literature.....   | 43 |
| 3.2.1 Banking competition.....  | 43 |
| 3.2.2 Banking competition and economic growth.....                                | 47 |
| 3.3 Data and estimation methodology.....  | 50 |
| 3.3.1 Estimating banking competition; the Boone Indicator.....                    | 51 |
| 3.3.2 Empirical model: banking competition and economic growth.....               | 53 |
| 3.3.3 Estimation technique.....   | 54 |
| 3.4 Empirical results.....  | 55 |
| 3.4.1 Estimation of bank competition.....   | 55 |
| 3.4.2 Estimating relation between banking competition and economic<br>growth..... | 58 |
| 3.5 Conclusion.....   | 59 |
| References.....   | 62 |
| Appendix 3.A Stepwise calculation of Boone Indicator (BI).....                    | 73 |
| Appendix 3.B Number of banks per country.....                                     | 75 |

**CHAPTER 4: BANKING EFFICIENCY AND ITS DETERMINANTS IN  
SELECTED FRONTIER AFRICAN MARKETS**

|       |   |     |
|-------|---|-----|
| 4.1   | Introduction .....  | 76  |
| 4.2   | Review of literature .....  | 79  |
| 4.3   | Data and estimation methodology .....                                   | 81  |
| 4.3.1 | Definition of inputs and outputs .....                                  | 81  |
| 4.3.2 | Technical, pure technical and scale efficiency .....                    | 82  |
| 4.3.3 | Estimating banking efficiency: DEA .....                                | 84  |
| 4.3.4 | DEA bootstrap .....   | 86  |
| 4.3.5 | Bank efficiency determinants .....                                      | 89  |
| 4.4   | Empirical results .....   | 92  |
| 4.4.1 | Evaluating the efficiency of Frontier African Banks .....               | 92  |
| 4.4.2 | Source of bank inefficiency .....                                       | 95  |
| 4.4.3 | Results of the determinants of efficiency .....                         | 96  |
| 4.5   | Conclusion .....  | 98  |
|       | References .....  | 100 |
|       | Appendix 4.A Variables used in the computation of bank efficiency ..... | 105 |
|       | Appendix 4.B Financial ratios used as explanatory variables .....       | 105 |

**CHAPTER 5: QUIET-LIFE IN BANKING: EVIDENCE FROM TEN  
FRONTIER MARKETS**

|       |   |     |
|-------|---|-----|
| 5.1   | Introduction .....  | 106 |
| 5.2   | Review of literature .....  | 108 |
| 5.3   | Data and estimation methodology .....   | 111 |
| 5.3.1 | Estimating cost and profit efficiency using Stochastic<br>Frontier Analysis ..... | 112 |
| 5.3.2 | Definition of inputs and outputs .....  | 114 |
| 5.3.3 | Estimating bank concentration using the Lerner Index .....                        | 115 |
| 5.3.4 | Testing the Quiet Life Hypothesis .....   | 116 |
| 5.4   | Empirical results .....   | 117 |

|  |     |
|--|-----|
| 5.4.1 Profit efficiency .....  | 117 |
| 5.4.2 Cost efficiency estimates .....                                  | 118 |
| 5.4.3 Lerner Index results.....  | 120 |
| 5.4.4 Regression results .....   | 120 |
| 5.5 Conclusion .....   | 123 |
| References .....   | 125 |
| Appendix 5.A Number of banks per country .....                         | 129 |
| Appendix 5.B Variables used in the computation of bank efficiency..... | 129 |

**CHAPTER 6: INCOME DIVERSIFICATION IN FRONTIER AFRICAN COUNTRIES: IMPLICATIONS FOR BANK EFFICIENCY**

|  |     |
|--|-----|
| 6.1 Introduction .....   | 142 |
| 6.2 Review of literature .....                                 | 142 |
| 6.2.1 Strategic focus and conglomeration hypotheses .....      | 132 |
| 6.2.2 Effect of income diversification on bank efficiency..... | 133 |
| 6.3 Data and estimation methodology.....                       | 136 |
| 6.3.1 Data, output variables and input prices .....            | 136 |
| 6.3.2 Estimation of bank efficiency .....                      | 138 |
| 6.3.3 Estimation of income diversification.....                | 139 |
| 6.3.4 Model estimation .....                                   | 140 |
| 6.4 Results and discussion .....                               | 142 |
| 6.4.1 Summary statistics.....                                  | 142 |
| 6.4.2 Income diversification and bank efficiency .....         | 145 |
| 6.5 Conclusion and recommendations .....                       | 147 |
| References .....   | 150 |
| Appendix 6.A .....   | 154 |
| Appendix 6.B .....   | 154 |
| Appendix 6.C .....   | 154 |

**CHAPTER 7: IMPACT OF INSTITUTIONAL QUALITY ON BANKING  
COMPETITION: EVIDENCE FROM FRONTIER AFRICAN  
COUNTRIES**

|       |  |     |
|-------|--|-----|
| 7.1   | Introduction .....   | 155 |
| 7.2   | Overview of institutional quality in Frontier Africa ..... | 157 |
| 7.3   | Literature review.....                                     | 161 |
| 7.3.1 | Institutional quality hypothesis.....                      | 161 |
| 7.3.2 | Banking competition.....                                   | 163 |
| 7.4   | Data and methodology .....                                 | 164 |
| 7.4.1 | The PR model .....   | 165 |
| 7.4.2 | Quantile regression approach .....                         | 166 |
| 7.4.3 | Empirical specification.....                               | 168 |
| 7.5   | Results .....  | 169 |
| 7.5.1 | H-statistic.....   | 169 |
| 7.5.2 | Simultaneous quantile regression .....                     | 170 |
| 7.6   | Conclusion and recommendations .....                       | 171 |
|       | References .....   | 173 |
|       | Appendix 7A: Correlation matrix .....                      | 179 |
|       | Appendix 7B: Description of variables used .....           | 179 |
|       | Appendix 7C: Results from Wald Test.....                   | 180 |

**CHAPTER 8: CONCLUSION AND RECOMMENDATIONS**

|       |  |     |
|-------|--|-----|
| 8.1   | Introduction .....                                       | 183 |
| 8.2   | Summary of key findings and policy recommendations ..... | 183 |
| 8.2.1 | Synthesis of key findings .....                          | 183 |
| 8.3   | Policy implications and recommendations.....             | 185 |
| 8.4   | Proposed agenda for future research.....                 | 187 |
|       | References .....   | 189 |

## LIST OF TABLES

|  |     |
|--|-----|
| Table 1.1: Measurement of key variables.....   | 13  |
| Table 2A.1: Implementation of major regulatory reforms .....                               | 39  |
| Table 2A.2: Payment and settlement systems .....   | 40  |
| Table 4.1: Descriptive statistics for explanatory variables for bank<br>inefficiency ..... | 92  |
| Table 4.2: Average efficiency results for ten Frontier African countries ....              | 94  |
| Table 4.3: Source of bank inefficiency .....   | 95  |
| Table 4.4: Second stage DEA bootstrap regression results.....                              | 96  |
| Table 5.1: Profit and cost estimates.....  | 119 |
| Table 5.2: Lerner Index estimates .....  | 120 |
| Table 5.3: Results for Random Effects estimation.....                                      | 120 |
| Table 6.1: Potential correlates of bank efficiency .....                                   | 142 |
| Table 6.2: Profit and cost efficiency estimates .....                                      | 144 |
| Table 6.3: Income diversification and cost efficiency.....                                 | 145 |
| Table 6.4: Income diversification and profit efficiency.....                               | 146 |
| Table 7.1: Control of corruption estimates .....   | 170 |
| Table 7.2: Government effectiveness estimates.....   | 171 |
| Table 7.3: Regulatory quality estimates.....   | 172 |
| Table 7.4: Panzer Rosse H-Statistic: panel fixed effect estimation .....                   | 174 |
| Table 7.5: Simultaneous Quantile Regression.....   | 175 |

## LIST OF FIGURES

|   |    |
|---|----|
| Figure 2.1: Return on Equity (2005-2014 average).....           | 33 |
| Figure 2.2: Return on Assets (2005-2014 average).....           | 34 |
| Figure 2.3: Capital Adequacy Ratio (2005-2014 average) .....    | 35 |
| Figure 2.4: Non-Performing Loans Ratio (2005-2014 average)..... | 36 |
| Figure 2.5: Liquid to Assets Ratio (2005-2014 average) .....    | 37 |

## LIST OF ACRONYMS AND ABBREVIATIONS

|      |   |
|------|---|
| ACH  | Automated Clearing House                    |
| BC   | Battese and Coelli                          |
| BI   | Boone indicator                             |
| CAR  | capital adequacy ratio                      |
| CCC  | Cheque Codeline Clearing                    |
| CE   | Cost Efficiency                             |
| CRS  | Constant Return to Scale                    |
| DEA  | Data Envelopment Analysis                   |
| DFA  | Distribution Free Approach                  |
| DMU  | Decision-making unit                        |
| DRS  | Decreasing Returns to Scale                 |
| ES   | Efficient Structure                         |
| FDH  | Free Disposal Hull                          |
| GCC  | Gulf Cooperation Council                    |
| GDP  | Gross Domestic Product                      |
| GMM  | Generalized Method of Moments               |
| HHI  | Herfindahl Hirschman Index                  |
| IFRS | International Financial Reporting standards |
| IRS  | Increasing Returns to Scale                 |
| LEV  | Financial Leverage                          |
| LOTA | ratio of loans to total assets              |
| MC   | Marginal Costs                              |

|      |  |
|------|--|
| MPI  | Malmquist Productivity Index           |
| NEIO | New Empirical Industrial Organization  |
| NPL  | Non-performing loans                   |
| OLS  | Ordinary Least Squares                 |
| POS  | Point of Sale                          |
| PR   | Panzar-Rosse                           |
| PTE  | Pure technical efficiency              |
| QLH  | Quiet Life Hypothesis                  |
| RBS  | Risk-based supervision                 |
| RMA  | Rand Monetary Area                     |
| ROA  | Return on Assets                       |
| ROE  | Return on Equity                       |
| RTGS | Real Time Gross Settlement             |
| S&P  | Standard & Poor                        |
| SADC | Southern African Development Community |
| SCP  | Structure-Conduct-Performance          |
| SE   | Scale Efficiency                       |
| SFA  | Stochastic Frontier Analysis           |
| SQR  | Simultaneous quantile regression       |
| SSA  | Sub-Saharan Africa                     |
| TE   | technical efficiency                   |
| VRS  | Variable returns to scale              |
| WACB | West African Currency Board            |

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background to the study**

The banking sector is the cornerstone of any well-functioning modern economy. A competitive and efficient banking sector is vital for the growth and development of any economy. If commercial banks are functioning in an efficient and competitive manner, then monetary policies are likely to be effective (Aikaeli, 2008). Ngalande (2003) states that efficiency in the banking sector is regarded as a key contributor to macroeconomic stability among central bankers in the Southern African Development Community (SADC). Banking efficiency is also a precondition for economic growth and important for the effectiveness of monetary policy (Hartmann, 2004; Kiyota, 2009).

This study focuses on the banking sub-sector because it is a vital service industry in any economy, and where it is competitive and efficient, it can spur innovation and growth. A competitive and efficient banking sector is vital for the proper functioning of any economy for a myriad of reasons, for instance at a micro level, banks sell financial products to customers. At a macro level, banks provide credit or loan facilities to both firms and consumers. Most importantly, however, banks raise, disburse, and invest much of society's savings, so bank performance has significant consequences on allocation of capital, firm growth, industrial expansion, and economic development (Berger, 1995). However, banking sector that is not competitive will lead to under-provision of such credit or loans which may negatively impact the overall economic performance of the country (Claessens & Laeven, 2005).

These are some of the reasons why establishing the level of competition in the commercial banking sector has been of utmost importance to policy makers, academics as well as the public (Greenberg & Simbanegavi, 2009). A competitive financial sector in Africa is very important for economic development, especially looking at the indication of the positive relation between finance and growth (Kasekende et al., 2009).

The banking sectors in Frontier African Countries have experienced fundamental changes over the last decade following financial institution reform that started in the early 1990s (Aikaeli, 2008). The Frontier African economies are countries that have over the past two decades displayed high economic growth rates, improved financial systems including a deepened banking sector as well as developed capital markets. In the late 1980s and early 1990s, several African countries began to restructure their financial sectors to boost banking competitiveness and efficiency (Brownbridge & Harvey, 1998). This was in line with the Structural Adjustment Programs set in place by the World Bank and International Monetary Fund. The structural adjustment programs were set out to promote liberalisation of the African economies through among other things wide ranging financial reforms.

These financial reforms have been a way of stimulating competition and efficiency in the financial sector with varying degrees of success. Financial reform has mainly led to increased competition and efficiency in the banking sector through the removal of entry barriers, liberalisation of product restrictions and elimination of intra-sectoral controls (Claessens, 2009). The banking systems in most African countries have improved because of financial reform, for instance, the Nigerian banking sector has witnessed stronger balance sheets and a greater capital base since undertaking the reforms (Kasekende et al., 2009). However according to Senbet and Otchere (2005), following the reform, some Sub-Saharan African (SSA) economies continue to face severe inefficiency and illiquidity. This study builds on earlier research that has been carried out on competition and efficiency in the commercial banking sector and the relationship they have on economic growth (Poshakwale & Qian, 2011). The study also examines the effect of institutional quality on banking competition and to the best of my knowledge is the first study to examine the interactions between bank competition, bank efficiency and economic growth in the Frontier market countries of Africa.

When we consider the implications of financial reform on economic growth in the academic literature, the results we get are imprecise. Several studies have shown that financial reforms are expected to result in a higher competitive

banking sector, better saving mobilisation and efficient allocation of resources to enhance economic growth (see Besanko & Thakor, 1992; Levine, 1997; Claessens & Laeven, 2004). On the other hand, some papers develop a link between the implementation of financial reform and the vulnerability of financial systems which result in financial and economic crisis (Rajan, 1992; Allen & Gale, 2000). This study will investigate this relationship in more detail using competitiveness in the commercial banking sector as a proxy for financial development and the relationship that it has with economic growth.

It has been further established that more competition and efficiency in the banking sector can contribute to greater financial stability, product innovation, and access by households and firms to financial services, which in turn can improve the prospects for economic growth (Hauner & Peiris, 2005). The studies predominantly point to the fact that development in the financial sector improves the banking sector's competitiveness, increases efficiency and leads to overall growth in the economy (Levine, 1997; Besanko & Thakor, 1992; Claessens & Laeven, 2004; Poshakwale & Qian, 2009). On the other hand, however, some studies conclude that financial reforms are unsettling and increase the vulnerability of the financial system to financial and economic crises (Rajan, 1992; Allen & Gale, 2000; Poshakwale & Qian, 2009).

Further, while some of these relationships between competition and efficiency in the commercial banking system and economic growth have been analysed in theoretical literature, empirical research on bank competition and efficiency, particularly in Africa, is still at an early stage. A hindrance for this research used to be insufficient data, as limited bank-level data were available outside developed countries, but recently established databases are allowing for better empirical work.

The extant literature also attempts to explain the determinants of banking efficiency and competition primarily focusing on a number of banks, markets and regulatory characteristics. However recent literature emphasises the role of institutions in explaining economic transitions and growth (Henisz, 2000),

institutional factors as potential sources of determinants of banking efficiency have largely been ignored (see Berger & Mester, 1997).

Growth and development of economies cannot occur in a vacuum, growth and expansion of banks likewise requires an institutional framework that allows for transactions to occur and agents to know that the decisions and contracts they make are protected and enforced by law. Lin and Nugent (1995) refer to institutions as a set of humanly devised behavioural rules that govern and shape the interaction of human beings. At a formal level, institutions can be defined in regard to the extent of property rights' protection; the degree to which laws and regulations are fairly enforced; extent of political corruption and the ability of the government to protect its citizens against economic shocks and provide social protection. Weak legal systems and poor institutions impede market development (La Porta et al. 1997, 1998; Demirguc-Kunt and Maksimovic, 2002). Issues like private contracting conflicts and information asymmetries in the banking sector can be resolved by well-functioning institutions.

Competition in the banking sector is weakened by lack of strong institutions. According to Delis et al (2009), relatively weak legal systems in developing and transition countries, as well as high levels of corruption in the financial system, may limit the strength of competitive forces. On the other hand, Chen (2008) highlights that quality of regulations impacts positively on bank competition. Demirgüç-Kunt et al. (2002) broadly find that a broad set of research suggests that better institutions will provide greater competition in the economy.

This occurs because, on the one hand, improvements in the institutional environment, for instance encompassing better property rights, stronger contract enforcement and a higher level judicial efficiency, increase the value of collateral for bank loans and therefore reduce the cost of financial intermediation for existing borrowers. On the other hand, such improvements can extend the credit market to low-grade borrowers and thereby raise the average interest rate paid on loans (Demirgüç-Kunt et al, 2003). This study looks at the quality of institutions accounted for in measures of banking

competition. Do strong institutions foster or hinder competitiveness in the commercial banking sector in Africa, or are weak institutions an enabling factor for competitiveness?

Relatively few studies around banking competitiveness and efficiency have come from the African continent. This had been in part due to a low level of financial development, limited market activities, and lack of quality data. However, it is worth noting that in recent years these frontier African countries have developed their financial systems, with commercial banks as the core financial intermediaries. The availability of data for these countries has also made it possible to understand how banks operate, and to investigate the major factors that can improve both their competitiveness and their efficiency (Chen, 2009).

With that context, this thesis is a group of connected research papers on the efficiency and competition of the banking sector in a selection of Frontier market African countries. The thesis looks at the subsequent research questions: First, what is the level of bank competition in Frontier African countries? Does banking competition empirically effect the level of economic growth? Second, what is the degree of bank efficiency in these countries? Third, does the degree of competitiveness impact on bank efficiency in the banking industry? Fourth, does income diversification impact the magnitude of bank competition? Fifth, does institutional quality impact on bank competition of the banking sector? The study examines the fundamental hypothesis that institutional quality improves the degree of bank competition.

## **1.2 Research problem**

Pre-independence, commercial banks in Africa consisted primarily of foreign-owned or expatriate banks. At the attainment of independence, to remedy several unfair practices that had been carried out by these foreign-owned banks, such as uncompetitive lending policies, African governments restructured their respective banking sectors. State banks were established, and the private sector was encouraged to set up local banks. Most governments held the belief that predominant government intervention was

necessary to ensure that the banking system played a more supportive role in developing the local economy (Brownbridge, 1996). Consequently, successive governments in Africa adopted interventionist policies in the banking sector. Interest rates were controlled, public sector banks were set up, and the government bought equity in the foreign banks, and in addition a variety of administered lending programmes were established.

However, the impact of government controls on financial markets and intervention in the banking sector failed to achieve the intended results. There was a steep decline in financial depth of the economy, and a marked deterioration in the institutional strength of the banking system (Brownbridge, 1996). It is for these, among many other reasons, that financial reforms in the financial sector with focus on commercial banks were deemed necessary.

Financial reform in Africa started to take place in earnest in the late 1980s. This was in reaction to financial sector repression that had been widespread on the continent, mostly because of government mismanagement of the sector. It was carried out to increase efficiency and competitiveness of the sector. The seminal works of McKinnon (1973) and Shaw (1973) attributed financial repression as the cause of the unsatisfactory growth performance in developing countries. They advocated financial liberalisation as a remedy to the issues caused by financially repressive policies of developing countries (Fowowe, 2011). The financial reforms that were carried out were a pre-condition laid out as part of the structural adjustment programs of the World Bank and the IMF in line with the ideals of financial liberalisation. Accordingly, the process led to removal of barriers to entry, entry of foreign banks, and reduction in interest rates to mention but a few.

According to Kablan (2010), numerous studies have been done on banking efficiency and competitiveness of commercial banks to assess the impact of those reforms. The impact of this reform on bank competitiveness and efficiency in literature is imprecise: some studies claim that to a significant extent the financial reform improved competitiveness as well as efficiency of commercial banks (Claessens & Laeven, 2004). These studies have usually

been carried out on groups of emerging countries (Grigorian & Manole, 2002; Bonin, Hasan & Wachtel, 2005; Boubakri et al., 2005; Fries & Taci, 2005). However, fewer studies have been carried out on Africa. Greenberg and Simbanegavi (2009) for instance, study competitiveness in South African banks and find that the banking sector faces a high level of monopolistic competition. Poshakwale and Qian (2011) find that the Egyptian banking sector is also monopolistically competitive. Further, their findings suggest a significant relationship between productive efficiency and economic growth in the short run which is not consistent in the long run.

This study analyses the level of competition as well as the level of efficiency in the commercial banking sector. We shall also study the relationship between competitiveness in the banking sector and efficiency in the banking sector. Whereas a positive relationship between competition and efficiency is often assumed, the specific characteristics of banking markets (i.e. entry barriers, sunk costs, information asymmetries) may lead to excessive market power of efficient banks, therefore reducing competition (Casu and Giradone, 2009). They further suggest a negative causation between efficiency and competition, whereas the causality running from competition to efficiency, although positive, is relatively weak (Casu and Giradone, 2009). Hauner and Peiris (2005) find that an increased level of bank competition as a outcome of financial reform is associated with a rise in efficiency.

This study will also highlight the relationship that competitiveness in the commercial banking sector has with economic growth in the economy. There is a paradigm that improved competitiveness will lead to higher economic growth. Numerous studies have examined the link between financial development and economic growth. Levine (1997) built on earlier works by Goldsmith (1969) to investigate this finance development–growth nexus; he argues that there is a positive first order relationship between financial development and economic growth in the short run. However, he concludes that further study of financial systems is necessary to understand the long-run relationship between financial development and economic growth. Fewer studies have focused on competitiveness and the relationship with economic

growth on the African continent. Poshakwale and Qian (2011) looked at competitiveness and productive efficiency in commercial banks in Egypt and the short- and long-term effects these have on economic growth. Their study further indicates that there is a significant relationship between competitiveness and productive efficiency in the banking sector and economic growth in the short run which is not significant in the long run. This study analyses the relationship between competitiveness in commercial banks and economic growth in Frontier African countries.

The studies on banking competitiveness have also tended to overlook the role played by institutions in banking competition models. By so doing, the link between these concepts seems neglected in the literature. There is therefore a need for a methodological process that delves into the relationships between the quality of institutions and competitiveness in commercial banking. The banking system requires institutions to provide a framework that will allow transactions to take place effectively. Further to this, institutions provide rules under which rational, optimising decisions can be made. Do strong institutions foster competitiveness in banking or do they hamper it? We shall account for the quality of institutions in several banking competition models. To the best of my knowledge, no study has measured the impact of quality of institutions on bank competition especially in the context of developing countries and the study will fill this gap. The main contribution of the research will be to account for the impact of quality of institutions in measures of banking competition.

With this background, the study explores the resulting research questions:

1. How will accounting for the quality of institutions affect competition measures in commercial banks.
2. How competitive is the commercial banking industry in these Frontier African economies?
3. How efficient is the banking industry in the Frontier African economies? This question attempts to find out whether there are unique characteristics within these African economies that affect the level of efficiency in the banking sector.

4. The relationship between competitiveness and efficiency in the commercial banking sector?
5. The relationship between competitiveness in the commercial banking sector and economic growth?

### **1.3 Justification and motivation for the study**

The banking sector is usually the largest single component of the financial system, which also includes securities firms and insurers. Within the financial system banks need special treatment for several reasons. Their functions interrupt all aspects of the economy and are central to the overall performance of the economy. The effectiveness of the financial system in the execution these functions is a major ingredient of the efficacy of the economy.

In well-functioning economies, banks tend to act as quality controllers for capital seeking successful projects, ensuring higher returns and accelerating output growth. Further, a competitive banking system is required to ensure that banks are effective forces for financial intermediation, channelling savings into investment fostering higher economic growth (Mugume, 2007). If commercial banks are functioning efficiently and in a competitive manner, monetary policies are likely to be effective. Similarly, the banking system is a vital service industry and where it is competitive and efficient, it can spur efficiency and innovation elsewhere in the economy. The converse is also true: there may be a transfer of welfare from individuals and non-bank businesses to the financial sector if the banking system is not competitive or efficient. It is for this reason that competitiveness and efficiency in the banking sector are of utmost value to the operation of the sector in Africa.

This study provides a valuable insight into the extent of competitiveness and efficiency of commercial banks in a sample of frontier African countries. The results are important for policy makers and academics alike and justify the need for continued reform in the financial sector. The study of efficiency and competitiveness in commercial banks and their relationship with economic growth in Africa is an area that has not been widely investigated on the African continent. In addition, the impact of quality of institutions on banking

competition is also an area that has not been investigated in frontier African countries. The available empirical evidence is that well-functioning financial markets, along with well-designed institutions and regulatory systems, foster economic development (Senbet & Otchere, 2005).

Poshakwale and Qian (2011) studied competitiveness, efficiency in the banking sector and the relationship with economic growth, using the Egyptian economy as a case study. Their findings indicate that financial reform seems to have had a positive and significant effect on improving competitiveness and productive efficiency in the commercial banking sector. The study also does not find evidence of a long-run association between increased bank competition and economic growth. Buchs and Mathisen (2005) looked at competition and efficiency in the economy of Ghana and found that banks behave in a non-competitive manner that possibly hampers financial intermediation. The findings from these studies indicate a high degree of monopolistic competition in the countries studied. Kiyota (2009) argues that foreign banks in Africa are more profit-efficient than domestic banks and their entry tends to have an impact on improving the performance of domestic banks.

The quality of institutions in an economy cannot be understated. Institutions provide a framework under which markets operate. The law and finance literature has found that financial markets are better developed in countries with strong institutions and frameworks (La Porta et al., 1998, Martin et al, 2015). The quality of institutions refers to how strong or weak they are. Many countries in Africa have been shown to have weak institutions over the years. In recent years, this has changed as institutional development has been entrenched in these countries. The frontier market economies in Africa provide a nice case study because these countries have developed their institutional environment.

#### **1.4 Objectives of the study**

The key objective of this study is to measure the effect of accounting for the quality of institutions in the measurement of banking industry competitiveness. Explicitly, the study seeks to realize the following objectives:

- To formulate a measure of commercial banking competition which accounts for the quality of institutions.
- To estimate the level of competitiveness in the commercial bank sector in Africa.
- To analyse the efficiency level of commercial banks in Africa. Efficiency is often the desired outcome of any financial reform that is undertaken in an economy. Have reforms in the financial sector increased banking efficiency in Africa?
- To examine the relationship between competitiveness in the commercial banking sector and economic growth in these economies.
- To examine the relationship between banking efficiency in the commercial banking sector and economic growth.
- To investigate the relationship between competitiveness and efficiency in the commercial banking sector. A positive relationship is always assumed between competitiveness and efficiency in the banking sector. This study will investigate whether increased competition in the banking sectors of these African economies has led to an increase in efficiency.

### **1.5 Organisation of the study**

This chapter is followed by an overview of the main facets of the financial system in the Frontier African Market region focussing on two principal issues: financial reforms and performance of the banking system. The financial reform section looks at regulatory and supervisory functions as well as payment and settlement reforms that were carried out in Africa. The performance section looks at issues around profitability, solvency, asset quality and liquidity. The attributes of the individual countries show a fairly heterogeneous system with fairly lower levels of development, and South

Africa which boasts a bigger more developed economy having a more developed financial system.

The proceeding chapters may be conceptualised by Figure 1.1 that outlines the associations between the three concepts, namely; banking competitiveness, banking efficiency and economic growth. The following chapters are linked to the interrelationships between these concepts. Chapter Three employs a panel data approach to measure competition in the banking systems of ten frontier African countries and looks at the impact bank competition has on economic growth. The findings indicate presence of monopolistic competition and finds that bank competitiveness enhances economic growth in the region.

Chapter Four measures bank efficiency using Data Envelopment Analysis (DEA), and the results indicate that banks in the countries studied have efficient banking sectors. The results of truncated regression indicate that bank size is negatively related to banking sector efficiency while the degree of risk is positively related to bank efficiency.

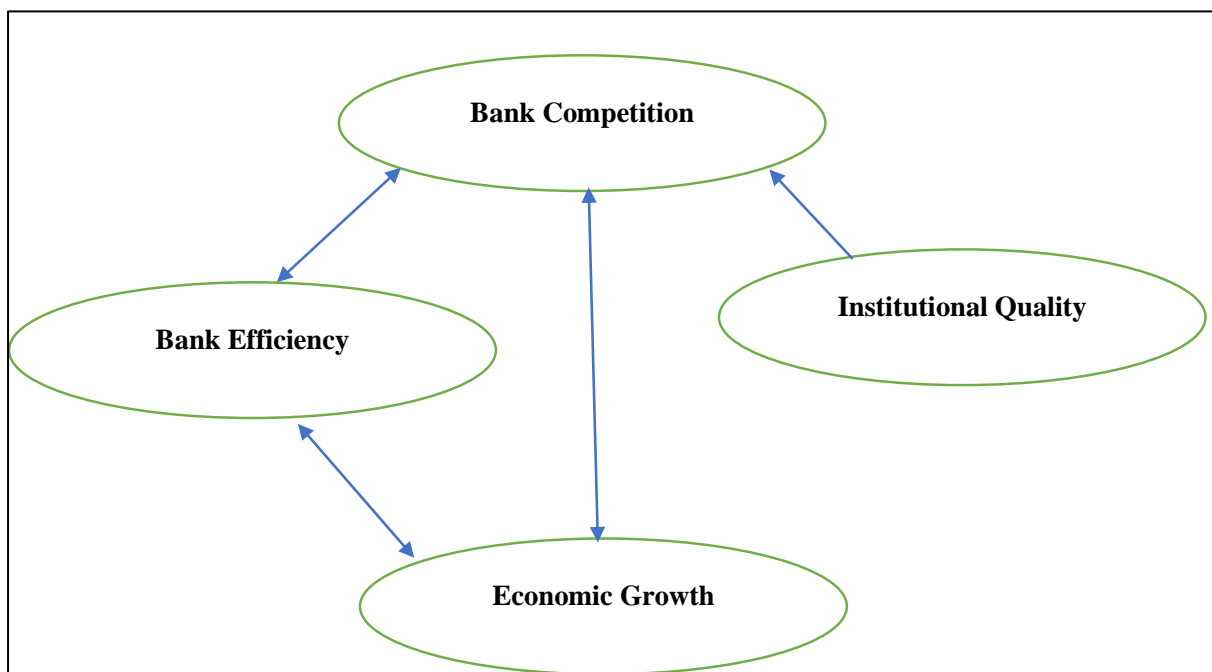
Chapter Five tests the hypothesis that there is a relationship between bank competition and bank efficiency and uses a random effects approach. The results indicate the existence of a positive and significant relationship between market power and both cost and profit efficiency, thus rejecting the Quiet Life Hypothesis.

Chapter Six seeks to test the hypothesis that the relationship between bank activity diversification and efficiency is non-linear among a sample of frontier African banks. The results indicate high revenue inefficiency, and that was indicated by a high cost efficiency as opposed to profit efficiency. The results observe a reversed U-shaped relationship between cost efficiency and income diversification, and this indicates that income diversification is efficiency-enhancing up to a point and after, the benefits are diminished.

Using the simultaneous quantile regression (SQR) approach, Chapter Seven seeks to test the hypothesis that institutional quality enhances bank competition by providing an enabling structure for the financial systems in

the various countries. The findings indicate that overall there is a positive relationship between regulatory quality and bank competition across the frontier African countries. The results authenticate the hypothesis and reveal the importance of effective institutional quality policies to curb financial instability and achieve bank competition. Chapter Eight summarizes the study and provides some policy recommendations. The theoretical connections amongst the central themes of the thesis are presented in Figure 1.1 below.

**Figure 1.1: Linkages between bank competition, bank efficiency, quality of institutions and economic growth**



*Source: Authors design*

## 1.6 Measurements of concepts and caveats

For the study to measure the relationships outlined in Fig 1.1 above, it is necessary to find suitable measurement variables. Table 1.1 defines all the variables that were used in this thesis.

Table 1.1: Measurement of key variables

| <u>Concept</u>        | <u>Variable</u>          | <u>Description</u>   |
|-----------------------|--------------------------|--|
| Bank competitiveness  | H-Statistic              | Calculated as the total of gross revenue input price elasticities  |
|                       | Boone indicator          | The degree of competition based on profit efficiency in the banking market. It is estimated as the elasticity of profits to marginal costs.            |
|                       | HHI                      | Measured as the sum of the squared deposit market shares of all the banks in the market, where market share may be based on either deposits or assets. |
| Bank efficiency       | DEA                      | This is a non-parametric approach using a linear programming algorithm.  |
|                       | SFA                      | The SFA adjusts a standard cost (production) function to allow inefficiencies to be included in the error term.  |
| Institutional quality | Control of corruption    | Index for the control of corruption, for 2005- 2012  |
|                       | Regulatory quality       | Index for regulatory quality, for 2005-2012  |
|                       | Voice and accountability | Index for voice and accountability, for 2005-2012  |

Source: Author

The study employs the H-statistic, the HHI and the Boone indicator to measure *bank competition*. The H-statistic approach has two advantages: first, it does not need a lot of data to estimate, and second, it produces robust results irrespective of the market description (Shaffer, 2004). On the other hand, the determining the market structure. In addition, though the sign of the H statistic is very useful, Shaffer (2004) contends that its value, for H not equal to one, has an uncertain explanation in theory.

The Boone indicator has benefits such as the ability to measure competition on specific and distinct product markets or on particular types of banks. This indicator requires small datasets to compute and is theoretically robust. Nevertheless, the indicator has a disadvantage if banks pass their efficiency

gains to their customers and ignores the differences in product quality (Van Leuvensteijn et al., 2007).

The Herfindahl Hirschman Index (HHI) is a simple but powerful tool for the measurement of concentration within an industry. It is calculated as the sum of the squared deposit market shares of all the banks in the market, where market share may be based on either deposits or assets. Market shares are derived from deposits, because it is assumed that the level of a bank's deposits in a market is an indication of the level of its other banking services in that same market.

*Bank efficiency* is measured by two variables: The Data Envelopment Analysis (DEA) technique which is deterministic and non-parametric, and the Stochastic Frontier Analysis (SFA) that is stochastic and parametric. DEA is the most commonly used non-parametric approach and is a linear programming algorithm developed by Charnes, Cooper and Rhodes (1978). This approach offers the advantage of simple application and restrictive assumptions regarding the functional form are not required in advance. The SFA, on the other hand, specifies a functional form for the cost, profit or production frontier and allows for a random error. The SFA adjusts a standard cost (production) function to allow inefficiencies to be included in the error term.

## REFERENCES

- Aikaeli, Jehovaness (2008). Commercial Banks Efficiency in Tanzania. Paper presented in a CSAE Conference on Economic Development in Africa, held at St. Catherine's College, Oxford, 16th-18th March.
- Allen, F. & Gale, D. (2000). Comparing Financial Systems. Cambridge, MA: MIT Press.
- Berger, A. (1995). The relationship between capital and earning in banking. *Journal of Money, Credit and Banking*, 27(2), 432-56.
- Berger, A.N. & Mester, L.J. (1997). Inside the black box: What explains differences in the efficiency of financial institutions? *Journal of Banking and Finance*, 21: 895-947.
- Besanko, David & Thakor, Anjan V. (1992). Banking deregulation: Allocational consequences of relaxing entry barriers. *Journal of Banking & Finance*, 16(5): 909-932.
- Bonin, J., Hasan, I. & Wachtel, P. (2005). Privatization matters: Bank efficiency in transition countries. *Journal of Banking and Finance*, 29: 2155-2178.
- Boubakri, N., Cosset, J-C., Fischer, K. and Guedhami, O. (2005). Privatization and Bank Performance in Developing Countries. *Journal of Banking and Finance*, 29: 2015-41.
- Brownbridge, M. (1996). Financial Policies and the Banking System in Zambia. IDS Working Paper No. 32.
- Brownbridge, M. and Gockel, A.F. (1997). The Impact of Financial Sector Policies on Banking in Ghana. Institute of Development Studies WP 38.
- Brownbridge, M. & Harvey, C. (1998). Banking in Africa: The Impact of Financial Sector Reform since Independence, Oxford: James Currey.
- Buchs, Thierry & Mathisen, Johan (2005). Competition and Efficiency in Banking: Behavioral Evidence from Ghana. IMF Working Paper No. 05/17 Washington: International Monetary Fund.

Casu, Barbara & Girardone, Claudia. (2009). Testing the relationship between competition and efficiency in banking: A panel data analysis. *Economics Letters*, 105(1): 134-137.

Charnes, A., Cooper, W.W. & Rhodes, E. (1978). Measuring the efficiency of the decision-making units. *European Journal of Operational Research*, 2: 429-444.

Chen, C. (2009). Bank efficiency in Sub-Saharan African middle-income Countries. IMF Working Paper No. 09/14.

Chen, S.H. (2008). Impacts of institutional quality on bank competition: Cross-country evidence from simultaneous quantile regression. Paper presented at the 3rd Annual Asia Pacific Financial Markets conference.

Claessens, Stijn. 2009. Competition in the financial sector: overview of competition policies. IMF Working Paper No. 09/45. International Monetary Fund.

Claessens, Stijn & Laeven, Luc. (2004). What drives bank competition? Some international evidence. Policy Research Working Paper Series No. 3113. The World Bank.

Claessens, Stijn & Laeven, Luc. (2005). Financial Dependence, Banking Sector Competition, and Economic Growth. *Journal of the European Economic Association*, 31: 179-201.

Delis, Manthos & Pagoulatos, George. (2009). Bank competition, institutional strength and financial reforms in Central and Eastern Europe and the EU. MPRA Paper 16494, University Library of Munich, Germany.

Demirgüç-Kunt, Asli & Maksimovic, Vojislav. (2002). Firms as financial intermediaries – evidence from trade credit data. Policy Research Working Paper Series 2696, The World Bank.

Demirgüç-Kunt, Asil, Beck, Thorsten & Maksimovic, Vojislav. (2002). Financing patterns around the world: the role of institutions. Policy Research Working Paper Series 2905, The World Bank.

Demirguc-Kunt, A., Laeven, L., & Levine, R. (2003). Regulations, market structure, institutions, and the cost of financial intermediation (No. w9890). National Bureau of Economic Research.

Fernández Martin, Andrés; Tamayo, César E. (2015) : From Institutions to Financial Development and Growth: What Are the Links?, IDB Working Paper Series, No. IDBWP-565, Inter-American Development Bank (IDB), Washington, DC,

Fowowe, B. (2008). Financial liberalization policies and economic growth: panel data evidence from Sub-Saharan Africa. *African Development Review*, 20(3): 549-574.

Fowowe, B. (2011). The Finance growth Nexus in Sub Saharan Africa: Panel Cointegration and Causality Tests. *Journal of International Development*, 23(2): 220-239.

Fries, S. & Taci, A. (2005). Cost efficiency of banks in transition: Evidence from 289 banks in 15 post-communist countries. *Journal of Banking and Finance*, 29: 55-81.

Goldsmith, Raymond W. (1969). *Financial structure and development*. New Haven, CT: Yale University Press.

Greenberg, J.B. & Simbanegavi, W. (2009). Testing for Competition in the South African Banking Sector. Faculty of Commerce, University of Cape Town.

Grigorian, D. & Manole V. (2002). Determinants of Commercial Bank Performance in Transition: An Application of Data Envelopment Analysis, World Bank Working Paper No. 2850.

Hartmann, P. (2004). The Impact of Financial Infrastructure Transformation on Monetary Policy Execution—the Namibian Experience. Keynote Address at the Perago User Group Conference. *BIS Review* 53 South Africa.

Hauer, D. & Peiris, S.J. (2005). 'Bank Efficiency and Competition in Low-Income Countries: The Case of Uganda', IMF Working Paper, OS/240

Henisz, Witold J. (2000). The institutional environment for economic growth. *Economics and Politics*, 12: 1-31.

Kablan, S. (2010). Banking efficiency and financial development in Sub-Saharan Africa. IMF working papers, No. WP/10/136.

Kasekende, L., Mlambo, K., Murinde, V. & Zhao, T. (2009). Restructuring for Competitiveness: The Financial Services Sector in Africa's Four Largest Economies. Chapter 1.3 in *The Africa Competitiveness Report*, World Economic Forum, the World Bank and the African Development Bank, 49-81.

King, Robert G. and Levine, Ross. "Finance and Growth: Schumpeter Might Be Right." *Quarterly Journal of Economics*, August 1993b, 108(3), pp. 717-37

Kiyota, Hiroyuki, (2009). Efficiency of Commercial Banks in Sub-Saharan Africa: A Comparative Analysis of Domestic and Foreign Banks. Working Papers UNU-WIDER Research Paper, World Institute for Development Economic Research (UNU-WIDER).

La Porta, Rafael, López de Silanes, Florencio, Shleifer, Andrei & Vishny, Robert W. (1997). Legal Determinants of External Finance. *Journal of Finance* 52(3): 1131-1150.

La Porta, Rafael, López de Silanes, Florencio, Shleifer, Andrei & Vishny, Robert W. (1998). Law and Finance. *Journal of Political Economy*, 106(6): 1113-1155.

Levine, R. (1997). Financial development and economic growth: views and agenda. *Journal of Economic Literature*, 35(2): 688-726.

Lin, Justin Yifu & Nugent, Jeffrey B. (1995). Institutions and Economic Development. In: *Handbook of Development Economics*, Jere Behrman and T.N. Srinivasan (eds), Vol. 3A, New York: Elsevier Science, North Holland, 2301-2370.

McKinnon, R. (1973). *Money and capital in economic development*. Washington, DC: The Brookings Institution.

Mugume, A. (2007). Market structure and performance in Uganda's banking industry. *African Econometrics Society*.

Ngalande, E.E. (2003). The importance of financial system modernisation in Africa. Keynote Address at the Perago User Group Conference. BIS Review 27 South Africa.

Okeahalam, C.C. (2001) "Structure and conduct in the commercial banking sector of South Africa", Paper presented at the TIPS 2001 Annual Forum.

Panzar, J. & Rosse, J. (1987). Testing for monopoly equilibrium. *The Journal of Industrial Economics*, 35(4): 443-456.

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.

Rajan, R. (1992). Insider and outsiders, the choice between informed and arm's-length debt. *Journal of Finance*, 47: 1367-1400.

Randall, Ruby (1998). Interest Rate Spreads in the Eastern Caribbean. IMF Working Paper, WP/98/59

Senbet, L. & Otchere, I. (2005). Financial Sector Reforms in Africa: Perspectives on Issues and Policies. Annual World Bank Conference on Development Economics, Dakar, Senegal.

Sephooko Motelle and Nicholas Biekpe (2014) "Financial Intermediation spread and stability of the banking system in the Southern African Custom Union" *Managerial Finance*, Vol. 40 No. 3, 2014pp. 276-299

Shaffer, S. (2004). Patterns of competition in banking. *Journal of Economics and Business*.

Shaw, E.S. 1973. *Financial Deepening in Economic Development*. New York: Oxford University Press.

van Leuvensteijn, Michiel, Bikker, Jacob A., Van Rixtel, Adrian & Kok, Christoffer (2007). A new approach to measuring competition in the loan

markets of the euro area. Working Paper Series 0768, European Central Bank.

World Bank. Global Findex Database, 2016. [Data file]. Retrieved from <http://data.worldbank.org/data-catalog/global-financial-development>

## **APPENDICES**

### **APPENDIX 1.A: Description of Frontier African countries**

Frontier Market African countries are located in Sub-Saharan Africa and possess similar economic characteristics. These are countries with fairly developed financial sectors, positive macroeconomic performance, and increased flow of foreign direct investment. A consequence of this has been increased integration of Frontier African countries with international capital markets.<sup>1</sup>

Frontier markets can also be referred to as pre-emerging markets and are a subset of emerging markets. They are markets that are investable but have less capitalisation and whose equity markets do not meet the diversity, stability or liquidity standard to be considered emerging markets. In addition, frontier markets provide investors with strong macroeconomic fundamentals combined with favourable demographics.

Over the past decade, frontier markets have become more accessible to foreign investors through lowering of restrictions on foreign ownership, reductions in capital gains tax and increased liquidity in local markets. Another rationale for increased investment in these markets is the high returns that these markets have been proven to provide.

FM countries have also been classified by indices established by four major providers: Standard & Poor (S&P), MSCI, Russell and FTSE. These providers use different selection criteria and construction methodologies, which lead to diverse constituents and the choice of countries is not homogenous. For instance, the FTSE Frontier Index includes 21 countries, whereas the Russell Frontier Index represents a broader opportunity set of 39 countries. In total, 44 countries are included in at least one of the frontier markets indices from MSCI, FTSE, S&P, or Russell, and 15 countries overlap across all four

---

<sup>1</sup> Frontier African countries used in the study are Ghana, Uganda, Tanzania, Tunisia, Morocco, South Africa, Botswana, Mauritius, Kenya and Nigeria. In South Africa, 22 banking institutions were used. Tanzania and Uganda each comprises 15 licensed banking institutions. Other frontier African countries all have on average more than seven banking institutions.

providers. The sample in this thesis consists of countries that are identified across all the four providers: availability of data guides our choice of countries (see Appendix 1.C).

### **Appendix 1.B: Classification of Frontier African Countries by provider**

| <b>Country</b> | <b>Classification by Provider</b> |
|----------------|-----------------------------------|
| Botswana       | S&P, FTSE, Russell                |
| Ghana          | S&P, Russell                      |
| Kenya          | S&P, MSCI, FTSE, Russell          |
| Mauritius      | S&P, MSCI, FTSE, Russell          |
| Morocco        | MSCI                              |
| Nigeria        | S&P, MSCI, FTSE, Russell          |
| South Africa   | MSCI                              |
| Tanzania       | MSCI, Russell                     |
| Tunisia        | MSCI, FTSE, Russell               |
| Uganda         | MSCI                              |

As highlighted above, frontier African countries have comparable characteristics among which are a high level of banking concentration. South Africa and Botswana, for instance, are seen to have the highest levels of banking concentration in the sample and this is also evidenced in a study by Okeahalam (2001). The high level of bank concentration allows for very limited deposit and lending competition. Another salient characteristic of these countries is oligopolistic nature of the banking sector. In Uganda for instance, four foreign-owned banks account for 75% of deposits and assets. Similarly, four banks account for 65% of market share in Ghana. In Tanzania, four foreign banks account for 49% and three local banks account for 49% market share (Senbet and Otchere, 2005).

To develop the banking sector on the continent, a most of the countries in the study have carried out financial reform over the last thirty years. The reform process covered restructuring of poorly run state-owned banks, financial regulatory and supervisory framework, monetary policy framework, removal of interest rate controls and credit ceilings, as well as capital account liberalisation (Motelle & Biekpe, 2014). South Africa removed the financial rand system of exchange control over non-residents in 1995. The reform in

Ghana began with the partial liberalisation of interest rates in 1987 and removal of sectoral credit ceilings the following year. This was accompanied by liberalisation of access to foreign exchange and the licensing of foreign exchange bureaux (Brownbridge & Gockel, 1997). These patterns have been similar across all the ten frontier African countries. This overview considers three indicators of financial development in the Frontier Market African countries: the interest rate spread, bank capital to asset ratio, and bank deposit to GDP.

The spread between deposit and lending rates is taken as an indicator of the health of the financial sector. A persistent and wide financial intermediation interest rate spread can symbolise lack of competition, perceived market risk, bank unsoundness, scale diseconomies, distortionary regulatory constraints, and the underdevelopment of the financial sector (Randall, 1998). Table A1.2 shows that among the Frontier Market African countries for 2012, South Africa is the most efficient economy because it has the narrowest spread between lending and deposit rates. Uganda was the least efficient in this regard with the highest interest rate spread.

The bank capital to asset ratio measures the ratio of bank capital and reserves to total assets. Capital and reserves comprise funds contributed by owners, retained earnings, general and special reserves, provisions, and valuation adjustments. Total assets here include all nonfinancial and financial assets. Uganda has the highest ratio in the sample: this indicates that in the sample, this banking sector has higher levels of capital. This is important as capital can serve as a cushion against credit risks. At the other end of the spectrum, Botswana has the lowest ratio and that means it has the lowest levels of capital in its banking sector.

The rate of bank deposits to GDP is another good indicator of the health of the banking sector. This reflects the depth and spread as well as reach of banking in an economy. Table A1.2 shows the rate of bank deposits to GDP in Frontier African countries. South Africa, Mauritius and Morocco have the highest percentage of bank deposits to GDP, and Uganda has the lowest percentage of bank deposits to GDP.

**Appendix 1.C: Some stylised facts for the banking sectors in Frontier African Countries for 2012<sup>2</sup>**

| Country      | Interest rate spread | Bank capital to assets ratio (%) | Bank deposits to GDP (%) |
|--------------|----------------------|----------------------------------|--------------------------|
| Botswana     | 7.39                 | 7.06                             | 14.63                    |
| Ghana        | ..                   | 14.77                            | 31.34                    |
| Kenya        | 8.15                 | 13.55                            | 42.24                    |
| Morocco      | ..                   | 8.50                             | 113.69                   |
| Mauritius    | 2.43                 | 8.47                             | 112.68                   |
| Nigeria      | 8.39                 | 10.82                            | 20.80                    |
| South Africa | 3.31                 | 7.79                             | 180.70                   |
| Tanzania     | 5.95                 | 10.06                            | 17.98                    |
| Tunisia      | ..                   | 7.80                             | 83.22                    |
| Uganda       | 10.08                | 16.66                            | 13.75                    |

Source: World Bank Financial Database (2016)

<sup>2</sup> No interest rate spread data was available for Ghana, Morocco and Tunisia for 2012.

## **CHAPTER TWO**

### **OVERVIEW OF FINANCIAL SYSTEMS IN FRONTIER AFRICAN COUNTRIES**

#### **2.1 Introduction**

This chapter gives an overview of the historic, financial as well as regulatory background in the banking sector for selection of frontier African market countries. This chapter sets the context for the chapters that follow by analysing the similar historical country overviews as well as performance indicators. The analysis also covers two important themes, namely; performance indicators as well as financial reforms. The reforms included interest rate liberalisation bank restructuring as well as enhancement of bank regulation and supervisory policies. However, the characteristics of the individual Frontier economies indicate fairly low to moderate levels of development in the financial systems, with the exception of South Africa as Africa's leading economy boasting of highly developed financial markets.

#### **2.2 Historical overview**

The banking systems and subsequent financial regulation for the sample of frontier African countries were established during the period of colonisation by various European countries. Prior to the advent of colonialism, trade in these countries was dominated by foreign merchants: Arabs and Dutch amongst others. The currency used for transactions during this period consisted of Indian rupees, silver and gold coins. After the advent of colonialism, the various colonial powers established currency boards in the countries under their sphere of influence. For instance, a currency board was established in 1919 in the British colonies of East Africa, just after the acquisition of Tanganyika, a colony previously under German rule. The area of the board's operations, i.e. the East African shilling monetary area, consisted of Kenya, Uganda and Tanganyika. With this came the introduction of a common currency, the East African shilling. This common currency remained in place until 1965 when the liquidation of East African Currency Board was decided, and the three East African countries established their

own independent currencies. With this came the establishment and regulation of banks in the various colonies, for instance the 1952 Banking Ordinance, and the Banking Amendment Act in Nigeria (Oluduro, 2015). The core business of the banks was to offer trade finance, and mainly served the expatriate community. The oldest bank to be established in Uganda was Stanchart in 1912 and it has maintained a continuous presence in the country to date. In Kenya, the Kenya Commercial Bank was the first commercial bank to be set up in 1896.

In South Africa in 1782, the Dutch Governor Van Plettenberg was the first to introduce paper money, owing to his inability to procure from the Netherlands a sufficient quantity of coinage for the requirements of the settlement. This earliest paper money was issued in rixdollar and silver denominations, the currency of the Cape at that time. The first bank to be established in the Cape was the Lombaard Bank, which was a State bank and opened its doors in Cape Town in 1793, with the view of bringing additional money into circulation, and thus assisting those who suffered from lack of currency (SARB, 2017). This bank was entrusted with the issuing of government notes. The first private bank in South Africa was the Cape of Good Hope Bank which opened in 1837. South Africa later formed the Rand Monetary Area (RMA) which comprised countries in Southern Africa that were under its sphere of influence. At the time of independence in 1966, Botswana was a member of the Rand Monetary Area (RMA) and the South African rand served as the national currency. However, in 1974, the country decided to withdraw from the RMA, and the country introduced a new currency known as the Pula. Standard Chartered Bank Botswana was the first commercial bank to set up business in Botswana as early as 1897.

Like what had been done in East Africa, in 1912 the British colonial government set up the West African Currency Board (WACB) oversee the banks in Ghana, Gambia, Nigeria and Sierra Leone. This was disbanded in 1965 after most of these countries had attained independence. Standard Chartered Bank was also the first bank to set up operations in Ghana in 1896. In 1953, the first indigenous bank, Ghana Commercial Bank, was opened to

offer credit services to the native Ghanaians. In Nigeria, the history of banking in Nigeria dates to 1892 when Standard Chartered Bank started the activities of banking in Lagos.

Banks in North Africa operated under the supervision of the French authorities who ruled Algeria, Morocco and Tunisia as colonies. Banks such as Société Générale and Société Marseillaise de Crédit were granted permission to operate in these countries from 1900. The Banque de Algérie was first established in 1853 and spread its influence to most of North Africa. A decree was granted in 1904 authorising the bank to issue banknotes and discount bills in Tunisia. The same arrangement was put in place in 1907 for Morocco. The arrangement did not fare as well in Morocco because of the existence of the Banque d'Etat du Maroc which had been formed to carry out the same role.

For most of these countries, the formalised banking system was initially set up and supervised by the various colonial powers in the different territories. Most of the banks however were set up as branches of banks in the European countries. After gaining independence from the colonial powers, most of the African countries formed independent central banks with their own independence and autonomy. This independence and autonomy led most countries to pursue policies that led to lack of competitiveness and efficiency in their banking sectors, and inevitably to a need for reform in the financial sector.

### **2.3 Banking reforms**

Most countries in SSA underwent extensive financial sector reforms over the past 20 years. These reforms included liberalisation of interest rates, removal of credit ceilings, restructuring and privatisation of government-owned banks, introduction of a variety of measures to promote development of financial markets, including capital markets, along with bank supervisory and regulatory schemes. A particularly interesting outgrowth of these financial sector reforms has been a surge of interest in the establishment of stock exchanges and their rapid proliferation in recent years (Senbet and Otchere,

2006). This increase in growth has been evidenced in a particular subset of countries of which this sample of countries is drawn from. The frontier market countries in Africa have shown high growth rates in the banking sector, with increased bank penetration and increased levels of innovation for instance mobile banking. These countries have also established capital markets albeit in various stages of development and exhibited strong signs of sustainable private sector led growth. For this to take place, there has been the need to ensure that macroeconomic policy and capital account prudential policies are tailored to avoid the traps of volatile short-term flows, and that policies promote financial sector stability (Nellor, 2008).

This reform that was carried out was in response to various challenges that had been faced by the financial systems in Africa. The financial reforms in Africa were a turnaround of policies from the post-independence era where African governments intervened in the financial sector (Senbet and Otchere, 2006). The menu of intervention was quite extensive and included nationalisation of private banks, establishment of entirely new state banks and non-bank financial institutions, imposition of quantitative restrictions on the allocation of credit, and restriction of external capital flows. Although the intentions of government intervention in the financial sector might have been benevolent in the sense of mobilising capital needed for investments and allocating capital to priority sectors, the actions were counterproductive and produced utterly dysfunctional financial systems. Moreover, the intended goals of capital mobilisation and allocation of capital to growth areas were not realised. In fact, the repressive era produced a lost decade (the 1980s) for Sub-Saharan Africa when the region marched backwards while the rest of the world, particularly emerging countries in East Asia and Latin America, moved forward (Senbet and Otchere, 2006). Prior to the reforms, frontier African countries were characterised by narrow financial systems which were not equipped to sustain a comprehensive banking sector reform process over a brief period. Most of the frontier African countries exhibit heterogeneity in terms of characteristics of their financial systems in terms of the depth of

their financial markets and sophistication of their financial markets (Moyo et al., 2014).

The reforms in the financial sector encompassed the liberalisation of interest rates, as well as exchange rates, withdrawal of ceilings pertaining to credits, privatisation of banks (which were owned by the state), and restructuring of banks owned by the state. The discussion of the banking reforms in the frontier African countries under study has been categorised broadly into regulatory and supervisory reforms and payment and settlement system reforms.

## **2.4 Regulatory and supervisory reforms**

The regulatory and supervisory framework in the frontier market countries was strengthened with regulatory policies. The process was undertaken in a similar pattern across Africa, though what differed was the time of implementation. The reforms were carried out over a wide range of areas as articulated below.

As a first step, these countries passed banking laws that provided a foundation for the regulatory structure to take shape. These laws provided for minimum capital requirements, capital adequacy ratios, prudential lending ratios, exposure limits, and accounting and auditing regulations (International Monetary Fund, 1999; Barth et al., 2013). These laws were set up because financial liberalisation placed a strong demand on prudential regulation and supervision, and insufficient regulatory and supervisory framework would hamper effective financial liberalisation.<sup>3</sup>

Reforms included the liberalisation of interest rates as well as abolishment of credit controls in these frontier African countries. This was done to increase the interest rate in the different countries which was thought would increase the volume of financial savings through financial intermediaries and thereby raise investment funds (McKinnon, 1973). There were also reforms in priority sector lending stipulations that were removed, for instance, that banks could

---

<sup>3</sup> Table 2A.1 indicates the timeline in which the various regulatory and supervisory reforms were carried out in the countries in the sample.

no longer lend to the agriculture sector. The reforms also relaxed the entrance requirements for foreign banks into the banking sectors of the various countries.

The different countries in the sample also passed laws that strengthened their various central banks (See Appendix 2A for breakdown of the different laws passed in the sample of Frontier African markets). The intention of these laws was to restructure the banking sector to offer stronger supervisory and regulatory powers to the different central banks. These laws gave the central banks independence in the formulation of monetary and financial policies. They also enabled the financial system to be more transparent and accountable. These changes were aimed at ensuring price and financial stability and providing a favourable economic environment for sustainable economic growth. In addition, most of the governments sold the shares that they held in commercial banks in the different countries to bolster competition and efficiency in the different banking systems. For instance, the government of Uganda sold its equity in Uganda Commercial Bank in 1997, and the Ghanaian government did the same with Ghana Commercial Bank in 1996 (IMF, 1999).

To further enhance bank competition in these markets, the universal banking model was introduced as one of the financial reforms. This permitted commercial banks to move into investment or merchant banking and insurance with no requirement for separate licences. Prior to these reforms, banks were only allowed to undertake retail banking, corporate banking, etc. Universal banking was intended to give banks the ability to take on the higher level of intermediation needed to support growth in an expanding economy. Linked to this the reforms also looked at minimum capital requirements that could be held. The aim was to strengthen the capital base of the banks to enable them to assume greater levels of risk, particularly, at a time when banks could engage in universal banking.

Further to this, most of the countries in the sample introduced Foreign Exchange Acts into their financial systems. The purpose of this was to offer a new statutory structure for foreign exchange payments and transactions.

With this act in place, instead of controlling forex as occurred before the reform era, the central banks focused on monitoring foreign exchange transactions for balance of payments and other purposes in line with international best practice. The banks would then submit reports on all foreign exchange transactions to various central banks. The purpose of this was to entice inflows of foreign exchange into the various economies for foreign direct investment purposes. An exception to this is South Africa, which has still maintained firm control on foreign exchange through its National Treasury (SARB, 2016).

As part of the financial reforms, some countries in the sample introduced a Credit Reporting Act. The banks in these countries were supposed to provide credit details to the various bureaux that had been set up. The purpose for this was to reduce the information asymmetry that had characterised the lending function in most countries in Africa. This is because no borrowers (individuals or firms) will willingly submit unfavourable information relating to themselves or their businesses. The problem of information asymmetry puts the financial system at greater risk. Credit reporting would ensure better and faster credit evaluation which could improve transparency and reduce lending risks (Mehran et al, 2012). Having credible information about bank borrowers will help the banking industry to improve its credit risk management. This law also protects and enforces creditor rights and helps to establish confidence in the banking system (Mehran et al, 2012).

Many of the countries in the sample also instituted an anti-money laundering act within their financial systems. This was put in place to offer a system that would criminalise money laundering in the various African countries. In relation to this, these countries also set up Financial Intelligence centres, the sole purpose of which was identify and monitor money-laundering activities and report to the investigating authorities any information obtained. The Anti-Money Laundering law stipulates that a person commits the offence of money laundering if they knowingly convert, conceal, disguise, transfer, take possession of, or use property forming part of the proceeds of unlawful activity (PricewaterhouseCoopers, 2017).

Furthermore, the central banks in various countries started risk-based supervision (RBS) as one of the financial reforms. The banks complied by setting up risk management departments with well-trained personnel. The RBS process involves critical identification, measurement, continuous monitoring, management of risks associated with the operations of banks such as modern technologies, branch expansion, product innovation, size, linkages and interdependence of banks. The importance of risk management systems is that they are intended to improve the overall efficiency and effectiveness of the supervision process.

Many of countries in the sample also instituted the Borrowers and Lenders Act (see Appendix 2A). The importance of this reform was to ensure full disclosure of information by borrowers and lenders and disallow certain credit practices. It indicated the role of collateral in granting credit and set up a collateral registry for charges and collateral credited by borrowers. It gave lenders the authority to take ownership of collateral security after a borrower was given 30-day notice of default without appealing to the court (International Monetary Fund, 2011). Thus, the Borrowers and Lenders Act provides the lending conditions and rights and obligations of lenders and borrowers (PricewaterhouseCoopers, 2009).

Lastly, a key reform that was carried out was the adhering to the International Financial Reporting standards (IFRS). All banks in these countries were to report their financial position and performance in line with IFRS. The relevance of this was to improve transparency and facilitate comparison of reported financial results with banks operating in these frontier African countries and international banks.

## **2.5 Payment and settlement reforms**

The different African countries also set out to reform the payment and settlement structures within their financial systems. This process is still ongoing, with some countries in the sample having more developed payment

and settlement systems than others.<sup>4</sup> The infrastructure put in place has created an environment for safe, efficient, secure and timely payments. The central banks of the countries in the study implemented the necessary infrastructure to bring their banking sectors up to international standards and to ensure the efficiency of the payment and settlement system. They intended that this infrastructure would lower the overdependence on cash-based transactions. This system was carried out in a series of steps in no order across the countries in the sample.

The central banks in the various countries set up a common electronic platform, or national Switch, for all payment transactions within their financial systems. This common platform links all banking institutions at significantly reduced costs. It also connects all ATMs and the settlement of payments transactions by customers of different banks at Points of Sale (POS). The National Switches enable transactions to be undertaken both online and offline. In addition, other countries, for instance Ghana, went a step further and introduced a biometric smartcard (e-zwich smartcard). This smartcard is mainly used for cash deposits and withdrawals, transfer of e-money, POS purchases, card to bank, loading and withdrawal of wages and salaries (Breckenridge, 2010).

The different central banks also introduced Cheque Codeline Clearing (CCC) with cheque truncation system. CCC has reduced the clearing cycle from 5-8 days to 2 days throughout the different country bank systems (International Monetary Fund, 2011). This has led to an increase in the efficiency of bank settlements.

The various central banks also implemented Real Time Gross Settlement (RTGS) for high-value payments. The system provided a good environment for safe, sound, secure, and timely payments. It has also reduced systemic payments and settlement risks because transactions are settled almost

---

<sup>4</sup> Table 2.B looks at selected indicators for Availability of Information & Payments Systems in Frontier African countries

instantaneously. To ensure the settlement of low-value payments, the various central banks also introduced a paper-based credit clearing system.

These countries also introduced an electronic direct credits transfer system. This retail payment system operates on the Automated Clearing House (ACH) platform and facilitates large electronic credit transfer of funds into the accounts of bank customers. Thus, it accelerates the clearing of funds into the accounts of bank customers.

Lastly, some of the central banks introduced branchless banking that allowed mobile phones to be used to provide financial services. It is a fast, convenient and secure method that mobile phone users use to transact. The services allow users to deposit and withdraw funds, make account balance enquiries, bill payments and funds transfer. The mobile money service providers aim to offer mobile phone users the chance to use banking services without having bank accounts. Therefore, it would assist both the banked and unbanked to transfer money.

## **2.6 Performance of the banking industry in Frontier African countries**

The analysis of the performance of the banking industry in frontier African countries focused on the following indicators: profitability, solvency, loan portfolio quality and liquidity. To a significant extent, these indicators are positive for most of the indicators across the sample.

### **2.6.1 Profitability indicators**

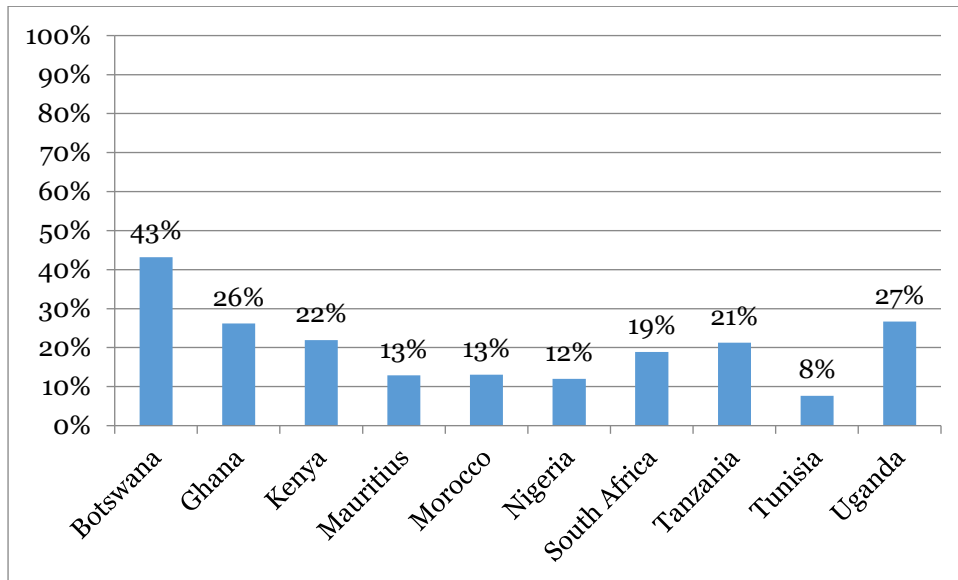
Two profitability ratios were used to study the profitability of the banking sector in frontier African countries.

#### **2.6.1.1 Return on Equity (ROE)**

ROE refers to the amount of net income that is retained as returns on shareholder's equity. Over the sample, we observe that Botswana has the highest average over the 10 years of study (43%). Tunisia has the lowest average (8%). Figure 2.1 shows the ROE averages across the sample in ROE from 2005 to 2014. We also observe a slight gradual decline in the ROE has across most of the African countries with the biggest downward trend

observed in Botswana. Appendix 2C shows the year trend per country over the time period. This shows the gradual decline across most countries with the exception of Tunisia. The overall industry's ROE over the 10-year period was 20.2%.

**Figure 2.1: Return on Equity (2005-2014 average)**

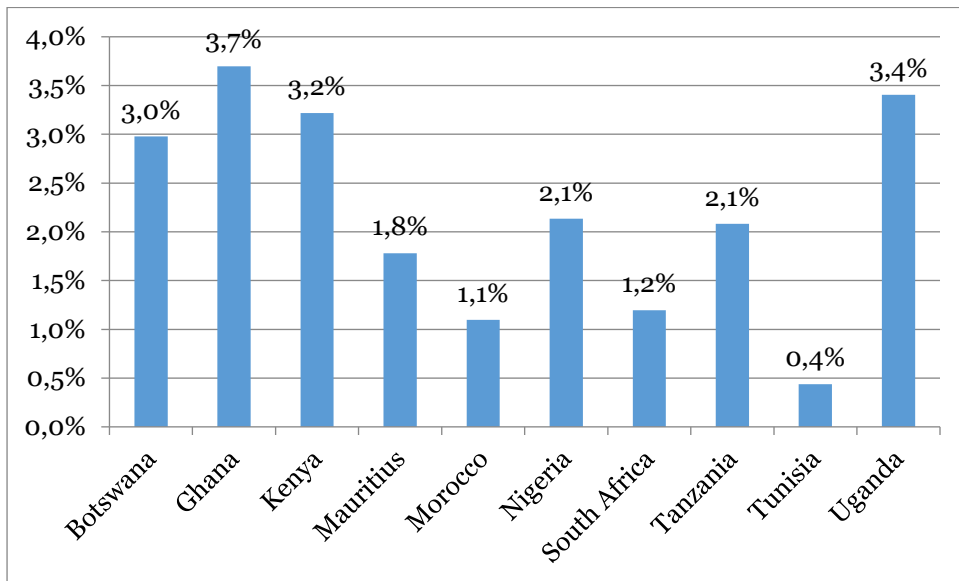


Source: World Bank Global Financial Development Database

### 2.6.1.2 Return on Assets (ROA)

The study observes a declining trend in the ROA across the years of study for most countries. The reason for this could be increased competition because of new banks entry into the banking sector. We observe that Ghana has the highest ROA (3.7%), with Tunisia having the lowest average (0.8%) across the sample. Figure 2.2 shows the ROA averages for 2005-2014. Appendix 2.B reflects the downward trend. Further Appendix 2D indicates the downward trend across the years for the countries in the sample.

**Figure 2.2: Return on Assets (2005-2014 average)**

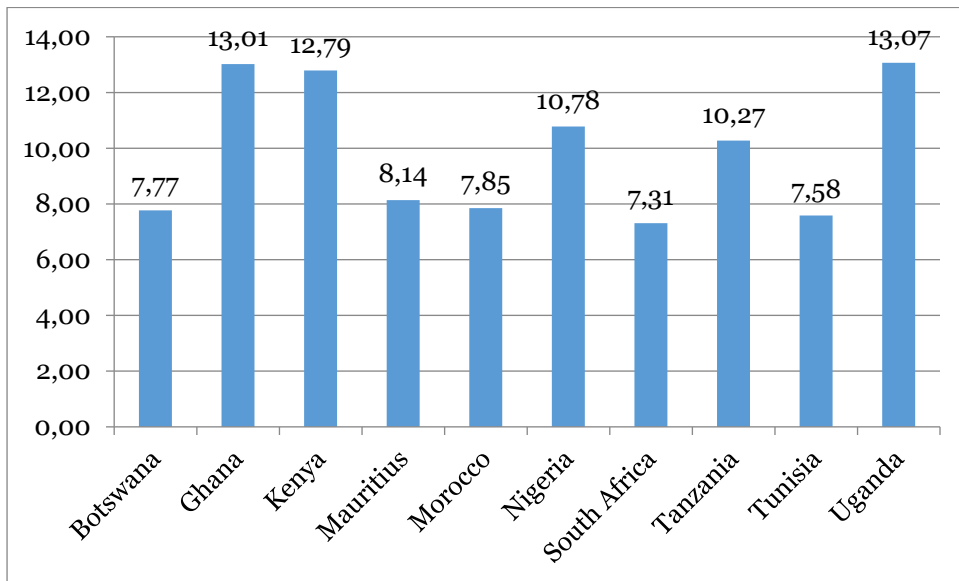


Source: World Bank Global Financial Development Database

### **2.6.1.3 Solvency indicator**

The capital adequacy ratio (CAR) measures banks' solvency. The industry's CAR is defined as the ratio of risk-weighted capital to risk-weighted assets. CAR determines the capacity of the banking system to absorb losses or risks. The aim is to protect depositors and other lenders and promote the stability and efficiency of the financial systems. Figure 2.3 shows the averages of the banking industry's capital adequacy ratio across the sample between 2005 and 2014. We observe the highest averages in Uganda (13.07%) and the lowest average in South Africa (7.31%).

**Figure 2.3: Capital Adequacy Ratio (2005-2014 average)**

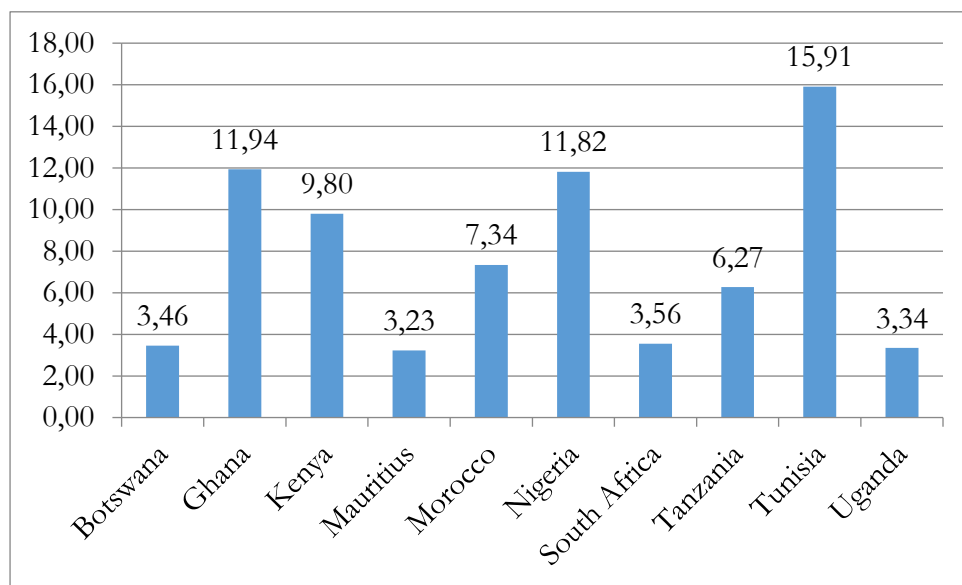


Source: World Bank Global Financial Development Database

#### **2.6.1.4 Asset Quality Indicator**

Non-performing loans (NPL) ratio is used as asset quality indicator. NPLs in Frontier Africa comprise loans that are 90 days or more past due. On average, we observe low percentages of NPL ratios across the banking industry in the Frontier African countries. We observe the highest ratios in Tunisia (15.91) and Ghana (11.94), and the lowest ratios are observed in Mauritius (3.23) and Uganda (3.34). High ratios usually reduce bank profitability and tie up bank capital, which inevitably impacts on credit supply. On average, however, the banking industry in frontier African countries has experienced low NPL ratios for the period from 2005 to 2014 (see Figure 2.4).

**Figure 2.4: Non-Performing Loans Ratio (2005-2014 average)**

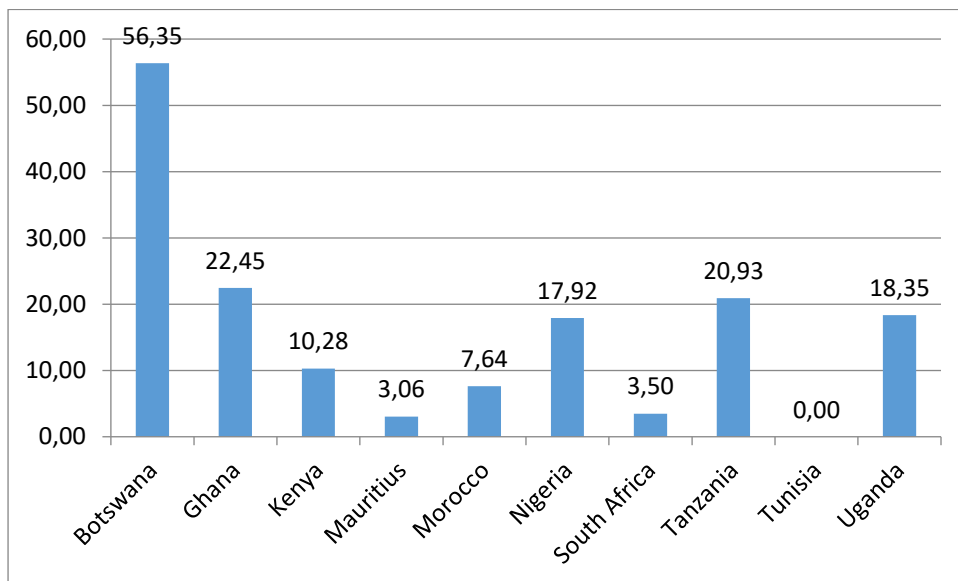


Source: World Bank Global Financial Development Database

### 2.6.1.5 Liquidity Indicator

Liquidity is defined as assets that can be transformed into cash quickly without much loss in value. It is measured by the ratio of liquid assets to total assets. Fig 2.5 shows the average values of liquidity across the sample between 2005 and 2014, we notice a declining trend across the sample, a plausible reason for this could be because banks held more funds in less risky assets and the various governments reduced their domestic borrowing to reduce interest rates. The aim of the government was to reduce inflationary pressures. However, the liquidity position of the banking industry appeared to be satisfactory. The rising trend in liquidity starting from 2006 was due to the abolition of the secondary reserves requirement in August 2006 which increased banks' liquidity (Mehran et al, 2012). Figure 2.5 illustrates the trend of liquidity in the banking industry between 2005 and 2014. We observe that Botswana has the highest average (56.35%) across the sample and Tunisia has the lowest (0.4%).

**Figure 2.5: Liquid to Total Assets Ratio (2005-2014 average)**



Source: World Bank Global Financial Development Database

## **2.7 Conclusion**

As discussed previously, the financial reform that was carried out in Frontier African countries was meant to redress the structural challenges that had been created in the different financial systems of the various countries post-independence. However, as the various performance indicators presented above have shown, in spite of the reform carried out, financial markets in the majority of the frontier market countries are relatively shallow and continue to display low levels of development.

The chapter that follows in this study measures the level of banking competition in frontier African countries and its impact on economic growth.

## REFERENCES

Barth, J., Caprio, G. & Levine, R. (2013). Bank regulation and supervision in 180 countries from 1999 to 2011. National Bureau of Economic Research Working Paper 18733.

Breckenridge, K. (2010). The world's first biometric money: Ghana's e-Zwich and the contemporary influence of South African biometrics. *Africa*, 80(4): 642-662.

International Monetary Fund. (1999). Ghana: Selected issues. IMF Staff Country Report No.99/3. Washington, DC: International Monetary Fund.

International Monetary Fund. (2011). Ghana: Financial system stability assessment update. IMF Country Report No.11/131, International Monetary Fund, Washington, D.C.

Mehran, H., & Mollineaux, L. (2012). Corporate governance of financial institutions. *Annu. Rev. Financ. Econ.*, 4(1), 215-232.

McKinnon, R.I. (1973). Money and capital in economic development. Washington, DC: The Brookings Institution.

Moyo, J., Nandwa, B., Council, D.E., Oduor, J. & Simpasa, A. (2014). Financial sector reforms, competition and banking system stability in sub-Saharan Africa. *New Perspectives*

Nellor, D. (2008, September). The rise of Africa's "frontier" markets. *Finance & Development*, 45(3), 30-33.

Oluduro, Olubisi Friday (2015). History and evolution of banking in Nigeria. *Academia Arena*, 7(1): 9-14.

PricewaterhouseCoopers. (2017). Anti-Money Laundering, Counter Terrorist Financing and Sanctions. [online] available; <https://www.pwc.co.za/en/services/advisory/anti-money-laundering-services.html> [23 April 2017]

Senbet, L. W., & Otchere, I. (2006, January). Financial sector reforms in Africa: perspectives on issues and policies. In *Annual World Bank Conference on Development Economics 2006: Growth and Integration* (pp. 81-120).

South African Reserve Bank. (2017). History of South African Banknotes 1782 to 1920 – South African Reserve Bank.[online] available;  
<https://www.resbank.co.za/BanknotesandCoin/SouthAfricanCurrency/BankNotes/Pages/HistoryofSouthAfricanbanknotes1782To1920.aspx> [27 May 2016]

## APPENDICES

### Appendix 2.A: Implementation of major bank regulatory reforms

|  | Tanzania   | Ghana | Kenya      | Tunisia    | Morocco          | Uganda          | Botswana   | Nigeria                  | SA         | Mauritius  |
|--|------------|-------|------------|------------|------------------|-----------------|------------|--------------------------|------------|------------|
| Passing Bank Regulatory Laws                         | 1991, 2006 | 1989  |            |            | 1993, 2009       | 1993            | 1990       | 1991,1997,1999, 2007     | 1990       | 2001       |
| Liberalisation of interest rates and credit controls | 1992, 1996 | 1990  | 1991, 1993 | 1987, 1994 | 1989, 1990, 1996 | 1992,1994       | 1990, 2009 | 1987,1991                | 1982, 1998 | 1987, 1992 |
| Laws strengthening Central Banks                     | 1965, 2006 | 1992  | 2015       | 1958,2007  | 1967, 1993       | 2000            | 1990       | 1958,1969,1997,1998,2007 | 1920,1990  | 2004       |
| Adopting Universal Banking Model                     |            | 2003  |            | 2006       | 1989             |                 |            | 2001, 2010               |            |            |
| Foreign Exchange Act                                 | 1992       | 2006  | 1992       | 1987, 2007 | 1990, 1993       | 1993,2004, 2010 | 1999       | 1986, 1988,1994, 1996    | 1961, 2011 | 1995, 2004 |
| Credit Reporting Act                                 | 2012       | 2007  | 2013       | 2006       | 2006             | 2004            |            | 2007                     | 2001       | 2002       |
| Anti-money laundering                                | 2006       | 2008  | 2009       |            | 2011             | 2010, 2013      | 2003       | 2011                     | 2001       | 2002       |
| Risk Based Supervision                               |            | 2007  |            |            | 2002             | 2010            |            | 2011                     | 1990       |            |
| Borrowers and Lenders Act                            | 2011       | 2008  | 2006       |            |                  | 2016            |            | 2008                     | 2005       | 2007       |
| International Financial Reporting standards          | 2014       |       | 1999       | 2005       | 2004             | 1998            | 2014       | 2012                     | 2011       | 2001       |

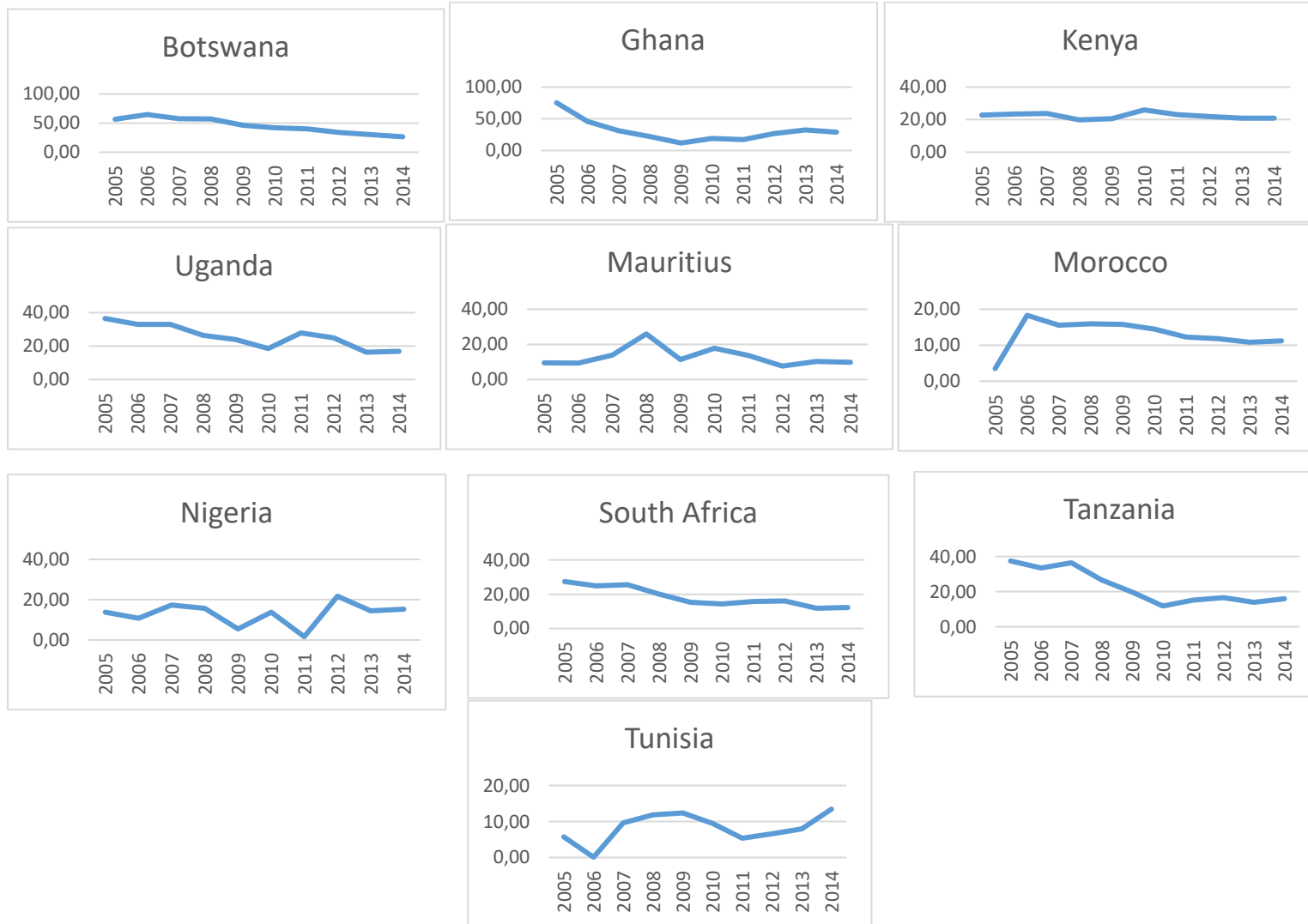
Source: Compiled by author from banking legislations of respective countries.

**Appendix 2.B: Payment and settlement systems**

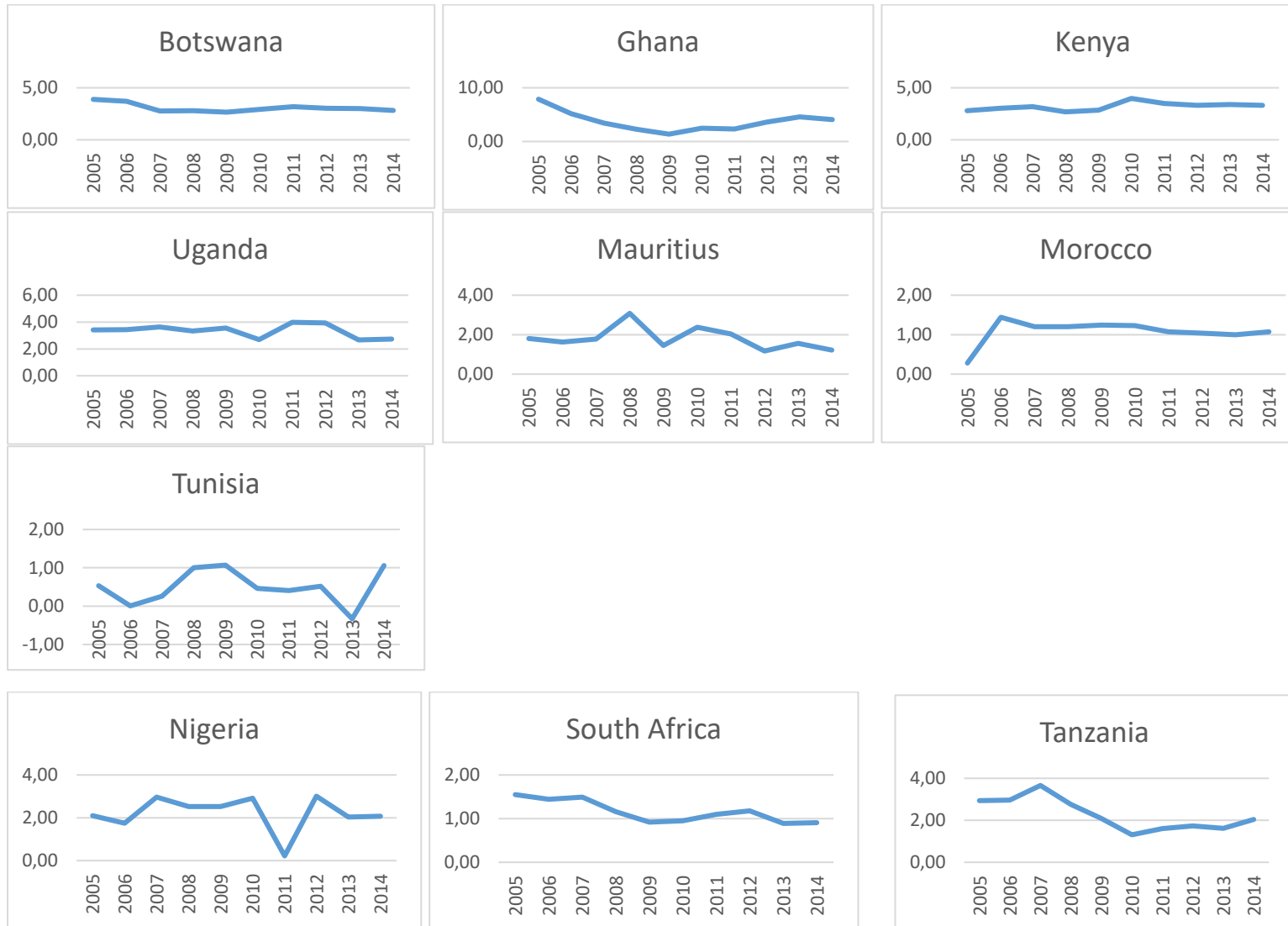
|              | Credit Bureaux | Branchless banking | Electronic Funds Transfer (EFT) | Real Time Gross Settlement (RTGS) | Cheque Codeline Clearing (CCC) | National Switches |
|--------------|----------------|--------------------|---------------------------------|-----------------------------------|--------------------------------|-------------------|
| Tanzania     | Yes            | Yes                | Yes                             | Yes                               | Yes                            | Yes               |
| Ghana        | Yes            | Yes                | Yes                             | Yes                               | Yes                            | Yes               |
| Kenya        | Yes            | Yes                | Yes                             | Yes                               | Yes                            | Yes               |
| Tunisia      |                |                    | Yes                             | Yes                               | Yes                            | Yes               |
| Morocco      | Yes            | Yes                | Yes                             | Yes                               | Yes                            | Yes               |
| Uganda       | Yes            | Yes                | Yes                             | Yes                               | Yes                            | Yes               |
| Botswana     | Yes            | Yes                | Yes                             | Yes                               | Yes                            | Yes               |
| Nigeria      | Yes            | Yes                | Yes                             | Yes                               | Yes                            | Yes               |
| South Africa | Yes            | Yes                | Yes                             | Yes                               | Yes                            | Yes               |
| Mauritius    | Yes            |                    | Yes                             | Yes                               | Yes                            | Yes               |

Source: Compiled by author from payment systems regulations of respective countries.

**Appendix 2.C: Return on Equity, Year Trend per Country**



**Appendix 2.D: Return on Assets, Year Trend per Country**



## **CHAPTER 3**

### **BANK COMPETITION AND ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM SELECTED FRONTIER AFRICAN COUNTRIES**

#### **3.1 INTRODUCTION**

The banking sector in Africa has undergone significant reforms over the last three decades following a period of mediocre performance. The reforms in the sector have looked at among other areas the liberalisation of credit markets, as well as interest rates. For example, interest rate controls in several African countries have been substituted with open market operations. There has also been privatisation of government run banks as a step to minimising inefficiencies in the sector (Fosu, 2013a). Evidence has highlighted that in developing countries with transparent financial regimes and where financial sector reforms have been carried out, competition in the banking industry has generally improved. In East Africa, some studies have indicated that financial sector reforms have motivated competitive pressures in the banking industry (Yildirim & Philippatos, 2007; Berger, Klapper & Turk-Ariss, 2009; Mugume, 2007). Bank competition has, therefore, been a subject of great academic interest and stays occupying a large body of empirical research. However, limited emphasis has been shed on the study of the impact of banking competition on economic growth. This is in spite of the fact that banking competition can significantly influence efficiency, innovation and quality services (Coccoresse, 2008). The impact of banking competitiveness on economic growth is therefore a major thrust of this research.

The main objective of this chapter is to test the hypothesis that banking competition is linked to economic growth. In the banking sector, the level of competition has implications for access to finance, allocation of capital funds, levels of economic growth and the extent of financial stability (Amidu & Wilson, 2014). Competition stimulates innovation, lowers prices and increases the quality of products and services produced, which in turn enhances choice and welfare and accelerates growth (Amidu & Wilson, 2014).

On the other hand, when banking systems are less competitive, borrowers will be less willing to engage with them, and in so doing lowering the demand for external backing from loans provided (Asante et al, 2011). Further, a less competitive banking system usually is costlier and also exhibits a lower quality of services, thus lowering the effective demand for external financing and therefore encouraging less growth (Claessens, 2005).

Extant literature on the association between banking competition and economic growth gives us imprecise results. On the one hand, conventional economic theory contends that the exercise of market power leads to an equilibrium position that is categorised by a higher rate of interest and a lower quantity of financing (Maudos & Fernandez de Guevara, 2006). As a result, the social inefficiency of monopoly adjusts into financing of a lesser number of investment projects, and thus into lower economic growth. Therefore, given investment opportunities in sectors of a country, the fact that some banks enjoy market power will reduce their incentive to invest in the most financially dependent sectors, therefore reducing their potential growth (Maudos et al., 2005). However, although market power results in higher costs of financing, there is no consensus as to its effects on the quantity of lendable funds. Therefore, it is argued that where market power exists, banks may have more motivation to invest in the acquisition of soft information by instituting close relationships with borrowers (relationship banking), thus allowing the availability of credit and then reducing firms' financial limits (Dell'Ariscia & Marquez, 2004; Maudos et al., 2005).

This study employs a two-stage approach to achieve its main objective. In the first stage, the Boone (2008) indicator was used to estimate competition of ten Frontier African countries between 2005 and 2012. In the second stage, the estimated Boone Indicator (BI) is used as the explanatory variable in a growth model using gross domestic product (GDP) growth as the dependent variable. Trade openness and gross fixed capital formation were employed as controls. The empirical model was estimated with the random effects model of regression.

The chapter also discusses the relationship between bank competition and economic growth in two ways. First, BI is used to measure competition in the banking sector (Boone, 2008). The BI makes the assumption that in a competitive environment, more efficient firms gain a larger market share than in a non-competitive environment (Fosu, 2013). This implies that there is more efficient allocation of resources which leads to economic growth. Second, the study examines the association between banking competitiveness and economic growth on a larger sample size of select frontier market economies of Africa

The subsequent sections of the chapter are organised as follows. Section 3.2 reviews the literature on the impact of banking competition as well as the relationship with economic growth. Section 3.3 outlines the source of data used, as well as provides explanations on the approaches used. Section 3.4 discusses the results of the study and Section 3.5 provides the conclusion of the study.

## **3.2 Review of the literature**

### **3.2.1 Banking competition**

Competition in the banking sector is of significant value because it impacts on the efficacy of production of financial services, the quality of financial products as well as the degree of financial innovation (Claessens, 2009). A study by Claessens & Laeven (2004) argues that the degree of banking competition can impact the access of households and firms to banking services, which in turn influences overall economic growth. The measures of competition can be classified into two main categories: the traditional structural measures of competition and the new empirical industrial organisation (NEIO) models (i.e. the non-structural approach). The Structure-Conduct-Performance (SCP) paradigm, was initially developed by Mason (1939) and Bain (1956) and seeks to describe aspects of the conduct and performance of firms in terms of the structural characteristics of the markets in which they operate. The structural characteristics of a market cover the number of firms and their absolute and relative size as well as the entry and

exit conditions and the extent of product differentiation (Léon, 2014). The traditional measures use concentration indices under the SCP paradigm or the efficient-structure hypothesis. Among the SCP measures commonly used is the Herfindahl-Hirschman Index (HHI).

However, inadequacies in the structural approach have led to several attempts to collect empirical evidence on the nature of competition by observing the conduct directly. The NEIO makes inferences about competitive pressure by directly observing the conduct of firms in the market. The NEIO employs a variety of different methodologies requiring different data and assumptions (Léon, 2014). In addition, a study by Carbó-Valverde et al. (2009) highlights that the first generation of non-structural measures is based on the oligopoly theory (neoclassical conception of competition). These models include the Lerner Index, the conjectural variation models (Iwata, 1974; Bresnahan, 1982; Lau, 1982) and the Panzar and Rosse (1987) model. One of the common non-structural indicators used to assess competitive behaviour is based on a model introduced by Panzar and Rosse (1987). This is derived from a reduced-form revenue function using bank-level data. The H-statistic measures the extent to which changes in factor prices are reflected in revenues. Panzar and Rosse show that this statistic can reflect the structure and conduct of the market to which the firm belongs. The H-statistic also measures the degree of bank-competition over a specific period, however it does not capture the evolution of bank competition. In addition, Bikker and Haaf (2002) and Jeon et al. (2011) set out to account for this by estimating the time-varying version of Panzar and Rosse's H-statistic to account for the market dynamic of a banking system. However, this approach also has limitations. For instance, use of the time-varying H-statistic implies that either bank competition is increasing or decreasing over time, and this is not in accordance with the real world, since if competition increases in one year, it may decrease or be constant in the next year.

Another method to estimate competition is the Lerner model that was developed by Lerner (1934). It develops from the (static) theory of firm models under equilibrium conditions and characteristically uses some form of price

mark-up against a competitive benchmark. Lerner index is calculated as the mark-up of price (average revenue) over marginal cost: the higher the mark-up, the greater is the realised market power.

This study uses the Boone indicator (BI), which is a more recent NEIO methodology for the measurement of competition. Boone (2000, 2004) and Boone et al. (2005) formulated the Boone indicator, which measures the impact of efficiency on performance in terms of profits or market-share. The underlying concept behind the indicator is that competition improves the performance of efficient banks and impairs the performance of inefficient banks. This is reflected in their respective profits or market share. The BI approach is closely associated with the well-known efficiency hypothesis, which also explains banks' performances by differences in efficiency (Goldberg & Rai, 1996). The hypothesis of the BI model takes two steps. First, efficient banks with lower marginal costs, gain higher market-share or profits. Second, this is translated into the fact that, if the stronger this effect is, the higher the degree of competition in that market (Mirzaei & Moore, 2014).

In a model where a bank decides to enter a market with prior knowledge that other banks have already entered, all competitors strategically decide to maximise their after-entry profits. Further, a subgame perfect equilibrium can be identified in which the firm's profits are related to its efficiency and are conditional on a measure of the aggressiveness of the firms' conduct in the market (Duygun et al., 2013). Therefore, comparing the relative profits between a randomly selected efficient bank and a bank with greater efficiency contains information about the level of competition in the industry, given that the more competitive the market is, the stronger the relationship between efficiency differences and performance differences.

The BI (2008) is measured using firm-level data as a percentage change in profits ( $\pi$ ) due to 1% change in marginal costs (MC). In practical terms, the Boone approach has advantages for studies on developing countries that often have a challenge of lack of data. The fact that it requires relatively little data makes the BI a very practical methodology. This is contrary to the other bank competition methodologies such as the Bresnahan model, which are very data

intensive (van Leuvensteijn et al., 2007). The BI approach requires only information on profits (or market shares) and costs. If costs are assessed using average costs, the computation of the BI does not require information on prices. Further, the Boone estimation is obtained using a simple linear econometric specification (only one equation with one exogenous variable) (Léon, 2014).

The literature on bank competition in Africa has been scant. However, many studies have provided some insight into work done thus far. For instance, Sanya and Gaertner (2012) offer evidence on countries in East African community and the results show that competition in the four countries was low. Turk Ariss (2010) further measures banking competition in a sample of 61 countries including 14 Sub-Saharan African countries over the 1999-2005 period. The study shows that banks tend to extract larger rents in Africa than in other regions (Léon, 2014). A study by Biekpe (2011) establishes that Ghanaian banks are monopolistically competitive. Chen (2009) also provides evidence using a more comprehensive sample of Sub Saharan African countries. The study finds that the degree of competitiveness varied across countries. Buchs and Mathisen (2005) carry out a study on banks in Ghana and note that financial reforms did not adequately foster banking competition, while Hauner and Peiris (2008) find contrasting evidence for Uganda (Simpasa, 2013). Delis (2012) used the Boone (2008) indicator on a large sample of developing and developed countries, including 11 African economies, and the study found that the degree of competition is higher than the global average for just three countries; Kenya, Cameroon and Senegal (Léon, 2014). Clerides et al. (2015) further carry out a study on banking competition to estimate the degree of competition in banks of 148 countries over the period 1997-2010 using three methods: the Lerner index, the adjusted Lerner index, and the profit elasticity. The results from countries in Sub-Saharan Africa seem to be the least competitive across all indices.

### **3.2.2 Banking competition and economic growth**

Economic growth can be caused by the activity of banks, provided that they act as intermediaries between providing loans and taking deposits, the former

coming from those use them as productive capital. A generally accepted result of this statement is that competitive financial markets can improve the intermediation process and spur economic growth. Banks would pay higher returns on deposits and ask for lower loan rates, thus inducing an increase of both savings and investments, with the result that countries would experience higher rates of economic growth (Carbó Valverde, et al, 2003; Cetorelli & Gambera, 2001). This could also explain why governments focus on promoting a higher degree of financial efficiency and competitiveness.

In the literature, the resounding view is that financial development is central to the needs of any economy (see Cameron, 1967; Goldsmith, 1969; McKinnon, 1973; Shaw, 1973). The studies emphasize that well-developed financial markets are critical to economic development and thus foreshadowing a causality running from financial development to economic growth.

There are two areas of research in which the direct or indirect effect of banking competition on economic growth have been analysed. First, studies on the importance of relationship banking, analysing the consequence of the intensity and duration of banking relationships on firms' conditions of finance. These studies have measured the impact of competition in the banking markets on the terms of the finance given, i.e. both on the cost of financing as well as the availability of credit, which has an effect on investment and economic growth. In the second case, several studies have measured directly the effect of banking competition on economic growth using aggregate sector information samples of countries.

The literature that examines the relationship between bank structure and macroeconomic performance is further defined by two distinct models: partial equilibrium models and general equilibrium models. Partial equilibrium models focus on aspects of the bank-borrower relationship and is not disturbed by the overall economic impact of the assumed banking industry structure. General equilibrium models consider the deposit side of banking as well as the influence of the banking structure on the economy, however the model leaves out many details in the analysis of the relationship between

banks and borrowers. In relation to the overall economic impact, the partial equilibrium models find the influence of a monopolistic structure of the banking industry on the whole economy is beneficial, or at worst ambiguous, given that it ensures the stability of industry (Caminal & Matutes, 2002; Greenbaum & Thakor, 1995; Schnitzer, 1999). In the general equilibrium models, this influence is harmful, or at best ambiguous, because only a competitive banking system grows economic activity and reduces the severity of the business cycle (Cetorelli, 1997; Guzman, 2000; Smith, 1998).

A study by Pagano (1993) shows that that imperfect competition in credit markets introduces inefficiencies that can limit a firms' access to credit, and in so doing hinder growth. Some other studies indicate that, in the presence of monopolistic power, banks are better motivated to establish lending relationships with firms, and thus facilitating the access to credit lines: Mayer (1988, 1990) and Petersen and Rajan (1995) argue this position. Primarily, when analysing credit availability for a cross-section of U.S. small businesses located in markets where different degrees of bank concentration exist, Petersen and Rajan find that firms are less credit-constrained in more concentrated banking markets, and younger firms are charged lower loan rates.

A study by Cetorelli and Gambera (2001) uses an extension of the Petersen and Rajan data set, with both cross-industry and cross-country characteristics, to examine whether the market structure of the banking sector has empirical relevance for economic growth. The study finds that the concentration in the banking sector determines a general deadweight loss which in turn depresses growth, impacting all sectors and all firms indiscriminately.

A focus on literature from Africa finds that while studying Egypt's financial structure and its relation to total factor productivity, Bolbol, Fatheldin and Omran (2005) establish that the banking system has a positive influence on growth only when related with higher per capita GDP. A study by Allen and Ndikumana (2000) used several indicators of financial development to measure the role of financial intermediation in stimulating economic growth

in southern Africa. Their results indicate a positive relationship between financial development and economic growth, lending support to the finance-led growth hypothesis.

Further studies by Cetorelli and Gambera (2001) and Claessens and Laeven (2005) also examine the relationship between banking competition and economic growth. The former empirically analyses the effect of the concentration of banking markets on the economic growth of sectors in the 1980s, using a sample of 41 countries and 36 manufacturing sectors. The results indicate that bank concentration promotes the growth of the youngest firms in the sectors most dependent on external finance, facilitating access to credit for the youngest firms (Maudos and Fernández de Guevara, 2011). However, the study also finds a negative effect of concentration on growth and this affects all sectors and firms broadly. As such, if we use market concentration as a measure of competition, greater market power would favour the economic growth of the youngest firms, precisely those in which asymmetries of information and uncertainty are most intense (Maudos and Fernández de Guevara, 2011).

There are few studies on banking competition in Africa primarily because of lack of adequate data. However, despite this some studies on Africa have been carried out, for instance Fosu (2013) examines the extent of banking competition in African sub-regional markets. This study uses a dynamic version of the Panzar–Rosse model that is adopted beside the static model, to assess the overall extent of banking competition in each sub-regional banking market over the period 2002 to 2009. The study results submit that African banks generally demonstrate monopolistic competitive behaviour. Simpasa (2011) examined the nature of competitive conditions in the Tanzanian banking sector between 2004 and 2008 using the Panzar–Rosse methodology. This study indicates that banks in Tanzania operate under monopolistic competition.

Poshakwale and Qian (2011) analyse the impact of increased competition and efficiency in commercial banking on the Egyptian economy. Their results indicate that the Egyptian banking sector has become more competitive over

the years. Their results also indicate a positive relationship between competition and economic growth in the short run. There is no evidence of a long-run relationship between banking competition and economic growth.

Economic growth is also influenced by several variables aside from banking competition. Several studies have attempted to analyse varying factors that influence economic growth. Barro (1997) investigated factors affecting economic growth in developing countries using a sample of 18 developing countries and using the growth rate of real per capita GDP as a proxy for economic growth. He finds that economic growth is influenced by maintenance of rule of law, longer life expectancy, smaller government consumption, higher levels of schooling, lower fertility rates, elevated level of investment, openness to trade, lower inflation and improved democracy.

Foreign direct investment has been cited as having either a positive or negative impact on economic growth (see Caves, 1971; Rappaport, 2000; Hanson, 2001; Aitekn & Harrison, 1999). International trade is also seen as a factor influencing economic growth: Kavoussi (1984) established that higher rates of economic growth were strongly correlated with higher rates of export growth. In addition to the factors outlined above, Upreti (2015) further identifies natural resource yield, government debt and net foreign aid received as other factors influencing economic growth.

Governance has also been found to have an impact on economic growth as a study carried out for 71 developed, developing and transition countries between 1996 and 2003 has shown. Arusha (2009) highlights in this study that countries with high governance grow faster compared with those with weak governance.

In addition, Murphy et al. (1993), Mauro (1995) state that corruption tends to have a negative effect on economic growth. These studies demonstrate that corruption has a negative influence on economic growth. Institutional framework has also been found to have an impact on economic growth. Rodrik (2000) states that five kinds of institutional frameworks (property rights, regulatory institutions, institutions for macroeconomic stabilization,

institutions for social insurance and institutions of conflict management) can have a direct outcome on growth and on other determinants of economic growth.

Further, political factors like political regimes, political instability, civil freedom, the perception of politics play also an important role in fostering economic growth and (Lensink et al., 1999). Socio-cultural factors also have an important role on economic growth. For instance, ethnic diversity and fragmentation, language, religion, civic norms, beliefs are among the sociocultural determinants that may have an effect on economic growth (Acemoglu, 2009).

Lastly Acemoglu (2009) also highlights that geography can affect economic growth. For instance, soil quality can have an influence on agricultural productivity, and natural resources directly contribute to the industrialization of a country by essential components for production (Boldeanu and Constantinescu, 2015).

### **3.3 Data and estimation methodology**

The data used in the study was obtained from the Bankscope database. The sample is drawn from ten African frontier market countries over the period 2005-2012. The study employs the growth rate of the per capita real GDP as a dependant variable. This is in line with a study by Claessens et al. (2003) which uses the logarithm of per capita GDP as a proxy for the level of development of the country. This study borrows this as a control for the countries' economic development and macro-economic stability as these can be expected to affect banking system performance. However, Demirgüç-Kunt et al. (2003) find that banking system structure indicators have a less close relationship with competitiveness indicators in more developed countries (Claessens et al. 2003).

The independent variable is the BI indicator (Boone, 2008) (see Appendix 3.A for details of the technique) for the aggregate of banks operating in each country. A negative value of the indicator indicates greater competition in the

banking sector. A random effects test was then employed to test the relationship between the banking competition and economic growth in the sample. To ascertain the ‘most optimal panel data estimation approach between fixed and random effects, we use the Hausman specification test. Further and in line with Hoechle (2007) and Green (2003), all the regression equations are estimated with robust standard errors to correct for heteroscedasticity and cross-sectional correlation in the panels (Simpasa, 2011).

### **3.3.1 Estimating banking competition: the Boone Indicator**

Boone (2008) formulated an innovative method of estimating competition. The Boone indicator ( $\beta$ ), as it is called, stipulates that competition improves the performance of efficient firms and weakens the performance of inefficient ones. The BI is based on the efficiency structure hypothesis by Demsetz (1973). The indicator measures the impact of efficiency on performance, in terms of profits and market shares. The stronger this effect is, the larger in absolute values  $\beta$  will be. This factor makes Boone indicator the ideal model to use to capture the dynamics of the market rather than focusing on static analysis. The equation to identify the BI bank  $i$  is defined as follows:

$$\ln\pi_{it} = \alpha_i + \lambda_t + \beta_t \ln MC_{it} + \varepsilon_{it} \quad \dots (3.1)$$

Where  $\alpha$  is the firm fixed effect,  $\pi$  measures the percentage change in profit,  $\lambda$  is a time dummy and  $\varepsilon$  measures the idiosyncratic shock. In addition, since theoretically profits and marginal costs have a negative relationship, the elasticity  $\beta$  should be negative. Further, a larger  $\beta$  in absolute value reflects a more competitive industry and can be interpreted as a reduction in the ability of the bank to affect its losses due to an increase in competition (Gaffeo & Mazzochi, 2014; pp:3).

Two main tenets make the BI an appealing approach. First, it has a robust theoretical underpinning as a measure of competition. Explicitly, it can accurately depict the when level of competition becomes more intense through more aggressive interactions between firms and when entry barriers are reduced. The BI (2008) models the change in competition using two

parameters: the conduct parameter, which mirrors the aggressiveness of firms, and the change in entry costs (Schiersch & Schmidt-Ehmcke, 2010). Second, it has similar data requirements as measures of competition grounded on price-cost margins (Boone, 2008). Gaffeo and Mazzochi (2014) further confirm that an increase in the efficiency of banks driven by greater competition contributes positively to economic growth.

Under the efficiency hypothesis (Demsetz, 1973), more efficient firms attain greater performance in regard to higher profits at the expense of their less efficient rivals and also attract greater market share. The model exploits this reallocation effect from inefficient to efficient firms. In the most extreme case, the reallocation effect is combined with a selection effect insofar as the least efficient firms leave the market (Léon, 2014). Boone (2008) shows that the reallocation effect rises monotonically with the degree of competition. While an intensification of competition can decrease the output of firms, this decrease will be smaller for more efficient firms. As a consequence, the market share and profits for more efficient firms rise while those of the less efficient firms decline. Said differently, the relative profit difference is sensitive to the degree of competition (Léon, 2014).

The fact that the relationship between costs and profits is continuous and monotonic is the main advantage of the Boone approach. In most cases, higher competition infers that the value of  $\beta$  is greater in absolute terms (more negative), and consequently,  $\beta$  serves as a continuous indicator of competition (Léon, 2014).

The BI requires only information on profits (or market shares) and costs. If costs are assessed by average costs, the computation of the BI does not require information on prices. Furthermore, the Boone estimation is obtained by a simple linear econometric specification (that is only one equation with one exogenous variable) (Léon, 2014).

The main advantage of the BI is that it can both capture market dynamics and be easily implemented for a limited number of observations (by employing average costs as measure of efficiency). However, one should note that the BI

is a comparatively new tool and therefore has not yet been thoroughly scrutinised by the literature.

### **3.3.2 Empirical model: banking competition and economic growth**

The key objective of this study is to evaluate the level of bank competition and its relationship with economic growth in a sample of frontier African countries. The study uses the BI to test for bank competition and then runs a random effects regression to analyse the relation between banking competition and economic growth. Both of these approaches have sound theoretical underpinnings as well as empirical appeal. The analysis also allows comparison of the estimated results with those obtained from previous studies, especially in developing countries.

The model used to analyse the effect of banking competition on economic growth is the random effects model of regression. The study builds on a model of specification adopted in Beck and Levine (2004). The model uses the annual growth rate of real per capita GDP as the dependent variable and a variable representing bank competition as the independent variable. The benchmark econometric model takes the following form:

$$y_{it} = \alpha_i + \omega\beta_i + \gamma_i X_{i,t} + \varepsilon_{i,t} \quad \dots(3.2)$$

Where

$y_{i,t}$  is real per capita GDP growth,

$\beta_i$  is the Boone Indicator,

$X_{i,t}$  represents a set of control variables,

$i$  and  $t$  represents country and time.

The control variables used are:

*Trade Openness:* Empirical studies describe trade openness in several ways and various approaches have been used in the attempt to capture, via a summary measure, the multifaceted nature of trade openness. David (2007) contends that as a result of this, a plethora of measures of trade openness have been created. Examples of these studies include Leamer (1988), Sachs

and Warner (1995), and Harrison (1996). This study uses the trade ratio approach.

*Log of gross fixed capital formation (LGCF)* is an additional variable used in the study. The variable is a measure of the sum value of a producer's acquisition, minus disposals of fixed assets during the accounting period plus certain additions to the value of non-produced assets realised by the productive activity of institutional units (Saleh, 1997). Uremadu (2007) further defines gross fixed capital formation as an addition in stock of capital assets. It is a part of the stock of capital assets set that is used for future productive activities in the real sector. It gains from savings accumulation which gives a positive effect to private savings accumulation, in other word contributes more savings (Hussin & Saidin, 2012).

The inflation variable is used to control for macroeconomic stability. The study proxies the inflation rate by using the annual growth rate of the CPI index. In line with the literature (see Barro, 1995; Ghosh & Phillips, 1998; Quartey, 2010), we can expect a negative coefficient sign between inflation rate and economic growth.

### **3.3.3 Estimation technique**

This study uses the random effects model to analyse the effect of bank-competition on economic growth across the sample.

The advantage of using the random effects panel estimator is that it allows us to estimate the effect of variables which are constant across banks (in each country) and over time. Another advantage is its robustness as the total residual is partitioned into two groups within and between groups, and its ability to accommodate distinct characteristics compared to the fixed effects model. Also, because of a short time series, the random effects model is often used to address this limitation.

The random effects case model is defined as follows:

$$y_{i,t} = \beta^l X_{i,t} + \varepsilon_{i,t} \quad \dots (3.3)$$

where  $\varepsilon_{i,t} = \mu_{i,t} + v_{i,t}$  reflect the error component instabilities. The individual effects are random but distributed normally ( $\mu_i \rightarrow IIN(0, \sigma_\mu^2)$ ). They are also independent of the residual term  $u_{it}$  which is also normally distributed.

The estimation results in Table 3.4 show that, despite the conditioning information set employed, an increase in bank competition exerts a highly significant positive effect on real growth, and that this effect turns out to be considerably stable as the set of controls is varied. Point estimates are also economically significant.

### **3.4 Empirical results**

#### **3.4.1 Estimation of bank competition**

This section presents the results from the BI estimation. To get the marginal costs, the study estimates a translog cost function for each country in the sample. I then regress these marginal costs on the market share in the loans market. The coefficient of this last variable ( $\beta$ ) is the BI. From the initial sample of 123 banks, the benchmark model is estimated on a sample of 107 frontier African banks. The sample size reduces because of missing data of some variables from certain periods in the sample. The more negative this indicator is, the more competitive the banking sector. The negative sign at the 1% level for the BI also confirms that banking competition increases via the efficiency channel.

The results of the BI by country for the period under study are presented in Table 3.4. These show that the BI scores vary across the sample of frontier African countries over the study period. From the results, we can also observe that competition has evolved differently across the frontier African countries. In some countries, where bank competition has decreased (Tanzania, Kenya, Tunisia and Mauritius), in others bank competition has increased (Ghana). For other countries, there are even years where the BI is not statistically different from 0 (zero) or significantly positive (Botswana and South Africa). The positive values for The BI may indicate perfect collusion. There is however a challenge of missing data in the samples which explains the missing data for some countries.

From the results of the study, Tunisia, Tanzania and Mauritius are observed to have the most competitive banking sectors in the sample. This result is consistent with the concentration results presented in Table 3.2. The rest of the countries experience varying levels of competition over the eight-year study period. The Wald test shows that the BI is significantly different from zero.

From Table 3.4, we also observe from the estimated results that the structure of the banking industry in South Africa, which is Africa's biggest economy, is characterised by monopolistic competition. This is indicated by the positive values of the BI estimates. This may reflect domination of the South African banking sector by five large banks, which together account for over 85% of total banking assets. The evidence is consistent with a 2008 Report by the Competition Commission on Banking, which found that the largest banks in the country tend to avoid outright competition against each other (Mlambo & Ncube, 2011).

**Table 3.4: Boone Indicator scores (2005–2012)**

|              | 2005       | 2006       | 2007       | 2008       | 2009       | 2010       | 2011       | 2012       |
|--------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Botswana     | -0.3395*** | -0.1847*** | -0.0187*** | -0.012     | -0.0075    | 0.00077    | 0.00491    | 0.00804    |
| South Africa | 0.55254    | .45980*    | .65622***  | .62098**   | .53973***  | .43797**   | 0.1095     | 0.57651    |
| Uganda       | -          | -          | -          | -0.1870**  | -0.191     | -0.2094    | -0.116     | -0.18      |
| Tanzania     | -0.0649*** | -0.0436*** | -0.0445*** | -0.0512*** | -0.0522*** | -0.0459*** | -0.0492*** | -0.0648*** |
| Tunisia      | -0.1244*** | -0.1131*** | -0.0563*** | -0.0194*   | -0.0129    | -0.0141*   | -0.0159    | -          |
| Nigeria      | -0.069     | -0.0671*   | .00237*    | -0.0405    | -0.1901*   | -0.1430*   | -0.0108*   | -0.0544*   |
| Mauritius    | -0.0210*   | -0.0315*   | -0.0329**  | -0.0449*   | -0.0232    | -0.0177*   | -0.0115    | -0.0176*   |
| Morocco      | -          | -1.47      | -2.027     | -0.6121    | -0.4684    | -0.4144    | -0.2097    | 0.06498    |
| Kenya        | -0.8114    | -1.152*    | -0.5611    | 0.20946    | 0.40191    | -0.0588    | 0.00982    | -0.1432    |
| Ghana        | -          | 1.5266     | .67179*    | 1.0976**   | -          | -          | -0.1815    | -          |

Source: Own calculations

Note: \*\*\*, \*\* and \* denote significance levels of 1%, 5% and 10%

### 3.4.2 Estimating relation between banking competition and economic growth

This section gives a detailed discussion of the regression estimates and examines the relationship between banking competition and economic growth using the random effects model of regression.

**Table 3.5: Competition and economic growth: random effects results**

|                            | SYSTEM GMM    |                  |               | DIFFERENCE GMM |                  |               |
|----------------------------|---------------|------------------|---------------|----------------|------------------|---------------|
|                            | <i>Coef.</i>  | <i>Std. Err.</i> | <i>P&gt;z</i> | <i>Coef.</i>   | <i>Std. Err.</i> | <i>P&gt;z</i> |
| <b>Constant</b>            | 1.179***      | 0.363            | 0.001         | -1.076         | 0.703            | 0.126         |
| <b>EG.L</b>                | 0.986***      | 0.013            | 0.000         | 0.715***       | 0.025            | 0.000         |
| <b>BOONE</b>               | <b>0.062*</b> | <b>0.032</b>     | <b>0.053</b>  | <b>0.033*</b>  | <b>0.018</b>     | <b>0.069</b>  |
| <b>TRADE</b>               | -0.130*       | 0.074            | 0.081         | 0.016          | 0.025            | 0.520         |
| <b>LGCF</b>                | -0.035***     | 0.011            | 0.001         | 0.184***       | 0.038            | 0.000         |
| <b>AR(1):p-value</b>       | 0.106         |                  |               | 0.1266         |                  |               |
| <b>AR(2):p-value</b>       | 0.516         |                  |               | 0.2263         |                  |               |
| <b>Hansen J:p-value</b>    | 0.315         |                  |               |                |                  |               |
| <b>Sargan:p-value</b>      |               |                  |               | 0.3199         |                  |               |
| <b>Number of Countries</b> | 10            |                  |               | 10             |                  |               |
| <b>Observations</b>        | 64            |                  |               | 53             |                  |               |

Source: Own calculations

Note: \*\*\*, \*\* and \* denote significance levels of 1%, 5% and 10%

The estimation results presented in Table 3.5 show both results of the random effects and fixed effects regression. The fixed effects model results are included as a check for robustness. These results indicate that the banking competition measure proxied by the BI has a positive and significant effect on economic growth at the 5% level. This specifies that an increase of 1 percentage point in banking competition could cause a 0.013 percentage point rise in per capita real GDP growth over an 8-year period. Thus, an increase in competitiveness of the banking sector exerts a significant positive effect on real growth. This

effect turns out to be noticeably stable as the set of controls vary. Point estimates as well are statistically significant.

The trade openness variable is significant but has a negative coefficient in relation with the real GDP growth over the eight-year period for the sample of frontier African banking sectors. This could in part be because the real exchange rate volatility has a significant negative impact on investment, and volatility in the terms of trade having a negative impact on economic growth (Bleaney & Greenaway, 2001). The study result is consistent with Wong (2009) who finds a significant negative relationship between terms of trade and GDP per capita using annual time series data of Japan and Korea from 1996 to 2003 and 1971 to 2006 respectively (Maudos & Guevara, 2006).

The study finds the gross fixed capital formation variable significant and with a positive coefficient in relation to the real GDP growth of the African countries. This is an expected sign and is consistent with the literature as gross fixed capital formation is one of the prime determinants of economic growth, because it either increases the physical capital stock in domestic economy directly (Plossner, 1992).

In addition, the study observes a positive coefficient for the inflation variable. This intuitively means that an increase of 1 point in real GDP growth could cause a 0.173 percentage point rise in inflation over the 8-year period. This goes against several studies that indicate an increase in economic growth leads to a decrease in inflation (Ghosh & Phillips, 1998; Quartey, 2010; Bittencourt, 2012; Seleteng et al., 2013). However, the study result is in line with Mallik and Chowdhury (2001) and Umaru and Zubairu (2012) who find that an increase in per capita GDP leads to a rise in inflation. However, this coefficient was observed to be insignificant across both estimations.

### **3.5 Conclusion**

We studied the impact of bank competition on economic growth in a sample of 10 Frontier African countries. The study used data from 107 banks from these countries over the years from 2005–2012 and employed a two-step approach. First, we used the Boone Indicator estimates as a measure of bank

competition: this measure assumes that competition drives efficiency. The BI results vary across the sample. For instance, bank competition has increased in some countries (Tanzania, Tunisia and Mauritius) over the years of study but in others (e.g. Kenya and Ghana), bank competition has decreased. For others like South Africa, banks have experienced years where the BI is not statistically different from 0 (zero) or significantly positive. Overall, Tunisia, Tanzania and Mauritius have the most competitive banking sectors in the study. Second, I used the random effects model of regression to examine the effect of bank competition on economic growth. The estimation results show that banking competition measures, proxied by the Boone Indicator, appear significant with a correct sign in our preferred specification. An increase of 1 point in banking competition, as proxied by the BI, results in an 0.013 percentage point raise in per-capita real GDP growth over an 8-year period. An increase of competitiveness in the banking sector applies a significant positive effect on real growth, and the effect turns out to be significantly stable as the set of controls varies. In addition, the control variables used for inflation and trade openness are positive and negative respectively and both insignificant. However, we observe a positive and significant co-efficient for gross fixed capital formation.

Based on the empirical findings, the estimates from the study suggest that bank competition could be beneficial for economic growth. As bank competition increases via the efficiency channel, this ultimately increases economic growth. Our results are consistent with the literature, Gaffeo & Mazzocchi (2014), for instance, confirm that an increase in the efficiency of banks, driven by fiercer competition, contributes positively to economic growth. These outcomes are important from a policymaker's point of view, first because a competitive banking system will allocate resources more efficiently and economic growth is likely to improve as a result. In addition, policies that sustains a higher growth of GDP could be put in place. These would create a vicious cycle with benefits on the efficiency of the banking sector, which in turn would lead to real growth. To this end, it would be in

the best interest of the central bankers from the frontier African countries to establish policies that favour competition in their individual banking sectors.

The study has not been without limitations. The sample period is short, and this may affect the robustness of some of the estimates as well as the choice of methodology used to measure the relationship between per capita GDP growth and bank competition. The inability to cover a longer sample period is due to the limited availability of data.

## References

- Acemoglu, Daron. 2009. *Introduction to modern economic growth*. Princeton NJ: Princeton University Press.
- Amidu, M. & Wilson, J.O.S. (2014). *Competition in African banking: do globalization and institutional quality matter?* Working papers, Responsible Banking and Finance.
- Arusha, Cooray V. 2009. "Government Expenditure, Governance and Economic Growth." *Comparative Economic Studies* 51(3): 401-418.
- Asante, S., Agyapong, D., & Adam, A. M. (2011). Bank competition, stock market and economic growth in Ghana. *International Journal of Business Administration*, 2(4), 33.
- Bain, J. (1956). *Barriers to new competition*. Cambridge: Harvard Press.
- Barro, R.J. (1997) *Determinants of Economic Growth: A Cross-Country Empirical Study* (Cambridge, MA: MIT Press).
- Barro, R.J. (1995). *Inflation and economic growth*. NBER Working Paper No. WP 5326.
- Berger, A. N.; L. F. Klapper; and R. Turk-Ariss. "Bank Competition and Financial Stability." *Journal of Financial Services Research*, 35(2009), 99-118
- Biekpe, N. (2011). The competitiveness of commercial banks in Ghana. *African Development Review*, 23: 75-87.
- Bikker, J. & Haaf, K. (2002). Measures of competition and concentration in the banking industry: a review of the literature. *Economic & Financial Modelling*, 9(2): 53-98.
- Bittencourt, M. (2012). Inflation and economic growth in Latin America: some panel time-series evidence. *Economic Modelling*, 29: 333-340.
- Bleaney, M. and D. Greenaway (2001). "The Impact of Terms of Trade and Real Exchange Rate on Investment and Growth in Sub-Saharan Africa," *Journal of Development Economics*, 65, 491-500.

- Bolbol, A., Fatheldin, A. & Omran, M. (2004). Ownership structure, firm performance, and corporate governance: evidence from selected Arab countries. Working paper, Arab Monetary Fund, Abu Dhabi.
- Boone, J. (2000). Competition. CEPR Discussion Paper Series No. 2636.
- Boone, J. (2004). A new way to measure competition. CEPR Discussion Paper Series No. 4330.
- Boone, J. (2008). A new way to measure competition. *Economic Journal*, 118: 1245-1261.
- Boone, J., Griffith, R. & Harrison, R. (2005). Measuring competition. Working Paper No. 22, Advanced Institute of Management Research.
- Boldeanu, Florin Teodor and Liliana Constantinescu. "The Main Determinants Affecting Economic Growth". *Bulletin of the Transilvania*, Vol. 8 (57) No. 2. (2015), p. 329-338.
- Bresnahan, T.F. (1982). The oligopoly solution concept is identified. *Economics Letters*, 10: 87-92.
- Buchs, T.D. & Mathisen, J. (2005). Competition and efficiency in banking: behavioural evidence from Ghana. Working Paper No. WP/05/17, International Monetary Fund, Washington, DC. Available at: [www.imf.org/external/pubs/ft/wp/2005/wp0517.pdf](http://www.imf.org/external/pubs/ft/wp/2005/wp0517.pdf) (accessed 10 June 2014).
- Cameron, R. (1967). *Banking in the early stages of industrialization*. New York, NY: Oxford University Press.
- Caminal, R. & Matutes, C. (2002). Market power and banking failures. *International Journal of Industrial Organization*, 20(9): 1341-1361.
- Carbó-Valverde, S., Gardener, E.P.M. & Williams, J. (2002). Efficiency in banking: empirical evidence from the savings banks sector. *Manchester School*, 70(2): 204-228.

Carbó Valverde, Santiago, David Humphrey, and Rafael López del Paso (2003), "The Falling Share of Cash Payments in Spain," *Moneda y Crédito*, 217, 167-190.

Carbo Valverde, S., Humphrey, D., Maudos, J. & Molyneux, P. (2009). Cross-country comparisons of competition and pricing power in European banking. *Journal of International Money and Finance*, 28(1): 115-134.

Carbó, S., Fernández de Guevara, J., Humphrey, D. & Maudos, J. (2005). The intensity of price and non-price competition in banking. Documento de Trabajo DT 2- 05, Fundación BBVA, Bilbao.

Caves, R.E. (1971). International corporations: the industrial economics of foreign investment. *Economica*, 38: 1-27.

Cetorelli, N. (1997). Competitive analysis in banking: appraisal of the methodologies. *Economic Perspectives*, Federal Reserve Bank of Chicago, 23: 2-15.

Cetorelli, N. & Gambera, M. (2001). Banking market structure, financial dependence and growth: international evidence from industry data. *Journal of Finance*, 56: 617-648.

Chen, C. (2009). Bank efficiency in Sub-Saharan African middle-income countries. IMF Working Paper, 09/14: 1-34.

Claessens, S. (2003). Designing financial systems in transition economies. *Economics of Transition*, 11(1): 197-199.

Claessens, S. (2005). Access to financial services: a review of the issues and public policy objectives. Policy Research Working Paper Series 3589, The World Bank.

Claessens, S. (2009). Competition in the financial sector: overview of competition policies. *The World Bank Research Observer*, 24(1): 83-118.

Claessens, S. & Laeven, L. (2004). What drives bank competition? Some international evidence. *Journal of Money, Credit and Banking*, 36(2): 563-583.

Claessens, S. & Laeven, L. (2005). Financial dependence, banking sector competition, and economic growth. *Journal of the European Economic Association*, 3: 179-207.

Claessens, S., Dobos, G., Klingebiel, D. & Laeven, L. (2003). The growing importance of networks in finance and its effects on competition. In Nagurney, A. (Ed.), *Innovations in Financial and Economic Networks*. Northampton, MA: Edward Elgar Publishers, pp. 110-135.

Clerides, S., Delis, M.D. & Kokas, S. (2015). A new data set on competition in national banking markets. Discussion Paper, New York University Salomon Center.

Coccorese, P. (2008). An investigation on the causal relationships between banking concentration and economic growth. *International Review of Financial Analysis*, 17(3): 557-570.

David, V. (2007). Theories of bank behavior under capital regulation. *Journal of Banking & Finance*, 31(12): 3680-3697.

Daumont, R., Le Gall, F. & Leroux, F. (2004). Banking in Sub-Saharan Africa: what went wrong? Working Paper No. 04/55(2004-2055), IMF.

Deidda, L. & Fattouh, B. (2002). Concentration in the banking industry and economic growth. Working Paper No. CRENoS 200202, Centre for North South Economic Research, University of Cagliari and Sassari, Sardinia.

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

Dell’Ariccia, G. & Bonaccorsi di Patti, E. (2004). Bank competition and firm creation. *Journal of Money, Credit, and Banking*, 36(2): 225-251.

Dell’Ariccia, G. & Marquez, R. (2004). Information and bank credit allocation. *Journal of Financial Economics*, 72: 185-214.

Demirgüç-Kunt, A., Laeven, L. & Levine, R. (2003). Regulations, market structure, institutions, and the cost of financial intermediation. National Bureau of Economic Research, WP 9890.

Demsetz, H. (1973). Industry structure, market rivalry and public policy. *Journal of Law and Economics*, 16: 1-9.

Duygun, M., Shaban, M. & Weyman-Jones, T. (2013). Measuring competition using the Boone relative profit difference indicator: an application to banking systems in emerging economies. *Economics Discussion Paper Series No. WP 2013-05*.

Fernandez de Guevara, J. & Maudos, J. (2011). Banking competition and economic growth: cross country evidence. *The European Journal of Finance*, 17(8): 739-764.

Fosu, S. (2013a). Banking competition in Africa: sub regional comparative studies. *Emerging Markets Review*, 15: 233-254.

Fosu, S. (2013b). Capital structure, product market competition and firm performance: evidence from South Africa. *The Quarterly Review of Economics and Finance*, 53(2): 140-151.

Gaffeo, E. & Mazzocchi, R. (2014). Competition in the banking sector and economic growth: panel based international evidence. *DEM Discussion Papers 2014/02*, Department of Economics and Management.

Ghosh, A. & Phillips, S. (1998). Warning: inflation may be harmful to your growth. *IMF Staff Papers*, 45(4): 672-710.

Goldberg, L.G. & Rai, A. (1996). The structure-performance relationship for European banking. *Journal of Banking & Finance*, 20(4): 745-771.

Goldsmith, R.W. (1969). *Financial structure and development*. New Haven, CT: Yale University Press.

Green, W.H. (2003). *Econometric analysis*. Upper Saddle River, NJ Pearson : Prentice Hall.

Greenbaum, S. & Thakor, A.V. (1995). Contemporary financial intermediation. Fort Worth, TX: Dryden Press.

Guzman, M. (2000). Bank structure, capital accumulation, and growth: a simple macroeconomic model. *Economic Theory*, 16(2): 421-455.

Hanson, G. (2001). Should countries promote foreign direct investment? G-24 Discussion Papers 9, United Nations Conference on Trade and Development.

Harrison, A., (1996). 'Openness and growth: A time series, cross-country analysis for developing countries', *Journal of Development Economics*, 48, 419-447.

Hauer, D. & Peiris, S. (2008). Bank efficiency and competitiveness in low-income countries: the case of Uganda. *Applied Economics*, 40(21): 2703-2720.

Hoechle, D. (2007). Robust standard errors for panel regressions with cross-sectional dependence. *Stata Journal*, 7(3): 281-312.

Hussin, F. and Saidin, N., 2012. Economic Growth in ASEAN-4 Countries: A Panel Data Analysis. *International Journal of Economics and Finance*, 49(1), pp. 119-127.

Iwata, G. (1974). Measurement of conjectural variations in oligopoly. *Econometrica: Journal of the Econometric Society*, 42(5): 947-966.

Jeon, B.N., Olivero, M.P. & Wu, J. (2011). Do foreign banks increase competition? Evidence from emerging Asian and Latin American banking markets. *Journal of Banking & Finance*, 35(4): 856-875.

Kavoussi, R.M. (1984). Export expansion and economic growth. *Development Economics*, 14(1): 241-250.

Lau, L. (1982). On identifying the degree of competitiveness from industry price and output data. *Economics Letters*, 10(1-2): 93-99.

Leamer, E.E. (1988). Measures of openness. In: *Trade Policy Issues and Empirical Analysis*. National Bureau of Economic Research, Inc. pp. 145-204. Ed: Baldwin, R.

- Léon, F. (2014). Measuring competition in banking: a critical review of methods, CERDI, January (2014)
- Lerner, A. (1934). The concept of monopoly and the measurement of monopoly power. *The Review of Economic Studies*, 1(3): 157-175.
- Levine, R. & Renelt, D. (1992). A sensitivity analysis of cross-country growth regressions. *American Economic Review*, 82: 942-963.
- Lensink, Robert, Hong Bo, and Elmer Sterken. 1999. "Does Uncertainty Affect Economic Growth? An Empirical Analysis." *Weltwirtschaftliches Archiv* 135: 379-396.
- Mallik, G. & Chowdhury, A. (2001). Inflation and economic growth: evidence from four south Asian countries. *Asian Pacific Development Journal*, 8(1): 123-135.
- Mason, E. (1939). Price and production policies of large-scale enterprise. *The American Economic Review*, 29(1): 61-74.
- Maudos, J. & Fernandez de Guevara, J . (2006). "The cost of market power in banking: social welfare loss vs inefficiency cost. *Journal of Banking and Finance*, 31(7): 2103-2125.
- Maudos, J., Carbó, S., Fernández de Guevara, J. & Humphrey, D. (2005). The intensity of price and non-price competition in banking. *Documento de Trabajo DT 2-05*, Fundación BBVA, Bilbao.
- Maudos, J. and J. Fernández de Guevara (2011): "Banking competition and economic growth: Cross-country evidence", *The European Journal of Finance*, 17(7-8).
- Mauro, Paolo. 1995. "Corruption and Growth." *Quarterly Journal of Economics* 110: 681-712.
- Mayer, C. (1988). New issues in corporate finance. *European Economy Review*, 32: 1167-1183.

- Mayer, C. (1990). Financial systems, corporate finance and economic development. In: Hubbard, G.R. (Ed.), *Asymmetric Information, Corporate Finance and Investment*. Chicago, IL: University of Chicago Press.
- McDonald, C. & Schumacher, L. (2007). Financial deepening in Sub-Saharan Africa: empirical evidence on the role of creditor rights protection and information sharing. Working Paper No. WP/07/203, IMF.
- Mckinnon, R. (1973). *Money and capital in economic development*. Washington, DC: The Brookings Institution.
- Mirzaei, A. & Moore, T. (2014). What are the driving forces of bank competition across different income groups? *Journal of International Financial Markets, Institutions and Money*, 32(2): 38-71.
- Mlambo, K. & Ncube, M. (2011). Competition and efficiency in the banking sector in South Africa. *African Development Review*, 23(1): 4-15.
- Mlachila, M., Park, S.G. & Yabara, M. (2013). *Banking in Sub-Saharan Africa: the macroeconomic context*. IMF working paper.
- Motelle, S. & Biekpe, N. (2014). Financial Intermediation spread and stability of the banking system in the Southern African custom union. *Managerial Finance*, 40(3): 276-299.
- Mugume, A. (2007). Market structure and performance in Uganda's banking industry. Paper presented to the African Econometrics Society, Cape Town.
- Murphy, Kevin M., Andrei Shleifer, and Robert W. Vishny. 1993. "Why is Rent Seeking So Costly to Growth?." *American Economic Review* 84(2): 409-414.
- Okeahalam, C. (2001). *Structure and Conduct in the Commercial Banking Sector of South Africa*. Presented at TIPS 2001 Annual Forum.
- Pagano, M. (1993). Financial markets and growth: an overview. *European Economic Review*, 37: 613-622.
- Panzar, J. & Rosse, J. (1987). Testing for 'monopoly' equilibrium. *The Journal of Industrial Economics*, 35: 443-456.

Petersen, M. & Rajan, R. (1995). The effect of credit market competition on lending relationships. *Quarterly Journal of Economics*, 110: 407-443.

Plossner, C. (1992). The search for growth in policies for long-run economic growth. Federal Reserve Bank of Kansas City, Kansas City, MO.

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.

Quartey, P. (2010). Price stability and the growth maximizing rate of inflation for Ghana. *Business and Economic Journal*, 1(1): 180-194.

Randall, R. (1998). Interest rate spreads in the Eastern Caribbean, IMF Working Paper, WP/98/59.

Rappaport, J. (2000). Is the speed of convergence constant? Federal Reserve Bank of Kansas City RWP 00-10. December.

Rajan, R. & Zingales, L. (1998). Financial dependence and growth. *American Economic Review*, 88: 559-587.

Rodrik, Dani. 2000. "Institutions for High-quality Growth: What they are and How to Acquire them." *Studies in Comparative International Development* 35: 3-31.

Sachs, J.D. & Warner, A.M. (1995). Natural resource abundance and economic growth. Working Paper No. 5398, National Bureau of Economic Research Cambridge, MA (revised 1997, 1999).

Saleh, K (1997) 'The Measurement of Gross Domestic Fixed Capital Formation in Indonesia.' Paper presented at the OECD Capital Stock Conference, Canberra, 10-14 March 1997

Sanya, S. & Gaertner, M. (2012). Assessing bank competition within the East African community. Working Paper No. 12/32, International Monetary Fund.

Schiersch, A. & Schmidt-Ehmcke, J. (2010). Empiricism meets theory: is the Boone-indicator applicable? Discussion Paper 1030, DIW Berlin.

Schnitzer, M. (1999). On the role of bank competition for corporate finance and corporate control in transition economies. *Journal of Institutional and Theoretical Economics*, 155(1): 22-46.

Senbet, L.W. & Otchere, I. (2006). Financial sector reforms in Africa: perspectives on issues and policies. *Annual World Bank Conference on Development Economics: Growth and Integration*, pp. 81-120.

Seleteng, M., Bittencourt, M. & van Eyden, R. (2013). Non-linearities in inflation-growth nexus in the SADC region: a panel smooth transition regression approach. *Economic Modelling*, 30: 149-156.

Shaffer, S. (1998). The competitive impact of disclosure requirements in the credit card industry. *Journal of Regulatory Economics*, 15(2): 183-198.

Shaw, E.S. (1973), *Financial deepening in economic development*. New York, NY: Oxford University Press.

Simpasa, A.M. (2011). Competitive conditions in the Tanzanian banking industry. *African Development Review*.

Simpasa, A.M. (2013). Competition and market structure in the Zambian banking sector. African Development Bank, Working Paper No. 168.

Smith, T. (1998). Banking competition and macroeconomic performance. *Journal of Money, Credit, and Banking*, 30: 793-815.

Turk Ariss, R. (2010). On the implications of market power in banking: evidence from developing countries. *Journal of Banking and Finance*, 34(4): 765-775.

Umaru, A. & Zubairu, J. (2012). The effect of inflation on the growth and development of the Nigerian economy: an empirical analysis. *International Journal of Business and Social Science*, 3(10): 187-188.

Uremadu, S. O. (2007), "A Review of Financial Indicators of banks Recapitalization and Performance", *Lagos Journal of Banking, Finance & Economic Issues*, Vol. 1, No. 1, pp. 74 - 93

Upreti, P. (2015). Factors affecting economic growth in developing countries. Major Themes in Economics, pp. 37 – 54. Available at: <http://business.uni.edu/economics/themes/Upreti.pdf> (Accessed: 10 May 2016)

van Leuvensteijn, M., Bikker, J.A., van Rixtel, A. & Kok Sørensen, C. (2007). A new approach to measure competition in the loan markets of the euro area. ECB Working Paper Series No. 768.

Wong, H.T. (2009). Terms of trade and economic growth in Japan and Korea: an empirical analysis. *Empirical Economics*, 38: 139-158. doi: 10.1007/s00181-009-0259-9.

World Bank (2010). A new database on financial development and structure. Available at: <http://go.worldbank.org/X23UD9QUX0> (accessed 3 May 2016).

Yildirim, S.H. & Philippatos, G.C. (2007). Competition and contestability in central and eastern European banking markets. *Managerial Finance*, 33: 195-209.

## APPENDICES

### Appendix 3.A: Calculation of Boone Indicator (BI)

The BI captures the link between competition and efficiency in a direct manner. It is based on the efficient-structure (ES) hypothesis in the sense that more efficient firms are more profitable (or attain higher market shares), and this relation increases with the degree of market power. More formally (and following closely Boone, Griffith & Harrison 2005), assume that each bank  $i$  produces one symmetrically differentiated product  $q$  at time  $t$  and faces a demand curve of the form (Brissimis et al., 2014).

$$p(q_i, q_{-i}) = a - bq_i - d \sum_{j \neq i} q_j,$$

where  $p$  is the price of the product  $q$ ,  $a$  corresponds to the size of the market,  $b$  corresponds to the market elasticity of demand,  $d$  captures the extent to which consumers view the different products in a market as close substitutes, and  $j$  is a competitor. Each bank chooses  $q$  to solve

$$\max \{(a - bq - d \sum_{j \neq i} q_j)q - mc_i q\},$$

where  $a > mc > 0$  and  $0 < d \leq b$ . For a Cournot-Nash game, the first-order condition is

$$a - 2bq_i - d \sum_{j \neq i} q_j - mc_i = 0.$$

If  $N$  banks are present in the banking system, one obtains  $N$  first order conditions of the form

$$q(mc_i) = [(2b/d - 1) a - (2b/d + N - 2) mc_i + \sum_{j=1} mc_j] / [(2b + d(N - 1))(2b/d - 1)].$$

A bank's variable profits are defined as

$$\pi(mc_i) = (a - bq(mc_i) - d \sum_{j \neq i} q(mc_j))q(mc_i) - mc_i q(mc_i) = 0.$$

These profits are variable in the sense that they do not include the entry cost  $\gamma$  of a bank in the market. In other words, a bank with marginal cost  $mc_i$  enters the industry if and only if  $\pi(mc_i) \geq \gamma$ . Given the above equations, Boone, Griffith, and Harrison (2005) verify that variable profits can be written as

$$\pi(mc_i) = b[q(mc_i)]^2$$

Two ways can be considered in which competition can change within this model. Competition increases (i) when goods become more substitutable (that is,  $d$  increases) and (ii) when entry costs  $\gamma$  are lower. Now define the relative profits measure of market power as

$$RP(mc_i, mc_j) = \pi(mc_i)/\pi(mc_j).$$

The following lemma shows the output reallocation effect that is important in understanding why this measure is a robust indicator of competition.

Lemma 1. The effect of an increase in  $d$  on relative variable costs with  $c_i < c_j$  is;

$$\frac{\partial \left\{ \frac{c_i q(c_i)}{c_j q(c_j)} \right\}}{\partial d} > 0$$

The effect of a fall in  $\gamma$ , which permits bank  $N + 1$  to come in the industry on relative variable costs with  $c_i < c_j$ , is;

$$\frac{\partial \left\{ \frac{c_i q(c_i)}{c_j q(c_j)} \right\}}{\partial N} > 0$$

The lemma shows that an increase in competition, either through a rise in  $d$  or a fall in  $\gamma$ , reallocates output from relatively inefficient to more efficient banks. Because of equation (11), the lemma also implies that an increase in competition raises profits of relatively more efficient banks (or reduces the profits of the relatively more efficient banks by less). Hence, relative profits are a robust measure of competition, because any change in competition intensity that reallocates output from less efficient to more efficient banks increases the profits of the more efficient banks relative to the less efficient. So, if, for example, a bank wants to keep its inputs higher than its efficient level of employment, output will be reallocated to other banks in the industry. This holds as long as there exists one bank in the industry that maximises profits. In the empirical analysis, we are using a world sample of banks with all banks pooled together under a technique that allows this (i.e., pooling

together all banks) irrespective of the different technologies faced by banks. Thus, clearly profit-maximising banks are present in our sample. The only way this would not hold would have been if a banking industry is completely fragmented—as, for example, in previously centrally planned economies. However, our samples on these countries start after the initiation of reforms (e.g., competition from foreign-owned banks has started). Now how can the relative profits measure of market power, as represented by equation (12), be approximated empirically? Instead of investigating the relation between relative profits of bank  $i$  and some reference bank  $\pi_i/\pi_1$  and marginal costs, one can estimate log profits as a function of marginal cost (i.e., as in equation (2)).<sup>8</sup> This is equivalent to estimating the relation using the log of profits relative to some reference profit  $\pi_1$  (e.g., the profits of the most efficient bank), since  $\ln(\pi_i/\pi_1) = \ln \pi_i - \ln \pi_1$ . In practice, it can be problematic to specify this reference profit, and so in equation (2) the parameter  $\ln \pi_1$  is absorbed into the constant term  $a$ . Therefore, the relative profits measure of competition is captured by the estimated coefficient  $\beta$  of equation (2), which measures the extent to which less efficient banks are punished with lower relative profits (Brissimis et al. 2014).

### **Appendix 3.B: Number of banks per country**

| <u>Countries</u> | <u>Number of Banks</u> |
|------------------|------------------------|
| Botswana         | 13                     |
| Ghana            | 10                     |
| Kenya            | 12                     |
| Mauritius        | 8                      |
| Morocco          | 7                      |
| Nigeria          | 7                      |
| South Africa     | 22                     |
| Tanzania         | 15                     |
| Tunisia          | 14                     |
| Uganda           | 15                     |
| <b>Total</b>     | <b>123</b>             |

## CHAPTER 4

### BANKING EFFICIENCY AND ITS DETERMINANTS IN SELECTED FRONTIER AFRICAN MARKETS

#### 4.1 Introduction

Financial reform in Africa over the past thirty years has led to many policy improvements, technological changes as well as an increased level of deregulation in the financial sector. This has led to an increase in productivity in the banking sector. With this increase, there has been an emphasis on improving efficiency in the banking sector as a means of getting the sector to the most efficient production frontier. It is for this reason that studies on banking efficiency on the African continent are very significant. They inform financial institutions and policy makers on how to improve their policies and enhance the performance of the sector.

Efficiency can be defined as a firm's ability to produce a result with minimum effort or resources. It is also a measure of how close a production unit gets to its production possibility frontier, which is composed of sets of points that optimally combine inputs to produce one unit of output (Kablan, 2010). Farrell (1957) proposed an approach to estimate the efficiency of observed units by decomposing efficiency into two elements: technical efficiency, which measures the firm's realisation in producing maximal output using a given set of inputs, and allocative (price) efficiency, which estimates the firm's success in choosing an optimum combination of inputs, given their respective prices. These two elements then combine to become the total economic efficiency (Segun & Ajugam, 2013).

Banking efficiency is of key importance because banks act as a conduit for the overall financial development in an economy (Andersen & Tarp, 2003; Khan & Senhadji, 2000; Levine, 2002; Chan & Karim, 2010). Ngalande (2003) in his study on banking efficiency in Southern Africa Development Community (SADC) countries recognises that efficiency in the banking sector is a key contributor to macroeconomic stability. In addition, the study of bank

efficiency is important from both a microeconomic and a macroeconomic standpoint (Berger & Mester, 1997). At a microeconomic level, banking efficiency is important as it enhances the level of competition for instance the increasing presence of foreign banks in the SSA region. From a macro perspective, the efficiency of the banking industry influences the cost of financial intermediation and the overall stability of financial systems.

Banking efficiency is therefore of great interest to policy makers and regulators in Africa, as well as academics studying trends in bank performance in Frontier African countries. This paper contributes to extant literature by analysing banking efficiency using DEA in a selection of ten Frontier African countries. Frontier African countries are countries in Sub-Saharan Africa with similar economic characteristics: they are countries with fairly developed financial sectors, positive macroeconomic performance, and increased flow of foreign direct investment. Specifically, we compute the technical, pure technical and scale efficiency and analyse the banking efficiency evolution in this selection of countries from 2008 to 2012. In addition, we also examine the determinants of banking efficiency in the sample countries. To the best of my knowledge, this is the first study on banking efficiency and its determinants using a cross-section of frontier African countries.

The rest of this chapter is organised as follows. Section 4.2 provides a review of the existing literature. Section 4.3 describes the sources of data and the variables as well as the specification and methodology used for the measurement of banking efficiency and its determinants. Section 4.4 discusses the empirical results and Section 4.5 concludes the chapter, drawing several practical implications based on the findings for policy makers.

## **4.2 Review of literature**

This section reviews the relevant literature on bank efficiency, with emphasis on studies on Africa. The ability for a banking institution to produce on the best practice frontier is one way of considering how efficient the institution is. The concept of measuring a firm's performance against best practice frontier

dates to the 1950s. Efficiency is defined by Koopmans (1951) as the ability of a firm to maximise output for several given inputs (Sena, 2003). The maximisation of these various input/output combinations makes up the best practice frontier. Two techniques have been applied in the literature to evaluate bank efficiency: the parametric and the non-parametric technique. The commonly used parametric approaches are the stochastic frontier approach (SFA)<sup>5</sup> and the Distribution Free Approach (DFA).

Unlike the parametric approaches, the non-parametric approaches do not use a specific functional form on the production frontier and allow for the rate of technological change to be obtained directly from the production structure rather than from its cost structure. This removes the need to input price data in the equation. There are two non-parametric approaches used in literature, Data Envelopment Analysis (DEA) and the free disposal hull (FDH).<sup>6</sup> The DEA, which is most commonly used non-parametric approach, is a linear programming algorithm developed by Charnes, Cooper and Rhodes (1978). This approach offers the merit of simple application and restrictive assumptions are not required in advance regarding the functional form. The DEA has been widely used in numerous studies on bank efficiency (see studies by Berger & Humphrey, 1997; Sufian & Abdul Majid, 2007; Simar and Wilson, 2007; Fukuyama & Weber 2009a, 2009b, 2010; Holod & Lewis, 2011; Sufian, 2010; Kumar, 2013; Alhassan et al., 2016). These studies focus mainly on North America as well as various European countries and not on banks in developing countries with specific emphasis on the African continent. This study will therefore contribute to the scanty literature on Africa.

Studies on bank efficiency are important especially in this context because most countries in Africa possess similar macroeconomic and regulatory

---

<sup>5</sup> The SFA was developed by Aigner, Lovell and Schmidt (1977) and Meeusen and Van den Broeck (1977). The SFA specifies a functional form for the cost or profit production frontier and allows for random error. Further, the predicted standard cost function is assumed to characterise the frontier while any inefficiency is captured in the error term, which is by structure orthogonal to the predicted frontier (Ferrier and Lovell, 1990).

<sup>6</sup> This approach was conceptualised, formulated and developed by Deprins, Simar and Tulkens (1984) and extended by Lovell et al. (1994).

conditions as the sample of Frontier African countries that we look at. Therefore, these studies will help place our study in context.

A study by Kiyota (2009) provides a comprehensive banking sector efficiency analysis of SSA countries. He uses a two-stage analysis to examine profit efficiency and cost efficiency of commercial banks: using the SFA and Tobit regression. The results of this study indicate that foreign banks outperform domestic banks and banks with higher leverage or lower equity were found to be associated with higher profit efficiency, however in regard to bank size, smaller banks were found to be more profit-efficient whereas medium size and large sized banks were cost-efficient. However, the study fails to account for the impact of scale and resource utilisation on bank efficiency. Kiyota (2009) builds this study on a similar study done by Kirkpatrick, Murinde and Tefula (2008) who suggest that on average banks are 67% profit efficient and 80% cost efficient, according to both the DFA and SFA metrics. Their study also finds that an increase in the degree of foreign bank penetration, is associated with a reduction in profit and cost x-inefficiency. Both studies however do not consider the issue of scale of operation and input (resource) utilisation as a source of bank inefficiency.

Musonda (2008) uses a single stage maximum likelihood estimation procedure applied to a stochastic frontier cost function on commercial bank data from Zambia. This study reveals that Zambian banks were on average inefficient in the order of 11.4%, and that foreign banks were more efficient than domestic banks, especially state banks.

Kamau (2011) and Aikaeli (2008) both employ the DEA approach to obtain estimated bank efficiency in Kenya and Tanzania respectively. The study by Kamau (2011) found that most banks performed fairly with more chance of improvement, the estimated scores were not less than 40% during the year of study, and large banks were relatively more efficient than small and medium sized banks. Aikaeli (2008) investigated the technical, scale and cost efficiency of commercial banks in Tanzania, also using the DEA model to derive efficiency estimates of the banks. This study finds that commercial banks in Tanzania over the period of study operated on the decreasing part of their

average cost curves and this gave them room to expand with increasing returns to scale.

A study by Frimpong et al. (2014) used the DEA to test the efficiency of the banking industry in Ghana over the period 2001–2010. The results suggest that Ghanaian banks in general are inefficient. In addition, they find that bank size has no influence on bank cost efficiency, suggesting that larger banks in Ghana have no cost advantages over smaller banks. In a study of banking efficiency in Namibia, Ikhida (2008) used operating ratios and the parametric approach (SFA) to measure efficiency for the period 1993–1998. He finds substantial evidence of economies of scale in Namibian banks, but they do not operate at the minimum point of average cost curve.

Further, Aboagye et al. (2012) studied technical efficiency in the Ghanaian banking sector over the period 2000 to 2008. Their study used DEA and a Tobit regression on the explanatory variables of bank efficiency. Their findings suggest that efficiency of domestic banks has been positively affected by the entry of foreign banks and a reduction in the overall concentration of the banking sector. A similar study by Isshaq and Bokpin (2012) on banking efficiency in Ghana uses the SFA and the findings of this study indicate a decline in profit efficiency of the Ghanaian banking sector, the results however show a positive level of cost efficiency over the period of the study.

Alhassan (2015) also analysed banking efficiency in Ghana using the SFA approach and, like Isshaq and Bokpin (2012), the results from his study also indicate high levels of efficiency in cost as opposed to profit to reflect high inefficiencies on the revenue side. An analysis of efficiency scores categorized by bank size also show that large banks have a higher cost and profit efficiency compared to small banks. To best of my knowledge, efficiency studies on banking markets in Africa by authors such as Alhassan (2015), Isshaq and Bokpin (2012), Musonda (2008), Kamau (2011), Ikhida (2008), Frimpong et al. (2014) and Aikaeli (2008) consider individual country studies without offering a comprehensive comparative study on Africa. This study attempts to address such a gap in the empirical literature as well as looking

at the source of bank efficiency by considering the issue of scale of operation and input (resource) utilisation.

### **4.3 Data and estimation methodology**

The data used in the study was obtained from the Bankscope database. The sample is drawn from ten African Frontier Market countries over the period 2008-2012<sup>7</sup>. All the variables are obtained from the various countries balance sheets and income statement information on the Bankscope database. The data excludes banks which have fewer than five years of operation during the study period.

#### **4.3.1 Definition of inputs and outputs**

A major challenge in the study of bank efficiency is the classification of bank inputs and outputs. There is a long-standing disagreement among researchers and academics over the choice of inputs and outputs. The most contentious issue, however, is the role of deposits and, more specifically, whether they should be treated as inputs or outputs. Lang and Welzel (1996) treat deposits as inputs, however Berger and Humphrey (1991) and Ferrier and Lovell (1990) treat them as outputs. Other studies by Humphrey (1990) and Aly et al. (1990) treat them simultaneously as inputs and outputs. However, it is worth noting that there is no consensus on what constitutes inputs and outputs of a bank (Casu and Giradone, 2002). The choice of input and output variables thus constitutes a major challenge, which must be addressed carefully. Such choice will be influenced by a number of factors, such as the selected concept of the banking firm and the questions under consideration.

Four approaches are used to determine the choice of inputs and outputs: production approach, intermediation approach, modern approach and operations approach. Banking efficiency studies generally tend to focus on the first two approaches: the production approach (*value added approach*) and the intermediation approach (*asset approach*). Under the production

---

<sup>7</sup> The number of banks per each of the sample countries is presented in Appendix B. Data was not available to cover the period up to 2015.

approach, banks produce accounts of numerous sizes by processing deposits and loans, and incurring capital and labour costs. In this approach, outputs are measured by the number of deposits and loan accounts or the number of transactions performed on each type of service provided, and costs are the operating costs needed to produce these products.

Under the intermediation approach, banks are treated as financial intermediaries that combine inputs (deposits, labour and capital) to produce outputs (total assets). The values of loans and investments are treated as output measures: labour, deposits and capital are inputs, and operating costs and financial expenses comprise total cost. We use the intermediation approach because it is more appropriate for evaluating entire financial institutions as it is inclusive of interest expense, which often accounts for half to two-thirds of total costs. Last, the intermediation approach may be better for evaluating the importance of frontier efficiency to the profitability of the financial institution, since minimisation of total costs, not just production costs, is needed to maximise profits (Berger and Humphrey, 1997).

This study employs input variables in deposits (customer's deposits) and labour (personnel expenses of bank staff such as salaries and wages) while total assets are used as the output variables. The prices for the input variables are defined as the ratio of interest expense to total deposits as proxy for price of deposits,  $p_1$ ; price of labour (Beccalli et al., 2006);  $p_2$  is the ratio of personal expenses to total assets. Lack of sufficient data limits us from using operating income in our input variables.

#### **4.3.2 Technical, pure technical and scale efficiency**

This section considers the definition of Technical Efficiency (TE) as well as its different derivations. TE, also termed x-inefficiency, is measured as the ratio between the observed output and the maximum output, under the assumption of fixed inputs. Alternatively, TE can also be measured as the ratio between the observed input and the minimum input under the assumption of fixed output. Technical efficiency is derived under the assumption of constant returns to scale (CRS).

Koopmans (1951) stated that a firm is technically efficient if an increase in one output requires a reduction in at least one other output or an increase in at least one input, and if a reduction in any input requires an increase in at least one other input or a reduction in at least one output. In DEA, the TE measure has been decomposed into two mutually exclusive and non-additive components: pure technical efficiency (PTE) and scale efficiency (SE). This decomposition allows an insight into the source of inefficiencies (Gulati, 2008).

PTE is a measure of TE that is derived under the assumption of variable returns to scale (VRS). As seen above the efficiency measure corresponding to CRS represents TE which measures inefficiencies due to the input/output configurations as well as size of operations. The PTE measure of efficiency corresponds to VRS and this measure considers inefficiencies due to managerial underperformance. Aly et al. (1990) suggest that from the measures of TE and PTE, it is possible to derive a measure of scale efficiency: the ratio of TE to PTE gives us a measure of Scale Efficiency (SE).

$$SE = \frac{TE}{PTE}$$

where  $TE$  is technical efficiency,  $PTE$  is pure technical efficiency and  $SE$  is scale efficiency, and  $0 \leq SE \leq 1$  since  $CR \leq VR$ .

In addition, if the value of  $S$  equals 1, the bank is scale efficient and all values less than 1 reflect scale inefficiency. If scale inefficiency exists ( $SE < 1$ ), the source of inefficiency is the result of operating at either increasing ( $NI < VR$ ) or decreasing ( $NI = VR$ ) returns to scale.

SE measures the ability of management to choose the optimum scale of production that will attain the expected production level. Inappropriate bank size (too large or too small) may sometimes be a cause of technical inefficiency. This is referred as scale inefficiency and takes three forms: constant returns to scale (CRS), decreasing returns to scale (DRS) and increasing returns to scale (IRS). Decreasing returns to scale is also referred to as diseconomies of scale and implies that a bank is too large to take full advantage of scale. In

contrast, a bank experiencing increasing returns to scale (also known as economies of scale) is too small for its scale of operations and, thus, operates at sub-optimum scale size. A bank is scale-efficient if it operates at CRS. The decomposition of TE gives us an insight into the source of inefficiencies.

Section 4.3.3 looks at the methodology that employed in the study and explains the banking determinants used.

#### **4.3.3 Estimating banking efficiency: DEA**

The DEA is a nonparametric method for generating a piecewise smooth linear convex frontier which is formed by enveloping the DMUs. It was first developed by Charnes et al. (1978) under the CRS assumption, and it provides a measure of TE. This study uses the DEA model because it allows comparison of banking markets of varied sizes with respect to a common frontier without imposing any specific parametric functional form. As a consequence the DEA does not pre-specify a production technology. The advantage of this is that we do not have to deal with any possible misspecifications due to inappropriate functional form (Pasiouras, 2008; Maghyereh & Awartani, 2011). In addition, the DEA does not need a longer time series data to carry out estimation compared to other parametric frontier methods such as SFA and DFA. For more clarity, see Berger and Humphrey (1997), Bauer et al. (1998) and Maudos et al. (2002). This makes the DEA a good model to use given the limited number of Frontier African banks with available and complete data. Further, the DEA has no restrictions on the functional form of the frontier and does not impose any specific assumption on the firm specific efficiency. It can accommodate multiple inputs and outputs but is sensitive to variable selection and errors.

Further, the DEA can be implemented using an input or an output orientation as explained above. In the input orientation approach, the goal is to estimate the degree of potential input savings for a given realised output level of the unit (Bougnol et al., 2010). DEA assigns a score of 1 to a unit only when comparisons with other relevant units do not provide evidence of inefficiency in the use of any input or output. It assigns an efficiency score of less than 1

to (relatively) inefficient units. A score less than 1 indicates that a linear combination of other units from the sample could produce the same vector of outputs using a smaller vector of inputs. The score reveals the radial distance from the estimated production frontier to the DMU under consideration (Mwega, 2011). It is also important to highlight other versions of the DEA model that do not take into consideration bank inputs or outputs. In extending earlier contributions by Daraio and Simar (2005), Daraio and Simar (2007) introduce a conditional DEA estimator that is an estimator of production frontier of DEA type which is conditioned to some external-environmental variables. These are neither inputs nor outputs under the control of the producer.

A simplified way is to think of the DEA as providing a price on each of the inputs and a value for each of the outputs. The efficiency of a DMU is the ratio of the inputs to the outputs and is constrained to be no more than 1. The prices and values have nothing to do with real prices and values: they are an artificial construct. The goal is to find a set of prices and values that puts the target DMU in the best possible light (Mwega, 2011).

The objective is to

$$\begin{aligned} & \text{Max } \frac{u^T Y_o}{v^T X_o} \\ & \text{subject to } \frac{u^T Y_j}{v^T X_j} \leq 1, j = 0, \dots, n \\ & u^T \geq 0, v^T \geq 0 \end{aligned} \quad \dots (4.1)$$

Where  $u$  and  $v$  are vectors of prices and values respectively

The basic form of the Charnes, Cooper and Rhodes (CCR) DEA model inferred the assumption of constant returns to scale; this assumption was later relaxed to allow for the evaluation of variable returns to scale and scale economies. The CCR DEA model assumes that input prices are the same across all DMUs. However, actual markets do not necessarily function under perfect competition and unit input prices might not be identical across all DMUs. Thus, as articulated by Tone (2002), the traditional DEA cost efficiency

model does not take account of the fact that costs can obviously be reduced by reducing the input factor prices.

For instance, if two banks have the same inputs and outputs while the unit input prices for one bank are twice those of the other bank, then the total costs of the bank with the higher unit input prices will be greater than those of the bank with the lower unit input prices. However, under the traditional DEA model the cost function is homogenous of degree one in input prices and the scaling factor cancels out in the cost efficiency ratio, and thus the two banks will be assigned the same measure of cost efficiency irrespective of the fact that they have significantly different input prices. This represents a serious disadvantage for assessing relative efficiency levels under the traditional DEA model. This is caused by the unusual structure of the DEA model which focuses exclusively on the technical efficiency of the two banks and cannot take account of variations in unit input prices between the banks. To avoid this inadequacy, Tone (2002) suggests a new approach of estimating cost efficiency under which the production technology is homogeneous of degree one in the total costs as distinct from being homogeneous of degree one in the input prices under the traditional DEA model. This indicates that under the improved DEA model banks with different input prices will return different measures of cost efficiency.

To identify the returns to scale under which these Frontier African banks operate, a bank which is efficient under the assumption of VRS is considered technologically efficient (the VRS score represents *pure technical efficiency*), whereas a bank that is efficient under the assumption of constant returns to scale is technologically efficient and uses the most efficient scale of operation.

#### **4.3.4 DEA bootstrap**

The bootstrap method was first introduced and used in a study by Efron (1979) while Efron and Tibshirani (1993) further provide a detailed description of various issues associated with bootstrapping. The bootstrap method is a process of drawing with replacement from a sample, mimicking the data generating process of the underlying true model and producing multiple

estimates that can be used for statistical inference. One of its key advantages is to test hypotheses, specially in cases where statistical inference is otherwise impossible. The resampling procedure within the framework of the bootstrap relates to redistributing the assumed randomness of the model among the observations. The randomness is reflected in the deviations of the model's variables from their expected values, as estimated by the model. The higher the variance of the residuals, the wider the constructed bootstrap confidence intervals will be in hypothesis testing.

In the regression framework, the deviations are the model's residuals. There are two approaches to bootstrap: to bootstrap pairs (also called "case resampling") and to bootstrap residuals (or "fixed resampling"). For case sampling, we resample pairs of observations and apply the Ordinary Least Squares (OLS) model each time. In the second approach, we resample residuals and then sum them to the expected value of the dependent variable, and we apply OLS each time on the new pseudo-variable and the original independent variables. In each case, we obtain a distribution for the estimated coefficients (betas) of the model which, in the limit, should be equal under both procedures.

The resampling of residuals is found to be more sensitive to model assumptions (Efron & Tibshirani, 1993), mainly since it assumes that the distribution of residuals does not depend on the observed sample: it is the same no matter the independent variable. On the other hand, resampling residuals might be more intuitive and suitable to be used in some cases (Efron & Tibshirani, 1993). The accuracy of the bootstrap estimates is dependent on two factors: the variance of the model residuals and the inherent bias of the bootstrap process. These vary with sample size. Residual variance causes variability for bootstrapping and the resulting bootstrap distributions should be similar to the residual distribution. In addition, the centre of the bootstrap distribution of an estimator is expected to be equal to the value of the estimator computed by the model. Any deviation from that value is known as the bootstrap bias and is due to the random resampling process of the bootstrap.

In this chapter, I use the Simar and Wilson (2007) model of complete double bootstrapping algorithm under the DEA model. This model will produce a set of bias-corrected estimates for all selected explanatory variables in a truncated regression model.

In the first step, I use the DEA model to acquire estimates of the TE scores, after which the scores for efficiency are regressed against a set of explanatory variables as follows:

$$\theta_m = \alpha + \beta z_m + \varepsilon_m \quad \dots(4.2)$$

where  $(\theta_m)$  represents the TE scores, and  $z_m$  is the vector of variables that influence the TE of a commercial bank. The TE of banks can be affected by macroeconomic factors as well as firm-specific characteristics. However, this study primarily used bank-specific variables to assess the determinants of bank efficiency. The variables used were bank size, risk (calculated as a ratio of loan loss provision to total loans), liquidity risk, financial leverage, bank diversification and ratio of fixed assets to total assets. The choice of determinants of bank efficiency is reinforced by various studies (Chen & Lin, 2007; Gupta et al., 2008; San et al., 2011; Sufian, 2008 and Delis & Papanikolaou, 2009).

In addition,  $\beta$  is a vector of the parameters to be estimated,  $\alpha$  is a constant term and  $\varepsilon_m$  is an error term where the value of  $\varepsilon_m$  is greater than or equal to the sum of  $1 - \alpha - \beta z_m$ . Conversely, Simar and Wilson (2007) and Banker and Natarajan (2008) find that the DEA results are serially correlated and therefore cannot be used in second-stage regression as this would violate the basic model assumption of the regression models.

Simar and Wilson (2007) then propose a double bootstrapping algorithm under the DEA model. This algorithm produces a set of bias-corrected estimates for all selected explanatory variables in a truncated regression model. Simar and Wilson (2007) demonstrate that a double bootstrap DEA approach can be a better choice

The double bootstrap DEA algorithm can be summarised in the following steps:

Step 1: Conduct a DEA analysis and transform the variable vectors using the estimated TE scores ( $\theta_m$ ). All the data points are then efficient and generated.

Step 2: Regress  $\theta_m$  on the explanatory variables  $z_m$  using the truncated regression model to obtain estimates  $\hat{\beta}$  and  $\hat{\sigma}_\varepsilon$  of the parameters  $\beta$  and  $\sigma_\varepsilon$  respectively.

Step 3: Repeat the following three steps  $D$  times to obtain a set of bootstrap estimates<sup>8</sup>.

$$D^* = \{(\hat{\beta}^*, \hat{\sigma}_\varepsilon^*)\}_{b=1}^D$$

- a) For each  $i = 1, \dots, n$ , draw  $\varepsilon_i^*$  from the  $N(0, \hat{\sigma}_\varepsilon^2)$  distribution with left truncation at  $(1 - z_i \hat{\beta})$ .
- b) For each  $i = 1, \dots, n$  compute  $\theta_i^* = z_i \hat{\beta} + \varepsilon_i^*$ .
- c) Estimate  $\hat{\beta}_b^*$  and  $\hat{\sigma}_{\varepsilon, b}^*$ , by regressing  $\theta_i^*$  on  $z_i$  again using the truncated regression model.

Step 4: Construct the confidence intervals [3] or [4] as described above.

#### 4.3.5 Bank efficiency determinants

Bank efficiency is expressed as a function of internal and external determinants. The internal determinants originate from the bank accounts that are balance sheets and/or profit and loss accounts and therefore could be termed bank-specific determinants of efficiency. The external determinants are not related to bank management but reflect the economic and legal environment that affects the operation of financial institutions (Delis and Papanikolaou, 2009). Various studies have come up with various explanatory variables for both categories, according to the nature and purpose of each study. This study uses the variables below.

The variable *size* was used because a major question underlying bank policy is determining the optimal bank size that boosts bank efficiency. The effect of

---

<sup>8</sup> The actual coverage probabilities of these bootstrap confidence interval methods may however not coincide with their nominal coverage probabilities. The difference between the actual coverage rate of a confidence interval and the claimed value  $1-2\alpha$  is defined as the coverage error.

an increase in size on efficiency has been proved to be positive to a certain extent. However, for banks that become extremely large, the effect of size could be negative especially due to issues of bureaucracy and other reasons. As a result, the size-efficiency relationship may be expected to be non-linear. The study uses the banks' real assets (logarithm) and their square to capture this possible non-linear relationship.

Risk is another variable that is used. It is calculated as the loan loss provision to total loans. The need for risk management in the banking sector is essential in the banking business. Deviations in credit risk may indicate changes in the health of a bank's loan portfolio (Cooper et al., 2003), which may affect the performance of the institution, since poor asset quality is the single most key cause of bank failures. During periods of uncertainty, financial institutions may decide to diversify their portfolios to reduce their risk. Risk is expected to have a negative coefficient because bad loans are expected to reduce profitability. Miller and Noulas (1997) suggest that the greater the exposure of the financial institutions to high-risk loans, the higher would be the accumulation of unpaid loans and profits would be much lower (Sufian et al., 2010).

Another variable used is liquidity risk, which is calculated as the ratio of total loans to total assets (LOTA). This variable expresses the long-term liquidity degree of the bank, as well as giving information about the relative weight of several activities (Dell'atti & Pacelli, 2015). It arises from the possible inability of banks to accommodate decreases in liabilities or to fund increases on the assets side of the balance sheet, it is therefore considered an important determinant of bank efficiency. The loans market, especially credit to households and firms, is risky but also has a greater expected return than other bank assets, such as government securities. Thus, one would expect a positive relationship between liquidity and efficiency (Bourke, 1989; Sufian et al., 2010).

We also used a proxy for bank diversification into non-traditional activities as another variable: the ratio of noninterest (NII) expenses to total assets (NITA). The NII is made up of commission, service charges and fees, guarantee fees,

net profit from sale of investment securities, and foreign exchange profit. We expect that an increase in bank diversification should lead to improved bank efficiency following the conglomeration hypothesis which asserts that multiple business segments can take more advantage in improving bank performance (Berger, 1999).

Financial leverage (LEV) is another variable that was used, and this is proxied by the ratio of debt to total assets. A major decision that banks must take is to decide the proportion of debt and equity that will constitute their capital structure. LEV measures the ability of the bank to pay off its debt with its total assets.

Last, the study used the ratio of fixed asset to total assets ratio (TANG). This variable estimates the extent to which management uses funds for unproductive uses.<sup>9</sup> The higher the value of TANG, the lower the levels of bank efficiency that can be expected.

In the second stage of the analysis, the study investigate how the explanatory variables impact the bank's level of efficiency by regressing the first stage estimates on the financial ratios described above. Specifically, we estimate the following regression equation:

$$EFF_{it} = \alpha + \beta_1 SIZE_{it} + \beta_2 LOTA_{it} + \beta_3 RISK_{it} + \beta_4 LEV_{it} + \beta_5 NITA_{it} + \beta_6 TANG_{it} + \varepsilon_{it} \quad \dots(4.3)$$

where  $i$  is the observation;  $t$  is the time period;  $\alpha$  is the constant term;  $\beta$  is the coefficient of each variable;  $\varepsilon$  is the error term; and  $EFF_{it}$  is the technical efficiency score (TE). Table 4.1 shows the descriptive statistics for the determinants of banking efficiency.

**Table 4.1: Descriptive statistics for explanatory variables for bank inefficiency**

|      | Mean   | Median | Std. Dev | Min    | Max    | N   |
|------|--------|--------|----------|--------|--------|-----|
| SIZE | 10.275 | 11.129 | 2.881    | 3.714  | 14.946 | 533 |
| LOTA | 0.543  | 0.546  | 0.168    | 0.024  | 0.987  | 529 |
| RISK | 0.025  | 0.011  | 0.082    | -0.875 | 0.955  | 520 |

<sup>9</sup> Appendix 4.B shows the financial ratios used as explanatory variables.

|      |       |       |       |       |       |     |
|------|-------|-------|-------|-------|-------|-----|
| LEV  | 0.868 | 0.890 | 0.107 | 0.217 | 1.600 | 528 |
| NITA | 0.687 | 0.673 | 0.166 | 0.167 | 1.000 | 491 |
| TANG | 0.025 | 0.020 | 0.021 | 0.000 | 0.186 | 533 |

Source: Author's calculations using data from Bankscope database

#### **4.4 Empirical results**

##### **4.4.1 Evaluating the efficiency of Frontier African banks**

An input-oriented DEA methodology was used to measure bank efficiency and yielded TE, PTE and SE DEA estimates. The efficiency scores are obtained by calculating the average score for each country. Table 4.2 reports the average efficiency scores of banks in the selection of Frontier African countries from 2008 to 2012. A value of 1 specifies an efficient use of inputs: the existing inputs are at the minimum achievable level to produce the actual outputs. Overall, the results show relatively high average TE, PTE and SE scores in all the countries analysed over the period. These results are consistent with efficiency results from studies by Alhassan (2015) and Isshaq and Bokpin (2012).

We also observe that across the years of study for the majority of the countries, there is a marked decline in 2009 and 2010, however this trend picks over the period 2011 to 2012. These results are consistent with Kablan (2007), Chen (2009) and Gwahula (2013) with slight variations in the efficiency scores of the countries under study. We detect interesting differences in the different average efficiency scores and their evolution over the years between countries. On average, over the entire period, Botswana banks were the most technically efficient (0.72), followed by South Africa (0.67) and Tanzania (0.66). The countries exhibiting the lowest average rates of TE over the period of study are Uganda (0.54), Nigeria (0.53) and Ghana (0.46). Looking at the evolution of the overall TE, we observe a slight deterioration in the average performance of the banks of our sample over the period of study.

In regard to PTE estimates, South African and Mauritian banks were the most efficient (both with 0.89) followed by Tunisian banks (0.82). Over the entire

period, in regard to SE, Tanzanian banks exhibited the highest efficiency (0.88), followed by Botswana (0.83) and Morocco (0.79). The countries with the lowest levels of PTE were Ghana (0.67) and Nigeria (0.61). The evolution of the average PTE for all the countries over the period under study indicates a declining trend. This indicates that the increase in bank inefficiency over the period could be because of inefficient use of labour, fixed assets and equipment.

The results for SE estimates indicate that over the period of study, the countries with the highest levels of bank efficiency were Tanzania (0.88) and Botswana (0.83). The countries that exhibited the lowest levels of SE were Ghana (0.70) and Mauritius (0.65). The evolution in bank efficiency shows a declining trend for SE, as does TE and PTE. This shows that the banks are not fully utilising their scale of production in the countries under study.

The results indicate that on average the banking sectors in the countries under study have a higher rate of SE than of PTE. This should tell us that banks are more efficient at utilising their appropriate scale of production as opposed to labour, fixed assets and equipment.

The analysis in the first stage is carried out for each country separately and therefore the mean efficiency scores presented in Table 4.2 only reflect the dispersion of efficiency within each country, we however include summary statistics on bank efficiency (see Table 4.2) that indicates the variability across the sample looking at the different country observations. Overall, we observe an average of 55 observations per country across the sample. We also observe a homogenous trend across the sample. Tanzania is the country with the highest number of observations (80), and Nigeria and Morocco are the countries with the lowest number of observations (40).

**Table 4.2: Average efficiency results for ten Frontier African countries**

|              | 2008  |       |       | 2009  |       |       | 2010  |       |       | 2011  |       |       | 2012  |       |       |
|--------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|              | TE    | PTE   | SE    | TE    | PTE   | SE    | TE    | PTE   | SE    | TE    | PTE   | SE    | TE    | PTE   | SE    |
| BOTSWANA     | 0.826 | 0.887 | 0.933 | 0.716 | 0.777 | 0.923 | 0.535 | 0.473 | 0.771 | 0.678 | 0.488 | 0.638 | 0.850 | 0.778 | 0.900 |
| GHANA        | 0.293 | 0.456 | 0.718 | 0.417 | 0.845 | 0.500 | 0.745 | 0.852 | 0.875 | 0.506 | 0.724 | 0.695 | 0.361 | 0.474 | 0.750 |
| KENYA        | 0.457 | 0.564 | 0.801 | 0.866 | 0.886 | 0.966 | 0.827 | 0.837 | 0.969 | 0.394 | 0.756 | 0.507 | 0.239 | 0.602 | 0.395 |
| MAURITIUS    | 0.780 | 0.944 | 0.828 | 0.577 | 0.985 | 0.585 | 0.512 | 0.935 | 0.550 | 0.626 | 0.829 | 0.754 | 0.448 | 0.801 | 0.562 |
| MOROCCO      | 0.799 | 0.797 | 0.982 | 0.511 | 0.715 | 0.710 | 0.707 | 0.728 | 0.952 | 0.287 | 0.682 | 0.414 | 0.666 | 0.712 | 0.919 |
| NIGERIA      | 0.680 | 0.795 | 0.861 | 0.893 | 0.878 | 0.968 | 0.527 | 0.638 | 0.793 | 0.194 | 0.307 | 0.532 | 0.383 | 0.480 | 0.676 |
| SOUTH AFRICA | 0.792 | 0.910 | 0.869 | 0.701 | 0.814 | 0.845 | 0.711 | 0.835 | 0.834 | 0.623 | 0.969 | 0.642 | 0.568 | 0.971 | 0.584 |
| TANZANIA     | 0.702 | 0.793 | 0.882 | 0.755 | 0.819 | 0.920 | 0.655 | 0.723 | 0.908 | 0.572 | 0.668 | 0.849 | 0.621 | 0.700 | 0.889 |
| TUNISIA      | 0.661 | 0.863 | 0.767 | 0.599 | 0.810 | 0.744 | 0.725 | 0.817 | 0.878 | 0.710 | 0.828 | 0.849 | 0.534 | 0.827 | 0.653 |
| UGANDA       | -     | -     | -     | 0.499 | 0.711 | 0.702 | 0.416 | 0.652 | 0.646 | 0.688 | 0.757 | 0.898 | 0.585 | 0.743 | 0.772 |

Source: Author's calculations using data from Bankscope database Note: Blank is Not Available due to the data availability.

#### 4.4.2 Source of bank inefficiency

When we look at the results of PTE and SE measures for the banking industry of the frontier African countries under study we observed that TE is due to both poor input utilisation (i.e. PTE) and failure to operate at the most productive scale size (i.e. SE).

Most the countries under study (six) attributed the source of bank inefficiency to PTE or poor input utilisation. This poor input utilisation is chiefly attributed to managerial inefficiency. The results for the remaining four countries indicate that the source of bank inefficiency is caused by scale inefficiency. This means that the banks in these countries are operating at an inappropriate productive scale size.

**Table 4.3: Source of bank inefficiency**

|                            | <b>TE</b> | <b>PTE</b> | <b>SE</b> | <b>Source of Inefficiency</b> |
|----------------------------|-----------|------------|-----------|-------------------------------|
| Botswana                   | 0.7209    | 0.6805     | 0.8573    | PTE***                        |
| Ghana                      | 0.4641    | 0.6701     | 0.7075    | PTE                           |
| Kenya                      | 0.5566    | 0.7290     | 0.7274    | SE                            |
| Mauritius                  | 0.5886    | 0.8986     | 0.6556    | SE***                         |
| Morocco                    | 0.5940    | 0.7267     | 0.7955    | PTE**                         |
| Nigeria                    | 0.5352    | 0.6195     | 0.7660    | PTE***                        |
| South Africa               | 0.6790    | 0.8999     | 0.7548    | SE***                         |
| Tanzania                   | 0.6611    | 0.7409     | 0.8896    | PTE***                        |
| Tunisia                    | 0.6457    | 0.8292     | 0.7782    | SE**                          |
| Uganda                     | 0.5469    | 0.7158     | 0.7547    | PTE                           |
| <b>Kruskal-Wallis Test</b> |           |            |           |                               |
| $\chi^2$                   | 55.562*** | 155.882*** | 98.836*** |                               |
| Prob > $\chi^2$            | 0.0001    | 0.0001     | 0.0001    |                               |

Source: Author's calculations using data from Bankscope database.

Note: \*\*, \*\*\* significant at 5 and 1 per cent levels, respectively.

A t-test was carried out to examine whether there are significant differences in the mean between PTE and SE for the Frontier African banks over the period of study. The results revealed that most countries in the sample (seven) were statistically significant, indicating that there were differences between the PTE and SE for Frontier African countries. The study however observes

that the differences between PTE and SE are not significant for Ghana, Kenya and Uganda.

#### 4.4.3 Results of the determinants of efficiency

TE scores were regressed against five explanatory variables comprising size, risk, leverage or the incentive to work proxy, assets quality, bank size and the excess liquidity, and country dummy variables were included as well to control for the country specific effects of the banks in the sample (equation 3). Table 4.4 indicates the results of the second stage DEA bootstrap regression.

**Table 4.4: Second stage DEA bootstrap regression results**

| <b>DEPENDENT VARIABLE: TECHNICAL EFFICIENCY</b> |              |                  |          |               |
|---|--------------|------------------|----------|---------------|
|   | <i>Coef.</i> | <i>Std. Err.</i> | <i>z</i> | <i>P&gt;z</i> |
| SIZE  | -0.002       | 0.005            | -0.33    | 0.741         |
| LOTA  | -0.021       | 0.055            | -0.38    | 0.707         |
| RISK  | 0.184        | 0.095            | 1.94     | 0.053*        |
| LEV   | -0.227       | 0.109            | -2.08    | 0.037**       |
| NITA  | 0.005        | 0.093            | 0.06     | 0.956         |
| TANG  | 1.833        | 0.717            | 2.56     | 0.011**       |
| R-squared                                       | 0.7572       |                  |          |               |
| Wald $\chi^2(16)$                               | 141.45       |                  |          |               |
| Prob > $\chi^2$                                 | 0.0000       |                  |          |               |
| Country Dummy                                   | Yes          |                  |          |               |
| Year Dummy                                      | Yes          |                  |          |               |
| Countries                                       | 10           |                  |          |               |
| Observations                                    | 474          |                  |          |               |

Note: \* Significant at 1% level, \*\* significant at 5% level.

The results indicate a negative but significant correlation between TE and all the individual country dummies. The same result is also observed for the year dummy in the sample. The estimated results of the truncated bootstrapping are presented in Table 4.5. The results show that the size of bank (SIZE) is not statistically significant and is negatively related to TE. This suggests that the smaller the bank is, the more efficient it will be. Nevertheless, these results are not conclusive due to the statistical significance of this relationship.

The results indicate that the ratio of loans to total assets (LOTA) is negatively related to TE. The obtained results are also not statistically significant.

RISK, which is proxied by loan loss provision to total assets, reveals a positive and statistically significant (at the 10% level) relationship with technical bank efficiency. The findings of the study seem to suggest that banks with high levels of credit risk are more efficient. A plausible explanation for this could be if the loan loss provision is directly related to the credit generated from the loans produced. According to Berger (1999) this positive relationship could be because of the “skimping hypothesis”, which states that there could be a positive relationship between efficiency and credit risk when banks decide not to spend sufficient resources on analysing loan applications. In this way, they would appear to be efficient but with a high level of bad loans (Pastor, 1999).

The results also show a negative and statistically significant (at the 5% level) link between LEV and technical efficiency. This indicates that an increase in LEV will lead to a decline in technical bank efficiency. This could be because a higher level of financial risk will lead to a reduction in bank profitability. This explanation is in line with studies that indicate a significant and negative relationship between financial leverage and firms’ performance (Mumtaz et al., 2013; Chinaemerem & Anthony, 2012; Gleason et al., 2000; Majumdar & Chhibber, 1999).

The level of diversification (NITA) has a positive relationship with TE. This follows from and is in line with literature that points out that diversification should increase risk-adjusted bank performance (Gurbuz et al., 2013). We also note, however, that this relationship is statistically insignificant.

Finally, the results highlight a positive and significant relationship between TANG and TE. As mentioned above this variable estimates the extent to which management uses funds for unproductive uses. The result supports the agency cost hypothesis and implies that higher values of TANG will increase TE of commercial banks.

#### **4.5 Conclusion**

The study investigates bank efficiency in a sample of ten Frontier African countries and estimates the determinants of bank efficiency over the period from 2008 to 2012. The bank efficiency estimates of individual banks are

measured using the DEA approach as well as a second stage truncated bootstrap procedure to compute bias corrected TE scores and to investigate the determinants of TE in the banks under study. The study uses financial ratios to act as proxies for the determinants of bank efficiency. In addition, this study used the intermediation approach that employs labour costs, deposits and assets as inputs and loans as well as other investments as outputs.

The findings suggest that TE has been above average for all the countries under study from 2008 to 2012. The highest average result of 0.65 was achieved in 2008, with the lowest estimate of 0.52 in 2012. The empirical findings clearly show a degree of increasing inefficiency in the Frontier African banking sector, especially from 2008 onwards to 2012.

Regarding the source of overall technical inefficiency for commercial banks in the Frontier African countries under study, we observe that TE is due to managerial inefficiency and failure to operate at the most productive scale size (scale inefficiency). For many of the countries, however, TE is mainly attributed to pure technical inefficiency as opposed to scale inefficiency. This indicates that managerial inefficiency is still a challenge in most of the African countries under the study. Hence, Frontier Market African banks are more successful in selecting optimal levels of output than adopting best practice.

An important outcome of this analysis lies with the results provided by the second stage DEA bootstrap regression. We gain insight into the fact that the banks in the Frontier African countries have high levels of SE, meaning that they adequately utilise their scale of production. Further, the Frontier African banking system has reached a level of diversification that is required to increase banking efficiency. In addition, the results also support the previous studies (see Mumtaz et al., 2013; Chinaemerem & Anthony, 2012; Gleason et al., 2000), which suggests that there is a significant and negative relationship between financial leverage and firms' performance.

The study has several limitations, and due to these, the study can be extended in the following ways. First, the scope of this study can be extended to

examine the efficiency of local banks vs foreign banks in the frontier African countries. Second, the present study can also be extended to analyse efficiency according to bank size (small, medium and large). Lastly, another extension to this study could be the examination of changes in productivity because of technological progress or decline by employing the Malmquist Productivity Index (MPI).

Nonetheless, the results of this study have important implications for the management of banks, for policy makers and bank regulators in Africa, as well as academics and others studying trends in bank performance in Frontier African countries. Primary among these policy implications is the increasing bank inefficiency across the sample of Frontier African countries over the years of study. Policy makers and regulators could put in place policies that foster bank efficiency, by instituting efficiency measures and restructuring the banking system to reduce the number of less efficient banks. In addition, capacity building and incentive schemes could be introduced to improve managerial efficiency.

## REFERENCES

- Alhassan, A.L. (2015). Income diversification and bank efficiency in an emerging market. *Managerial Finance*, 41(12): 1318-1335.
- Alhassan, A.L., Tetteh, M.L. & Brobbey, F.O. (2016). Market power, efficiency and bank profitability: evidence from Ghana. *Economic Change and Restructuring*, 49(1): 71-93
- Aboagye, A.Q.Q. & Gemegah, A. Saka, A.D. (2012). Technical efficiency of the Ghanaian banking industry and the effects of the entry of foreign banks. *Journal of African Business*, 13(3): 232-243. DOI: 10.1080/15228916.2012.727755.
- Adjei-Frimpong, K., Gan, C. & Hu, B., (2014). Cost Efficiency Of Ghana's Banking Industry: A Panel Data Analysis. *The International Journal of Business and Finance Research*, 8(2), pp. 69 - 86.
- Aigner, D., Lovell, C.A.K. & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics* 6: 21-37.
- Aikaeli, J. (2008). Commercial bank efficiency in Tanzania. A paper presented at a CSAE Conference on Economic Development in Africa, held at St. Catherine's College, Oxford, 16th-18th.
- Aly, H.Y., Grabowski, R., Pasurka, C. & Rangan, N. (1990). Technical, scale and allocative efficiencies in US banking: An empirical investigation. *The Review of Economics and Statistics*, 72: 211-218.
- Andersen, T. & Tarp, F. (2003). Financial liberalization, financial development and economic growth in LDCs. *Journal of International Development*, 15(2): 189-209.
- Banker, R.D. & Natarajan, R. (2008). Evaluating contextual variables affecting productivity using data envelopment analysis. *Operations Research*, 56: 48-58.
- Bauer, P.W.; Berger, A.N.; Ferrier, G.D. and Humphrey, D.B. (1998): Consistency conditions for regulatory analysis of financial institutions: a comparison of frontier efficiency methods, *Journal of Economics and Business*, 50(2), 85-114.
- Beccalli E, Casu B, Girardone C (2006). Efficiency and stock performance in European banking. *J. Bus. Finan. Account.*, 33: 245- 262.
- Berger, A.N. and Humphrey, D.B. (1991): "The dominance of inefficiencies over scale and product mix economies in banking", *Journal of Monetary Economics* 28, pp. 117- 148.

- Berger, A.N. & Humphrey, D.B. (1997). Efficiency of financial institutions: international survey directions for future research. *European Journal of Operational Research*, 98: 175-212.
- Berger, A.N., Hunter, W.C. & Timme, S.G. (1993). Efficiency of financial institutions: A review and preview of research, past present, and the future. *Journal of Banking and Finance*, 21: 895-947.
- Berger, A.N. & Mester, L.J. (1997). Inside the Black Box: what explains differences in the efficiencies of financial institutions? The Working Paper Series, Wharton School Centre for Financial Institutions, University of Pennsylvania.
- Berger, A. N. (1999). The" big picture" about relationship-based finance. In *Federal Reserve Bank of Chicago Proceedings* (No. 761).
- Bougnol, M.L., Dulá, J.H., Estellita Lins, M.P. & Moreira da Silva, A.C. (2010). Enhancing standard performance practices with DEA. *Omega*, 38(1-2): 33-45.
- Bourke, P., 1989. Concentration and other determinants of bank profitability in Europe, North America and Australia. *J. Bank. Finance* 13 (1), 65–79.
- Brownbridge, M. & Gockel, A.F. (1997). The impact of financial sector policies on banking in Ghana. Working Paper 38, Institute of Development Studies. Brighton.
- Casu, B., & Girardone, C. (2002). A comparative study of the cost efficiency of Italian bank conglomerates. *Managerial Finance*, 28(9), 3-23.
- Casu, B. and Girardone, C. (2004), 'Financial conglomeration: efficiency, productivity and strategic drive', *Applied Financial Economics*, **14**, 687-696.
- Casu, B. & Girardone, C. (2006). Bank competition, concentration and efficiency in the single European market. *The Manchester School* 74: 441-468.
- Chan, S.-G. & Karim, M.Z.A. (2010). Bank efficiency and macro-economic factors: The case of developing countries. *Global Economic Review*, 39(3): 269-289.
- Charnes, A., Cooper, W.W. & Rhodes, E. (1978). Measuring efficiency of decision making. *Management Science*, 27: 668-97.
- Chen, Y. and Lin, C. (2007), 'Empirical study on the efficiency analysis of Australian banks', *Banks and Bank Systems*, **2**, 38-49.
- Chen, C. (2009). Bank efficiency in Sub-Saharan African middle-income countries. IMF Working Paper, WP/09/14.
- Chinaemerem, O.C. & Anthony, O. (2012). Impact of capital structure on the financial performance of Nigerian firms. *Arabian Journal of Business and Management Review*, 1(12): 43-61.

- Cooper, M., Jackson, W. & Patterson, G. (2003). Evidence of predictability in the cross-section of bank stock returns. *Journal of Banking and Finance*, 27: 817-50.
- Daraio, C. & Simar, L. (2005). Introducing environmental variables in nonparametric frontier models: A probabilistic approach. *Journal of Productivity Analysis*, 24(1): 93-121.
- Daraio, C. & Simar, L. (2007). Conditional nonparametric frontier models for convex and non-convex technologies: A unifying approach. *Journal of Productivity Analysis*, 28: 13-32.
- Dell'Atti, S., Pacelli, V., & Mazzarelli, G. (2015). The efficiency of the European banking groups and its determinants. *Managerial Finance*, 41(7), 734-751.
- Delis, M.D. & Papanikolaou, N.I. (2009). Determinants of bank efficiency: evidence from a semi-parametric methodology. *Managerial Finance*, 35(3): 260-275.
- Dell'Atti, S., Pacelli, V. & Mazzarelli, G. (2015). The efficiency of the European banking groups and its determinants. *Managerial Finance*, 41(7): 734-751.
- Deprins, D., Simar, L. & Tulkens, H. (1984). Measuring labor inefficiency in post offices. In: *The performance of public enterprises: concepts and measurements*. M. Marchand, P. Pestieau, H. Tulkens (Eds.), *The Performance of Public Enterprises: Concepts and Measurements*, North-Holland, Amsterdam (1984), pp. 243-26
- Efron, B. (1979). Bootstrap methods: Another look at the jack knife. *Annals of Statistics*, 7: 1-26.
- Efron, B. & Tibshirani, R. (1993). *An introduction to the bootstrap*. London: Chapman and Hall.
- Farrell, M.J. (1957). The measurement of productive efficiency. *Journal of Royal Statistical Society Series*, 253-81. <http://dx.doi.org/10.2307/2343100>.
- Ferrier, G. & Lovell, C.A.K. (1990). Measuring cost efficiency in banking: Econometric and linear programming evidence. *Journal of Econometrics*, 46: 229-245. [http://dx.doi.org/10.1016/0304-4076\(90\)90057-Z](http://dx.doi.org/10.1016/0304-4076(90)90057-Z)
- Fukuyama, H., & Weber, W. L. (2009a). Estimating indirect allocative inefficiency and productivity change. *Journal of the Operational Research Society*, 60(11), 1594–1608.
- Fukuyama, H., & Weber, W. L. (2009b). A directional slacks-based measure of technical inefficiency. *Socio-Economic Planning Sciences*, 43(4), 274–287.
- Fukuyama, H., & Weber, L. W. (2010). A slacks-based inefficiency measure for a two- stage system with bad outputs. *Omega*, 38(5), 239–410.

- Gleason, K., Mathur, L. & Mathur, I. (2000). The interrelationship between culture, capital structure, and performance: evidence from European retailers. *Journal of Business Research*, 50(2): 185-191.
- Gulati, R. (2008). An examination of technical, pure technical, and scale efficiencies in Indian public sector banks using Data Envelopment Analysis. *Eurasian Journal of Business and Economics*, 1(2): 33-69.
- Gupta, O.k.; Doshit, Y. & Chinubhai, A. (2008). Dynamics of Productive Efficiency of Indian Banks, *International Journal of Operations Research* Vol.5, No. 2, 78-90.
- Gurbuz, A.O., Yanik, S. & Ayturk, Y. (2013). Income diversification and bank performance: evidence from Turkish banking sector. *Journal of BRSA Banking and Financial Markets*, 7(1): 9-29.
- Gwahula, R. (2013). Efficiency of commercial banks in East Africa: A non - parametric approach. *International Journal of Business and Management*, 8(4): pp 55-67
- Holod, D. & Lewis, H. F. (2011). Resolving the deposit dilemma: A new DEA bank efficiency model. *Journal of Banking and Finance*, 35(11), 2801-2810.
- Humphrey, D.B. (1990). Why do estimates of bank scale economies differ? *Economic Review*, Federal Reserve Bank of Richmond, September/October: 38-50.
- Ikhide, D. (1998). The impact of financial liberalisation on the finance of small and medium scale enterprises in Nigeria. *Development Policy Centre Working Paper Series*.
- Isshaq, Z., & Bokpin, G. A. (2012). Expansion and efficiency in banking: Evidence from Ghana. *Managerial Decision and Economics*, 33, 19-28
- Kablan, S. (2007). Measuring bank efficiency in developing countries: The case of WAEMU (West African Economic Monetary Union). *African Economic Research Consortium*, May 2007.
- Kamau, A.W. (2011). Intermediation efficiency and productivity of the banking sector in Kenya. *Interdisciplinary Journal of Research in Business*, 1(9): 12-26.
- Khan, M.S. & Senhadji, A.S. (2000). Threshold effects in the relationship between inflation and growth. *IMF Working Paper*
- Kirkpatrick, C.H., Murinde, V. & Tefula, M. (2008). The measurement and determinants of X-inefficiency in commercial banks in Africa. *European Journal of Finance*, 14 (7), 625-639.
- Kiyota. (2009). Efficiency of commercial banks in Sub Sahara: A comparative analysis Domestic and Foreign bank. Paper presented at the CSAE conference 2009 on "Economic Development in Africa".

- Kongwa, L.L. (2015). Frontier markets, the pre-emerging markets of Africa. Unpublished Master's thesis. Wits Business School.
- Koopmans, T.C. (1951). Activity Analysis of Production and Allocation. New York: T.C., Ed., John Wiley and Sons, New York, 359-373
- Kumar, S. (2013). Banking reforms and the evolution of cost efficiency in Indian public sector banks. *Economic Change and Restructuring*. 46: 143. doi: 10.1007/s10644-012-9121-8
- Lang, G. & Welzel, P. (1996). Efficiency and technical progress in banking: Empirical results for a panel of German Cooperative Banks. *Journal of Banking and Finance*, 20: 1003-23.
- Levine, Ross E. 2002. "Bank-Based or Market-Based Financial Systems: Which is Better?" *Journal of Financial Intermediation* 11, 1-30.
- Lovell, C.A.K., Walters, L.C. & Wood, L.L. (1994). Stratified models of education production using modified DEA and regression analysis. In: Charnes, A., Cooper, W.W., Lewin, A.Y. and Seiford, L.M. (Eds.), *Data Envelopment Analysis: Theory, Methodology, and Applications*. Boston: Kluwer Academic Publishers.
- Maghyereh, A. and Awartani, B. 2011, 'Return and Volatility Spillovers Between Dubai Financial Market and Abu Dhabi Stock Exchange in the UAE', *Applied Financial Economics*, vol.22, pp.837-848.
- Majumdar, S.K. & Chhibber, P. (1999). Capital structure and performance: evidence from a transition economy on an aspect of corporate governance. *Public Choice*, 98(3/4): 287-305.
- Maudos, J., Pastor, J.M., Perez, F., & Quesada, J. (2002), Cost and profit efficiency in European banks. *Journal of International Financial Markets, Institutions and Money*, 12(1), 33-58.
- Meeusen, W. & van den Broeck, J. (1977). Efficiency estimation from Cobb-Douglas production functions with composed error. *International Economic Review*, 18: 435-444.
- Miller, S. & Noulas, A. (1996). The technical efficiency of large bank production. *Journal of Banking Finance*, 20(3): 495-509.
- Motelle, S.I. & Biekpe, N. (2014). Financial intermediation spread and stability of the banking system in the Southern African Custom Union. *Managerial Finance*, 40(3): 276-299.
- Mumtaz, R., Rauf, S. & Noreen, B. (2013). Capital structure and financial performance: evidence from Pakistan (Kse 100 index). *Journal of Basic and Applied Scientific Research*, 3(4): 113-119.
- Musonda, A. (2008). An investigation into the determination of cost efficiency in the Zambian Banking system. Paper presented at the 13th Annual African Econometrics Society (AES) conference, South Africa.

- Mwega, F. (2011). The competitiveness of the financial services in Africa: A case study of Kenya. *African Development Review*, 23(1): 44-59.
- Ngalande, E. (2003). The importance of financial system modernization in Africa. Keynote address at the peer user group conference, BIS Review 27 South Africa.
- Okeahalam, C. (2001). Structure and conduct in the commercial banking sector of South Africa. Presented at TIPS 2001 Annual Forum.
- Okuda, H., Hashimoto, H. & Murakami, M. (2003). The estimation of stochastic cost functions of Malaysian commercial banks and its policy implications to bank restructuring. Centre for Economic Institutions Working Paper Series, No. 2003-2.
- Pasiouras, F. (2008). International evidence on the impact of regulations and supervision on banks' technical efficiency: an application of two-stage data envelopment analysis, *Review of Quantitative Finance and Accounting*, Springer, vol. 30(2), pages 187-223.
- Pastor, J. M. (1999). Efficiency and risk management in Spanish banking: a method to decompose risk. *Applied financial economics*, 9(4), 371-384.
- San, T.O.; Theng Y.L, & Heng, B.T. (2011). A Comparison on Efficiency of Domestic and Foreign Banks in Malaysia: A DEA Approach, *Business Management Dynamics* Vol.1, No.4, Oct 2011, pp.33-49.
- 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.
- Schmidt, P. & Sickles R.C. (1984). Production frontiers and panel data. *Journal of Business and Economic Statistics*, 2: 367-374.
- Segun, K.R.S. & Anjugam, M. (2013). Measuring the efficiency of Sub Saharan Africa's microfinance institutions and its drivers. *Annals of Public & Cooperative Economics*, 84(4): 399-422.
- Sena, V. (2003). The determinants of firm performance: can finance constraints improve technical efficiency? *European Journal of Operational Research*. 2, 429-444
- Sherman, H.D. & Gold, F. (1985). Bank branch operating efficiency: evaluation with Data Envelopment Analysis. *Journal of Banking and Finance*, 9(2): 297-315.
- Simar, L. & Wilson, P.W. (2007). Estimation and inference in two-stage, semi-parametric models of production processes. *Journal of Econometrics*, 136: 31-64.
- Sufian, F. & Abdul Majid, M.Z. (2007). Singapore banking efficiency and its relation to stock returns: A DEA Window Analysis Approach. *International Journal of Business Studies*, 15(1): 83-106.

Sufian, F. (2008). Determinants of bank efficiency during unstable macroeconomic environment: Empirical: evidence from Malaysia. *Research in International Business and Finance*, 23(2009), 54-77.

Sufian, F. & Habibullah, M.S. (2009). Asian financial crisis and the evolution of Korean Banks efficiency: a DEA approach. *Global Economic Review: Perspectives on East Asian Economies and Industries*, 38(4): 335-369.

Sufian F. (2010). Financial Depression and the profitability of the banking sector of the Republic of Korea: Panel Evidence on bank specific and macroeconomic determinants. *Asia-Pacific Development Journal*, 17, 65-92

Tone, K. (2002). A slacks-based measure of super-efficiency in Data Envelopment Analysis. *European Journal of Operational Research*, 143: 32-41.

## APPENDICES

### Appendix 4.A: Variables used in the computation of bank efficiency

| <b>Variable</b>      | <b>Description</b>   |
|----------------------|--|
| <b>Inputs:</b>       |  |
| Deposits             | Customers' deposits  |
| Labour               | Personnel expenses of bank staff such as salaries and wages                  |
| <b>Outputs:</b>      |  |
| Total Assets         | Sum of gross investments, cash and equivalents, receivables and other assets |
| <b>Input prices:</b> |  |
| Price of deposits    | Interest expenses divided by total deposits                                  |
| Price of labour      | Personnel expenses divided by the total assets                               |

### Appendix 4.B: Financial ratios used as explanatory variables

| <b>Variable</b> | <b>Description</b>                     |
|-----------------|--|
| LOTA            | total loans over total assets          |
| NITA            | noninterest expenses over total assets |
| LEV             | debt/total assets                      |
| TANG            | fixed assets/total assets              |
| SIZE            | log of total assets                    |
| RISK            | the loan loss provision/total loans    |

## CHAPTER 5

### QUIET-LIFE IN BANKING: EVIDENCE FROM TEN FRONTIER MARKETS

#### 5.1 Introduction

The recent liberalisation of the banking sector in Africa has precipitated several key reforms, for instance deregulation of interest rates and the entry of foreign competitors. These reforms have impacted the structure of the banking sector as well as influenced competition which has, in turn, significant implications on the efficiency and overall stability of the banking sector. Competition is of key importance to the banking sector, and as it increases, we expect to see a reduction or removal of cost inefficiencies to promote welfare gains and foster economic growth (Jayaratne & Strahan, 1996). Policymakers are particularly interested in banking competition, and central banks take measures to amend competitive levels for the greater good of the economy (Kapsis, 2012). In the Frontier African countries, bank credit is a major source of finance (Moyo et al, 2014) and, therefore, expected gains due to improving competitive conditions are of importance. Theory suggests that an increase in competition encourages banks to decrease managerial inefficiencies and hence reduce on the operating costs. This comes from two channels of transmission. On the one hand, an increased degree of banking competition will result in a lower monopoly power for banks, and therefore a decrease of banking prices. On the other hand, heightened competition should encourage banks to reduce their costs so that their cost efficiency, meaning their ability to produce with the minimal costs, would improve (Weil, 2003). Subsequently, the combined improvements in competition and efficiency in the financial sector can also contribute to greater financial stability, product innovation, and access by households and firms to financial services, which in turn can improve prospects for economic growth (Hauer & Peiris, 2005; Mwega, 2008).

The nexus between banking competition and efficiency has not been extensively studied and empirical studies have predominately focused on

developed countries (see Bertrand & Mullainathan, 2003; Chen & Zhao, 2008; Maudos & Fernandez de Guevara, 2007; Qiu & Yu, 2009; and Coccoresse & Pellecchia, 2010). The perceived relationship between competition and efficiency has been explained by the 'quiet-life' hypothesis of Hicks (1935). The theory suggests that firms with market power incur inefficiencies through the enjoyment of monopolistic rents. Early empirical studies on the 'quiet life' hypothesis in banking found compelling evidence that banks in more concentrated markets exhibit lower cost efficiency levels. However, more recent studies have re-examined the issue in different contexts with mixed results. This study, therefore, seeks to examine the relationship between banking competition and efficiency in ten frontier African countries.

The objective of this paper is achieved in a three-stage analysis. The first stage estimates a translog function model using the SFA approach to calculate cost and profit efficiency measures for the selection of frontier African countries over the period 2005 to 2012. SFA has been used in several empirical studies on banking efficiency in Africa (e.g. Okeahalam, 2006; Mlambo & Ncube, 2011; Poshakwale & Qian, 2011; Alhassan, 2015). The Lerner Index is employed to measure bank competition (market power). In the third stage, the paper employs the Random Effects technique to estimate a panel regression model which is used to examine the relationship between competition and efficiency in the banking sectors of the Frontier African countries.

This paper contributes to the empirical literature by extending on an earlier study by Léon (2014) by estimating both the profit and cost efficiency for ten Frontier African countries. Léon (2014) employed only the cost efficiency measure to investigate the Quiet Life Hypothesis (QLH) in a sample of ten African countries. This study incorporates profit efficiency which is a broader concept than cost efficiency as it considers the effects of the choice of a vector of production on both costs and revenues (Maudos et al., 2000).

The results from the empirical estimation show that there was a variation in competitive conditions across the sample from 2005 to 2012. Our results reject the prediction of the QLH, as banks' market power looks to positively affect both cost and profit efficiency, even if the overall impact is not

particularly significant in scale. This means that the 'quiet life' behaviour of Frontier African banks, although existing, leads to a noteworthy loss of efficiency.

The rest of this paper is structured as follows. Section 5.2 provides a review of the existing literature on the relationship between competition and efficiency in the banking sector. Section 5.3 describes the sources of data and the variables and approaches that are used for the measurement of banking competition and efficiency, as well as the specification used to analyse the relationship between the two. Section 5.4 discusses the empirical results and Section 5.5 concludes the study.

## **5.2 Review of literature**

This literature review examines the theoretical underpinnings behind the Quiet Life Hypothesis (QLH). It further delves into empirical studies, with a specific focus on Africa that will help situate the contribution of this study in the broader literature.

The QLH advanced from the Efficient Structure (ES) hypothesis,<sup>10</sup> and asserts that firms in monopolistic markets may forego excess profits in favour of enjoying discretionary expenses or less effort. This was first expressed by Hicks (1935) who said that the best of all monopoly profits is a "quiet-life". Applied to banking markets, the QLH postulates that banks trade-off higher profits for less risk. Because of this, bank managers in a monopolistic market may be particularly sensitive about showing abnormally high profits. However, the quest for cost efficiency is less intense at the expense of lower

---

<sup>10</sup> The ES theory hypothesises that under the weight of market competition, efficient firms overcome the competition and grow, and as they become larger, they obtain greater market share, and thereby earn higher profits. Under this hypothesis, a market becomes inefficient as it becomes more concentrated. This hypothesis was first proposed by Demsetz (1973). The theory suggests a reverse causality between competition and efficiency. Further, per the ES hypothesis, more efficient firms have lower costs, which in turn lead to higher profits. Therefore, the most efficient firms can increase their market share, resulting in higher concentration. Many empirical studies have tested this hypothesis extensively, with the majority focusing on the US and countries in Europe.

profits. Because of this 'slack' in management, firms with greater market power are more inefficient (Coccoresse & Pellecchia, 2010).

Leibenstein (1966) suggests that inefficiencies may result from the existence of imperfections in the internal organisation of firms, for instance due to informational asymmetries. These inefficiencies could be lowered through market competition, which provides an incentive for managers to work harder and firm owners to make a better assessment of firm (and managerial) performance relative to other companies (Coccoresse & Pellecchia, 2010).

Previous theoretical studies have looked at management discretion and its impact on business decisions. For instance, Williamson (1963) suggested that managers, after reaching a certain obligatory profit level, followed objectives other than pure profit-maximisation. Hart (1983) developed a formal model that shows the relationship between competition and management behaviour. The study showed that managerially run firms face the problem of operational slack even if they have optimal incentive structures in place because the owner is unable to observe the real cost of production, thus they cannot observe whether high or increasing total costs are due to mismanagement.

Schmidt (1997) further shows that an increase in competition has two effects on managerial incentives. First, it raises the probability of liquidation, which positively affects managerial effort, but it also reduces firm's profits, which may make the provision of high effort less attractive. Hence, the total effect is ambiguous. Empirical evidence of a 'quiet life' preference of managers, when they are protected from takeover threats, is found by Bertrand and Mullainathan (2003), Chen and Zhao (2008), Giroud and Mueller (2010) and Qiu and Yu (2009).

Using a sample of 5,000 banks in the US over a period from 1980 to 1989, Berger and Hannan (1989), starting from the original standpoint of the 'quiet life' theory, were the first to investigate whether banks operating in more concentrated markets exhibit lower cost efficiency because of slack management. This behaviour, if valid, might result in lower cost efficiency because of shirking by managers, the pursuit of objectives other than profit

maximisation, political or other activities to defend or gain market power, or simple incompetence that is obscured by the extra profits made available by the exercise of market power (Berger & Hannan, 1989). Berger and Hannan (1998) further find that credit institutions operating in more concentrated markets (in terms of the Herfindahl–Hirschman index) are characterised by a lower cost efficiency.

Casu and Girardone (2006) studied the relationship between competition and efficiency and their findings do not support the QLH. They indicate that an increase in banks' monopoly power does not translate into a decrease in cost efficiency. On the other hand, results of the reverse causality tests provide no evidence that increases in efficiency precede increases in market power as argued in the ES hypothesis.

Podpiera et al. (2008) used the Lerner index as a proxy for competition in the Czech banking system and found no improvement in competition during the period 1994-2005, and the causality test showed a negative relationship between competition and efficiency. Thus, the QLH was rejected, as was the case in an earlier study by Maudos and Fernández de Guevara (2007).

(Coccoresse & Pellicchia, 2010) used data on the Italian banking industry for the period 1992–2007 to investigate the QLH. They apply a two-step procedure by first estimating bank-level cost efficiency scores and Lerner indices. They then used the estimated market power measures, as well as a vector of control variables, to explain cost efficiency. Their study supports the QLH, although the impact of market power on efficiency is not particularly remarkable in magnitude.

Some studies have analysed the relationship between market power and efficiency in banking from developing countries with ambiguous results (see Turk Ariss, 2010; Williams, 2012). However, few studies have examined the impact of market power on efficiency in Africa (Hauner & Peiris, 2008; Mwega, 2011). These studies did, however, specifically consider the direct relationship between market power and efficiency. For instance, Hauner and Peiris (2008) consider the impact of the banking sector reforms undertaken in Uganda to

improve competition and efficiency. The study by Mwega (2011) on Kenya investigates the factors that promote financial development in a reforming low-income African country and also analyses ways in which financial markets and policies influence growth and development. However, fewer studies on the determinants of efficiency in Sub-Saharan Africa include a measure of bank concentration (Ndiaye, 2008; Kirkpatrick et al., 2008; Kablan, 2010, 2009). Chen (2009) and Zhao and Murinde (2011) include non-structural measures of competition in the determinants of bank efficiency in Africa (Léon, 2015).

The studies by Chen (2009) and Zhao et al (2013) both support the QLH but both studies suffer from two inadequacies. First, they both presume that the extent of bank competition is exogenous which is not in line with the efficient structure hypothesis. Second, both studies employ structural (market-based) measures of competition and thus implicitly assume that all banks have the same degree of market power (Léon, 2015). In line with Léon (2014), we employ the non-structural measure of competition in the Lerner Index to test the QLH. The Lerner Index has a benefit of being bank-specific and represents the individual power exhibited by each bank in the market. It also controls for endogeneity due to reverse causation. This study contributes to the literature on Africa by considering the effect of not just cost efficiency but profit efficiency on market concentration (proxied by the Lerner Index).

### **5.3 Data and estimation methodology**

The data for the analysis is sourced from Bankscope and uses balance sheets and income statement banks from ten Frontier African countries over the period 2005-2012. After checking the data for errors and multiple erroneous entries, our sample is reduced to 123 banks operating in ten countries (see Appendix 5.A). Complete data for the study was only available from 2005-2012.

To ascertain the most suitable panel data estimation approach between fixed and random effects, I use the results of the Hausman specification test. In addition, consistent with studies by Hoechle (2007) and Green (2003), all the

regression equations are estimated using robust standard errors to correct for groupwise heteroscedasticity and cross-sectional correlation in panels (Simpasa, 2011).

### **5.3.1 Estimating cost and profit efficiency using Stochastic Frontier Analysis**

The definitions of cost and profit efficiency correspond, respectively, to two significant economic objectives: cost minimisation and profit maximisation. Cost efficiency is the ratio between the minimum cost at which it is possible to attain a given volume of production and the realised cost. Profit efficiency measures the ability of banks to produce the maximum possible profit for a given level of input and output prices. Profit efficiency is a much broader concept than cost efficiency since it considers the effects of the choice of vector of production on both costs and revenues (Maudos et al., 2000).

To estimate the cost and profit efficiency of the Frontier African banks we employ the SFA developed by Aigner et al. (1977). Given the panel structure of the data, we employ the stochastic frontier model of Battese and Coelli (1992), because it allows us to estimate time varying cost and profit efficiency scores (Coccorese & Pellicchia, 2010). The SFA specifies a functional form for cost and profit equations, usually in a trans logarithmic form, and allows for random error. It assumes that these errors consist of inefficiencies, which follow an asymmetric distribution (usually a truncated or half normal distribution), and random errors that follow a symmetric distribution (usually standard normal distribution). The reason for this structure of the composite error term is that inefficiencies cannot be negative. Both the inefficiencies and random errors are assumed to be orthogonal to input prices, outputs and country-level or bank-specific variables specified in the estimating equation. For detail on the SFA methodology, see Battese and Corra (1977), Battese and Coelli (1993) and Coelli et al. (1998).

Based on the model of Aigner, Lovell and Schmidt (1977), the cost function of a firm is defined as follows:

$$C_{i,t} = C(y_{i,t}, w_{it}, \varepsilon_{i,t}) \quad \dots(5.1)$$

The costs, as defined below, are a function of the output vector ( $y$ ), the price of inputs ( $w$ ), and a set of random factors ( $\varepsilon$ ) which incorporate the effect of errors in the measurement of variables.

Assuming that, for firm  $i$  at time  $t$ , production costs are function of output  $Q$ , input prices  $W$ , inefficiency  $u$  and random error  $\nu$ , and that the last two terms are independent, we can write the logarithmic specification of the cost function as

$$\ln C_{i,t} = f(Q_{i,t}, W_{i,t}) + v_{i,t} + u_{i,t} \quad \dots(5.2)$$

where  $v_{it}$  is the usual error term that is independent and identically distributed  $N(0, \sigma_v^2)$  – although the non-negative inefficiency term  $u_{it}$  is assumed to be independent and identically distributed as a truncated normal distribution with mean  $\mu$  and variance  $\sigma_u^2$ .

The standard profit function assumes that markets for outputs and inputs are perfectly competitive. Given the input and output price vectors ( $q$ ) and ( $w$ ), the bank maximises profits by adjusting the amounts of inputs and outputs. Thus, the profit function can be expressed as:

$$\Pi = \Pi(w, q, v, u) \quad \dots(5.3)$$

And in logarithmic terms it is expressed as:

$$\ln(\Pi + \theta) = f(w, q) + \ln v - \ln u \quad \dots(5.4)$$

where  $\theta$  is a constant added to the profits of each firm in order to attain positive values, thus able to take logarithms.

We estimate the efficiency levels by specifying the commonly used translog functional form for the cost and profit functions. The cost function is presented as follows:

$$\begin{aligned} \ln TC_n = & \alpha + \sum_{i=1}^2 \alpha_i \ln Q_i \ln YEAR + \sum_{j=1}^3 \beta_j \ln P_j + \frac{1}{2} \left[ \sum_{i=1}^2 \sum_{j=1}^2 \delta_{i,j} \ln Q_i \ln Q_j + \right. \\ & \left. \sum_{i=1}^3 \sum_{j=1}^3 \gamma_{i,j} \ln P_i \ln P_j (\ln YEAR)^2 \right] + \sum_{i=1}^2 \sum_{j=1}^3 \rho_{i,j} \ln Q_j \ln P_i + \ln YEAR + \varepsilon_n \quad \dots(5.5) \end{aligned}$$

where TC is the measure of the total costs of production which comprise of operating costs and interest paid on deposits;  $Q_i$  ( $i = 1, 2$ ) are output quantities

where  $Q_1$  is total loans;  $Q_2$  is other earning assets;  $P_j$  ( $j = 1, 2$ ) are input prices where  $P_1$  is the price of labour;  $P_2$  is the price of deposits;  $\varepsilon_i$  is a two component stochastic error term; and  $\alpha$ ,  $\beta$ ,  $\delta$  and  $\gamma$ , are parameters to be estimated and YEAR is included to take into account the time trend.

### **5.3.2 Definition of inputs and outputs**

In the banking efficiency literature, there is a nuanced divergence among researchers about what should constitute inputs and outputs of banking sector (Sathye, 2003). However, the production and intermediation methods are the two most common approaches that are used in the literature regarding the measurement of inputs and outputs of a bank.

The intermediation approach views the banks as using deposits together with purchased inputs to produce various categories of bank assets (outputs). In contrast, the production approach views banks as using purchased inputs to produce deposits and various categories of bank assets (outputs). Both loans and deposits are, therefore, treated as outputs and measured in terms of the number of accounts. This approach considers only operating costs and excludes the interest expenses paid on deposits since deposits are viewed as outputs.

This study uses the intermediation approach because it is best suited for analysing bank level efficiency (Berger & Humphrey, 1997). To define inputs and outputs in this study we use a variation of the intermediation approach, which was originally developed by Sealey and Lindley (1977) and has been widely adopted. The approach suggests that total loans and securities are outputs, whereas deposits, along with labour and capital, are inputs. Cost figures corresponding to these inputs are interest expenses, personnel expenses, and other operating costs, respectively. The last variable has been computed by subtracting labour costs from all operating costs (which are net of financial expenses).

This study employs input variables in deposits (customer's deposits) and labour (personnel expenses of bank staff such as salaries and wages). In addition, and in line with Angelini and Cetorelli (2003), the output ( $Q$ ) is

proxied by the value of the total assets as the output variables. The prices for the input variables are defined as the ratio of interest expenses to total deposits as proxy for price of deposits,  $P_1$  price of labour (Beccalli et al., 2006);  $P_2$  is the ratio of personal expenses to total assets. Appendix 5.B provides a summary of the inputs and outputs employed.

### 5.3.3 Estimating bank concentration using the Lerner Index

We employ the non-structural Lerner Index to measure bank market competition. The Lerner index usually employed in empirical work to capture the degree to which banks maintain a price level over their marginal costs of production. Lerner (1943) defined his “index of the degree of monopoly power” (or “degree of monopoly” for short) as:

$$Lerner_i = \frac{P_i - mc_i}{P_i} \dots (5.6)$$

where  $P_i$  and  $mc_i$  are firm  $i$ 's price and marginal cost respectively. The index ranges between 0 and 1, with zero corresponding to perfect competition and larger values reflecting more market power and one corresponding to monopoly. The key attractiveness of the Lerner Index lies in (a) simplicity, (b) an intuitive understanding, and (c) relatively mild data requirements. It also allows market power to be proxied at a bank level and its evolution analysed over time. When data on prices and marginal cost are available, the Lerner Index can be computed as a simple ratio.

For each bank, average revenues proxied by price and marginal costs are obtained from the approximation of cost function with three inputs: labour, physical capital and deposits (for more details on the Lerner Index see Angelini & Cetorelli (2003); Maudos and Fernández de Guevara (2004)). The Lerner Index for country  $c$  is the weighted (by bank size) average of individual Lerner indices of all banks in country  $c$  as follows:

$$L_c = \sum_{i \in c} s_{ic} L_{ic} \dots (5.7)$$

where  $s_{ic}$  is the market share of bank  $i$  in country  $c$  and  $L_{ic}$  is the value of the Lerner Index for this bank. Greater values of the Lerner Index are linked to greater levels of market power.  $L_c$  is bounded between 0 and 1 with

intermediate values denoting monopolistic competition. However, it is not uncommon for the Lerner Index to take on negative values. According to the literature, a negative value of the Lerner Index denotes ‘super competition’ and may occur when banks price their output below their marginal cost. This could arise because of using accounting data to estimate the unobserved prices (Daglish et al., 2015).

#### **5.3.4 Testing the Quiet Life Hypothesis**

In the last step of the analysis, we implement the test of the QLH for Frontier African countries by regressing the cost and profit efficiency scores on the estimated Lerner Index as well as a set of bank-level control variables.

We run a regression with the SFA efficiency (profit and cost) estimates on the left-hand side:

$$EFF_{i,t} = \beta_i + \beta_1 LI_t + \beta_2 Z_{i,t} + \varepsilon_{i,t} \quad \dots(5.8)$$

The dependent variable here is the measure of firm efficiency,  $Z_{i,t}$  is a vector of bank level control variables, and  $\varepsilon_{i,t}$  is an ordinary error term. The main independent variable is  $LI_{i,t}$ , which is a measure for market concentration and we use the Lerner Index to estimate this. The QLH postulates that there is a positive relationship between market concentration and firm inefficiency, because of insufficient managerial effort, lack of profit-maximisation behaviour, wasteful expenditures to obtain and maintain monopoly power, and/or survival of inefficient managers, in a more concentrated market (Berger & Hannan, 1998).

Bank-specific variables are constructed using information from the Bankscope database. The bank level control variables used in this study are:

- (a) The ratio of the loan loss provision to total loans (RISK). The need for risk management in the banking sector is inherent in banking business. Changes in credit risk may reflect changes in the health of a bank’s loan portfolio (Cooper et al., 2004), which may affect the performance of the institution, since poor asset quality is the single most important cause of

bank failures. Risk is expected to have a negative coefficient because bad loans are expected to reduce profitability of the bank.

(b) The natural Log of total asset (*SIZE*). The effect of increase in size on efficiency has been proved to be positive to a certain extent. However, for banks that become extremely large, the effect of size could be negative due among other things to issues of bureaucracy that stifle efficiency. Because of this, the size-efficiency relationship may be expected to be non-linear in nature.

(c) The equity to assets ratio<sup>11</sup> (*EQUITY*). The ratio measures the number of assets that are financed by owners' investments by comparing the total equity in the company to the total assets. If banks with high equity ratios experience lower bankruptcy costs and thus lower funding costs, a positive influence of this variable on relative margins (Lerner Index) is expected (Maudos & Nagore, 2005).

## **5.4 Empirical results**

### **5.4.1 Profit efficiency**

The estimates of profit inefficiency scores are obtained from the Battese and Coelli (1995) SFA model that estimates simultaneously efficiency scores as defined in Equation 5.7, which includes output levels, input prices and bank-specific control variables. The average estimated scores of profit inefficiency across the sample are reported in Table 5.1. The estimated average profit efficiency for the whole sample is 0.38: this suggests that an average bank in the sample operates at 62% below the efficient frontier. This average is lower than some past studies carried out on Africa which suggested that banks are on average 67% profit efficient (Kirkpatrick, et al, 2008). The low profit efficiency scores could suggest that the banks in the Frontier African countries are unable to maximise their revenue potential.

---

<sup>11</sup> Equity capital is measured using the Basel Committee definition of bank capital by summing the *TIER I* (i.e. total equity, retained earnings and other disclosed equity reserves) and *TIER II* (i.e. undisclosed equity reserves, general provisions, hybrid capital instruments, and subordinated debts) components of bank capital.

From the sample, we observe that on average banks in Ghana (39.6%), Botswana (39.4%), Nigeria (39.4%) and Tunisia (39.4%) have the highest level of profit efficiency in the sample. Banks in Uganda (31.8%) have the lowest profit efficiency across the sample for the period under study.

In regard to the evolution of profit efficiency, we observe that profit efficiency scores remained somewhat stable with slight variation over the period of study. This could indicate that banks' revenues have not changed considerably in these years under study. We also observe that the profit efficiency values are more homogeneous across countries than cost efficiency.

#### **5.4.2 Cost efficiency estimates**

Table 5.1 shows the estimated cost efficiency results for the Frontier African countries. We observe the estimated average cost inefficiency across the sample is 0.39: this suggests that an average bank in the sample operates at 61% below the efficient frontier. This indicates that the banks on average have higher cost efficiency than profit efficiency, albeit marginally. These values are in line with the literature in the sense that banks appear to manage their costs better than their profits. However, the estimates we get are lower than what is evidenced in past studies on cost efficiency in Africa. For instance, Kirkpatrick et al. (2008) in a study on SSA banks find the cost efficiency of banks at around 80%.

Our results indicate that on average banks in Tunisia (41.6%), Morocco (41.4%) and Kenya (40.6%) have the highest cost efficiency across the sample, while banks in Uganda (32.3%) and Tanzania (37.9%) have the lowest levels of cost efficiency across the sample. Like the results of profit efficiency, in regard to evolution of the cost efficiency, similar to the profit efficiency estimates, we observe stable with slight variation trend over the period of study. This could imply that bank's ability to manage their cost has not changed to a large degree over the period of study.

The results we get from the revenue side (profit efficiency) support the necessity to consider the cost side as well when evaluating banking efficiency. Profit efficient banks seem to be cost efficient, but the inverse does not

necessarily hold (Maudos et al., 2002; Tabak et al., 2011). An exception to this rule was found by Srari (2009), who concluded that banks from countries of the Gulf Cooperation Council (GCC) are more efficiency in profits than in costs. Bos and Kool (2006) state that in a perfect competitive market, profit efficient banks are also cost efficient (Tabak et al., 2011).

**Table 5.1: Profit and cost efficiency estimates**

|                          | Uganda       | Ghana        | Tunisia      | Kenya        | Mauritius    | Morocco      | Nigeria      | SA           | Botswana     | TZ           |
|--------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>Profit Efficiency</b> |              |              |              |              |              |              |              |              |              |              |
| 2005                     | -            | 0.391        | 0.393        | 0.387        | 0.392        | 0.381        | 0.393        | 0.37         | 0.394        | 0.386        |
| 2006                     | -            | 0.395        | 0.395        | 0.39         | 0.393        | 0.372        | 0.391        | 0.375        | 0.39         | 0.383        |
| 2007                     | 0.343        | 0.397        | 0.396        | 0.389        | 0.393        | 0.37         | 0.392        | 0.37         | 0.39         | 0.382        |
| 2008                     | 0.341        | 0.398        | 0.396        | 0.39         | 0.395        | 0.372        | 0.394        | 0.36         | 0.396        | 0.384        |
| 2009                     | 0.342        | 0.399        | 0.394        | 0.391        | 0.394        | 0.374        | 0.397        | 0.359        | 0.395        | 0.382        |
| 2010                     | 0.33         | 0.399        | 0.393        | 0.389        | 0.391        | 0.374        | 0.396        | 0.362        | 0.393        | 0.378        |
| 2011                     | 0.32         | 0.396        | 0.393        | 0.389        | 0.39         | 0.374        | 0.393        | 0.365        | 0.391        | 0.383        |
| 2012                     | 0.229        | 0.395        | 0.394        | 0.393        | 0.392        | 0.37         | 0.396        | 0.372        | 0.401        | 0.39         |
| <b>Average</b>           | <b>0.318</b> | <b>0.396</b> | <b>0.394</b> | <b>0.390</b> | <b>0.393</b> | <b>0.373</b> | <b>0.394</b> | <b>0.367</b> | <b>0.394</b> | <b>0.384</b> |
| <b>Cost Efficiency</b>   |              |              |              |              |              |              |              |              |              |              |
| 2005                     | 0.336        | 0.407        | 0.416        | 0.386        | 0.402        | 0.405        | 0.414        | 0.392        | 0.38         | 0.381        |
| 2006                     | -            | 0.416        | 0.419        | 0.396        | 0.384        | 0.401        | 0.398        | 0.392        | 0.383        | 0.379        |
| 2007                     | 0.322        | 0.39         | 0.415        | 0.404        | 0.38         | 0.408        | 0.404        | 0.385        | 0.376        | 0.378        |
| 2008                     | 0.333        | 0.386        | 0.413        | 0.403        | 0.379        | 0.407        | 0.397        | 0.369        | 0.377        | 0.385        |
| 2009                     | 0.331        | 0.394        | 0.415        | 0.404        | 0.382        | 0.425        | 0.389        | 0.371        | 0.38         | 0.38         |
| 2010                     | 0.326        | 0.395        | 0.415        | 0.406        | 0.389        | 0.423        | 0.385        | 0.381        | 0.398        | 0.375        |
| 2011                     | 0.316        | 0.394        | 0.418        | 0.404        | 0.391        | 0.421        | 0.385        | 0.386        | 0.395        | 0.378        |
| 2012                     | 0.305        | 0.39         | 0.4          | 0.396        | 0.395        | 0.413        | 0.386        | 0.391        | 0.4          | 0.378        |
| <b>Average</b>           | <b>0.323</b> | <b>0.393</b> | <b>0.416</b> | <b>0.401</b> | <b>0.388</b> | <b>0.414</b> | <b>0.394</b> | <b>0.383</b> | <b>0.385</b> | <b>0.379</b> |

Source: Authors estimations from Research Data

### 5.4.3 Lerner Index results

Table 5.2 presents annual averages of the Lerner Index for the ten frontier African countries under study. The trend of the Lerner Index is one of marked variation over the period of study, and this indicates that the market power of the Frontier African banks has fluctuated during the time interval under study. To be more precise, the yearly average of the Lerner Index ranges between 0.26 (in 2005) and 0.21 (in 2012). Banks in Uganda on average experienced the highest levels of competition across the sample (-0.046). On

average, banks in Tunisia had the lowest levels of competition across the sample (0.625).

**Table 5.2: Lerner Index estimates**

|       | Uganda | Ghana | Tunisia | Kenya | Mauritius | Morocco | Nigeria | SA    | Botswana | TZ    |
|-------|--------|-------|---------|-------|-----------|---------|---------|-------|----------|-------|
| 2005  | -0.232 | 0.659 | 0.549   | 0.505 | -0.153    | 0.451   | 0.316   | 0.1   | 0.095    | 0.313 |
| 2006  | -0.124 | 0.58  | 0.552   | 0.468 | -0.357    | 0.473   | 0.3     | 0.046 | 0.045    | 0.332 |
| 2007  | 0.339  | 0.434 | 0.624   | 0.473 | -0.418    | 0.338   | 0.435   | 0.062 | -0.205   | 0.277 |
| 2008  | 0.558  | 0.318 | 0.634   | 0.425 | -0.356    | 0.304   | 0.478   | 0.234 | 0.066    | 0.378 |
| 2009  | 0.539  | 0.234 | 0.669   | 0.434 | -0.176    | 0.376   | 0.304   | 0.181 | 0.077    | 0.351 |
| 2010  | -0.56  | 0.213 | 0.67    | 0.476 | 0.045     | 0.408   | 0.312   | 0.073 | 0.012    | 0.41  |
| 2011  | -0.435 | 0.265 | 0.668   | 0.479 | 0.036     | 0.413   | 0.301   | 0.129 | 0.104    | 0.387 |
| 2012  | -0.454 | 0.144 | 0.705   | 0.315 | 0.098     | 0.397   | 0.309   | 0.155 | 0.248    | 0.219 |
| Total | -0.046 | 0.304 | 0.625   | 0.451 | -0.16     | 0.384   | 0.348   | 0.098 | 0.055    | 0.336 |

*Source: Authors estimations*

#### 5.4.4 Regression results

To further analyse this issue, which represents the core of our paper, we use the cost and profit efficiency estimates, bank specific variables and the Lerner indices, as calculated in the first step from the SFA Battese Coelli (BC) model and run a random effects regression (Table 5.3). Our main objective is to examine whether bank competition has a positive or negative effect on both cost and profit efficiency.

Following from (Coccoresse & Pellicchia, 2010), we carry out the Wald test which rejects the null hypothesis of exogeneity of the Lerner Index, confirming that our measure of market power is endogenous.

**Table 5.3: Results for Random Effects estimation**

|                   | Profit Efficiency |             |              | Cost Efficiency |              |              |
|-------------------|-------------------|-------------|--------------|-----------------|--------------|--------------|
|                   | Coef.             | z           | P>z          | Coef.           | Z            | P>z          |
| Constant          | 0.380***          | 29.2        | 0.000        | 0.359***        | 22.77        | 0.000        |
| <b>Lerner</b>     | <b>0.004</b>      | <b>1.44</b> | <b>0.151</b> | <b>0.033***</b> | <b>11.14</b> | <b>0.000</b> |
| Size              | -0.005***         | -5.94       | 0.000        | -0.004***       | -4.89        | 0.000        |
| Equity            | -0.005            | -1.43       | 0.154        | 0.00            | 0.03         | 0.973        |
| Risk              | -0.003            | -0.34       | 0.736        | -0.006          | -0.74        | 0.459        |
| Wald $\chi^2(13)$ | 210.34            |             |              | 350.68          |              |              |
| Prob > $\chi^2$   | 0.000             |             |              | 0.000           |              |              |
| R-squared         | 0.4933            |             |              | 0.5804          |              |              |
| Country Dummy     | YES               |             |              | YES             |              |              |

|              |     |     |
|--------------|-----|-----|
| Banks        | 109 | 109 |
| Observations | 723 | 723 |

---

Source: Authors estimations

Note: \*\*\* denotes significance at 1%.

The coefficient of LERNER is positive and statistically significant at the 1% level in all specifications for both profit and cost efficiency. This indicates that bank market power (competition) increases (reduces) cost and profit efficiency scores. These finding rejects the QLH because, for the Frontier African banks, higher Lerner indices are associated with cost and profit efficiencies and increased market power seems to increase the incentive to minimise costs and maximise profits. This may be because bank managers apply more effort in their working activities. The elasticity associated with the Lerner Index shows that a 1% increase in the Lerner Index determines an increase in the profit efficiency score, on average, by 0.004%.

In the same way, a 1% increase in the Lerner Index generates a statistically significant increase in the cost efficiency score, on average, by 0.033%. The biggest percentage increase is observed in cost efficiency as opposed to profit efficiency for the Frontier African countries. The existence of lower levels of profit efficiency than of cost efficiency are similar to those obtained in other studies (Berger & Mester (1997) and Rogers (1998) for the US banking system, and Lozano (1997) for the Spanish savings banks). The results are in line with Léon (2014) whose study identifies a positive relationship between the cost efficiency estimates and the measure of bank competition using a sample from 7 countries from West Africa.

Looking at the bank-level variables, the coefficient of the natural log of total asset (*SIZE*) is negative for both profit and cost efficiency. This could mean that the larger the bank, the better it manages its cost and profit. There is also empirical evidence to suggest that an increase in the size of banks will result in lower cost and profit efficiency. The reason for this could be that as banks increase in size, they could be less pressured to control their expenses and become less cost efficient (Maudos et al., 2002). Similarly, the negative effect of bank size on profit efficiency shows that as banks get bigger in size, they cannot exploit additional profits by relying on their

market power, because of intense competition in the markets (Xiang et al., 2011). However, it is important to note that the influence is not statistically significant for both profit and cost efficiency.

For the coefficient of the ratio of the loan loss provision to total loans (*RISK*), we observe a negative relation for both profit and cost efficiency for the Frontier African countries. This goes to show that as bank risks increase, both profit and cost efficiency reduce. This could mean that banks with risk taking behaviour are, *ceteris paribus*, more distant from the profit and cost frontier (Tabak et al., 2011). These conclusions stem from among others, the 'bad luck' hypothesis of Berger and DeYoung (1997), which states that an increase in a bank's risk, which is translated into an increase in the bank's probability of default, will cause managers to operate less efficiently.

A reason for this is that bank managers when faced with increased risk, should take additional precautions and incur additional risk-monitoring costs. These extra operating costs result from various sources, for instance monitoring of delinquent borrowers and the value of collateral, as well as the costs of seizing and disposing of collateral in cases of default (Podpiera & Weill, 2007). In addition, in attempting to mitigate the risk, bank managers also divert their attention away from solving day-to-day operational problems and pursuing efficiency improving strategies. Consequently, we expect that an increased risk could cause reduced cost and profit efficiency.

The coefficient of equity to assets ratio (*EQUITY*) is negative and not significant for profit efficiency and zero for cost efficiency. This could mean that the higher the shareholders' capital in relation to a bank's assets, the more cost efficient the bank is. This may be a sign that a higher shareholders' leverage forces banks to become more cost efficient as a way of attaining better results.

## 5.5 Conclusion

The main thrust of this paper is to empirically test the so-called 'Quiet Life' Hypothesis, which states that banks with higher market power are less efficient due to slack managerial behaviour. To this end, first we used the Stochastic Frontier Analysis to compute cost and profit bank efficiency on a sample of ten Frontier Market African countries. Second, we calculated the Lerner Index as an estimate for bank competition, and finally we ran a random effects regression to investigate the relationship between bank efficiency and competition.

The analysis has highlighted that the banking sectors in the Frontier market African countries have low levels of both cost and profit efficiency. In addition, we observe a marked variability in bank competition across the years of study. On average, banks in the Frontier Market African countries seem to have reduced their marginal costs faster than price falls, which has caused an increase in the Lerner index, and consequently proposed greater market power.

Further, our results indicate the existence of a positive and significant relationship between market power and both cost and profit efficiency. These findings, however, reject the QLH because, for the Frontier market African banks, higher Lerner indices are associated with cost and profit efficiencies and increased market power seems to increase the incentive to minimise costs and maximise profits. Hence increased bank competition may impede cost and profit efficiency of banks, and this could result in increased loan rates.

These results have implications for policymakers and regulators as the findings highlight the uncertainty of the view that promotion of bank competition would lead to a reduction in the prices of financial services. Policy makers could, therefore, pursue strategies that regulate the pricing of banking services in competitive environments to check for managerial inefficiency.

A limitation that arose from this study was the short time period of the data, and this could impact on the robustness of some of the estimates derived as

well as influencing the choice of methodology that was used to measure the relationship between bank efficiency and bank competition. The failure to analyse a longer sample period is due to the limited data availability.

## REFERENCES

- Aigner, D.J., Lovell, C.A.K. & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production functions. *Journal of Econometrics*, 6: 21-37. [http://dx.doi.org/10.1016/0304-4076\(77\)90052-5](http://dx.doi.org/10.1016/0304-4076(77)90052-5).
- Alhassan, A.L. (2015). Income diversification and bank efficiency in an emerging market. *Managerial Finance*, 41(12):1318-1335.
- Angelini P. and N. Cetorelli, 2003, "Bank Competition and Regulatory Reform: The Case of the Italian Banking System," *Journal of Money Credit and Banking*, 35, 663-684.
- 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(1), 153-169.
- Battese, G.E., T.Coelli.(1993). A Stochastic Frontier Production Function Incorporating a Model for Technical Inefficiency Effects: University of New England. Department of Econometrics.
- Battese, G., and T. Coelli. (1995). A Model for Technical Inefficiency Effects in a Stochastic Frontier Production Function for Panel Data. *Empirical Economics* 20:325.332.
- Battese, G.E. & Corra, G.S. (1977). Estimation of a production frontier model: with application to the pastoral zone of eastern Australia. *Australian Journal of Agricultural Economics*, 21: 169-179.
- Beccalli E., Casu B. & Girardone C. (2006). Efficiency and stock performance in European banking. *Journal of Business Finance and Accounting*, 33(1&2): 245-262.
- Berger, A.N. & Hannan, T.H. (1989). The price-concentration relationship in banking. *The Review of Economics and Statistics*, 291-299.
- Berger, A.N. & Humphrey, D.B. (1997). Efficiency of financial institutions: international survey and directions for future research. *European Journal of Operational Research*, 98:175-212.
- Berger, A.N. & DeYoung, R. (1995). Problem loans and cost efficiency in commercial banks. Office of the Comptroller of the Currency, Economics and Policy Analysis Working Paper 95-5.
- Berger, A. and R. DeYoung (1997). Problem loans and cost efficiency in commercial banks. *Journal of Banking and Finance* 21(6), 849-870.
- Berger, A. and 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* 27(2), 404-431.

- Berger, A. and L. Mester (1997). Journal of banking and finance. Inside the Black Box: What Explains Differences in the Efficiencies of Financial Institutions? 21, 895–947.
- Bertrand, M. & Mullainathan, S. (2003). Enjoying the quiet life? Corporate governance and managerial preferences. Journal of Political Economy 111(5): 1043-1075.
- Bos, J.W.B. & Kool, C.J.M. (2006). Bank efficiency: the role of bank strategy and local market conditions. Journal of Banking and Finance, 30: 1953-1974.
- Casu, B. & Giradone, C. (2009). Bank competition, concentration and efficiency in single European market. working paper. Cass Business School, Working Paper Series, WP 01/09.
- Chen, L., and X. Zhao. (2008). Return decomposition. *Review of Financial Studies* 22:5213–49.
- Chen, C. (2009). Bank efficiency in Sub-Saharan African middle-income countries. IMF Working Paper, 09/14:1-34.
- Coccoresse, P. & Pellicchia, A. (2010). Testing the ‘Quiet Life’ Hypothesis in the Italian banking industry. *Economic Notes*, 39(3): 173-202.
- Coelli, T., D. Prasada, and G. Battese (1998), *An Introduction to Efficiency and Productivity Analysis*, Kluwer Academic Publishers.
- Cooper, W.W., Seiford, L.M. & Zhu, J. (2004). Data Envelopment Analysis: History, Models and Interpretations, in *Handbook on Data Envelopment Analysis*, eds W.W. Cooper, L.M., Seiford and Zhu, J., Chapter 1, 1-39, Boston: Kluwer Academic Publishers.
- Daglish, T., Robertson, O., Tripe, D. & Weill, L. (2015). Translog Cost Function Estimation: Banking Efficiency. Working Paper Series 4180. Victoria University of Wellington.
- Demsetz, H. (1973). Industry structure, market rivalry and public policy. *Journal of Law and Economics*, 16: 1-9.
- Giroud, X. and H. Mueller (2010). Does corporate governance matter in competitive industries? *Journal of Financial Economics* 95(3), 312–331.
- Green, E. (2003). What tasks should central banks be asked to perform? available at [www.riksbank.com/conferences/efficiency](http://www.riksbank.com/conferences/efficiency)
- Hart, O. (1983). The market mechanism as an incentive scheme. *Bell Journal of Economics*, 74: 366-382.
- Hauner, D. & Peiris, S. (2008). Bank efficiency and competitiveness in low-income countries: the case of Uganda. *Applied Economics*, 40(21): 2703-2720.

- Hicks, J. (1935). Annual survey of economic theory: The theory of monopoly. *Econometrica: Journal of the Econometric Society*, 3: 1-20.
- Hoechle, D. (2007). Robust standard errors for panel regressions with cross-sectional dependence. *The Stata Journal*, 7(3): 281-312.
- Jayaratne, J. & Strahan, P.E. (1996). The finance-growth nexus: evidence from bank branch deregulation. *Quarterly Journal of Economics*, 111(3): 639-70.
- Kablan, S. (2009), "Measuring bank efficiency in developing countries: The case of WAEMU", *African Development Review* 21, 367-99.
- Kablan, S. (2010). Banking efficiency and financial development in Sub-Saharan Africa. *IMF Working Paper*, 10/136: 1-26.
- Kirkpatrick, C., Murinde, V. & Tefula, M. (2008). The measurement and determinants of x-inefficiency in commercial banks in sub-Saharan Africa. *The European Journal of Finance*, 14(7): 625-639.
- Kapsis, L. (2012). Competition law and policy for the EU banking sector in a period of increased economic uncertainty. *International Journal of Law and Management*, 54(4): 284-301.
- Leibenstein, H. (1966). Allocative efficiency vs. X-efficiency. *American Economic Review*, 56: 392-415.
- Léon, F. (2014). Market power and bank efficiency in low-income countries: Evidence from Africa. *CERDI Etudes & Documents*, 12
- Léon F. (2015) "What do we know about the role of bank competition in Africa?", *Etudes et Documents*, n° 16, CERDI.
- Lerner, A. P. (1943) "Functional Finance and the Federal Debt", *Social Research*, 10(1/4), February: 38-51.
- Lozano A.V., 1997, Profit efficiency for Spanish saving banks, *European Journal of Operational Research*", 98, pp.381-394.
- Maudos, J., Pastor, J. M., & Serrano, L. (2000). Convergence in OECD countries: technical change, efficiency and productivity. *Applied Economics*, 32(6), 757-765.
- Maudos, J. & Fernandez de Guevara, J. (2004). Factors explaining the interest margin in the banking sectors of the European Union. *Journal of Banking & Finance*, 28(9): 2259-2281.
- Maudos, J. & Nagore, A. (2005). Explaining market power differences in banking: a cross-country study. WP-EC 2005-10, Instituto Valenciano de Investigaciones Economicas, S.A.

- Maudos, J., Pastor, J.M., Perez, F. & Quesada, J. (2002). Cost and profit efficiency in European banks. *Journal of International Financial Markets, Institutions and Money*, 12: 33-58.
- Maudos, J., Fernandez de Guevara, J., (2007). The Cost of Market Power in Banking: Social Welfare Loss vs. Cost Inefficiency. *Journal of Banking and Finance*, 31, 2103 -2125.
- Maudos, J. & Solis, L. (2009). The determinants of net interest income in the Mexican banking system: An integrated model. *Journal of Banking & Finance*, 33: 1920-1931.
- 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 & Banking System Stability in sub-Saharan Africa. Paper presented at the joint RES-SPR Conference on “Macroeconomic Challenges Facing Low-Income Countries”, IMF- Washington D.C.
- Mwega, F. (2009) A Case study of aid effectiveness in Kenya. Volatility and fragmentation of foreign aid, with a focus on health. Wolfesnsohn Center for development. Working paper 8
- Mwega, F. (2011). The competitiveness and efficiency of the financial services sector in Africa: A case study of Kenya. *African Development Review*, 26(1): 44-59.
- Ndiaye, G.S. (2008). Institutions financières et développement économique. PhD thesis, Université d’Auvergne, Clermont-Ferrand 1, CERDI.
- Okeahalam, C.C. (2002). Concentration in the banking sector of the common monetary area of southern Africa. Paper presented at Conference on Development Issues in the New Economy , University of Cape Town, South. Africa, March 24-26 2002.
- Okeahalam, C.C., (2006). Production Efficiency in the South African Banking Sector: A Stochastic Analysis, *International Review of Applied Economics*, 20, pp. 103—23.
- Podpiera, P.A, Weill, L. & Schobert, F. (2007). Banking competition and efficiency: a micro-data analysis on the Czech Banking industry. 50: 253.
- Podpiera, P.A, and Weill, L. (2008). Bad luck or bad management? Emerging banking market experience. *Journal of Financial Stability* 4 (2), 135–148.
- Podpiera, P.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.

- 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.
- Qiu, J. & Yu, F. (2009). The market for corporate control and the cost of debt. *Journal of Financial Economics*, 93: 504-524.
- Rogers, K. E. (1998). Nontraditional activities and the efficiency of US commercial banks. *Journal of Banking & Finance*, 22(4), 467-482.
- Sathye, M. (2001). X-efficiency in Australian banking: An empirical investigation. *Journal of Banking and Finance*, 25(3): 613-630.
- Sathye, M. (2003). Efficiency of Banks in a Developing Economy: The Case of India. *European Journal of Operational Research*, 148(3) 662-671.
- Schmidt, K., (1997). Managerial incentives and product market competition. *Review of Economic Studies* 64, 191-213.
- Sealey, C.W. & Lindley, J.T. (1977). Inputs, outputs, and a theory of production and cost at depository financial institutions. *Journal of Finance*, 32: 1251-1266. <http://dx.doi.org/10.1111/j.1540-6261.1977.tb03324.x>
- Simpasa, A. (2011). Competitive condition in the Tanzania banking industry. *African Development Review*, 23(1): 88-98.
- Srari, S.A. (2009). Cost and profit efficiency of conventional and Islamic banks in GCC countries. *Journal of Productivity Analysis*, 34: 45-62.
- Tabak, B., G. Craveiro, and D. Cajueiro (2011). Bank efficiency and default in Brazil: Causality tests. Working Paper Series, No. 235, Central Bank of Brazil.
- 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, 3366-3381.
- Turk Ariss, R. (2010). On the implications of market power in banking: Evidence from developing countries. *Journal of Banking & Finance*, 34(4): 765-775.
- Weill L. (2003), "Banking efficiency in transition economies: The role of foreign ownership", *Economics of Transition*, Volume 11 (3) 2003, pp. 569-592.
- Williams, J.C. (2011). Risk management and macro prudential supervisory policies. Paper series at IDEAS. Pp. 36
- Williams, J. (2012). Efficiency and market power in Latin American banking. *Journal of Financial Stability* 8, 263-276.
- Williamson, O. (1963). Managerial discretion and business behaviour. *American Economic Review*, 53: 1032-1057.

Xiang, D, Shamsuddin, A, and Worthington, A.C. (2011). A comparative technical, cost and profit efficiency analysis of Australian, Canadian and UK banks: Feasible efficiency improvements in the context of controllable and uncontrollable factors," Discussion Papers in Finance: 201119, Griffith University, Department of Accounting, Finance and Economics.

Zhao, T. & Murinde, V. (2011). Bank deregulation and performance in Nigeria. *African Development Review*, 26(1): 30-43.

Zhao, T., Matthews, K., & Murinde, V. (2013). Cross-selling, switching costs and imperfect competition in British banks. *Journal of Banking & Finance*, 37(12), 5452-5462.

## APPENDICES

### Appendix 5.A: Number of banks per country

| <b>Countries</b>    | <b>Number of Banks</b> |
|---------------------|------------------------|
| <b>Uganda</b>       | 15                     |
| <b>Ghana</b>        | 10                     |
| <b>Tunisia</b>      | 14                     |
| <b>Kenya</b>        | 12                     |
| <b>Mauritius</b>    | 8                      |
| <b>Morocco</b>      | 7                      |
| <b>Nigeria</b>      | 7                      |
| <b>South Africa</b> | 22                     |
| <b>Botswana</b>     | 13                     |
| <b>Tanzania</b>     | 15                     |
| <b>Total</b>        | <b>123</b>             |

### Appendix 5.B: Variables used in the computation of bank efficiency

| <b>Variable</b>      | <b>Description</b>   |
|----------------------|--|
| <b>Inputs:</b>       |  |
| Deposits             | Customers deposits   |
| Labour               | Personnel expenses of bank staff such as salaries and wages                |
| <b>Outputs:</b>      |  |
| Total Assets         | Sum of gross investments, cash and equivalents, receivables & other assets |
| <b>Input prices:</b> |  |
| Price of deposits    | Interest expenses divided by total deposits                                |
| Price of labour      | Personnel expenses divided by the total assets                             |

## CHAPTER 6

### INCOME DIVERSIFICATION IN FRONTIER AFRICAN COUNTRIES: IMPLICATIONS FOR BANK EFFICIENCY

#### 6.1 Introduction

The banking sector the world over has undergone several reforms over the last couple of decades. Increased competition, deregulation and productivity have led banking institutions to expand their activities and develop new lines of business in addition to the traditional interest-generating activities. The significance of banking deregulation has been shaped by a global trend towards diversification in banks' revenues and an expansion into non-interest sources of revenue. This has been in line with the universal banking model which has become widely adopted. The model of a universal banking consists of a spectrum of financial activities, including traditional commercial banking, investment banking as well as insurance services. Benefits of bank diversification include improvement in bank efficiency and profitability; hedging for insolvency risk; increase in a bank's intermediation function; and increase in competitiveness and innovation from the banking industry (Sanya and Wolfe, 2011). However, diversification has raised considerable concerns about a desirable structure and appropriate regulation for financial institutions among regulators and central bankers (Biggar & Heimler, 2005). The effects of diversification on bank performance, profitability and risk, have been widely studied for most developed countries. This stems from the fact that the banking sectors in most developed economies have diversified into non-interest income generating activities over a longer duration of time, especially after the beginning of the financial liberalisation era (Gurbuz et al., 2013). Notwithstanding the proportion of non-interest income in banks as well as net operating income has increased around the world, with banking sectors in developing countries also diversifying their activities over the last three decades (Gurbuz et al., 2013).

Diversification in the banking sector has different scopes per a classification by Mercieca et al. (2007). There is diversification according to financial

products and services and geographic diversification, as well as a combination of geographic and business diversification (Mercieca et al., 2007). This study focuses on the former classification of diversification. Financial products and services diversification in the banking sector means an increase in share of fees, net trading profits and other non-interest income inside the net operating income of a bank. According to the theory, diversification of income sources in a bank has the potential to result in low risk and higher risk-adjusted performance (Gurbuz et al., 2013). In addition, since service fees, net trading profits and other non-interest income are not correlated or imperfectly correlated with net interest income, diversification of income sources ought to make net operating income of a bank more stable (Gurbuz et al., 2013).

Most studies however find that non-interest activities are often associated with profitability gains but also with higher risk because of their unstable nature (Stiroh, 2004; Stiroh & Rumble, 2006; Lepetit et al., 2008). Other studies that examine the impact of income diversification on bank performance however indicate that diversification could increase the unpredictability of bank operating income.

A large majority of developing countries have less advanced financial systems and different banking market structures as well as institutional and regulatory backgrounds than most developed economies. A result of this, the impact on bank performance from the creation of new business lines could be inconsistent with the evidence from the developed markets. Few studies focus on developing countries, especially in Africa, with a few exceptions (Sanya & Wolfe, 2011; Pennathur et al., 2012; Nguyen et al., 2012; Alhassan, 2015 and Alhassan & Tetteh, 2016) and these find varying results on the diversification of banks into other business lines. The fact that we see varying results from the different studies provides more impetus to study the relationship between income diversification and banking competition for banks in Africa. It is important to understand whether income diversification is beneficial for bank productivity or not. The objective of this study therefore is to contribute to the

scanty literature from Africa dedicated to the impact of diversification on bank efficiency using a sample of ten Frontier African countries.

This paper builds on an empirical investigation on study on Ghanaian universal banks by Alhassan (2015) and Alhassan and Tetteh (2016). To the best of our knowledge, this is the first cross-sectional study on income diversification and its implications for bank efficiency in a sample of ten Frontier African countries. A question of interest is whether the relationship between bank activity diversification and efficiency is non-linear among the sample of Frontier African banks.

The rest of this paper is organised as follows. Section 6.2 provides a review of the existing literature. Section 6.3 describes the sources of data and the variables used, as well as the specification and methodology employed for the measurement of banking efficiency and its determinants. Section 6.4 discusses the empirical results and Section 6.5 concludes the study, drawing several practical implications based on the findings for policy makers.

## **6.2 Review of literature**

### **6.2.1 Strategic focus and conglomeration hypotheses**

The relationship between income diversification and bank efficiency can be analysed through the lenses of two opposing hypotheses. First, the strategic focus hypothesis which states that banks can maximise their profitability by concentrating on their core business. Second, the conglomeration hypothesis, which asserts that multiple business segments can be more advantageous in improving bank performance (Berger, 1999). Income diversification arises from the conglomeration hypothesis that sees banks seeking to diversify their sources of income and in so doing, helping to foster bank performance and stability (Gambacorta & Marques-Ibanez, 2011).

The conglomeration hypothesis further postulates that operating a range of financial activities, and diversifying bank income away from only interest-earning assets and towards non-interest earning services may improve efficiency and add value from taking advantage of revenues, or from exploiting cost scope economies by sharing inputs in joint production (Gallo et al., 1996;

Calomiris, 1998; Meador et al., 2000). In addition, conglomeration into different activities may diversify risks, allowing higher financial leverage, permitting financial institutions to earn greater revenue from risk-sensitive clients, thereby increasing market value and boosting bank performance (Papanikolaou, 2009; Sawada, 2013). The theory also indicates that diversification of income sources can reduce total risk and increase productivity, as diversification can stabilise operating income if income sources are negatively correlated.

Studies of the opposing strategic focus hypothesis tend to challenge the conglomeration hypothesis by asserting that financial institutions can maximise their profitability by concentrating on their core competencies and core business. They argue that conglomeration may lead to agency problems as managers attempt to add new business lines. In addition, because costs of diversification may outweigh the benefits, it is in the best interest of banks to focus on a single line of business to reduce these agency problems and maximise on management's expertise (Denis et al., 1997).

### **6.2.2 Effect of income diversification on bank efficiency**

Several studies lend support to the conglomeration hypothesis that banks should be as diversified as possible. Diversification in banks is done by combining into what is called a conglomerate such activities as commercial banking, securities trading, insurance and other financial services (Baele et al., 2007). The diversification across different products may enable banks to reduce their expected costs of financial distress/bankruptcy (Boot & Schmeits, 2000).

A further study by Baele et al. (2007) analyses if income diversification can lead to a better performance or risk profile in European banks from 1989 to 2004. Their study finds a positive relationship between income diversification and the market's expectation of predicted bank profits. The study also finds that diversification can reduce risk for most banks, however banks with increased non-interest income proportion have a more systematic risk (Baele et al, 2007).

Demirguc-Kunt and Huizinga (2010) analyse the impact of the bank activities and the short-term funding strategy on the bank risk and return, using a sample of 1,334 banks in over 101 countries. They conclude that the diversification of the non-interest income activities has increased the asset return, and significantly reduced the risk to a very low level. Elsas et al. (2010) investigates the impact of income diversification on bank performance and market value using data of nine countries from 1996 to 2008. This study found that income diversification could improve bank profitability and market value (Gurbuz et al., 2013).

A study by Apergis (2014) explains that both profitability and risk profiles of banking activities are impacted positively by a shift to non-interest activities. This has also been proved in emerging countries by Sanya and Wolfe (2011). They find that both interest activities and non-interest activities can decrease insolvency risk and enhance profitability. Elsas et al. (2010) also explain that in the condition of inevitable crisis, diversification is better suited to resist shocks. However, Baele et al. (2007) contend that while diversification can decrease the total risk of the bank, it could also increase the systemic risk of the bank itself.

Although diversification plays a significant role in the required efficiency for a bank, the costs of diversification may be associated with higher income volatility, implying higher risk. This argument is put forward by some empirical studies: DeYoung and Roland (2001) and Goddard et al. (2008) conclude that a move toward non-interest income is related to higher leverage and increased revenue volatility, which may increase bank earnings' volatility.

De Young and Roland (2001) further advance reasons as to why non-interest income may increase volatility and therefore negatively affect productivity of the sector. First, they state that revenues from fee-based activities may be more volatile than interest income because the customer-bank relationship is stronger in the traditional lending business, for instance for many of the new fee-based activities, it is easier for customers to switch to another bank. In addition, expansion into fee-based services can considerably increase fixed costs (for instance investments in technology and human resources). Third,

in contrast to the lending business, fee-based activities require less regulatory capital, and this suggests a higher degree of financial leverage which ultimately leads to higher earnings volatility.

Stiroh (2004) looked at the potential benefit of income diversification for banks in the United States of America. The study finds that since the growth of net interest and net non-interest income in the period 1984-2001 is increasingly correlated, diversification benefits decreased during the period in question. The study further indicates that at the bank level, risk-adjusted returns are negatively associated with non-interest income shares.

In addition, Chiorazzo et al. (2008) analysed the relation between income diversification and profitability for Italian banks using annual bank data over the period 1993–2003. Their study finds that income diversification can increase risk-adjusted returns for Italian banks and this relation is stronger in larger banks. Busch and Kick (2009) also analysed the impact of fee-based income activities on risk-adjusted performance measures of German universal banks between 1995 and 2007. They empirically found that higher fee-based income could increase risk-adjusted returns of German universal banks (Gurbuz et al., 2013).

Income diversification of the banking sector seems to be negatively associated with its performance if the costs of diversification exceed its benefits. A study by Goddard et al. (2008) used a sample of small US credit unions and found a negative association between diversification and both the unadjusted and risk-adjusted profitability. This is true particularly in terms of cost and profit efficiency according to the study of Berger et al. (2010), who show that diversified banks are less profitable than non-diversified Chinese banks.

Regarding the cost of diversification, Rajan et al. (2000) in their study on US banks, show that average misallocation of capital across divisions is increased by more diversity between segments, leading to higher costs of inefficient investment. This evidence is confirmed by Stiroh and Rumble (2006), who suggest that the increased switching costs are associated with product-line expansion, worsening the diversification discount. Studies by Mercieca et al.

(2007) and Trujillo-Ponce (2013) found no direct benefits of income diversification on bank performance. Other studies, such as Baele et al. (2007), Lepetit et al. (2008), Berger et al. (2000), De Jonghe (2010) and Fiordelisi et al. (2011), have indicated the negative effect of revenue diversification

As mentioned earlier, studies from developing countries on income diversification and bank performance are few. For instance, Sanya and Wolfe (2011) carried out a study on income diversification of banks in emerging countries. Their analysis found evidence that income diversification has a positive effect on risk-adjusted performance of banks in these emerging markets. The model that they used also shows that the System GMM estimators used are a better approach to overcome the endogeneity problem in panel-data regression model estimations.

A study by Alhassan (2015) analysed income diversification of banks and the impact on bank efficiency in Ghana. The findings reveal higher levels of cost efficiency as opposed to profit efficiency to reflect high revenue inefficiency. An examination of efficiency scores by bank size indicates that bigger banks possess higher cost and profit efficiency as opposed to smaller sized banks. The study by Alhassan (2015) further finds that non-linear connection is found between income diversification and efficiency, while size is found to be significant in enabling banks to take advantage of the benefits of income diversification. To the best of my knowledge this is the first comparative study looking at the relationship between income diversification and bank efficiency using ten Frontier African countries. The study seeks to address this gap in the literature and uses cost and profit efficiency as a proxy for bank performance.

### **6.3 Data and estimation methodology**

#### **6.3.1 Data, output variables and input prices**

The study used yearly bank-level data from 2005 to 2012 for 123 banks over the period. The bank-level data was sourced from Bankscope. Specifically, the data was got from financial statements of the banks in the sample. The time

frame used was primarily because of data availability with an emphasis on banks' non-interest generation. Also, considering the statistical technique employed, banks with fewer than five years of complete data available were eliminated from the sample<sup>12</sup>.

There has been a long-standing disagreement amongst researchers regarding what should constitute inputs and outputs in the banking sector (Sathye, 2003). Four different approaches are commonly used in literature to measure the inputs and outputs of banks: the production approach, the intermediation approach, the modern approach and the operations approach. However, banking efficiency studies tend to generally focus on the first two approaches: the production approach (*value added approach*) and the intermediation approach (*asset approach*).

The intermediation approach views the banks as utilising their deposits together with purchased inputs to produce various categories of bank outputs, while the production approach considers that banks use procured inputs to produce deposits and various categories of bank outputs. In this approach, both loans and deposits are, therefore, treated as outputs and measured in terms of the number of accounts. This approach considers only operating costs and excludes the interest expenses paid on deposits since deposits are viewed as outputs (Kumar & Gulati, 2009).

This study uses the intermediation approach because it is best suited for analysing bank level efficiency (Berger & Humphrey, 1997). To define inputs and outputs, we use a variation of the intermediation approach, which was originally developed by Sealey and Lindley (1977) and has been widely adopted: it suggests that total loans are outputs, whereas deposits along with labour and capital are inputs. Cost figures corresponding to these inputs are interest expenses, personnel expenses, and other operating costs.

This study employs inputs variables in deposits (customer's deposits) and labour (personnel expenses of bank staff such as salaries and wages). In line with Angelini and Cetorelli (2003), the output ( $Q$ ) is proxied by the value of

---

<sup>12</sup> Number of banks per country is presented in Appendix 6.A.

the total assets as the output variable. The prices for the input variables are defined as the ratio of interest expenses to total deposits as proxy for price of deposits,  $p_1$  price of labour (Beccalli et al., 2006);  $p_2$  is the ratio of personal expenses to total assets. In accordance with the assumed constraint of linear homogeneity in prices, TC and  $p_1$  are normalised by the price of labour,  $p_2$  (Berger & Mester, 1997), and the approximation of input portion equations using Shepherd's Lemma constraint is avoided. Appendix B provides a summary of the inputs and outputs employed.

### **6.3.2 Estimation of bank efficiency**

To measure the cost and profit efficiency frontier, we build on the study by Maudos et al. (2002) and employ the SFA approach used by Aigner et al. (1977) as well as Meeusen and van der Broeck (1977).

In the SFA, the specification of the functional form of the frontier is assumed to contain an error term with two components: a non-negative random variable representing production inefficiencies, and a random error term. The random error considers the measurement error and other random factors together with the total effects of unspecified input variables in the production function. Further we also employ the BC (1995) model of a stochastic frontier function for panel data. This model is a one-step procedure in which the stochastic frontier is quantified using the Fourier flexible functional form, while the level of firm inefficiency is determined by a vector of country-specific factors that are hypothesised to affect inefficiency. The key reason for specifying variables is to avoid bias in efficiency models which has been identified in the banking literature (Dietsch & Lozano-Vivas, 2000; Lozano-Vivas et al., 2001; Lozano-Vivas et al., 2002).

The BC model has several other methodological advantages. First, it controls for environmental differences across the countries and examines the effects of these variables on estimated efficiency scores. Second, it decreases several of the variances present in the two-step approach. The BC methodology essentially allows for a firm-specific and time-varying intercept shift in the

distribution of the inefficiency term, and this intercept shift is itself a function of the exogenous environmental variables that vary across countries.

Panel data condition of a translog function is specified by:

$$TC_{i,t} = \ln TC(y_i, t; t; \beta) + \varepsilon_{i,t} \quad \dots(6.1)$$

Where TC represents the total operating cost and  $y_i$  and  $w_i$  are vectors of outputs and input prices and:

$$\varepsilon_{i,t} = v_{i,t} + u_{i,t} \quad \dots(6.2)$$

Where  $v_{i,t}$  is the variable that captures the errors in approximation and  $u_{i,t}$  captures inefficiency. The multivariable cost function in its translog form takes on the following model:

$$\begin{aligned} \ln TC \left( \frac{TC}{w_2} \right)_{i,t} &= \beta_1 \ln y_{1,i,t} + \beta_2 \ln \left( \frac{w_1}{w_2} \right)_{i,t} + \beta_3 \ln^2_{1,i,t} + \beta_4 \left( \ln \left( \frac{w_1}{w_2} \right) \right)^2_{i,t} + \\ &\beta_5 \left( \ln \left( \frac{w_1}{w_2} \right) \ln y_1 \right)_{i,t} + \beta_6 \ln E_{i,t} + \beta_7 \ln E^2_{i,t} + \beta_8 (\ln E \ln y_1)_{i,t} + \beta_9 \left( \ln E \ln \left( \frac{w_1}{w_2} \right) \right)_{i,t} + \\ &\beta_{10} \text{year}_t + v_{i,t} + \mu_{i,t} \quad \dots(6.3) \end{aligned}$$

Where TC represents the total cost of a bank, comprised of,  $w_i$  ( $i = 1, 2$ ) where  $w_1$  is price of labour and  $w_2$  is the price of deposit funds;  $y_i$  ( $i=1$ ) is the output quantity where  $y_1$  is total assets;  $v_{i,t}$  and  $\mu_{i,t}$  are the error terms presumed to have a normal distribution and truncated distribution. In addition, consistent with Maudos et al. (2002), the study includes (equity) proxied by financial capital, E as a control for banks' degree of risk. A year dummy, year, is included to control the effect of technological improvements of efficiency. The study also uses the Battese and Coelli (1995) specification under a postulation of a truncated normal random distribution when estimating the translog models.

### 6.3.3 Estimation of income diversification

To measure income diversification levels, we assume that there are two elements of a bank's net operating income, that is: net interest income (*net*) and non-interest income (*non*). The *net* variable is calculated as total interest revenue minus total interest expenses, and the non-interest income variable

is calculated as the sum of net commission fees, net trading profit/loss and other non-interest income (Gurbuz et al., 2013). The sum of the net interest and non-interest income is the net operating income of a bank. To diversify its income, a bank must diversify its sources of net operating income among net interest income and non-interest income components. When the values of net interest income and non-interest income are equal to each other in a bank, this bank is accepted as fully diversified (Gurbuz et al., 2013). To measure the income diversification level of each bank, we calculate the widely used HHI for all banks,<sup>13</sup> calculated as follows:

$$hhi_{div} = 1 - \left[ \left( \frac{non}{totinc} \right)^2 + \left( \frac{net}{totinc} \right)^2 \right] \quad \dots(6.4)$$

A higher value of the *hhi* reflects concentration while a lower value reflects diversification. The specification in Equation 6.4 indicates that increased values of *hhi<sub>div</sub>* indicate very diversified bank income and vice versa (Alhassan, 2015).

#### **6.3.4 Model estimation**

To estimate the hypothesised relationship between bank efficiency and income diversification the study uses the efficiency cost and profit estimates as the dependent variable in a second stage regression analysis employing a fixed effects regression model. The advantage of using the fixed effects panel estimator is that it allows us to analyse the impact of variables that vary over time. Another merit of the model is that it allows us to remove the effect of time-invariant characteristics, so we can assess the net effect of the predictors on the outcome variable. Lastly, the fixed effects model allows us to deal with unobserved heterogeneity when heterogeneity is persistent over time and correlated with independent variables.

This empirical association between cost and profit efficiency and bank income diversification is in consistent with studies Gaganis et al. (2013) as well as Alhassan (2015):

---

<sup>13</sup> HHI is measured as the sum of the squared market share of each bank in each country for each year. Market shares are measured in percentages.

$$U_{i,t} = \beta_0 + \beta_1 hhi_{div,i,t} + \beta_2 hhi_{i,t}^2 + \beta_3 size_{i,t} + \beta_4 lp_{i,t} + \beta_5 eq_{i,t} + \beta_6 lota_{i,t} + \beta_7 tang_{i,t} + \beta_8 hhil_t + \varepsilon_{i,t} \quad \dots(6.5)$$

where  $hhi_{div}$  is used as a proxy for bank income diversification described above in Equation 6.4, and  $hhi_{div}^2$  is a quadratic measure for bank income diversification.

In the quadratic model, a high correlation between  $hhi_{div}$  and  $hhi_{div}^2$  proposes that the results could indicate multicollinearity biases (Alhassan, 2015). To solve this challenge, the study undertakes centring of the  $hhi_{div}$ . This conversion is done by using the difference between the  $hhi_{div}$  and its average values to generate new  $hhi_{div}$ . The bank-specific variables used are constructed by use of data from the Bankscope database. The bank-level control variables used in this study are as follows:

Bank size (*size*) is calculated as the natural logarithm of total assets. Studies by Hauner (2005) and Chen et al. (2005), Isik and Hassan (2003), Girardone et al. (2004) and Weill (2004) have however found indecisive evidence on the relationship between bank size and efficiency.

*Asset quality*, which is calculated as a ratio of loan loss provisions to total loans: this study expects that banks with low asset quality indicated by a high *lp* will have a high level of inefficiency (Alhassan, 2015).

*Eq* is the variable used to control for regulatory conditions of the bank. A higher ratio of equity/total assets refers to risk aversion and protection to bank default risk (Gurbuz et al., 2013). This variable is also used in most of the recent studies in income diversification literature (Sanya & Wolfe, 2011; Chiorazzo et al., 2008).

Another variable used is the liquidity risk (*Lota*), which is calculated as the ratio of total loans to total assets. This arises from the possible inability of banks to accommodate decreases in liabilities or to fund increases on the assets side of the balance sheet and is considered an important determinant of bank efficiency. The loans market, especially credit to households and firms, is risky but also has a greater expected return than other bank assets,

such as government securities, thus one would expect a positive relationship between liquidity and efficiency (Bourke, 1989; Sufian et al., 2010).

Lastly, we use the fixed asset to total assets ratio (Tang) as a measure of the extent to which fixed assets are financed by owners' equity (capital).

## 6.4 Results and discussion

### 6.4.1 Summary statistics

Table 6.1 indicates the summary statistics of the potential correlates of bank efficiency that are used in this study. The mean value of HHI variable in our sample (0.401) specifies that banks in the Frontier Market African countries are not as concentrated in the interest income generating activities over the sample period. The mean value of *eq* variable (equity/total assets) is fairly high (0.144). The *lota* variable has an average that is greater than 50% (0.531) this may indicate a greater risk appetite for bank managers. The mean value of bank asset quality in Frontier African banks over the period 2005–2012 is relatively low (0.02) and this could also be a reason for the high level of risk in most of these banking systems.

**Table 6.1: Potential correlates of bank efficiency**

|               | Mean   | SD    | Min    | Max    | <i>n</i> |
|---------------|--------|-------|--------|--------|----------|
| Hhidiv        | 0.401  | 0.238 | -3.75  | 0.500  | 1084     |
| Lnta          | 10.082 | 2.787 | 1.194  | 15.253 | 1081     |
| Asset quality | 0.02   | 0.03  | -0.143 | 0.343  | 1035     |
| Eq            | 0.144  | 0.122 | -0.152 | 0.991  | 1073     |
| Lota          | 0.531  | 0.185 | 0      | 0.987  | 1078     |

Notes: hhidiv, 1-Herfindahl index for income  
 lnta, log of total assets  
 asset quality, loan loss provisions to total loans  
 eq, equity to total assets  
 lota, loans to total assets

In line with Alhassan (2015), before the estimation of the regression models, the study tests for collinearity amongst the independent variables. The correlation analysis results show a weak collinearity among the independent variables. The analysis uses a threshold of 0.70 as proposed by Kennedy

(2008), which indicates that estimation of the regression models would not be biased by multicollinearity. The correlation matrix is shown in Appendix 6C.

The cost and profit efficiency estimates are presented in Table 6.2. Generally, the study shows that there are relatively higher cost efficiency values for Frontier African banks over the study period.

An average cost efficiency (CE) of 84.77% specifies that the average Frontier African bank in the sample functions at about 15% below the efficient frontier. This also indicates the capacity of banks to display higher levels of technical and allocative efficiency. The CE estimates are also in line with what Das and Ghosh (2006) found in the Indian banks between 1992 and 2004, and Alhassan (2015) found for Ghanaian banks.

The average profit efficiency (PE) indicates that on average Frontier African banks are able to attain 79.7% of their potential revenue as opposed to banks on the efficient frontier. The diffusion in CE is lower as opposed to the diffusion in the PE in the period of study. This result is in line with other studies that find higher levels of CE than profit efficiency in the banking industry (see Berger & Mester, 1997; Maudos et al., 2002; Kasman & Yildirim, 2006; Das & Ghosh, 2006; Pasiouras et al., 2008 and Alhassan, 2015).

In addition, we observe that both profit and cost efficiency scores remained stable with slight variation over the period of study. This could indicate that banks revenues have not changed considerably in these years under study.

**Table 6.2: Profit and cost efficiency estimates**

|                          | <b>Uganda</b> | <b>Ghana</b> | <b>Tunisia</b> | <b>Kenya</b> | <b>Mauritius</b> | <b>Morocco</b> | <b>Nigeria</b> | <b>SA</b> | <b>Botswana</b> | <b>TZ</b> |
|--------------------------|---------------|--------------|----------------|--------------|------------------|----------------|----------------|-----------|-----------------|-----------|
| <b>Profit Efficiency</b> |               |              |                |              |                  |                |                |           |                 |           |
| 2005                     | .             | 0.861        | 0.856          | 0.828        | 0.789            | 0.780          | 0.557          | 0.674     | 0.857           | 0.793     |
| 2006                     | .             | 0.787        | 0.858          | 0.828        | 0.796            | 0.790          | 0.798          | 0.856     | 0.857           | 0.809     |
| 2007                     | 0.768         | 0.758        | 0.856          | 0.780        | 0.796            | 0.793          | 0.829          | 0.853     | 0.860           | 0.776     |
| 2008                     | 0.774         | 0.783        | 0.858          | 0.775        | 0.813            | 0.796          | 0.801          | 0.833     | 0.857           | 0.754     |
| 2009                     | 0.738         | 0.855        | 0.859          | 0.767        | 0.811            | 0.789          | 0.804          | 0.796     | 0.858           | 0.747     |
| 2010                     | 0.752         | 0.863        | 0.857          | 0.754        | 0.804            | 0.786          | 0.778          | 0.777     | 0.854           | 0.737     |
| 2011                     | 0.878         | 0.868        | 0.857          | 0.769        | 0.798            | 0.762          | 0.799          | 0.749     | 0.759           | 0.696     |
| 2012                     | 0.914         | 0.873        | 0.856          | 0.748        | 0.800            | 0.741          | 0.787          | 0.729     | 0.817           | 0.640     |
| <b>Average</b>           | 0.801         | 0.838        | 0.856          | 0.763        | 0.799            | 0.762          | 0.793          | 0.791     | 0.824           | 0.743     |
| <b>Cost Efficiency</b>   |               |              |                |              |                  |                |                |           |                 |           |
| 2005                     | .             | 0.904        | 0.778          | 0.862        | 0.821            | 0.786          | 0.715          | 0.912     | 0.923           | 0.907     |
| 2006                     | .             | 0.854        | 0.781          | 0.846        | 0.769            | 0.849          | 0.920          | 0.896     | 0.897           | 0.896     |
| 2007                     | 0.935         | 0.844        | 0.772          | 0.793        | 0.833            | 0.845          | 0.889          | 0.877     | 0.913           | 0.892     |
| 2008                     | 0.933         | 0.844        | 0.737          | 0.806        | 0.807            | 0.860          | 0.876          | 0.869     | 0.886           | 0.867     |
| 2009                     | 0.923         | 0.859        | 0.724          | 0.794        | 0.848            | 0.852          | 0.855          | 0.865     | 0.858           | 0.851     |
| 2010                     | 0.910         | 0.828        | 0.683          | 0.742        | 0.829            | 0.845          | 0.851          | 0.842     | 0.827           | 0.826     |
| 2011                     | 0.906         | 0.747        | 0.631          | 0.739        | 0.790            | 0.819          | 0.822          | 0.782     | 0.806           | 0.804     |
| 2012                     | 0.894         | 0.798        | 0.869          | 0.804        | 0.778            | 0.864          | 0.833          | 0.745     | 0.860           | 0.797     |
| <b>Average</b>           | 0.902         | 0.843        | 0.774          | 0.816        | 0.830            | 0.857          | 0.862          | 0.862     | 0.874           | 0.857     |

Source: Authors estimations

### 6.4.2 Income diversification and bank efficiency

In this second stage of the analysis, we look at the effects of income diversification on both cost and profit bank efficiency using the fixed effect regression model, while controlling for the effects of other relevant bank-specific variables. In order to determine the most suitable panel data estimation approach between fixed and random effects, the study uses the results of the Hausman specification test.

The estimation results presented in Tables 6.3 and 6.4 indicate both the random effects and fixed effects results. We include the random effects results as a check for robustness.

**Table 6.3: Income diversification and cost efficiency**

|                                 | Fixed Effects |       |       | Random Effects |       |       |
|---------------------------------|---------------|-------|-------|----------------|-------|-------|
|                                 | Coeff.        | Z     | P>z   | Coeff.         | z     | P>z   |
| Constant                        | 0.853***      | 15.87 | 0.000 | 0.826***       | 31.17 | 0.000 |
| hhi <sub>div</sub>              | 0.244***      | 5.56  | 0.000 | 0.194***       | 4.95  | 0.000 |
| hhi <sup>2</sup> <sub>div</sub> | 0.064***      | 5.53  | 0.000 | 0.051***       | 4.81  | 0.000 |
| Asset Quality                   | -0.109        | -0.77 | 0.443 | 0.030          | 0.24  | 0.808 |
| Equity                          | -0.057        | -0.76 | 0.447 | 0.022***       | 0.41  | 0.000 |
| Lota                            | 0.062***      | 3.69  | 0.000 | -0.071*        | -2.59 | 0.01  |
| Tang                            | 0.076         | 0.56  | 0.578 | 0.045          | 0.49  | 0.623 |
| Size                            | 0.002         | 0.91  | 0.648 | 0.004*         | 2.32  | 0.021 |
| Wald /F-test                    | 52.4          |       |       | 43.89          |       |       |
| Prob > X <sup>2</sup>           | 0.000         |       |       | 0.000          |       |       |
| R-Squared                       | 0.468         |       |       | 0.436          |       |       |
| Year Dummy                      | Yes           |       |       | Yes            |       |       |
| Countries                       | 10            |       |       | 10             |       |       |
| Observations                    | 958           |       |       | 958            |       |       |

Notes: CE, cost efficiency scores from SFA; hhi<sub>div</sub>, 1-Herfindahl index for income; equity = equity to total assets; lota, loans to total assets; tang, fixed assets to total assets;

\*, \*\*, \*\*\* Significant at 10, 5 and 1 per cent levels, respectively

In Table 6.3, we observe a positive and statistically significant relationship between the linear term of  $hhi_{div}$  and Cost Efficiency at 1%. The result highlights that increasingly diversified banks possess a high cost efficiency. The study also looked at the non-linear relation between bank efficiency and diversification, and presented a quadratic term of diversification,  $hhi^2_{div}$  to

study this effect. The quadratic term,  $hhi_{div}^2$  is also positively related to Cost Efficiency (CE) and is significant at the 1% level. This specifies that  $hhi_{div}$  has a cumulative marginal effect on CE. It also shows that banks can take advantage of economies of scope and operate at lower unit cost. In addition, efficiency improvements also increase at higher levels of diversification. The result proposes that increased diversification into non-interest generating activities is efficiency-enhancing. These results are consistent with the conglomeration hypothesis.

**Table 6.4: Income diversification and profit efficiency**

|                       | Fixed Effects |       |       | Random Effects |       |       |
|-----------------------|---------------|-------|-------|----------------|-------|-------|
|                       | Coeff.        | Z     | P>z   | Coeff.         | Z     | P>z   |
| Constant              | 0.844***      | 14.27 | 0.000 | 0.863***       | 20.2  | 0.000 |
| $hhi_{div}$           | 0.078*        | 1.54  | 0.012 | 0.082*         | 1.69  | 0.010 |
| $hhi_{div}^2$         | 0.021*        | 1.59  | 0.011 | 0.022*         | 1.73  | 0.083 |
| Asset Quality         | 0.294*        | 1.69  | 0.010 | 0.174          | 1.06  | 0.289 |
| Equity                | 0.052         | 0.62  | 0.447 | 0.011          | 0.15  | 0.880 |
| Lota                  | 0.025         | 0.64  | 0.524 | 0.036          | 1.02  | 0.310 |
| Tang                  | 0.076         | 0.56  | 0.578 | 0.045          | 0.49  | 0.623 |
| Size                  | -0.007        | 0.91  | 0.204 | 0.0101**       | -2.74 | 0.006 |
| Wald /F-test          | 17.3          |       |       | 18.8           |       |       |
| Prob > X <sup>2</sup> | 0.000         |       |       | 0.000          |       |       |
| R-Squared             | 0.634         |       |       | 0.612          |       |       |
| Year Dummy            | Yes           |       |       | Yes            |       |       |
| Countries             | 10            |       |       | 10             |       |       |
| Observations          | 799           |       |       | 799            |       |       |

Notes: PE, profit efficiency scores from SFA  
 $hhi_{div}$ , 1-Herfindahl index for income  
equity = equity to total assets  
lota, loans to total assets  
tang, fixed assets to total assets  
\*, \*\*, \*\*\* Significant at 10, 5 and 1 per cent levels, respectively

Relating to profit efficiency (Table 6.4), the linear value sustains the positive sign at 10% and the quadratic term is positive and significant at 10%. This may suggest that banks benefit from revenue side efficiencies at reduced levels of diversification into non-interest generation actions. In addition, at

higher levels of diversification, we see that Frontier African banks can further improve their income creation to counterbalance any extra cost linked to the increase in non-interest generating activities.

In addition, the study indicates a positive but insignificant relationship between bank size and CE. The result highlights the economies of scale and scope benefits linked to large banking scale and this is consistent with the studies by Vu and Turnell (2011) as well as Alhassan (2015). We however observe a negative and insignificant relationship between size and profit efficiency.

Bank equity exhibits an insignificant and negative relationship with cost efficiency. The result specifies that banks with increased equity capital are more cost inefficient. Conversely, we observe an insignificant and positive relation between equity and profit efficiency. This indicates that banks with high equity capital are more profit efficient. This is clarified by the importance played by bank equity capital as a cover for future losses. As a result, very capitalised banks most likely would operate on the profit frontier (Alhassan, 2015).

However, a positive and significant relationship between *lota* and cost efficiency, and a positive insignificant relationship with profit efficiency shows that improved intermediation actions cause an increase in both cost and profit efficiency. A reason for this could be that banks with a higher intermediation ratio have significantly lower costs and hence cost efficiency. This also could be explained by an increase in the credit created. This in turn results in reduced loan defaults and an increase in interest income leading to increased profits.

In addition, asset tangibility, has a negative relation to CE but has a positive relation to PE.

Lastly, we observe a positive and significant relationship between asset quality and profit efficiency and a negative insignificant relationship with CE.

## **6.5 Conclusion and recommendations**

The financial reform and liberalisation over the past three decades in Africa has led to an increase in non-interest generating activities in commercial banks. This chapter studied the impact of bank income diversification on cost and profit efficiency of ten Frontier African countries from 2005 to 2012. SFA was used to measure cost and profit efficiency and the Herfindahl index employed to measure the diversification of bank income. The results indicate high revenue inefficiency, and this is evidenced by the high efficiency in cost as opposed to profit. Explicitly, across the sample we observe average efficiency in cost of 84.77% and average profit efficiency of 79.7%. These results tell us that Frontier African banks earn 20.3% less of possible revenue as opposed to more efficient banks and operate 15.23% below the efficient cost frontier.

In the second stage, the fixed and random effects estimations were employed to examine the effect of income diversification and other bank specific variables on cost and profit efficiency. The outcome indicates an inverted U-shaped relation between cost efficiency and income diversification. This infers that income diversification is efficiency-enhancing up to a point and after, the benefits are diminished. The same result is also observed for profit efficiency. This strongly proposes that diversification into non-interest generation can allow banks to increase their income.

In line with Alhassan (2015), the results further propose that while intermediation activities improve Frontier African banks' cost efficiency, they don't assist banks to improve their revenue potential. We also observe that asset quality improves the banks' PE with no significant effect on the CE. In addition, related bank factors are found to have no significant effect in aiding banks to take advantage of the advantages of income diversification.

In conclusion, the results of this study propose that diversification into non-interest generating activities enhances bank efficiency. The study also observes that the bank efficiency is attained at increased levels of diversification. This study gives useful insight to regulatory and bank authorities in Frontier market countries. Policymakers could for instance

focus on formulating strategies to maximise the probable benefit from non-interest generating revenue streams.

A major limitation of the study was the inability to collapse non-interest income into its different components as a result of missing data across the sample. This however presents a stimulating path for future research. The effect of foreign banks entry into the domestic market on bank efficiency is also another avenue for future research.

## REFERENCES

- Aigner, D., Lovell, C. & Schmidt, P. (1977). Formulation and estimation of stochastic frontier function models. *Journal of Econometrics*, 6(1): 21-37.
- Alhassan, A.L. (2015). Income diversification and bank efficiency in an emerging market. *Managerial Finance*, 41(12): 1318 -1335.
- Alhassan, A.L., Tetteh, M.L. and Owusu, F.B. (2016) Market Power, Efficiency and Bank Profitability: Evidence from Ghana, *Economic Change and Restructuring*, 49 (1):71-93.
- Apergis, N. (2014). The long-term role of non-traditional banking in profitability and risk profiles: Evidence from a panel of U.S. banking institutions. *Journal of International Money and Finance*, 45: 61-73.
- Angelini, P. & Cetorelli, N. (2003). The effects of regulatory reform on competition in the banking industry. *Journal of Money, Credit and Banking*, 35(5): 663-684.
- Baele, L., De Jonghe, O. & Vennet, R.V. (2007). Does the stock market value bank diversification? *Journal of Banking and Finance*, 31(7): 1999-2023.
- Batesse, G. E. and Coelli, T. J. (1995) A Model for Technical Inefficiency Effects In A Stochastic Frontier Production Function For Panel Data, *Empirical Economics*, 20:325-332
- Beccalli, E., Casu, B. & Girardone, C. (2006). Efficiency and stock performance in European banking. *Journal of Business Finance and Accounting*, 33 (1-2): 245-262.
- Berger, A., Hasan, I., Korhonen, I. & Zhou, M. (2010). Does diversification increase or decrease bank risk and performance? Evidence on diversification and the risk-return tradeoff in banking. Bank of Finland, Institute for Economies in Transition. Discussion Papers 9.
- Berger, A.N. & Humphrey D.B. (1997). Efficiency of financial institutions: International survey and directions for future research, *European Journal of Operational Research*, 98: 175-212.
- Berger, A.N. & Mester, L.J. (1997). Inside the black box: what explains differences in the efficiencies of financial institutions? *Journal of Banking and Finance*, 21: 895-947.
- Berger, A.N., DeYoung, R., Genay, H. & Udell, G.F. (2000). The globalization of financial institutions: Evidence from cross-border banking performance. *Brookings-Wharton Papers on Financial Services*, 3: 23-158.
- Biggar, D, & Heimler, A. (2005). An increasing role for competition in the regulation of banks. Antitrust Enforcement in Regulated sectors – Subgroup 1, ICN (International Competition Network). Bonn.

- Boot, A. W., & Schmeits, A. (2000). Market discipline and incentive problems in conglomerate firms with applications to banking. *Journal of Financial Intermediation*, 9, 240-273.
- Bourke, P., (1989), "Concentration and other Determinants of Bank Profitability in Europe". *Journal of Banking and Finance*, pp65-80.
- Busch, R. & Kick, T. (2009). Income diversification in the German banking industry, Deutsche Bundesbank Euro system. Discussion Paper. Series 2: *Banking and Financial Studies*. No: 09/2009.
- Calomiris, Charles W. (1998). Blueprints for a new global financial architecture. American Enterprise Institute.
- Chen, X., Skully, M., & Brown, K. (2005). Banking efficiency in China: Application of DEA to pre- and post-deregulation eras: 1993–2000. *China Economic Review*, 16, 229–245.
- Chiorazzo, V., Milani, C. & Salvini, F. (2008). Income Diversification and Bank Performance: Evidence from Italian Banks. *Journal of Financial Services*. 33: 181-203.
- Das, A. & Ghosh, S. (2006). Financial deregulation and efficiency: an empirical analysis of Indian banks during the post reform period. *Review of Financial Economics*, 15(3): 193-221.
- Demirgüç-Kunt, A. & Huizinga, H.P. (2010). Bank activity and funding strategies: the impact on risk and return. *Journal of Financial Economics*, 98:626-650.
- Denis, D. J., Denis, D. K., & Sarin, A. (1997). Ownership structure and top executive turnover. *Journal of financial economics*, 45(2), 193-221.
- DeYoung, R. & Roland, K.P. (2001). Product mix and earnings volatility at commercial banks: evidence from a degree of total leverage model. *Journal of Financial Intermediation*. 10: 54-84.
- De Jonghe, O. (2010). Back to the basics in banking? A microanalysis of banking system stability. *Journal of Financial Intermediation*, 19(3): 387-417.
- Dietsch, M. & Lozano-Vivas, A. (2000). How the environment determines banking efficiency: a comparison between French and Spanish industries. *Journal of Banking and Finance*, 24: 985-1004.
- Elsas, R., Hackethal, A. & Holzhauser, M. (2010). The anatomy of bank diversification. *Journal of Banking & Finance*. 34: 1274-1287.
- Fiordelisi F., Marques-Ibanez D. & Molyneux P. (2011). Efficiency and risk in European banking. *Journal of Banking and Finance*, 35(5): 1315-1326
- Gambacorta, L. & Marques-Ibanez, D. (2011). The bank lending channel: lessons from the crisis. *Economic Policy*, 26(66): 135-182.

- Gaganis C., Hasan, I., and F. Pasiouras, 2013, Efficiency and Stock Returns: Evidence from the Insurance Industry, *Journal of Productivity Analysis*, 40(3): 429–442.
- Gallo, J., Apildado, V. & Kolari, J. (1996). Commercial bank mutual fund activities. *Journal of Banking and Finance*, 20: 1775-1791.
- Girardone, C., Molyneux, P., Gardener, E.P.M. (2004), Analysing the determinants of bank efficiency: The case of Italian banks. *Applied Economics*, 36, 215–227.
- Goddard, J. & Wilson, J.O.S. (2005). US credit unions: An empirical investigation of size, age and growth. *Annals of Public and Cooperative Economics* ,76, 375-406.
- Goddard, J., McKillop, D.G. and Wilson, J.O.S. (2008) The diversification and financial performance of US Credit Unions“, *Journal of Banking and Finance*, 32, 1836-49
- Gurbuz, A., Yanik, S. & Ayturk, Y. (2013). Income diversification and bank performance: evidence from Turkish banking sector. *Journal of BRSA Banking and Financial markets*, 7: 9-29.
- Hauner D., (2005), Explaining Efficiency Differences among Large German and Austrian Banks, *Applied Economics*, 37, 969-980.
- Isik, I. and M.K. Hassan, (2003), Financial Deregulation and Total Factor Productivity Change: An Empirical Study of Turkish Commercial Banks. *Journal of Banking and Finance*, 27, 1455-1485.
- Kasman, A. & Yildirim, C. (2006). Cost and profit efficiencies in transition banking: the case of new EU members. *Applied Economics*, 38: 1079-1090.
- Kennedy, P. (2008). A guide to econometrics (6th ed.). Oxford: Blackwell Publishing.
- Kumar, S, & Gulati, R. (2008). An examination of technical, pure technical, and scale efficiencies in Indian public sector banks using data envelopment analysis. *Eurasian Journal of Business and Economics*, 1(2): 33-69.
- Kumar, S., & Gulati, R. (2009). Did efficiency of Indian public sector banks converge with banking reforms? *International Review of Economics*, 56(1), 47–84.
- Lepetit, L., Nys, E., Rous P. & Tarazi, A. (2008). Bank income structure and risk: an empirical analysis of European banks. *Journal of Banking & Finance*. 32: 1452-1467.
- Lozano-Vivas, Ana, Pastor, Jesús T. & Hasan, Iftekhhar. (2001). European bank performance beyond country borders: What really matters? *European Finance Review*, 5: 141-165.

- Lozano-Vivas, A., Pastor, T.J. & Pastor, M.J. (2002). An efficiency comparison of European banking systems operating under different environmental conditions. *Journal of Productivity Analysis*, 18: 59-77.
- Maudos, J., Pastor, J.M., Perez, P. & Quesada, J. (2002). Cost and profit efficiency in European banks. *Journal of International Financial Markets, Institutions and Money*, 12(1): 33-58.
- Meador, Joseph W., Ryan, Jr., Harley E. & Schellhorn, Carolin D. (2000). Product focus versus diversification: estimates of X-Efficiency for the US life insurance industry. In Harker, Patrick T. & Zenios, Stavros A. (eds.) *Performance of financial institutions: efficiency, innovation, regulation*. New York: Cambridge University Press,.
- Meeusen, W. & van der Broeck, J. (1977). Efficiency estimation from Cobb-Douglas production functions with composed error. *International Economic Review*, 18(2): 435-444.
- Mercieca, S., Schaeck, K. & Wolfe S. (2007). Small European banks: benefits from diversification? *Journal of Banking and Finance*. 31: 1975-1998.
- Nguyen, M., Skully, M. & Perera, S. (2012). Bank market power and revenue diversification: Evidence from selected ASEAN countries. *Journal of Asian Economics*, 23: 688-700.
- Papanikolaou, N. (2009). How output diversification affects bank efficiency and risk: an intra-EU comparison study. Chapters in SUERF Studies, SUERF - The European Money and Finance Forum.
- Pasiouras F., Liadaki A., Zopounidis C., (2008), Bank efficiency and share performance: evidence from Greece, *Applied Financial Economics*, 18, 1121-1130.
- Pennathur, A.K., Subrahmanyam, V. & Vishwasrao, S. (2012). Income diversification and risk: does ownership matters? An empirical examination of Indian Banks” *Journal of Banking and Finance*, 36(8): 2203-2215
- Rajan, R., Servaes, H. & Zingales, L. (2000). The cost of diversity: the diversification discount and inefficient investment. *Journal of Finance*, 55: 35-80.
- Sanya, S. & Wolfe, S. (2011). Can banks in emerging economies benefit from revenue diversification? *Journal of Financial Services Research*, 40: 79-101.
- Sathye, Milind. (2003). Efficiency of banks in a developing country: The case of India. *European Journal of Operational Research*, 148: 662-671.
- Sawada, M. (2013). How does the stock market value bank diversification? Empirical evidence from Japanese banks. *Pacific-Basin Finance Journal*, 25: 40-61.

Sealey Jr., C.W. and Lindley, J.T. (1977). Inputs, outputs, and a theory of production and cost at depository financial institutions. *Journal of Finance*, 32(4): 1251-1266.

Stiroh, K.J. (2004). Diversification in banking: is noninterest income the Answer? *Journal of Money, Credit and Banking*. 36(5): 853-882.

Stiroh, K.J. & Rumble, A. (2006). The dark side of diversification: the case of US financial holding companies. *Journal of Banking and Finance*, 30: 2131-2161.

Trujillo-Ponce, A. (2013). What determines the profitability of banks? Evidence from Spain. *Accounting and Finance*, 53: 561-586.

Vu, H. & Turnell, S. (2011). Cost and profit efficiencies of Australian banks and the impact of the global financial crisis. *The Economic Record*, 87(279): 525-536.

Weill, L. (2004). Measuring cost efficiency in European banking: a comparison of frontier techniques. *Journal of Productivity Analysis*, 21(2): 133-152.

## APPENDICES

### Appendix 6A: Number of banks per country

| Countries    | Number of banks |
|--------------|-----------------|
| Uganda       | 15              |
| Ghana        | 10              |
| Tunisia      | 14              |
| Kenya        | 12              |
| Mauritius    | 8               |
| Morocco      | 7               |
| Nigeria      | 7               |
| South Africa | 22              |
| Botswana     | 13              |
| Tanzania     | 15              |
| <b>Total</b> | <b>123</b>      |

### Appendix 6B: Variables used in the computation of bank competition

| Variable             | Description  |
|----------------------|--|
| <b>Inputs:</b>       |  |
| Deposits             | Customers deposits   |
| Labour               | Personnel expenses of bank staff such as salaries and wages                |
| <b>Outputs:</b>      |  |
| Total Assets         | Sum of gross investments, cash and equivalents, receivables & other assets |
| <b>Input prices:</b> |  |
| Price of deposits    | Interest expenses divided by total deposits                                |
| Price of labour      | Personnel expenses divided by the total assets                             |

### Appendix 6C: Correlation matrix

|               | $hhi_{div}$ | $hhi^2_{div}$ | $eq$   | $lota$  | $inter$ | $assetqty$ |
|---------------|-------------|---------------|--------|---------|---------|------------|
| $hhi_{div}$   | 1           |               |        |         |         |            |
| $hhi^2_{div}$ | -0.8807     | 1             |        |         |         |            |
| $eq$          | -0.1041     | -0.002        | 1      |         |         |            |
| $lota$        | -0.0564     | -0.032        | 0.1947 | 1       |         |            |
| $inter$       | -0.02       | -0.0014       | 0.2116 | 0.0849  | 1       |            |
| $assetqty$    | 0.0695      | -0.0294       | 0.057  | -0.0113 | 0.0102  | 1          |

## CHAPTER 7

### IMPACT OF INSTITUTIONAL QUALITY ON BANKING COMPETITION: EVIDENCE FROM FRONTIER AFRICAN COUNTRIES

#### 7.1 Introduction

The banking sector plays a significant role in directing capital from savings to investment (Demirgüç-Kunt & Levine, 2001). The role performed by banks is however not just to mobilise and utilise savings, but also to certify the quality of borrowers and increase their probability of successful innovation to enhance productivity, and to monetise liabilities which otherwise would fail to find purchasers in the markets (Fama, 1985; Minsky, 1986; Moore, 1988; Stiglitz & Weiss, 1988; Lucchetti et al. 2001). With this background in mind, banking competitiveness is therefore of utmost importance as it fosters the relative ability of banks to efficiently utilise their resources to generate outputs. Studies on banking competitiveness help to yield important implications for financial institutions in areas of government policy, research, and managerial performance (see survey by Berger and Humphrey, 1997). The financial reform and development that has taken place in Africa over the past three decades has had a considerable effect on banking sector competitiveness. The results of this reform however vary across countries. One key reason for this variation could be the difference in the quality of institutions in the different countries. Marcelin and Mathur (2014) state that cross-country variations in institutional quality and their effect on financing options can have an impact on banking system performance.

The idea of an institution is a complex concept that is understood differently by various scholars, and its definition has been an area of debate. Some scholars define institutions as rules, enforcement characteristics of rules, and norms of behaviour that structure human interaction (North, 1990). For others, they are simply a set of constraints which govern the behavioural relations among individuals or groups (Nabli & Nugent, 1989). The World Bank defines institutions as “sets of formal and informal rules governing the

actions of individuals and organisations and the interactions of participants in the development process” (World Bank, 1999, pp 22,23). Through formal rules and informal norms and traditions, institutions determine what is acceptable and unacceptable to a society. This in turn enables the society to run in a smooth and efficient manner. Accordingly, the institutional environment may well affect the way in which banks conduct business and could ultimately be a determinant of banking competition. In many countries, political institutions for instance may be a catalyst to external finance by easing market tensions and facilitating greater access to finance, while in others, they may contribute to erecting barriers to finance (Marcelin & Mathur, 2014).

There have been several cross-country empirical studies on the determinants of banking competition (see Bikker & Haaf, 2002; Claessens & Laeven, 2004; Demirgüç-Kunt et al., 2004; Fernández de Guevara et al., 2005; Fernández de Guevara & Maudos, 2007; Yildirim & Philippatos, 2007; and Bikker et al., 2007). These studies have identified various factors that positively or negatively determine bank competition. However, despite institutional quality having been found to have an impact on bank performance in reference to varying levels of bank competition, few studies have analysed this significant relation (see Abuzayed & Al-Fayoumi, 2016; Léon, 2015; Amidu & Wilson, 2014; and Chen, 2008). All these studies are built largely on the institutional theories which highlight the importance of quality institutions in financial and economic development (North, 1990). These studies have furnished both theoretical and empirical evidence on the differences in institutional quality, however there remains a lack of comprehensive study on Frontier African countries.

The study measures the relationship between institutional quality and bank competition in ten Frontier African countries over the period 2005-2012. The empirical analysis is executed in two stages. First, we calculate a measure of bank competition that is the H statistic derived from the Panzar–Rosse model. In the second stage, we carry out a simultaneous quantile regression to test the determinants of bank competition. Our contribution is twofold: (a) this

chapter seeks to contribute to the limited literature from Africa on the cross-country determinants of banking competition, and (b) it creates a better understanding of the role of institutional quality in the financial and economic development of African economies.

The rest of this chapter is organised as follows. Section 7.2 gives a brief overview of institutional quality in the Frontier African countries. Section 7.3 provides a review of related literature. Section 7.4 gives a description of the data and the various measures employed in the study. The empirical results are presented in Section 7.5, and Section 7.6 concludes and gives policy recommendations.

## **7.2 Overview of institutional quality in Frontier Africa**

Many African countries gained independence from their colonial masters in the late 1950s through to the 1960s. This period also saw increased development of social and economic institutions in these various countries. Most African countries underwent development of policies and reforms to accelerate their economic development. Because of these reforms most of these countries experienced a brief period of economic growth from the mid-1960s to early 1970s. However, during this period, the financial sectors in most African countries operated under tight controls and investment was often directed into state-owned enterprises. The state's growing role in the economy was enhanced by expansion of social services in the various African countries (Osman et al., 2011). However, during this period, many African countries also witnessed periods of bad governance, civil wars and rampant corruption. This led to a breakdown and failure in most of the reforms and policies that had been put in place post-independence. Under these conditions, important institutions in the countries, including the civil service and the judiciary, did not have the expected impact on economic development of the countries.

The period from the 1990s saw a marked improvement in governance practices, liberalisation of the various economies and a reduced state role, and this coincided with reform in institutional quality in most African

countries. This period was also marked by a period of resurgence in economic growth in Africa (Fosu, 2015). However, despite the apparent reform of the institutional frameworks in most African countries, we still observe them scoring low across a series of institutional quality variables. The subject of poor institutional quality in most African countries has remained a concern for their development process, with a view that poor institutional quality is one of the main factors responsible for economic stagnation of sub-Saharan African countries.

This overview looks at three estimates for institutional quality: control of corruption estimates, governance effectiveness estimates and regulatory quality estimates across the Frontier African countries under study for the period 2005-2012.

**Table 7.1: Control of corruption estimates**

|              | 2005  | 2006  | 2007  | 2008  | 2009  | 2010  | 2011  | 2012  |
|--------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Ghana        | -0.36 | -0.02 | 0.05  | -0.04 | 0.03  | 0.06  | 0.04  | -0.10 |
| Kenya        | -0.97 | -0.87 | -0.91 | -1.03 | -1.08 | -0.94 | -0.95 | -1.09 |
| Nigeria      | -1.16 | -1.07 | -0.98 | -0.81 | -0.98 | -1.00 | -1.13 | -1.15 |
| South Africa | 0.58  | 0.43  | 0.22  | 0.16  | 0.14  | 0.09  | 0.03  | -0.17 |
| Uganda       | -0.85 | -0.75 | -0.80 | -0.83 | -0.89 | -0.90 | -0.89 | -0.98 |
| Tanzania     | -0.65 | -0.22 | -0.34 | -0.42 | -0.44 | -0.54 | -0.63 | -0.80 |
| Botswana     | 1.14  | 0.90  | 0.94  | 0.99  | 0.92  | 1.00  | 0.98  | 0.92  |
| Morocco      | -0.30 | -0.40 | -0.32 | -0.38 | -0.31 | -0.18 | -0.40 | -0.44 |
| Tunisia      | -0.09 | -0.07 | -0.11 | -0.18 | -0.11 | -0.15 | -0.17 | -0.15 |

Source: World Bank, 2016

The control of corruption estimates capture perceptions of the level to which public power is exercised for private gain, comprising both small and large forms of corruption, as well as “capture” of the state by elites and private interests. The indicator is an index combining up to 23 different assessments and surveys, depending on availability, each of which receives a different weight, depending on its estimated precision and country coverage (WGI, 2013). The index ranges from -2.5 to 2.5 with a higher score meaning better control of corruption. Corruption is perceived as one of the principal

impediments to the development of an efficient government system, since it is conceived as a symptom that something has gone wrong in the management of the state (Rose-Ankerman, 1999). In Table 7.1, we observe that the country with the highest average control of corruption estimate is Botswana (0.97). Nigeria has the lowest average control of corruption across the sample (-1.04). The apparent high level of corruption in Nigeria has hindered the development of well-functioning transparent institutions in the country (Ogbewere, 2015). Apart from Botswana and South Africa, we observe that all the other countries in the study have a negative score on average across the years of study. This indicates that corruption is still a challenge for most of the Frontier African countries.

Government effectiveness measures public perception on the quality of public services, civil service as well as its degree of independence from political pressure. This indicator also measures how the public perceives the quality of policy design, its implementation, and how credible the government's commitment to such policies is. The index ranges from -2.5 to 2.5 with a higher score meaning better government effectiveness.

Effective governance implies smaller central government, greater devolution of power to local regional entities, and more rights to individuals and local/regional communities in deciding about resource utilisation and allocation. Effective governance helps to foster inclusive and well-organised institutions that encourage sustainable social and economic development. Table 7.2 below indicates government effectiveness estimates for the countries under study. Botswana (0.53) has the highest average estimate of effective governance across the sample, and Nigeria (-1.04) has the lowest average estimate of government effectiveness across the sample. The low governance effectiveness in Nigeria is reflected through a smaller tax base as well as inefficient government expenditure (PWC, 2016).

**Table 7.2: Government effectiveness estimates**

|       | 2005  | 2006 | 2007 | 2008 | 2009  | 2010  | 2011  | 2012  |
|-------|-------|------|------|------|-------|-------|-------|-------|
| Ghana | -0.16 | 0.11 | 0.08 | 0.02 | -0.04 | -0.04 | -0.05 | -0.07 |

|              |       |       |       |       |       |       |       |       |
|--------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Kenya        | -0.67 | -0.58 | -0.50 | -0.59 | -0.60 | -0.54 | -0.56 | -0.54 |
| Nigeria      | -0.88 | -0.96 | -1.04 | -0.97 | -1.20 | -1.15 | -1.08 | -1.00 |
| South Africa | 0.64  | 0.50  | 0.49  | 0.52  | 0.48  | 0.39  | 0.41  | 0.33  |
| Uganda       | -0.54 | -0.48 | -0.41 | -0.57 | -0.62 | -0.52 | -0.51 | -0.57 |
| Tanzania     | -0.39 | -0.34 | -0.38 | -0.48 | -0.59 | -0.58 | -0.63 | -0.69 |
| Botswana     | 0.66  | 0.52  | 0.59  | 0.56  | 0.48  | 0.46  | 0.48  | 0.45  |
| Morocco      | -0.26 | -0.14 | -0.16 | -0.17 | -0.13 | -0.09 | -0.15 | -0.07 |
| Tunisia      | 0.42  | 0.58  | 0.47  | 0.31  | 0.40  | 0.24  | 0.03  | -0.05 |

Source: World Bank, 2016

The regulatory quality estimates insights of the ability of the government to put in place and implement sound policies and regulations that allow for and promote development. The quality of regulation in African countries is of utmost importance and of key significance to the efficient operation of institutions. The index ranges from -2.5 to 2.5 with a higher score meaning better regulatory quality. Regulations provide an enabling environment for institutions to work smoothly. Some studies have indicated that financial institutions do not thrive in an institutional vacuum but need a regulatory environment where contracts are enforced, and bankers are given strong incentives to behave honestly (see Kaufmann et al., 1999; Demirgüç-Kunt & Levine, 1999; and Demetriades & Andrianova, 2004). Table 7.3 shows the regulatory quality in the Frontier countries under study. We observe the highest average estimate in regulatory quality from Botswana (0.53), followed by South Africa (0.49). The lowest regulatory quality estimates are observed in Nigeria (-0.77).

**Table 7.3: Regulatory quality estimates**

|              | 2005  | 2006  | 2007  | 2008  | 2009  | 2010  | 2011  | 2012  |
|--------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Ghana        | -0.11 | -0.08 | -0.06 | -0.04 | 0.09  | 0.12  | 0.13  | 0.12  |
| Kenya        | -0.23 | -0.17 | -0.23 | -0.20 | -0.13 | -0.07 | -0.21 | -0.31 |
| Nigeria      | -0.77 | -0.89 | -0.86 | -0.78 | -0.73 | -0.71 | -0.67 | -0.72 |
| South Africa | 0.67  | 0.71  | 0.53  | 0.50  | 0.40  | 0.36  | 0.40  | 0.37  |
| Uganda       | -0.18 | -0.20 | -0.20 | -0.22 | -0.15 | -0.15 | -0.14 | -0.24 |
| Tanzania     | -0.45 | -0.37 | -0.40 | -0.50 | -0.42 | -0.41 | -0.40 | -0.40 |
| Botswana     | 0.67  | 0.50  | 0.44  | 0.48  | 0.48  | 0.46  | 0.50  | 0.69  |

|         |       |       |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Morocco | -0.40 | -0.18 | -0.20 | -0.18 | -0.05 | -0.07 | -0.11 | -0.09 |
| Tunisia | -0.11 | 0.12  | 0.06  | 0.07  | 0.00  | -0.02 | -0.19 | -0.21 |

Source: World Bank, 2016

### 7.3 Literature review

#### 7.3.1 Institutional quality hypothesis

The institutional quality hypothesis states that economic development is impacted by the institutional framework within which the economic agents interact with each other in an economy (Alexiou et al., 2014). The hypothesis further states that what matters most are the “rules of the game” in a society which is predefined by the prevailing explicit and implicit behavioural norms and their ability to create appropriate incentives for desirable economic behaviour (Rodrik & Subramanian, 2003). Adam Smith (1776) in his seminal work emphasised that nations will prosper once they create the institutions that encourage entrepreneurship and savings. Most of the recent research on “institutional quality hypothesis” has been associated with North’s (1990) study to explore the relationship between economic performance and institutional factors.

One of the basic institutional characteristics addressed in the relevant literature has been “economic freedom”. Studies by Scully (1988) and Dawson (2003) conclude that countries with economic freedom and policies that provide security of property, non-confiscatory taxes and enforcement of contracts promote development and experience better economic performance. Adkins and Savvides (2002), use data from 73 developed and developing countries for the period 1975-1990, and show that institutions that promote economic freedom have a positive effect on economic performance. In specific reference to the financial sector, the empirical literature that links economic freedom and banking performance is relatively recent with only a few studies available (Sufian & Habibullah, 2010; Sufian & Abdul Majid 2012; Chortareas et al., 2012). Sufian (2010) finds 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.

Political freedom is another characteristic that has been considered in the literature. One strand of the empirical research has looked at the extent to which more political freedom has led to less income inequality and to economic prosperity. For instance, studies by Easterly and Levine (2003), Sylwester (2002), Easterly (2001), Bourguignon and Verdier (2000) and Granato et al. (1996) report that countries with greater civil liberties have lower levels of income inequality and as such better economic development. Engerman et al. (2000) argue that high inequality provides a high level of unbalanced access to economic opportunities, and that the route of causality flows from inequality to democracy and, in turn, to other institutions, without ruling out the reverse relation. Political freedom can then offer an enabling environment for the financial sector to grow.

The study on institutions has also looked at aspects such as corruption, quality of bureaucracy and rule of law to mention but a few. With respect to corruption, early works by Huntington (1968) and Leff (1964) supported the view that corruption may aid bureaucracy and positively affect the economy, whereas De Soto (1989) and Krueger (1974) argued the opposite. Although these models gained some credibility in the 1980s, they suffered from a lack of empirical justification. Using survey data from the World Economic Forum and World Bank, Kaufmann and Wei (1999) and Wei (2000) found that corruption increases the degree of regulatory burden on economic agents. In the financial sector, corruption can be a proxy for several exogenous influences including institutional quality and riskiness. However, the literature has paid relatively little attention to the nexus between corruption and financial performance (see Beck et al., 2006 and Huang & Wei, 2006).

Overall, the literature shows that various institutional characteristics have had an influence on the economic development of countries. We also see that they can directly impact the financial sector in various ways. This evidence further suggests that to understand why some banks are more competitive

than others, we should understand the impact that the various institutional characteristics have on bank productivity.

### **7.3.2 Banking competition**

In theory, the causes of bank competition stem from two contrasting theories; the contestability theory and the efficiency hypothesis. The efficiency hypothesis says that well managed and more efficient firms can attain the largest market share, thus leading to higher concentration and more market power (Demsetz, 1974; Peltzman, 1977). The contestability theory, on the other hand, states that a concentrated banking market can still behave competitively if the entry barriers for potential newcomers are limited (see Baumol, 1982 and Bikker & Finnie, 2007). This section of the literature review looks at the determinants of bank competition in particular market structure, macroeconomic variables and quality of institutions.

The degree of bank competition has been linked to productive efficiency (Maudos & Fernandez de Guavara, 2007), and this study indicates that productive efficiency is gained when outputs are produced at the lowest cost. Schure and Wagenvoort (1999) use results from Italian banks to show that these banks achieved productive efficiency post 1993, and this was a time where Angelini and Cetorelli (2000) describe the banks in Italy as competitive. In addition, Evenoff and Ors (2002) link bank competition in the United States of America with increased productive efficiency. The market structure has been considered as a major determinant of competition.

The SCP suggests a positive relation between bank concentration and profit (Weiss, 1989). There is also indication that increased concentration boosts profits and leads to broader spreads between lending and deposit rates (Clarke et al., 2003). Bikker et al. (2007) infer this to mean that concentration can impair bank competition. However, Yeyati and Micco (2007) argue that more concentrated banking markets are not necessarily less competitive, and

this is because mergers often reduce duplication of activities and increase efficiency.

Bank competition is also influenced by bank ownership (Micco et al., 2007; Angelini & Cetorelli, 2003; Maudos & Nagore, 2005; Fernandez de Guevara et al., 2005). Claessens et al. (2001) highlights that there is an indirect and positive effect of the contribution made by foreign banks in concentrated domestic banks from eighty countries. The entry of foreign banks into a domestic market puts pressure on domestic bank profitability and encourages competition. A study by Simpasa (2013) provides evidence of increased competitive behaviour because of foreign bank entrance in Zambia.

Banking competition is also contingent on convenience of substitute-financial products and services (Corvoisier & Gropp, 2002), bank regulation, diversification into other non-interest activities (Winton, 1997) and bank size (Bikker et al., 2006). Bikker et al. (2006) contend that large banks tend to have a bigger market share: this means that markets with large banks have high concentration rates. Further, the relative market power proposition says that small banks only serve as a competitive frontier (Skully & Perera, 2012).

In addition, banking competition is linked to macroeconomic variables such inflation (Claessens & Laeven, 2005). Revell (1979) suggests that inflation could significantly affect bank performance by increasing the industry's operational expenses. Perry (1992) suggests that the effect of inflation on bank performance depends on the degree of precision of the industry in estimating its inflationary expectations.

#### **7.4 Data and methodology**

The data used in the study was obtained from the Bankscope database and the World Bank. The sample is drawn from ten African Frontier Market countries over the period 2008-2012. All the variables are obtained from the various countries' balance sheet and income statement information on the Bankscope database. The data on institutional quality was obtained from the World Bank's World Development Indicator database. The indicators measure various dimensions of governance such as voice and accountability,

government effectiveness, political instability, regulatory quality, rule of law, and control of corruption. We used three of the six governance indicators: voice and accountability, regulatory quality, and control of corruption. This is after we ran the test of correlation, where we checked the correlations among the banking variables and firm-characteristic variables for possible multicollinearity issues. Most of the correlation coefficients are minimal and below 0.8, making it possible to include these variables in the models. Appendix 7.A presents the correlation matrix and Appendix 7.B presents a description for all variables used.

The first step in this study is to measure the level of banking competition in the Frontier African countries. With regard to empirical measurement of banking competition one can consider three types of approaches: market structure and associated indicators; contestability and regulatory indicators to gauge contestability; and formal competition measures (Claessens, 2009). In this study, we consider the market structure approach and we implement the Panzar-Rosse (PR) methodology to estimate banking competition. The second step of the analysis involves breaking down the different distributions of institutional quality by the use of a simultaneous quantile regression.

#### **7.4.1 The PR model**

We use the PR technique because of its sound theoretical foundations and empirical appeal. The H-statistic is an indicator of the degree of market competition developed in the context of the NEIO (Panzar & Rosse, 1987). It is based on the premise that monopolistic theory implies that the revenue of a monopolist falls as marginal cost rises and the H-statistic is interpreted as follows:

The H-statistic is equal to zero or negative when the competitive structure is a monopoly or a perfectly colluding oligopoly.

When H-statistic is equal to 1, this indicates perfect competition:

$0 < H < 1$  indicates monopolistic competition.

H can be interpreted as a continuous measure of the level of competition, between 0 and 1, in the sense that higher values of the H-statistic indicate stronger competition than lower values.

The advantage of using the PR technique is that it allows for bank specific differences in the reduced form revenue function, and the derivation of the PR H-statistic in this study is based upon the work of Bikker and Haaf (2002). It also assumes that banks have revenue and cost functions, respectively given as:

$$R_i(y_i, n, z_i) \text{ and } C_i(y_i, w_i, t_i)$$

where  $R_i$  and  $C_i$  are the revenue and cost of bank  $i$ ,  $n$  is the number of banks, and  $z_i$  and  $t_i$  are vectors of exogenous variables relevant respectively to the revenue and cost functions. Following a profit maximisation path requires that marginal revenue is equal to marginal cost. That is:

$$R'_i(y_i, n, z_i) = C'_i(y_i, w_i, t_i) \quad \dots(7.1)$$

where  $R'_i$  and  $C'_i$  are respectively the marginal revenue and marginal costs of bank  $i$ . The long-run equilibrium in the product market imposes a zero-profit constraint:

$$R_i^*(y_i^*, n^*, z_i) = C_i^*(y_i^*, w_i, t_i) \quad \dots(7.2)$$

where the variables with asterisks are the equilibrium values of the previously defined variables in Equation 7.1.

The H-statistic is derived, as the sum of factor price elasticities.

$$H = \sum_{k=1}^m \frac{\partial R_i^*}{\partial w_{ki}} \frac{w_{ki}}{R_i^*}$$

where  $\frac{\partial R_i^*}{\partial w_{ki}}$  is the derivative of total revenue with respect to the price of the  $k$ th input.

#### 7.4.2 Quantile regression approach

Koenker and Basset (1978) first developed the conditional quantile regression approach. The study employs this approach because of the heterogeneous

distribution of diverse levels of bank competition across the countries in the sample. Further, the approach is useful in tracking the whole spread of bank competition and is provisional upon against a choice of explanatory variables for institutional quality and the macroeconomy. Further, since the sample comprises large outliers and the distribution of the disturbances is not normal, applying conditional mean estimators to the equation would not be suitable since these estimators are not robust to departures from normality or long tail error distributions, and therefore OLS is likely to lead to inefficient and biased estimates. By contrast, quantile regression is robust to departures from normality and skewed tails (Mata & Machado, 1996).

In addition, the QR technique is particularly useful because it is a robust method, but also because it is able to compute several regression curves corresponding to different conditional quantiles in the distribution. Its robustness comes from the fact that the QR method fits hyperplanes among the observations so that a certain proportion  $\theta$  of the observations will be below of the hyperplane and the rest above it

In the equation  $(c_i, z_i), i = 1, 2, \dots, n$  is a sample from a population where  $x_i$  is a  $(k \times 1)$  vector of regressors. The study assumes that the  $\lambda$ th quantile of the conditional distribution of  $c_i$  is linear in  $z_i$ , we can therefore present the conditional quantile regression model as follows:

$$c_i = z_i' \beta_\lambda + \mu_{\lambda i}$$

$$Q_\lambda(c_i | z_i) = 0$$

And  $Q_\lambda(c_i | z_i)$  represents the  $\lambda$ th conditional quantile of  $c_i$  in the vector of regressors  $z_i$ ;  $\beta_\lambda$  is the unknown vector of parameters to be measured for different values of  $\lambda$  in  $(0, 1)$ ; and  $\mu_{\lambda i}$  is the error term. The error term is presumed to have a differentiable c.d.f.  $\Gamma_{\mu\lambda}(\cdot | z)$ , and a density function  $k_{\mu\lambda}(\cdot | z)$ . Further  $\Gamma_i(\cdot | z)$  signifies the conditional distribution function of  $c$ . In changing the value of  $h$  from 0 to 1, the study tracks the whole distribution of  $c$  conditional upon  $z$ .

The estimator for  $\beta_\lambda$  is derived from

$$\min \sum_i^n \Gamma_\lambda(c_i - z_i' \beta_\lambda)$$

Where  $\Gamma_\lambda(\mu)$  is the ‘verifying’ function that is defined as

$$\Gamma_\lambda(\mu) \begin{cases} \lambda\mu & \text{if } \mu \geq 0 \\ (\lambda - 1)\mu & \text{if } \mu < 0 \end{cases}$$

The estimator does not have an explicit form; however, the subsequent minimisation problem can be described by use of linear programming methods. Two approaches are used for the approximation of the covariance matrix of the regression parameter vector: the first generates the asymptotic standard error of the estimator while the second uses bootstrap methods to calculate these standard errors and construct confidence intervals, as suggested by Armstrong et al. (1979).

Following an approach used by Chen (2008), this paper employs the design matrix bootstrap approach to produce measures of the standard errors for the coefficients in the quantile regression<sup>14</sup>. The approach is good because it can be used with small samples and is robust to changes in the bootstrap sample size relative to the data sample size (Buchinsky, 1995). However, significantly, the design matrix bootstrap method is effective under different cases of heterogeneity.

We also employ the percentile method constructed by Koenker and Hallock (2001). The technique permits for the construction of confidence intervals for each parameter in  $\beta_\gamma$ , when the intervals are calculated from the empirical distribution of the bootstrapped  $\beta_\gamma$ 's. The advantage of using the bootstrap percentile confidence intervals is that they are not symmetric around the basic parameter estimate.

### 7.4.3 Empirical specification

The empirical model is detailed and measured using the quantile regression approach below:

---

<sup>14</sup> See Buchinsky, 1995 and 1998.

$$Comp_{i,t} = \lambda_0 + \sum_{k=1}^6 \gamma_k X IQuality_{j,t} + \lambda_1 X \log(GDP) + \lambda_2 X \log(inflation) + \mu_{j,t}$$

The equation is employed to examine if institutional quality, proxied by *IQuality*, has an impact on bank competition, which is estimated by *comp* or otherwise proxied by the H-statistic. A comprehensive description of the definitions used is provided in Appendix 7.B

## 7.5 Results

This section presents the estimation results of the PR model for the Frontier African countries as well as results from the simultaneous regression model to determine the effect of institutional quality on banking competition.

### 7.5.1 H-statistic

The PR model stipulates that banks should be studied whilst in long-run equilibrium. Thus, a Wald test is carried out to find out if the E-statistic is statistically significant from zero. The H-statistic estimates are all statistically significantly different from both zero and unity. The existence of long-run equilibrium is thus not rejected, as indicated in Appendix 7. C.

Table 7.4 shows that the H-statistics are positive and statistically significant for all the Frontier African countries banking markets. The average H-statistic for all the Frontier market countries is 0.613. The highest levels of competition on average are observed in South Africa (0.902), and the lowest average levels in Tanzania (0.243).

The findings suggest that the banking markets in the Frontier African countries are characterised by monopolistic competitive behaviour. Thus, competition coexists with high levels of banking market concentration, suggesting contestable market behaviour. This is in line with Fosu (2013) and Motelle (2013) who find that the banking market in selected SSA countries are monopolistically competitive. Given that most of the studies on banking competition (See section 7.3.2) report results that are consistent with monopolistic competition, the findings of this study suggest that recent

financial sector reforms in Africa may have had some beneficial effects in terms of market discipline.

The trend in competition is stable most of the countries, with significant reduction in competition across the whole sample over 2007 to 2008. This could for instance imply that the Frontier African banking industry experienced structural transformation over this period.

**Table 7.4: Panzer Rosse H-Statistic: panel fixed effect estimation**

|              | 2005  | 2006  | 2007  | 2008  | 2009  | 2010  | 2011  | 2012  |
|--------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Uganda       | 0.686 | 0.726 | 0.784 | 0.709 | 0.685 | 0.755 | 0.794 | 0.816 |
| Ghana        | 0.346 | 0.315 | 0.526 | 0.363 | 0.457 | 0.387 | 0.502 | 0.498 |
| Tunisia      | 0.666 | 0.787 | 0.841 | 0.690 | 0.640 | 0.674 | 0.788 | 0.768 |
| Kenya        | 0.341 | 0.343 | 0.445 | 0.333 | 0.344 | 0.379 | 0.471 | 0.483 |
| Mauritius    | 0.625 | 0.649 | 0.766 | 0.635 | 0.580 | 0.638 | 0.691 | 0.708 |
| Morocco      | 0.604 | 0.756 | 0.792 | 0.632 | 0.640 | 0.730 | 0.866 | 0.898 |
| Nigeria      | 0.447 | 0.475 | 0.637 | 0.510 | 0.503 | 0.528 | 0.691 | 0.706 |
| South Africa | 0.844 | 0.887 | 0.973 | 0.831 | 0.833 | 0.890 | 0.916 | 0.913 |
| Botswana     | 0.453 | 0.565 | 0.677 | 0.547 | 0.565 | 0.579 | 0.697 | 0.718 |
| Tanzania     | 0.127 | 0.163 | 0.324 | 0.184 | 0.211 | 0.190 | 0.303 | 0.272 |

Source: Authors estimations from Research Data

### 7.5.2 Simultaneous quantile regression

Table 7.5 presents the simultaneous quantile regression estimates in five different quantiles (10%, 25%, 50%, 75%, and 90%) corresponding to competition measures of H-statistic. The coefficients of the regulatory quality variable are positive and significant with bank competition proxied by H-statistic as the dependent variable in both the OLS as well as the quantile regression model. Specifically, the estimates highlight that the scale of the estimated positive effects of regulatory quality progressively increases from the 10th quantile to the 75th quantile of the distribution in bank competition, suggesting that better regulatory quality will boost competition in the banking industry across the different Frontier Africa countries. For example, the regulatory quality coefficient as the dependent variable of the H-statistic is 0.309, 0.343 and 0.459 at the 25th, 50th, and 75th quantiles, respectively. As the quantiles increase, the magnitude of the regulatory quality coefficient also increases. The results could suggest that countries with high regulatory quality derive more value from more banking competition than countries with lower levels of regulatory quality for the same degree of bank competition. A similar study by Chen (2008) indicates that the availability of a positive result

for regulatory quality indicates that high regulatory quality provides better operating flexibility in response to financial stability.

We also observe that control of corruption has a positive effect on bank competition up until the 50<sup>th</sup> quantile and thereafter has a negative effect on bank competition. This means that at a higher quantile control of corruption, regulations have a negative effect on bank competition. This may occur because government rules and procedures in this regard may delay transactions and thus reduce overall efficiency and consequently affect bank competition (Batabyal & Yoo, 2007). Voice and accountability are observed to impact bank competition negatively across all the quantiles but a positive relationship with bank competition at the 90<sup>th</sup> quantile for the Frontier African countries under study. These results could indicate that countries that have high levels of control of corruption and voice and accountability derive less value from more banking competition.

The results also indicate an increasing negative effect of bank inflation on bank competition (-0.002, -0.033, -0.043, -0.046 and -0.076) at the 10<sup>th</sup>, 25<sup>th</sup>, 50<sup>th</sup>, 75<sup>th</sup> and 90<sup>th</sup> quantiles. We observe an increasing positive relationship between GDP and bank competition across the 10<sup>th</sup> to the 90<sup>th</sup> quantiles.

**Table 7.5: Simultaneous Quantile Regression**

| Dependant Variable: Panzar-Rosse H-Statistic |                  |                  |                  |                  |                  |
|--|------------------|------------------|------------------|------------------|------------------|
| Simultaneous Quantile Regression             |                  |                  |                  |                  |                  |
| Independent Variables                        | 10th<br>Quantile | 25th<br>Quantile | 50th<br>Quantile | 75th<br>Quantile | 90th<br>Quantile |
| Constant                                     | -3,066           | -2,342           | -2,193           | -0,416           | -0,046           |
| Control of Corruption                        | 0,046            | 0,068            | 0,043            | -0,193           | -0,145           |
| Regulatory Quality                           | 0,403            | 0,309            | 0,343            | 0,459            | 0,203            |
| Voice and Accountability                     | -0,159           | -0,102           | -0,127           | -0,063           | 0,038            |
| Log(inflation)                               | -0,002           | -0,033           | -0,043           | -0,046           | -0,076           |
| Log(GDP)                                     | 0,143            | 0,120            | 0,117            | 0,048            | 0,040            |
| Number of Observations                       | 98               | 98               | 98               | 98               | 98               |

Source: Authors estimations from Research Data

## **7.6 Conclusion and recommendations**

The liberalisation policies carried out in the 1990s led to the development and reform of institutions in most African countries. Against this background, this chapter examined the impact of institutional quality on bank competition in Frontier African banking. A two-stage approach was employed: in stage one, the H-statistic was used to measure the extent of competition, and in the second stage, the quantile regression was used to estimate the variances in bank competition caused by the impact of institutional quality in the sample of Frontier African countries.

The empirical findings suggest that there is a positive relationship between regulatory quality and bank competition. The study highlights that the scale of the estimated positive effects of regulatory quality progressively rises from the 10th quantile to the 75th quantile of the distribution in bank competition, signifying that improved regulatory quality will boost competition in banking. However, we observe a negative relationship between control of corruption, voice and accountability, and bank competition.

This study makes the following policy recommendations. First, we observe a negative relationship between control of corruption, voice and accountability and bank competition. Policy makers need to formulate policies that remove or modify the inefficient rules that lead to the negative impact of control of corruption measures as well as issues around voice and accountability. In addition, policy makers should design policies that consider the capacity of bureaucrats and assess the quality of the judiciary to adjudicate rules and regulations.

## REFERENCES

- Abuzayed, B. & Al-Fayoumi, N. (2016). Bank concentration, institutional quality, and economic growth: Empirical evidence from MENA countries. *Review of International Business and Strategy*, 26(2), 219-231.
- Adkins, L.C., Moomaw, R.L. & Savvides, A. (2002). Institutions, freedom, and technical efficiency. *Southern Economic Journal*, 69(1): 92-108.
- Alexiou, C., Tsaliki, P., & Osman, H. R. (2014). Institutional quality and economic growth: Empirical evidence from the Sudanese economy. *Economic Annals*, 59(203), 119-137.
- Amidu, M. and Wilson, J. (2014). Competition in African banking: Do globalization and institutional quality matter? University of St Andrews Working Paper, 14:1 32.
- Angelini, P. & Cetorelli, N. (2000). Bank competition and regulatory reform: the case of the Italian banking industry. *Temì di discussione*, n. 380, Banca d'Italia.
- Angelini P. & Cetorelli, N. (2003). Bank competition and regulatory reform: the case of the Italian banking system. *Journal of Money Credit and Banking*, 35: 663-684.
- Amstrong, R.D., Frome, E.L. & Kung, D.S. (1979). Algorithm 79-01: a revised simplex algorithm for the absolute deviation curve fitting problem. *Communications in Statistics. Simulation and Computation*, B8(2): 175- 190.
- Batabyal, Amitrajeet A. & Yoo, Seung Jick. (2007). Corruption, bribery, and wait times in the public allocation of goods in developing countries. *Review of Development Economics*, 11(3): 507-517.
- Baumol, William J. (1982). Contestable markets: an uprising in the theory of industry structure. *American Economic Review*, 72(1): 1-15.
- Beck, T., Demirgüç-Kunt, A. & Levine, R. (2006). Bank supervision and corruption in lending. *Journal of Monetary Economics*, 53: 2131-63.
- Berger, A.N. & Humphrey, D.B. (1997). Efficiency of financial institutions: International survey and directions for future research, Working Paper 97-05. The Wharton School, University of Pennsylvania, 177
- Bikker, J.A. & Haaf, K. (2002). Measures of competition and concentration in the banking industry: a review of the literature. *Economic and Financial Modelling*, 9: 53-98.
- Bikker, J.A., Spierdijk, L. & Finnie, P. (2006). Misspecification in the Panzar-Rosse model: assessing competition in the banking Industry. DNB Working Paper nr 114, De Nederlandsche Bank.
- Bikker, J.A., Spierdijk, L. & Finnie, P. (2007) Market structure, contestability and institutional environment: the determinants of banking competition. DNB Working Paper nr. 156/Tjalling C. Koopmans Research Institute Discussion Paper Series nr. 07-29, Utrecht University.

- Bourguignon, François & Verdier, Thierry. (2000). Oligarchy, democracy, inequality and growth. *Journal of Development Economics*, 62(2): 285-313.
- Buchinsky, M. (1995). Estimating the asymptotic covariance matrix for quantile regression models: a Monte Carlo study. *Journal of Econometrics*, 65: 109-154.
- Buchinsky, M. (1998). Recent advances in quantile regression models: A practical guide for empirical research. *Journal of Human Resources*, 33: 88-126.
- Chen, S.H. (2008). Impacts of institutional quality on bank competition: Cross-country evidence from simultaneous quantile regression. Paper presented at the 3rd Annual Asia Pacific Financial Markets conference.
- 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.
- Claessens, S., Demirgüç-Kunt, A., Huizinga, H. (2001). How does foreign entry affect the domestic banking system? *Journal of Banking and Finance*, 25: 891-911.
- Claessens, S. & Laeven, L. (2004). What drives bank competition? Some international evidence. *Journal of Money, Credit and Banking*, 36: 563-83.
- Claessens, S. & Laeven, L. (2005). Financial dependence, banking sector competition, and economic growth. *Journal of the European Economic Association*, 3(1): 179-201.
- Claessens, F. (2009). Competition in the financial sector: overview of competition policies. *World Bank Research Observer*, Vol. 24, pp. 83-118.
- Clarke, J, Ajay, K, Ajay P, & P. Raghavendra R. (2003). Do all-star analysts drive investment banking deal flow? Working paper, Wake Forest University.
- Corvoisier, S. & Gropp, R. (2002). Bank concentration and retail interest rates. *Journal of Banking and Finance*, 26(11): 2155-2189.
- Dawson, John W. (2003). Causality in the freedom-growth relationship. *European Journal of Political Economy*, 19: 479-495.
- Demetriades, P. & Andrianova, S. (2004). Finance and growth: what we know and what we need to know. In: Goodhart, C. (ed.), *Financial development and economic growth: explaining the links*, 38-65. Basingstoke and New York: Palgrave Macmillan.
- 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.
- Demirgüç-Kunt, A. & Levine, R. (1999). Bank-based and market-based financial systems: cross-country comparison. Mimeo, World Bank.

- Demirgüç-Kunt, A. & Levine, R. (2001). *Financial structures and economic growth: a cross-country comparison of banks, markets, and development*. Cambridge, MA: MIT Press.
- Demsetz, H. (1974), "Two Systems of Belief about Monopoly," in H. Goldschmid et al., eds., *Industrial Concentration: The New Learning*, Boston: Little, Brown, 164-84.
- De Soto, Hernando. (1989). *The other path*. New York, NY: Basic Books
- Easterly, W. (2001). The lost decades: developing countries' stagnation in spite of policy reform 1980–1998. *Journal of Economic Growth*, 6(2), 135-157.
- Easterly, W. & R. Levine, R. (2003). Tropics, germs, and crops: the role of endowments in economic development. *Journal of Monetary Economics*, 50(1): 3-40.
- Engerman, Stanley L., Haber, Stephen & Sokoloff, Kenneth L. (2000). Inequality, institutions, and differential paths of growth among New World economies. In: *Institutions, Contracts, and Organizations*, edited by Claude Menard, 108-34. Cheltenham: Edward Elgar.
- Evanoff, D.D. & Ors, E. (2002). Local market consolidation and bank productive efficiency. Bank of Chicago Working Paper.
- Fama, E.F. (1985). What's different about banks? *Journal of Monetary Economics*, 15(1): 29-39.
- Fernández de Guevara, J. & Maudos, J. (2007). Explanatory factors of market power in the banking sector. *Manchester School* 75 (3), 275-296.
- Fernandez De Guevara, J., Maudos, J. & Perez, F. (2005). Market power in European banking sectors. *Journal of Financial Services Research*, 27(2): 109-137.
- Fosu, A.K. (2015). Growth and institutions in African development. In: A.K. Fosu (ed.), *Growth and institutions in African development*. Abingdon, U.K.: Routledge Publishing. Chapter 1, pp. 1-18.
- Granato, J., Inglehart, R. & Leblang, D. (1996). The effect of cultural values on economic development: theory, hypotheses, and some empirical tests. *American Journal of Political Science*, 40(3): 607-31.
- Hashim Osman, Rasha, Alexiou, Constantinos & Tsaliki, Persefoni. (2011). The role of institutions in economic development: evidence from 27 Sub-Saharan African countries. *International Journal of Social Economics*, 39(1): 142-160.
- Huang, H., & Wei, S. J. (2006). Monetary policies for developing countries: The role of institutional quality. *Journal of International Economics*, 70(1), 239-252.
- Huntington, Samuel P. (1968). *Political order in changing societies*. New Haven: Yale University Press.

- Kaufmann, D. & Wei, S.-J. (1999). Does 'grease money' speed up the wheels of commerce? National Bureau of Economic Research Working Paper 7093, Cambridge MA.
- Kaufmann, Daniel, Kraay, Aart & Zoido-Lobaton, Pablo (1999). Aggregating governance indicators. World Bank Policy Research Working Paper No. 2195, Washington, D.C.
- Koenker, R. & Bassett, G. (1978). The asymptotic distribution of the least absolute error estimator. *Journal of the American Statistical Association*, 73: 618-622.
- Koenker, R. & K. Hallock (2001). Quantile regression. *Journal of Economic Perspectives*, 15: 143-156.
- Krueger, A. (1974). The political economy of the rent seeking society. *American Economic Review*, 64: 291-303.
- Leff, Nathaniel. (1964). Economic development through bureaucratic corruption. *American Behavioral Scientist*, 8(3): 8-14.
- Léon F. (2015) "What do we know about the role of bank competition in Africa?", *Etudes et Documents*, n° 16, CERDI.
- Lucchetti, R., Papi, L. & Zazzaro, A. (2001). Banks' inefficiency and economic growth: a micro-macro approach. *Scottish Journal of Political Economy*, 48(4): 400-424.
- Marcelin, I. & Mathur, I. (2014). Financial development, institutions, and banks. *International Review of Financial Analysis*, 31(C): 25-33.
- Mata, J. & Machado, J.A.F. (1996). Firm start-up size: a conditional quantile approach. *European Economic Review*, 40: 1305-1323.
- Maudos, J. & Fernández de Guevara, J. (2004). Factors explaining the interest margin in the banking sectors of the European Union. *Journal of Banking and Finance*, 28(9): 2259-2281.
- Maudos, J. & Fernandez de Guevara, J. (2007). The cost of market power in banking: social welfare loss vs. cost inefficiency. *Journal of Banking and Finance*, 31: 2103-2125.
- Maudos, J., & Nagore, A. (2005). *Explaining market power differences in banking: a cross-country study*. Instituto Valenciano de Investigaciones Económicas.
- Micco, A., Panizza, U. & Yañez, M. (2007). Bank ownership and performance. Does politics matter? *Journal of Banking and Finance*, 31: 219-241.
- Minsky, H.P. (1986). The evolution of financial institutions and the performance of the economy, *Journal of Economic Issues* 20: 345-353.
- Moore, B.J. (1988). The endogenous money supply. *Journal of Post Keynesian Economics*, vol. X(3), 372-85.

- Nabli, M.K. & Nugent, J.B. (1989), The new institutional economics and its applicability to development. *World Development*, 17(9): 1333–47.
- North, D. (1990). *Institutions, institutional change and economic performance*. Cambridge: Cambridge University Press.
- North, D.C. & Weingast, B.R. (1989). Constitutions and commitment: the evolution of institutions governing public choice in seventeenth century England. *Journal of Economic History*, 49(4): 803-832.
- Ogbewere, B.I. (2015). Anatomy of corruption in the Nigerian public sector: theoretical perspectives and some empirical explanations. *SAGE Open* April-June 2015: 1–16 DOI: 10.1177/2158244015581188.
- Osman, I. H., Berbary, L. N., Sidani, Y., Al-Ayoubi, B., & Emrouznejad, A. (2011). Data envelopment analysis model for the appraisal and relative performance evaluation of nurses at an intensive care unit. *Journal of medical systems*, 35(5), 1039-1062.
- Panzar, J.C. & Rosse, J.N. (1987). Testing for “monopoly” equilibrium. *The Journal of Industrial Economics*, 35: 443-456.
- Peltzman, S. (1977). The gains and losses from industrial concentration. *Journal of Law and Economics*, 20(3): 229-263.
- Perera, S., Skully, M. & Wickramanayake, J. (2006). Competition and structure of South Asian banking: A revenue behaviour approach. *Applied Financial Economics*, 16: 789-801.
- Perry, P. (1992). Do banks gain or lose from inflation. *Journal of Retail Banking*, 14(2): 25-40.
- Revell, J. (1979). *Inflation and financial institutions*. London: Financial Times.
- Rodrik, Dani & Subramanian, Arvind. (2003). The primacy of institutions (and what this does and does not mean). *Finance and Development*, 31-34.
- Rose-Ackerman, S. (1999). Political corruption and democracy. *Conn. J. Int'l L.*, 14, 363.
- Schure, P. & Wagenvoort, J.L.M. (1999). Economies of scale and efficiency in European banking: new evidence. *Economic and Financial Reports*, 99/01, EIB.
- Scully, G.W. (1988). The institutional framework and economic development. *Journal of Political Economy*, 96(3): 652-662.
- Skully, M., & Perera, S. (2012). Market power, revenue diversification and bank stability: Evidence from selected South Asian countries. *Journal of International Financial Markets, Institutions and Money*, 22(4), 897-912.
- Simpasa, A.M. (2013). Increased foreign bank presence, privatization and competition in the Zambian banking sector. *Managerial Finance*, 39(8): 787-808.

- Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations*, 2 vols. *W. Strahan and T. Cadell.*[MTG].
- Stiglitz, J. & Weiss, A. (1988). Macro-economic equilibrium and credit rationing. Working paper 2164, National Bureau of Economic Research, Cambridge, MA.
- Sufian, F. (2010). Developments and performance of Malaysian banking sector: Opportunity cost and regulatory compliance. *International Journal of Competition and Growth*, 1
- Sufian, F. & Habibullah, M. (2010). Has economic freedom fostered bank performance? Panel evidence from China. *China Economic Journal*, 3(3): 255-279.
- Sufian, F. & Abdul Majid, M.Z. (2012). The nexus between economic freedom & Islamic bank performance: Empirical evidence from the MENA banking sectors. 8th International Conference on Islamic Economics & Finance.
- Sylwester, K. (2002). Can education expenditures reduce income inequality? *Economics of Education Review*, 21: 43-52.
- Wei, S.-J. (2000). Corruption, composition of capital flows, and currency crises. World Bank working paper No. 2429.
- Weiss, L. (1989). *Concentration and price*. Cambridge, Mass: The MIT Press.
- Winton, A. (1997). Competition among financial intermediaries when diversification matters. *Journal of Financial Intermediation*, 6(4), 307-346.
- WGI, Worldwilde Governance Indicators. (2013). Frequently Asked Questions. Availabe at: <http://info.worldbank.org/governance/wgi/faq.htm>
- World Bank, (1999). *World Development Report, 1999*. New York, Oxford University Press.
- Yeyati, E.L. & Micco, A. (2007). Concentration and foreign penetration in Latin American banking sectors: impact on competition and risk. *Journal of Banking and Finance*, 31: 1633-1647.
- Yildirim, S. & Philippatos, G. (2007), Efficiency of banks: Recent evidence from the transition economies of Europe 1993–2000. *European Journal of Finance*, 13: 123-143.

## APPENDICES

### Appendix 7.A: Correlation matrix

|             | Corruption | Voice & Acc | Reg qty | GDP    | Inflation |
|-------------|------------|-------------|---------|--------|-----------|
| Corruption  | 1          |             |         |        |           |
| Voice & Acc | 0,6548     | 1           |         |        |           |
| Reg qty     | 0,7361     | 0,7327      | 1       |        |           |
| GDP         | -0,359     | -0,2655     | -0,341  | 1      |           |
| Inflation   | -0,118     | 0,2001      | -0,181  | -0,063 | 1         |

### Appendix 7B: Description of variables used

| Variable                 | Definition   | Source                             |
|--------------------------|--|------------------------------------|
| H-statistic              | Measured as the sum of the elasticities of a bank's total revenue in respect to that bank's input prices | Bankscope and Author's Calculation |
| HHI                      | Sum of the squares of the bank sizes measured as market shares   | Bankscope and Author's calculation |
| Voice and Accountability | Index for voice and accountability, for 2005-2012  | World Governance Indicators (2016) |
| Political Stability      | Index for political stability, for 2005-2012   | World Governance Indicators (2016) |
| Government Effectiveness | Index for government effectiveness, for 2005-2012  | World Governance Indicators (2016) |
| Regulatory Quality       | Index for regulatory quality, for 2005-2012  | World Governance Indicators (2016) |
| Rule of Law              | Index for the rule of law, for 2005-2012   | World Governance Indicators (2016) |
| Control of Corruption    | Index for the control of corruption, for 2005- 2012  | World Governance Indicators (2016) |
| Log (Inflation)          | Logarithm of inflation deflated by GDP   | World Indicators Development       |
| Log (GDP)                | Logarithm of gross domestic product in constant 2000 US dollars, for 2005-2014                           | World Indicators Development       |

## Appendix 7C: Results from Wald test

### Uganda

|      | H-stat | H=0   |            | H=1   |            |
|------|--------|-------|------------|-------|------------|
|      |        | Chi   | Prob > chi | Chi   | Prob > chi |
| 2005 | 0,686  | 45,15 | 0,000      | 9,44  | 0,0021     |
| 2006 | 0,726  | 41,08 | 0,000      | 5,85  | 0,0156     |
| 2007 | 0,784  | 70,78 | 0,000      | 5,39  | 0,0203     |
| 2008 | 0,709  | 70,51 | 0,000      | 11,9  | 0,0006     |
| 2009 | 0,685  | 62,83 | 0,000      | 13,24 | 0,0003     |
| 2010 | 0,755  | 60,45 | 0,000      | 6,37  | 0,0116     |
| 2011 | 0,794  | 81,98 | 0,000      | 5,5   | 0,019      |
| 2012 | 0,816  | 83,32 | 0,000      | 4,24  | 0,0395     |

### Ghana

|      | H-stat | H=0   |            | H=1   |            |
|------|--------|-------|------------|-------|------------|
|      |        | Chi   | Prob > chi | Chi   | Prob > chi |
| 2005 | 0,3463 | 18,82 | 0,0000     | 67,08 | 0,0000     |
| 2006 | 0,3155 | 11,93 | 0,0006     | 56,17 | 0,0000     |
| 2007 | 0,5258 | 39,66 | 0,0000     | 32,26 | 0,0000     |
| 2008 | 0,3633 | 19,68 | 0,0000     | 60,45 | 0,0000     |
| 2009 | 0,4574 | 35,71 | 0,0000     | 50,24 | 0,0000     |
| 2010 | 0,3868 | 22,17 | 0,0000     | 55,72 | 0,0000     |
| 2011 | 0,5017 | 38,33 | 0,0000     | 37,82 | 0,0000     |
| 2012 | 0,4985 | 38,35 | 0,0000     | 38,82 | 0,0000     |

### Tunisia

|      | H-stat | H=0    |            | H=1   |            |
|------|--------|--------|------------|-------|------------|
|      |        | Chi    | Prob > chi | Chi   | Prob > chi |
| 2005 | 0,6663 | 46,38  | 0,0000     | 11,63 | 0,0006     |
| 2006 | 0,7873 | 57,48  | 0,0000     | 4,2   | 0,0405     |
| 2007 | 0,8409 | 126,25 | 0,0000     | 4,52  | 0,0336     |
| 2008 | 0,6899 | 72,98  | 0,0000     | 14,74 | 0,0001     |
| 2009 | 0,6404 | 68,65  | 0,0000     | 21,65 | 0,0000     |
| 2010 | 0,6737 | 53,29  | 0,0000     | 12,5  | 0,0004     |
| 2011 | 0,7882 | 85,49  | 0,0000     | 6,17  | 0,0130     |
| 2012 | 0,7680 | 79,27  | 0,0000     | 7,24  | 0,0071     |

### Kenya

|      | H=0    |       |            | H=1   |            |
|------|--------|-------|------------|-------|------------|
|      | H-stat | Chi   | Prob > chi | Chi   | Prob > chi |
| 2005 | 0,3415 | 21,75 | 0,0000     | 80,87 | 0,0000     |
| 2006 | 0,3432 | 19,34 | 0,0000     | 70,86 | 0,0000     |
| 2007 | 0,4450 | 41,96 | 0,0000     | 65,26 | 0,0000     |
| 2008 | 0,3334 | 24,28 | 0,0000     | 97,03 | 0,0000     |
| 2009 | 0,3443 | 26,89 | 0,0000     | 97,54 | 0,0000     |
| 2010 | 0,3786 | 28,68 | 0,0000     | 77,26 | 0,0000     |
| 2011 | 0,4707 | 40,47 | 0,0000     | 51,19 | 0,0000     |
| 2012 | 0,4832 | 38,79 | 0,0000     | 44,39 | 0,0000     |

### Mauritius

|      | H=0      |        |            | H=1   |            |
|------|----------|--------|------------|-------|------------|
|      | H-stat   | Chi    | Prob > chi | Chi   | Prob > chi |
| 2005 | 0,624842 | 67,59  | 0,0000     | 24,36 | 0,0000     |
| 2006 | 0,648759 | 78,41  | 0,0000     | 22,98 | 0,0000     |
| 2007 | 0,766366 | 145,54 | 0,0000     | 13,53 | 0,0002     |
| 2008 | 0,63539  | 90,85  | 0,0000     | 29,92 | 0,0000     |
| 2009 | 0,57998  | 78,65  | 0,0000     | 41,25 | 0,0000     |
| 2010 | 0,637858 | 75,16  | 0,0000     | 24,23 | 0,0000     |
| 2011 | 0,690627 | 90,53  | 0,0000     | 18,17 | 0,0000     |
| 2012 | 0,708252 | 97,81  | 0,0000     | 16,6  | 0,0000     |

### Morocco

|      | H=0    |       |            | H=1   |            |
|------|--------|-------|------------|-------|------------|
|      | H-stat | Chi   | Prob > chi | Chi   | Prob > chi |
| 2005 | 0,6041 | 47,5  | 0,0000     | 20,4  | 0,0000     |
| 2006 | 0,7559 | 51,46 | 0,0000     | 5,36  | 0,0206     |
| 2007 | 0,7924 | 89,26 | 0,0000     | 6,13  | 0,0133     |
| 2008 | 0,6320 | 48,54 | 0,0000     | 16,45 | 0,0000     |
| 2009 | 0,6396 | 58,69 | 0,0000     | 18,63 | 0,0000     |
| 2010 | 0,7302 | 57,96 | 0,0000     | 7,92  | 0,0049     |
| 2011 | 0,8661 | 93,37 | 0,0000     | 2,23  | 0,1352     |
| 2012 | 0,8976 | 94,65 | 0,0000     | 1,23  | 0,2669     |

### Nigeria

|      | H=0    |       |            | H=1   |            |
|------|--------|-------|------------|-------|------------|
|      | H-stat | Chi   | Prob > chi | Chi   | Prob > chi |
| 2005 | 0,4475 | 20,59 | 0,0000     | 31,39 | 0,0000     |
| 2006 | 0,4746 | 17,84 | 0,0000     | 21,85 | 0,0000     |
| 2007 | 0,6365 | 57,28 | 0,0000     | 18,68 | 0,0000     |
| 2008 | 0,5096 | 34,54 | 0,0000     | 32    | 0,0000     |
| 2009 | 0,5030 | 39,89 | 0,0000     | 38,95 | 0,0000     |

|      |        |       |        |       |        |
|------|--------|-------|--------|-------|--------|
| 2010 | 0,5281 | 34,18 | 0,0000 | 27,3  | 0,0000 |
| 2011 | 0,6914 | 59,06 | 0,0000 | 11,77 | 0,0006 |
| 2012 | 0,7064 | 56,16 | 0,0000 | 9,7   | 0,0018 |

### South Africa

|      | H=0    |        |            | H=1  |            |
|------|--------|--------|------------|------|------------|
|      | H-stat | Chi    | Prob > chi | Chi  | Prob > chi |
| 2005 | 0,8444 | 64,23  | 0,0000     | 2,18 | 0,1396     |
| 2006 | 0,8866 | 50,63  | 0,0000     | 0,83 | 0,3627     |
| 2007 | 0,9727 | 100,96 | 0,0000     | 0,08 | 0,7778     |
| 2008 | 0,8314 | 68,7   | 0,0000     | 2,82 | 0,0928     |
| 2009 | 0,8326 | 77,72  | 0,0000     | 3,14 | 0,0764     |
| 2010 | 0,8903 | 71,62  | 0,0000     | 1,09 | 0,2972     |
| 2011 | 0,9163 | 107    | 0,0000     | 0,05 | 0,8298     |
| 2012 | 0,9131 | 106,29 | 0,0000     | 0,05 | 0,8269     |

### Botswana

|      | H=0    |       |            | H=1   |            |
|------|--------|-------|------------|-------|------------|
|      | H-stat | Chi   | Prob > chi | Chi   | Prob > chi |
| 2005 | 0,4525 | 23,41 | 0,0000     | 34,27 | 0,0000     |
| 2006 | 0,5653 | 28,33 | 0,0000     | 16,74 | 0,0000     |
| 2007 | 0,6772 | 69,62 | 0,0000     | 15,82 | 0,0001     |
| 2008 | 0,5468 | 45,36 | 0,0000     | 31,15 | 0,0000     |
| 2009 | 0,5653 | 58,11 | 0,0000     | 34,36 | 0,0000     |
| 2010 | 0,5789 | 52,06 | 0,0000     | 27,55 | 0,0000     |
| 2011 | 0,6972 | 71,39 | 0,0000     | 13,46 | 0,0002     |
| 2012 | 0,7176 | 68,14 | 0,0000     | 10,56 | 0,0012     |

### Tanzania

|      | H=0    |       |            | H=1    |            |
|------|--------|-------|------------|--------|------------|
|      | H-stat | Chi   | Prob > chi | Chi    | Prob > chi |
| 2005 | 0,1267 | 2,89  | 0,0894     | 137,11 | 0,0000     |
| 2006 | 0,1628 | 3,47  | 0,0624     | 91,85  | 0,0000     |
| 2007 | 0,3237 | 17,74 | 0,0000     | 77,46  | 0,0000     |
| 2008 | 0,1844 | 5,75  | 0,0165     | 112,48 | 0,0000     |
| 2009 | 0,2111 | 7,88  | 0,0050     | 110,14 | 0,0000     |
| 2010 | 0,1900 | 5,47  | 0,0194     | 99,4   | 0,0000     |
| 2011 | 0,3035 | 13,36 | 0,0003     | 70,38  | 0,0000     |
| 2012 | 0,2717 | 10,46 | 0,0012     | 75,15  | 0,0000     |

## CHAPTER 8

### CONCLUSION AND RECOMMENDATIONS

#### 8.1 Introduction

The thesis is a group of related empirical research papers around themes of bank competition, and efficiency and economic growth in ten Frontier African countries. Theory says that financial institutions, specifically the banking sector, are a channel for financial resources to move from excess to deprived sectors of the economy and thus leading to economic growth. It is for this reason that development of this sector is very important and a necessary condition for growth of the economy. This study has highlighted based on empirical inference that the level of bank competition, degree of bank efficiency, degree of income diversification and quality of institutions can act to boost or diminish the level of economic growth.

The thesis is comprised of seven chapters, five of which are empirical studies. A key caveat is that the study used different methodologies to measure the various key concepts and this would be evidenced in the disparities in the results that are derived. Chapters one and two provide an introduction and background of the banking sector in Frontier African countries. The first empirical subject in Chapter three presents estimations of banking competition and impact on economic growth by estimation of the Boone Indicator in the first stage and using the BI as the explanatory variable in a growth model with GDP growth as the dependent variable.

In Chapter four, the study empirically analyses banking efficiency using Data Envelopment Analysis, Chapter five examines the 'Quiet-Life' hypothesis. The study uses the stochastic frontier analysis approach to estimate the Cost and profit efficiency. Chapter six proceeds to measure the theorized relationship between income diversification and bank efficiency using the SFA estimates in the first stage and the Herfindahl Hirschman Index (HHI) as a measure of income diversification into non-interest generating activities in the second stage. The next chapter explore the effect of quality of institutions on banking

competition. We estimate the H statistic as a measure of banking competition and in the second stage, we carry out a simultaneous quantile regression to test the determinants of bank competition. The last chapter of the thesis synthesizes the outcomes of the empirical chapters and analyses the implications that follow. The last chapter also outlines the key benefits made to empirical literature on banking competition and efficiency in the Frontier African Countries and unpacks the limitations as well as areas for future research.

## **8.2 Summary of key findings and policy recommendations**

### **8.2.1 Synthesis of key findings**

The study first measured banking competition in the Frontier African market countries using the Boone Indicator. The findings indicate that the banking industry in the Frontier Market African countries is defined by monopolistic competition. The outcomes also show that competition has grown/reduced differently across the various Frontier African countries. This is due to the heterogeneous nature of the different economies. While in some countries (Tanzania, Kenya, Tunisia and Mauritius) competition has decreased through the years, in other countries (Ghana) competition has increased. For other countries (Botswana and South Africa), there are years where the BI is not statistically different from 0 (zero) or significantly positive.

Next, the study investigated the relationship of bank competition on economic growth. The estimation results show that banking competition measures, proxied by the Boone Indicator, is significant with a correct sign in our preferred specification. The increase of 1 point in banking competition, as proxied by the BI, results in 0.013 percentage point rise in per capita real GDP growth over the 8-year period. An increase of competitiveness of the banking sector exerts a significant positive effect on real growth. In addition, the proxies used for inflation and trade openness are positive and negative respectively and insignificant. We also observe a positive and significant coefficient for gross fixed capital formation.

*Efficiency and determinants:* This study also investigated the degree of bank efficiency and analysed the determinants of banking efficiency in ten frontier African countries. The efficiency estimates of individual banks were evaluated by the DEA approach as well as a second stage truncated bootstrap procedure to compute bias corrected TE scores as well investigating the determinants of TE in the Frontier African Banks. Financial ratios were used as proxies for the determinants. The study used the intermediation approach that employs labour costs, deposits and assets as inputs and loans and other investments as outputs. The results suggest that TE has been above average for all the countries under study from 2008 to 2012. The highest average result of 0.65 was achieved in 2008, with the lowest of 0.52 being evidenced in 2012. The empirical findings clearly show a degree of increasing inefficiency in the Frontier African banking sector especially from 2008 onwards to 2012.

*Competition-efficiency nexus:* The study examined the empirical relationship between banking competition and efficiency using bank-level data for a selection of ten Frontier African countries. We used another measure of market power, the Lerner Index. The Stochastic Frontier Analysis (SFA) technique was applied as another approach to measure cost and profit efficiency, and a test for random effects was used to examine the relationship between bank competition and efficiency. Our findings indicate the existence of a positive and significant relationship between market power and both cost and profit efficiency. However, we reject the Quiet Life Hypothesis because, for the Frontier market African banks, higher Lerner indices are associated with cost and profit efficiencies and increased market power seems to increase the incentive to minimise costs and maximise profits.

*Efficiency and income diversification nexus:* Income diversification has been in line with the theory of universal banking. In theory, diversification of income sources in a bank has the potential to lower risk level and higher risk-adjusted performance. The study looked at the impact of bank income diversification on cost and profit efficiency in a sample of ten Frontier African countries from 2005 to 2012. SFA was used to measure both cost and profit efficiency, and the HHI was employed to measure the diversification of bank income. The

results indicate the existence of high revenue inefficiency. This was indicated by the high efficiency in cost as opposed to profit.

*Quality of institutions and bank competition nexus:* The results of banking sector reforms carried out in Frontier African countries vary from country to country. One key reason for this variation could be the difference in quality of the institutions in the different countries. Marcelin and Mathur (2014) study state that cross-country variations in institutional quality and their effect on financing options can have an impact on banking system performance. Our empirical findings suggest that there is a positive relationship between regulatory quality and bank competition. The study observes that the scale of the estimated effects of regulatory quality are positive and progressively rise from the 10th quantile to the 75th quantile of the distribution in banking competition, signifying that better regulatory quality boosts competition in the banking. However, we observe a negative relationship between control of corruption, voice and accountability and bank competition.

### **8.3 Policy implications and recommendations**

The results of the study have numerous policy implications that are resultant from the key themes examined in this study. First, the results propose that bank competition can be advantageous for economic growth. As bank competition increases via the efficiency channel, this would ultimately increase economic growth. This is because a competitive banking system allocates resources more efficiently, as such economic growth is likely to improve. In addition, a set of appropriate policies can be put in place and effectively carried out to grow bank competition. This could be accompanied with policies intended to remove barriers to entry and exit and increase competition. These policies would create a virtuous cycle with benefits from the banking efficiency, which in turn would cause real growth.

Second, there is evidence of high levels of bank inefficiency in the sample, policy makers and regulators could put in place regulations that enable bank efficiency. In addition, they could also institute efficiency measures as well as restructuring the banking system to reduce the number of less efficient

banks. Furthermore, capacity building and incentive schemes could be introduced to improve managerial efficiency. This means that human resource development coupled with the appropriate policies can play a significant role in improving banking competition and efficiency.

Third, policy makers could also pursue strategies that regulate the pricing of banking services in competitive environments to check for managerial inefficiency.

Fourth, we observe from the results that diversification into non-interest generation improves bank efficiency. We also observe that efficiency benefits are realized at increased stages of diversification. This gives useful insight to regulatory and bank authorities in Frontier market countries. Policy makers could for instance place emphasis on formulating strategies to maximise the probable benefit of non-interest generating actions. Most of the Frontier countries have adopted universal banking, which is a first step, policies that encourage diversification in banking should be encouraged.

Lastly, the study indicates that whereas there is a positive relationship between regulatory quality and bank competition, there is a negative relation between control of corruption and voice and accountability. Instinctively control of corruption as well as voice and accountability should have a positive relation with bank competition. The negative relationship in this case indicates that the policies in place hamper bank competition. Therefore, there is a need to formulate policies that remove or modify the inefficient rules that lead to the negative impact of control of corruption measures as well as issues around voice and accountability. In addition, policy makers should design policies that consider the capacity of bureaucrats and the quality of the judiciary to adjudicate rules and regulations.

#### **8.4 Proposed agenda for future research**

The analysis carried out in this thesis extends the limited research that has already been carried out on the African continent with a specific focus on Frontier African countries. More study could be undertaken on aspects of the research gaps below, that were not examined in the thesis.

The results of the study have shown that the banking industry in Frontier Africa is defined by increasing levels of bank inefficiency. Future study can examine the efficiency of the local banks vs foreign banks in the frontier African countries. Furthermore, an additional extension to this study could be the examination of changes in productivity because of technological progress or decline by employing the Malmquist Productivity Index (MPI).

Future studies can also examine the real cost of an increase in pricing power as well as monopolistic inclinations on bank efficiency as well as social welfare. This would quantify the social welfare loss related to pricing power and efficiency loss related to the 'quiet life' that is enjoyed by banks.

In addition, future studies on the impact of income diversification on bank competition should look at disintegrating the non-interest income into its various components that this study failed to address due to data unavailability across the sample.

Finally, another area for future research is a study into different causal relationships between bank competition and economic growth. The thesis assumes a simplistic unidirectional connection from bank competition to economic growth, however there is also evidence of inverse causality from economic growth to bank competition.

## **REFERENCES**

Marcelin, I. & Mathur, I. (2014). Financial development, institutions, and banks. *International Review of Financial Analysis*, 31(C): 25-33.