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UNIVERSITY OF THE
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BANK REGULATION, CROSS-BORDER BANKING AND INTEREST RATE PASS-THROUGH IN SUB-SAHARAN AFRICA

DOCTORAL THESIS

By

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A thesis submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the Degree of Doctor of Philosophy in Economics.

March 2023

Declaration

I declare that the thesis I am submitting for the degree of Doctor of Philosophy (Economics) at the University of the Witwatersrand in Johannesburg is my own work and that I have not submitted it for any other degree or examination. This thesis contains no material previously published or written by any other person except where references have been made in the thesis.



Signed: _____

Name of Student: Sopani Emmanuel Gondwe

29 March 2023

Date: _____

Dedication

Dedicated to my late mother, Agnes and late father, Soliam who now sleep a sleep all humanity shall sleep.

Acknowledgements

First, I thank God, the Almighty, for his love and amazing graces. My gratitude also goes to the University of the Witwatersrand for offering me a Postgraduate Merit Award, without which my PhD studies could not have materialized. In a special way, I also wish to sincerely thank Professor Tendai Gwatidzo and Dr Nyasha Mahonye – my Supervisors, for their untiring support and constructive guidance throughout my study period. I am also very grateful to my wife, Hellen; and my children – Josephine and Sopani, who always stood by me during the most pressing times of my study. I remain extremely grateful for their prayers, encouragement and support. Lastly, I thank the Executive Management of the Reserve Bank of Malawi for allowing me to pursue my PhD studies and availing me a long-term study leave.

Abstract

The thesis comprises five interrelated chapters that seek to advance empirical literature on banking and financial sector stability (risk) by focusing on some salient regulatory and monetary issues of policy relevance and interest to developing countries of Sub-Saharan Africa (SSA). The market structure and regulatory environment in which banks operate in SSA have significantly changed over the last two decades, and the banking systems of a number of countries have also markedly grown during this period. For instance, and especially after the global financial crisis (GFC), supervisory authorities in most countries introduced new regulations, and/or in some cases, enhanced their existing bank regulatory frameworks to conform with international best practice and standards. However, questions have been raised as to whether developing countries like those in SSA need to adopt international regulatory standards indiscriminately – and whether the benefits arising from the adoption of such policies or standards outweigh the costs. At the same time, the SSA region has witnessed significant penetration of foreign banks – a development that has heightened the risk of financial contagion and cross-border spill over effects. In most countries, there have also been considerable changes in the design and implementation of monetary policy over the past two decades. These changes have triggered a considerable debate on whether and how regulatory and structural factors in the financial system impede or facilitate monetary policy transmission – a debate that, as yet, is not fully settled.

This study interrogates the above issues by focussing on three related questions. First, how do regulations – that are based on international best practice and standards, impact or shape risk-taking behaviour (i.e. stability) of banks in SSA? Second, what are the banking sector stability implications of increased foreign bank penetration in the host countries? Finally, how does competition and capital regulation affect the transmission of monetary policy to commercial banks' lending and deposit rates i.e. the interest rate pass-through (IRPT) in SSA? In addressing each question, the study applied panel econometric analyses using bank and country-level data. The data was obtained from various sources, namely; Bankfocus database, the World Bank Regulatory and Supervision Surveys (BRSSs), IMF International Financial Statistics (IFS), IMF Financial Soundness Indicators (FSIs), World Bank Governance Indicators (WBGIs), Global Financial Development Database (GFDD, 2019), and The Heritage Foundation.

Chapter 1 is a general introduction to the research problem while Chapters 2, 3, and 4 are distinct but related chapters, each addressing a specific research question. Chapter 5 is the conclusion. In chapter 2, the objective is to explore the effect of four prudential regulations (capital, activity restrictions, supervisory power, and market discipline) on bank stability in 25 SSA countries between 2009 and 2019. The bank regulation-stability relationship is examined by focusing on two dimensions of bank risk: solvency and liquidity risk. A two-step system Generalised Method of Moments (GMM) estimator is employed to examine the regulation-risk relationship. The results – which remain robust when using alternative risk measures, show that regulations pertaining to capital and market discipline reduce bank risk (i.e., increase banking sector stability) while regulations that increase activity restrictions, increase bank risk (i.e., reduce banking sector stability). For liquidity risk, the study also finds that regulations that increase supervisory power are associated with higher liquidity risk i.e. low banking sector stability. This chapter was published in the Journal of Financial Regulation and Compliance in May 2022.

In Chapter 3, the objective is to examine the implications of increased cross-border banking on banking sector stability. For this chapter, panel Fixed Effects (FE) and two-step system GMM estimators are applied to analyse the cross-border banking-stability relationship. The analysis is based on a panel of 270 banks from 29 SSA countries over the period 2005 to 2019. The results show significant evidence that the stability of banks in host countries declines with an increased presence of foreign banks – suggesting that the risk-increasing effect attributable to cross-border banking in the domestic market, outweighs its potential beneficial impact.

In Chapter 4, the objectives are two-fold: to investigate the implications of banking sector competition (market power) and prudential capital regulation on the transmission of monetary policy to commercial banks i.e., the IRPT to lending and deposit rates. For this study, a Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) model is employed to examine the competition/capital regulation-IRPT nexus. The sample comprises 22 SSA countries and the study period covered the years 2005 to 2019. The results show evidence that: (i) higher market power (less competition) reduces the size of the pass-through to lending rates. In other words, increased competition in the banking sector enhances monetary policy effectiveness; and (ii) higher regulatory capital requirements reduce the pass-through to both, lending and deposit rates. This chapter was published in the South African Journal of Economics in March 2023.

Multiple policy implications are drawn from the results of the study, which are outlined in detail in Chapter 5. First, the supervisory focus in SSA should be directed at enhancing capital and market disclosure requirements for banks. Second, a universal banking model (i.e. lower activity restrictions) should be encouraged, as it is stability enhancing. Third, although foreign banks may bring benefits to host markets, the benefits need to be weighed carefully against the possible costs of fragility (reduced banking sector stability) that these banks introduce into the host country. Fourth, supervisory authorities should encourage policies that reduce market power i.e. enhance competition in the banking sector because they facilitate the effectiveness of monetary policy transmission to commercial banks. Finally, although higher regulatory capital requirements are a key macro-prudential tool for enhancing banking sector stability, they could also have the unintended consequences of limiting economic expansion. This trade-off, therefore, calls for a careful analysis and balance in the implementation of monetary and bank regulatory policies in SSA.

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List of Abbreviations

AGM	Augments Mean Group
BCBS	Basel Committee on Banking Supervision
BCP	Basel Core Principles
BIS	Bank for International Settlement
BRSS	Bank Regulation and Supervision Surveys
CADF	Cross-sectionally Augment Dickey Fuller
CCEM	Common Correlated Effects Mean Group
CEMAC	Central African Economic and Monetary Community
CFA	French-Anglophone African
CMA	Common Monetary Area
CS-ARDL	Cross-Sectionally Autoregressive Distributed Lag
CS-ECM	Cross-Sectionally augmented Error-Correction Model
DEA	Data Envelopment Analysis
DFE	Dynamic Fixed Effects
D-SIBS	Domestic Systemic Important Banks
EAC	East African Community
ECOWAS	Economic Community of Western African States
ETA	Equity to total assets
FE	Fixed Effects
FFINDEX	Financial Freedom Index
Findex	Financial Development Index
FSI	Financial Soundness Indicators
GCC	Gulf Cooperating Countries
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GFDD	Global Financial Development Database
GMM	Generalised Method of Moments
IFS	International Financial Statistics
IMF	International Monetary Fund
IRPT	Interest rate pass-through
IV	Instrumental Variable
LA	Latin America
LLR	Loan Loss Reserve
MENA	Middle East and North Africa
MG	Mean Group
NPL	Non-Performing Loans
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Squares
PAB	Pan African Banks
PCA	Principal Component Analysis
PMG	Pooled Mean Group
RE	Random Effects
ROA	Return on Assets
SADC	Southern African Development Community

SEA	South East Asia
SME	Small and Medium Enterprise
SSA	Sub Saharan Africa
SUR	Seemingly Unrelated Regression
WBGI	World Bank Governance Indicators

Chapter 1: Introduction

1.1. Background to the Study

The market structure and regulatory environment in which banks operate in SSA have significantly changed over the last two decades, and the banking systems of a number of countries have also markedly grown during this period (IMF Regional Economic Outlook, 2018). Three banking sector policy reform-related developments can be identified and isolated in SSA: First, in most countries, supervisory authorities introduced new regulations, and/or in some cases, enhanced their existing bank regulatory frameworks (Bank Regulation and Supervision Survey (BRSS, 2019)[1]. For example, several countries increased their minimum capital requirements (e.g. Ghana, Zambia, Kenya, Botswana, Malawi, Nigeria, Tanzania, Mauritius, South Africa, and Zimbabwe) while others (e.g. Nigeria, Malawi, Namibia and South Africa) also introduced additional capital requirements for domestic systemically important banks (D-SIBs). Some of the countries migrated to Basel II (e.g. Namibia, Mozambique, Ghana, Senegal, Botswana, Rwanda, Kenya, Malawi, Nigeria, Tanzania, Mauritius, South Africa, Zimbabwe) while a few others (e.g. South Africa, Mauritius, Kenya, Nigeria and Namibia) partially or fully implemented some elements of Basel III. Regulatory enhancements were also made in the area of supervisory powers – largely through review of banking legislations (e.g. Nigeria, Malawi, South Africa, Kenya, Zambia, Uganda). The amended legislations were mainly aimed at enhancing the mandate of the regulatory authorities to among other things, effectively impose supervisory sanctions, resolve problem banks, conduct consolidated supervision and enhance loan classification and provisioning criteria. The scope of banking activities and products, which banks offer, was also reviewed in some countries based on lessons from the mortgage backed-securities of the global financial crisis (GFC). In countries such as Malawi, South Africa, Namibia, Nigeria, Rwanda, Kenya, Zambia, there were also notable enhancements in market discipline regulations – in which the requirements on disclosures for banks were expanded. Overall, between 2008 and 2019, the surveys show that 16 of the 30 countries surveyed in Africa, strengthened their supervisory powers and market disclosure requirements; 10 stayed the same and the rest weakened their power of supervisory agencies.

[1] The regulatory enhancements were mainly aligned to international bank regulatory standards – the so-called Basel Core Principles (BCPs) as prescribed by the Basel Committee on Banking Supervision (BCBS).

Almost half of the surveyed countries increased their capital requirements and 12 tightened the restrictions on bank activities.

The policy expectation was that enhanced regulations would reduce the overall risk in the financial system and promote a more stable and resilient banking sector that can support economic development and growth. As suggested by (Beck & Cull, 2015), banks can only make a meaningful contribution to the growth of African economies if regulatory gaps are adequately addressed. Beck & Maimbo, (2013) also document that even though African banks are highly capitalised and excessively liquid compared to other developing regions in the world (see Table 1.3 in section 1.1.3 below), deficiencies in regulatory infrastructure and supervisory capacity in most African countries could reduce bank resilience with adverse impact on the real sector. Similar views are echoed by the IMF Africa Department (Takebe et al., 2016) in their regional study analysing financial sector development in Africa. The study notes that weak regulatory frameworks – including those pertaining to disclosure requirements, investor protection schemes, and governance structures, continue to hinder the African banking sector from meaningfully contributing to economic development.

Secondly, the SSA region has witnessed increased penetration of foreign banks – both, from developed countries as well as those from within the African continent. The percentage (average) of foreign banks in SSA (in terms of assets) increased from 30.6% in 2000 to 66.3% in 2005 and stood at around 64.2% in 2019 (Cull et al., 2018). This, combined with decreased state-owned banks, or in some cases, their reorientation towards commercial lines, has allowed foreign banks to become dominant players in most SSA banking systems. Among the countries that experienced significant entry of foreign banks include Malawi (from 43% to 62.5%); Mali (from 38% to 75%); Namibia (from 43% to 60%); Rwanda (from 38% to 62%); and Senegal (from 64% to 85%). In other countries (e.g. Zambia, Burkina Faso, Benin, and Ivory Coast) the percentage of foreign banks remained high throughout the period at over 80%, while the banking systems of Madagascar, Lesotho and Eswatini were completely (100%) dominated by foreign banks. Table 1.1 shows the average trend summary in cross-border banking penetration in SSA from 2005 to 2019.

Table 1.1: Trend in cross-border banking penetration in SSA (2005-2019)

Period (Years)	2005 – 2009	2010 – 2014	2015 – 2019
% number of foreign banks	59.2	61.4	62.1
% share of assets held by foreign banks	65.6	63.8	64.4

Source: Bankfocus and GFDD (2019)

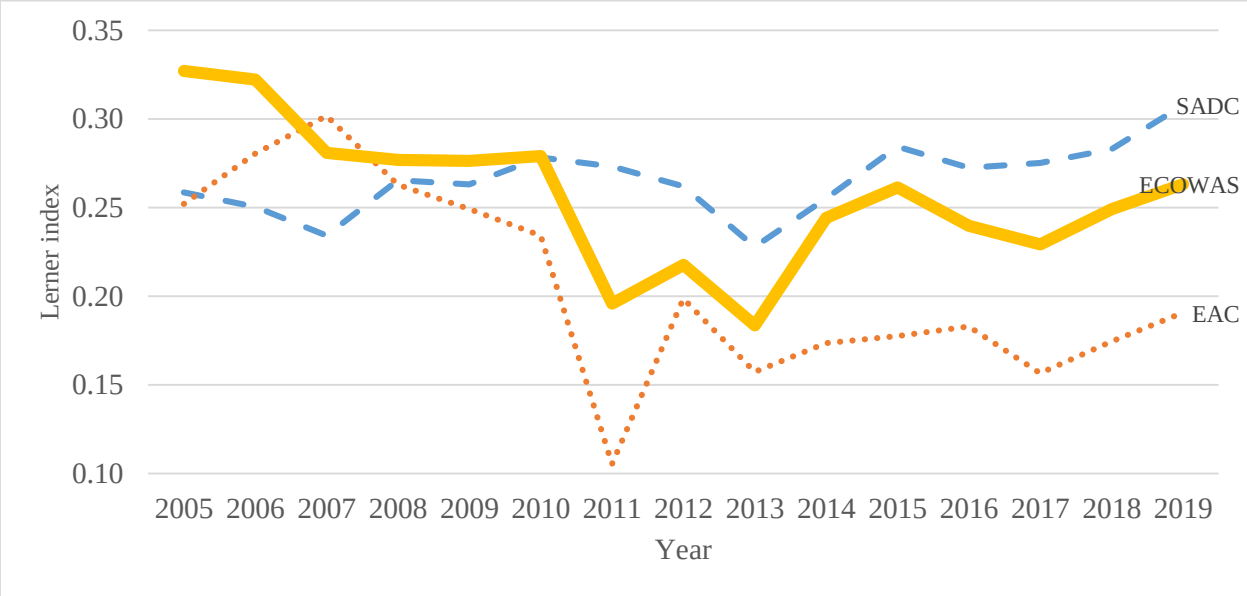
Although these banks bring benefits to host countries, such as increasing competition and access to financial services, stabilizing credit quantity during domestic turmoil, and enhancing small and medium enterprises (SMEs) access to finance (Léon & Zins, 2020; Navaretti et al., 2010; Beck et al., 2016), increased cross-border banking means that financial stability risks can easily be transmitted across borders especially when there is weak or no supervisory coordination between home and host supervisory authorities. The risks are further compounded due to inadequate supervisory capacity in the area of consolidated supervision in most countries (Beck & Maimbo, 2013). Previous episodes of regional banks with cross-border banking operations in Africa, for example, the International Bank of West Africa (1991) and Meridian Bank (1996), resulted in collapse of their subsidiaries in multiple countries as well[2]. At global level, affiliates of multinational banks also failed in multiple countries or were significantly impaired during the global financial crisis following the collapse of their parent banks in the home jurisdictions – a scenario that brought to the fore the need for effective home-host coordination arrangements and consolidated supervision.

Third, most SSA countries have seen considerable changes in the design and implementation of monetary policy (IMF Regional Economic Outlook, 2018). These changes have triggered a considerable debate on whether and how regulatory and structural factors in the financial system impede or facilitate monetary policy transmission – a debate that, as yet, is not fully settled. Among the key structural factors, the literature identifies the degree of competition in the banking system as a key factor that impacts the transmission of monetary policy (Cecchetti, 1999; Ghossoub et al., 2012). Most competition studies in Africa find that the banking sector in most countries is generally monopolistic (see for example, Fosu, 2013; Igbinosa & Osifo, 2016;

[2] After the global financial crisis, one of the four banks that were officially diagnosed as undercapitalised by the Nigerian supervisory authorities, was internationally active with cross-border banking affiliates.

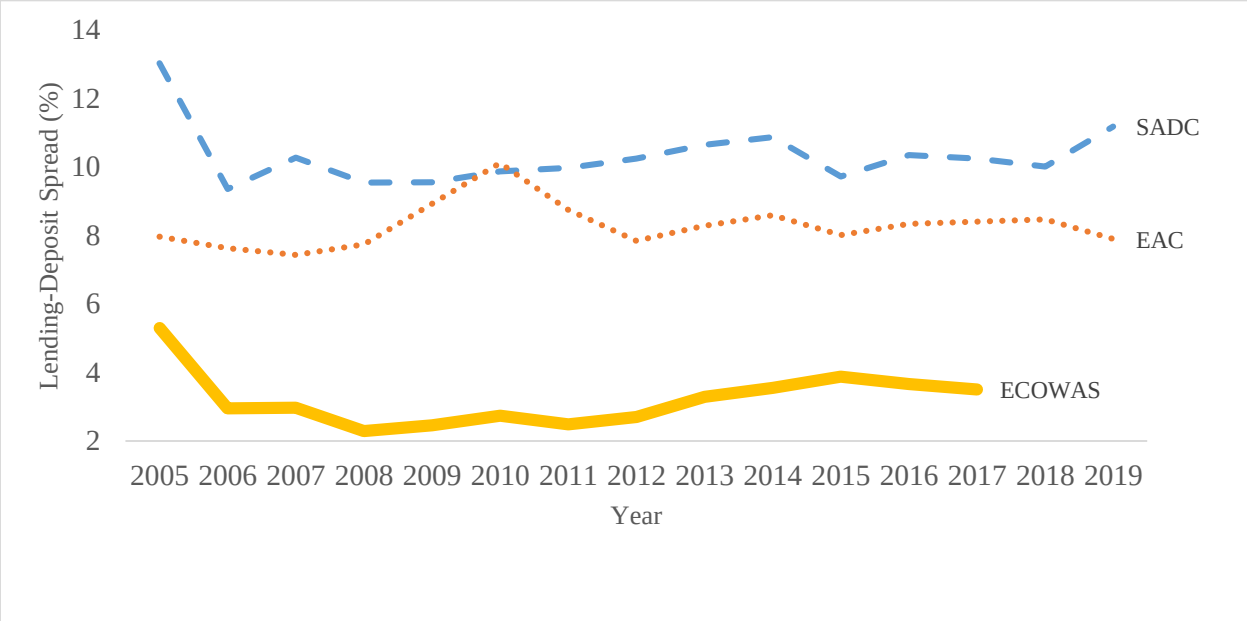
Simatele, 2015; Simbanegavi et al., 2015). Monopolistic competition is often regarded as an obstacle to the smooth transmission of monetary policy impulses (Cottarelli & Kourelis, 1994). Given the pivotal role of the banking sector in the economy, an understanding of the conditioning impact of bank competition and monetary policy transmission is therefore important for policy as it helps ensure the right mix between banking sector competition and economic growth. Figures 1.1 and 1.2 show evolution in the competition (Lerner index) and interest spread, respectively, for selected countries in three regional blocks in SSA from 2005 to 2019. Figure 1.1 shows that on average, after 2010, competition has generally been low in the banking systems of Southern African Developing Community (SADC) compared to the other two regional blocks, the Economic Community of Western African States (ECOWAS) and the East African Community (EAC). Figure 1.2 shows that average lending rates are also relatively higher in the SADC region, as evidenced by the wide interest spread compared to the other two regions.

Figure 1.1: Average competition trend in SSA (2005-2019)



Sources: Compiled by the author using data from IMF International Financial Statistics (IFS)

Figure 1.2: Average interest spread in SSA (2005-2019)



Sources: Compiled by the author using data from IMF IFS

At the same time, SSA countries have adopted higher regulatory capital requirements (BRSS, 2019) as a key macro-prudential tool to ensure the soundness and stability of the banking sector. A key policy issue in this regard is how the regulatory capital regime shapes the effectiveness of monetary policy transmission – because, with a binding risk-based capital ratio (as is the case under the current Basel standards that apply in SSA), banks cannot simply expand credit without obtaining additional capital (Aiyar et al., 2014; Eickmeier et al., 2018; Fraisse et al., 2017; Imbierowicz et al., 2021). Capital regulation is thus projected to change how banks react to a monetary policy stimulus. Given that both, competition and capital regulation have been prominent reform areas in SSA, a dual analysis of their implications for monetary policy transmission to commercial banks' rates thus raises interesting questions of policy relevance to the authorities in the region.

1.1.1. The SSA Banking System and Landscape

This section summarizes the structure and performance of SSA banking sectors and how they compare with those from other developing regions. Since the financial sectors in SSA are at different levels of sophistication and development, analysing the financial performance at the

regional level is quite challenging. The study thus follows the approach by (Demirgüç-Kunt & Singer, 2017) and focus mainly on the structure and key stability and performance indicators.

1.1.2. Financial Structure

The SSA region ranks last among the world's developing sub-regions in terms of depth and efficiency of financial institutions. Based on the IMF's measure of financial development for countries and regions, the financial development index (Findex) for SSA also remains substantially low – over 50.0% lower than that of other developing regions. In most countries, the depth and activity of capital markets are still shallow and illiquid – rendering alternative sources of financing almost non-existent. As a consequence, firms and households largely depend on banks as their main source of capital financing (Mutarindwa et al., 2018). The banking sector thus remains a key catalyst to economic growth and development in the region although in most countries, the sector is dominated by very few banks – typically three to five banks (GFDD, 2019). Takebe et al., (2016) also document that banking fees and charges in SSA are comparatively higher than those in other developing regions. Consequently, interest rate spreads are also comparatively high. Table 1.2 presents some key financial structure indicators for SSA and other developing regions.

Table 1.2: Selected financial structure indicators (average): SSA and Other Developing Regions (2010-2019)

	Findex		Stock Market Cap/GDP (%)		Lending-deposit spread (%)		3-Bank concentration ratio (%)		Cost-Income ratio	
Year	**2010**	**2019**	**2010**	**2019**	**2010**	**2018**	**2010**	**2017**	**2010**	**2017**
SSA	0.14	0.16	58.58	66.93	10.2	11.4	75.66	66.40	60.4	61.0
MENA	0.25	0.26	49.23	75.79	4.2	3.4	71.73	69.21	41.0	46.8
LA	0.30	0.32	57.43	36.39	8.6	8.5	60.71	59.30	60.3	60.8
SEA	0.33	0.35	110.25	94.04	4.6	3.3	61.77	56.10	48.6	51.5

Notes: MENA=Middle East and North Africa; LA=Latin America; SEA=South East Asia.
Source: IMF, Financial Soundness Indicators (FSIs), and GFDD (2019)

Despite the foregoing overall structural characteristics, there is great variation in the depth and financial complexity of financial sectors across the SSA region. On one extreme, there are few countries with well-developed financial systems (e.g., South Africa and Mauritius) whose credit to private sector/GDP ratios stood above 115% and 80%, respectively, as at end of 2019. These countries also have liquid and well-developed capital markets. Few other countries, such as Kenya,

Botswana, and Senegal had a private sector credit/GDP ratio of around 30%. On the other extreme, however, there are many countries with very shallow banking sectors and illiquid capital markets with average private sector/GDP ratios of below 15%.

1.1.3. Financial Soundness Indicators (FSIs)

Table 1.3 provides an overview of the banking sector stability and performance indicators in SSA compared to other developing regions at the end of 2017. The table shows that banks operating in SSA are characterized by excessive liquidity and higher capitalization. The average liquidity ratio (as measured by liquid assets to short-term labilities) for SSA banks was 76.7% between 2010 and 2017 compared to below 35.0% for the other regions. The excessively high liquidity ratio confirms the low intermediation levels in SSA (Nana & Samson, 2014; Takebe et al., 2016) – a situation that tend to constrain economic growth. In terms of solvency, the average capital ratio for SSA banks (at about 18%), significantly surpasses that prescribed by the BCBS of 8.0%. The average Z-scores for SSA banks also compare favourably with those of other developing regions. Nyantakyi & Sy, (2015) suggest that the relatively high capital ratios partly helped to cushion the SSA banks from the GFC.

Table 1.3: Selected FSIs (average): SSA and Other Developing Regions (2010-2017)

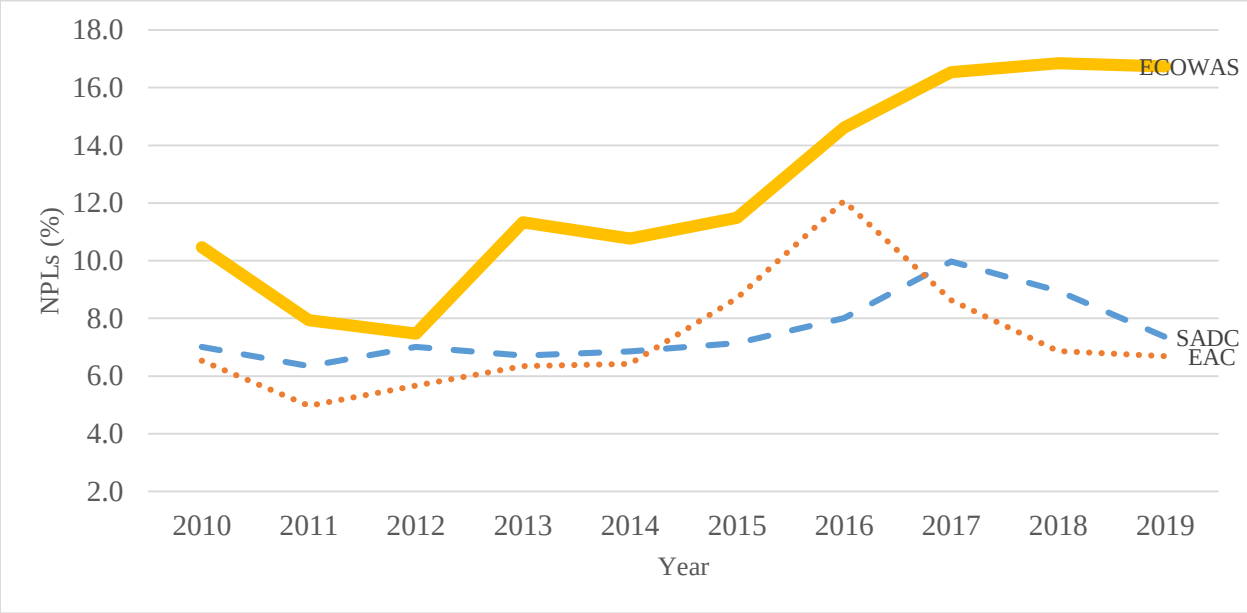
	SSA		MENA		SEA		LA	
Year	**2010**	**2017**	**2010**	**2017**	**2010**	**2017**	**2010**	**2017**
Z-score	16.7	18.1	24.7	23.6	11.8	12.7	15.9	16.7
Liquidity ratio	96.9	56.5	44.2	40.3	38.9	23.5	32.0	30.6
Capital ratio	18.4	18.6	17.0	17.5	18.1	17.8	15.7	16.5
NPL ratio	8.2	13.2	8.9	9.1	3.3	3.1	2.7	2.4
ROE	25.1	22.3	16.8	13.9	17.3	13.0	21.6	20.9

Notes: NPL=Non-performing loan ratio; ROE= Return on equity.
Source: Bankfocus and GFDD

The above stability indicators, however, mask a serious financial stability problem that has characterised the banking sectors of SSA countries since the GFC: the banks in SSA have on average recorded high levels of non-performing loans (NPLs) compared to those from the other regions. As depicted in the table, the SSA region had NPLs at 13.2% on average in 2017, compared to 9.1%, 3.1%, and 2.4%, respectively, for the Middle East and North Africa (MENA), South East

Asia (SEA), and Latin American (LA) countries. Within the SSA region, the increase was more pronounced in countries belonging to the ECOWAS, including a few countries that belong to the Central African Economic and Monetary Community (CEMAC). The two regions combined accounted for over 60.0 percent of the growth in NPLs between 2010 and 2017 (BRSS, 2019). The decline in return on equity (ROE) is partly an indication that the high NPLs have been taking a toll on bank profitability in most countries. The true magnitude and severity of bank risk in the SSA region could indeed be masked by the zero risk weighting of government securities on banks' balance sheets in most countries – in case of sovereign default, the underlying capital coverage in some banks may prove to be inadequate.[3] Overall, the high and rising NPLs have increased banking sector risk (hence threatening financial stability) in most SSA countries. Figure 1.3 shows the evolution of NPLs loans in the different SSA economic blocks since 2010.

Figure 1.3: The trend in NPLs across the 3 regional economic blocks in SSA



Source: Compiled by the author using data from IMF FSIs

[3]Basel II rules give supervisory authorities the discretion to either assign a zero risk weight on bank claims to government or assign the risk weight based on the sovereign's rating. For most SSA countries, the sovereign ratings are low (adverse), hence most regulatory authorities opt to assign a zero risk weight on claims to government.

1.2. Motivation of the Study

The thesis is principally motivated by three key issues pertaining to the importance of banking sector stability and monetary policy to the growth and development of the economy (Gjedrem, 2001; Jokipii & Monnin, 2013). Specifically, chapter 2 is motivated by an apparent lacuna in how regulations based on international best practices and standards shape the risk-taking behaviour of banks in developing countries. The importance of regulations in mitigating banking sector risk is critical in SSA because most firms are bank dependent on capital financing, as alternative sources of capital are almost non-existent due to nascent capital markets in most countries. The effectiveness of the banking sector in providing capital finance can however, be undermined by the type of regulatory policies implemented by supervisory authorities (Triki et al., 2017). Although the link between banking sector stability and regulation has been widely explored after the GFC (Barth et al., 2013; Delis & Staikouras, 2011; Klomp & de Haan, 2015; Pasiouras et al., 2009), research that specifically investigates the impact of regulations on bank risk in the banking sectors of developing countries has received relatively less attention – yet these countries have adopted international regulatory standards and are integrated into the global banking system.

Chapter 3 is motivated by the increased penetration of foreign banks across-borders in SSA and the inconclusive debate regarding the potential benefits that these banks bring to host countries. Most foreign banks in SSA are considered systemically important, both in terms of balance sheet size as well as the share of deposits – with the IMF Africa Department (2015) estimating the latter at more than 30% of total customer depositors in most jurisdictions. The main point of the debate is whether the benefits (in terms of competition and efficiency) that are associated with globalisation through cross-border banking outweigh the cost of greater financial instability. Previous banking crises in Africa resulted in huge economic and social costs (Kriljenko et al., 2015). The expansion of foreign banks across borders thus raises relevant supervisory policy questions about the role played by these banks – in particular, whether allowing their participation introduces more (in)stability in the host country. So far, studies on how cross-border banks affect domestic financial stability in developing countries are much less numerous, and to my knowledge, in the SSA region, this issue remains comparatively unexplored.

Finally, the fourth chapter is motivated by the lack of documented studies on how competition and capital regulation shape monetary policy transmission to commercial banks in SSA i.e., the IRPT.

Among the key policy objectives of the financial liberalization program in most SSA countries was the desire to encourage a more competitive banking system that would, among other things, facilitate the transmission of monetary policy. At the same time, and in a bid to enhance the stability of the banking sector, regulatory authorities in the region adopted higher and more stringent regulatory capital requirements. In some countries, such requirements have resulted in bank consolidations – with potential implications for banking sector competition. The implications of competition and capital regulation on monetary policy transmission to commercial bank rates, thus raises interesting questions for empirical analysis – especially given that changes in capital requirements by supervisory authorities are often based on idiosyncratic or systemic stability objectives, rather than on monetary policy considerations.

1.3. Research Objectives

The thesis has three objectives, namely to:

1. Investigate the effect of prudential regulations (capital, activity restrictions, supervisory power and market discipline) on bank risk (stability);
2. Examine how cross-border banking affect banking sector stability; and
3. Investigate how competition and capital regulation shape the transmission of monetary policy to commercial banks' lending and deposit rates (i.e. the IRPT).

1.4. Research Questions

The research seeks to answer the following questions:

1. Do regulations mitigate or acerbate bank risk in SSA?
2. Does the increased penetration of cross-border banks in SSA increase or decrease banking sector stability in host countries where they operate?
3. Does competition and capital regulation increase or reduce the IRPT to commercial bank rates in SSA?

1.5. Contribution of the Study

The thesis makes four contributions to banking literature and knowledge. First, it identifies which regulations are more effective in mitigating bank risk in SSA. In this way, the study sheds important supervisory insights on which pillars of Basel II are more effective in enhancing banking

sector stability in the region[4]. Given that supervisory resources are generally constrained in most countries (Beck & Maimbo, 2013), the findings can thus inform supervisory policy in terms of which pillars of the Basel II should be prioritized for implementation. Second, the study analyses bank risk from two dimensions: *solvency risk and liquidity risk*. The study thus provides a more comprehensive methodological approach to understanding the bank regulation-risk relationship and allows for a more focused policy intervention by authorities based on the type of risk under consideration. It is shown in this study that the way regulations impact financial stability via the liquidity-risk dimension is different from that of solvency risk. Third, the study provides new evidence of the banking sector stability implications of cross-border banks in SSA. It specifically identifies which type of banks in the host country are most adversely affected by the presence of foreign banks. The findings are important in informing regulatory policy on home-host supervisory coordination considering that the foreign banks are systemically important in most countries where they operate in SSA. Finally, the study sheds light on the trade-off between prudential capital regulation and monetary policy transmission to commercial bank rates. In this regard, the findings have important implications for the implementation of supervisory and monetary policies in SSA and could serve as a good basis for further academic research on banking related studies in the region.

1.6. Research Significance

The focus on the SSA banking sector is relevant and significant for three reasons. First, firms are mainly bank dependent on capital financing in SSA because alternative financing sources (stock markets) are still at their developmental stages in most countries. The banking sector also serves as the main conduit for monetary policy transmission to the real sector in the region. In addition, banks are the major players in driving financial inclusion in most countries[5]. A stable banking sector, where risk is prudently managed and mitigated, is thus a prerequisite catalyst to economic growth and development in the region. Given that SSA countries adopted Basel international

[4] The regulations under consideration are all aligned to Basel II. Capital regulation is Pillar 1 (Minimum Capital Requirements), Supervisory power is Pillar 2 (Supervisory Review Process) and Market Discipline is Pillar 3 (Disclosures)

[5] Studies suggest that financial inclusion reduces inequality and poverty by boosting the income of the poor (see for example, Omar & Inaba, 2020). The World Bank, through its Financial Inclusion Global Initiative (FIGI) and the Alliance for Financial Inclusion (AFI) both consider financial inclusion as a key tool to improving living standards of the people in developing countries, especially those in the lower income segment.

regulatory standards, the region presents a good ground to test the relevance of these regulations in mitigating bank risk in developing countries. Second, over the past two decades, most countries in SSA have undertaken banking and market structure-related reforms, especially those pertaining to capital regulation and competition. The region thus presents a good ground to explore how these reforms shape the transmission of monetary policy to commercial banks – in particular, whether they facilitate or impede the interest-rate pass-through. Finally, a large number of foreign banks have presence in a number of countries in the region – which creates both: opportunities for banking sector growth and more competitive banking structures, as well as posing a threat to financial stability due to contagion risk. Previous episodes of bank failures and crises (for example, Nigeria (1999; 2009-2011), Zambia (1995-1999), Zimbabwe (1995-1999), Kenya (1993-1995) Cote d'Ivoire (1988-1991) and Ghana (2017-2020) resulted in huge economic costs and significant losses, setting back financial development. Policy makers are thus keen to avoid further financial crises given their adverse effects on the economy. The current study is thus relevant and significant in this context as well.

1.7. Organisation of the thesis

The rest of the thesis is organised as follows. Chapter 2 explores the impact of regulations on bank risk (stability). Chapter 3 examines the implication of increased cross-border banking on bank stability. Chapter 4 investigates the impact of competition and capital regulation on the IRPT. Chapter 5 is conclusion and policy recommendations.

Chapter 2: Bank Regulation and Risk-Taking in Sub-Sahara Africa

2.1. Introduction

A sound and stable banking system underpins economic growth and development and is crucial in alleviating poverty and shared prosperity. Some empirical studies also find evidence in support of the bank stability and economic growth relationship (Jayakumar et al., 2018; Levine, 2004; Lin & Huang, 2012; Pradhan et al., 2017). Banks, however, do not always function in a beneficial manner so as to support this growth objective in the economy. In case of SSA countries, the risks in banking systems have been significantly elevated over the past decade due to among other reasons, higher loan default rates, product sophistication as well as innovation (BRSS, 2019). The increased risks pose a threat to financial stability in most countries and in the extreme case of correlated defaults and accumulation of such risks, banking institutions could become vulnerable, leading to a systemic collapse. Given the huge economic costs associated with bank failures and potential losses that could be passed on to society, SSA supervisory authorities have also adopted, as part of the banking sector reforms, prudential regulations based on international Basel standards aimed at mitigating excessive risk-taking behaviour by banks. Among other areas, the regulatory surveys by the World Bank lists four regulations as being common reform areas in most supervisory agencies in the SSA region post-the global financial crisis: (i) capital regulation – including for D-SIBs; (ii) supervisory power (banking laws, resolution, enforcement powers, loan classification and provisioning criteria); (iii) restrictions on scope of activities and products that banks can engage in or offer; and (iv) market discipline (disclosure requirements and consumer protection policies). The policy expectation has been that such regulations will reduce the overall risk in the financial system and hence allow banks to meaningfully contribute towards economic development and growth (Thakor, 2014).

However, there are still divergent views – both, in the public policy arena and academic circles, with regard to the effectiveness of prudential regulation in mitigating bank risk. For instance, the Organisation for Economic Cooperation and Development (OECD) in its 2011 report, argues that during the GFC, regulation appears to have been ineffective in deterring banks from assuming excessive risks in their quest for higher returns. Other views (e.g., Ayadi et al., 2016; Schaeck & Čihák, 2012) suggest that there was a misalignment between private sector incentives and public interests in most countries for most of the period leading to the crisis. The Bank for International

Settlements (BIS) has also previously cautioned on how "too big to fail" and "too big to discipline" banks might have weakened the effectiveness of prudential regulation prior to the crisis through "regulatory capture" – i.e., a scenario where regulatory policies are shaped by, or serve the interests of large or selected banking institutions in the market. Gambacorta & Rixtel, (2013) on the other hand, argue that regulations that impose restrictions on the scope of activities for banks tend to constrain liquidity and income for banks – and hence create more fragility in the financial system. It is, therefore, not surprising that the interaction between bank risk and prudential regulations has become one of the commonly researched areas in banking after the global financial crisis (Bermpei et al., 2018; Danisman & Demirel, 2019; Klomp & de Haan, 2015; Barth et al., 2013; Saif-Alyousfi et al., 2020). However, studies that specifically investigate the impact of regulations on bank risk in the banking sectors of developing countries has received relatively less attention – yet most of these countries have adopted international regulatory standards as prescribed by the BCBS. Given that a sound and stable banking system underpins economic growth and development and is crucial in alleviating poverty and shared prosperity, understanding whether regulations achieve the intended effect of mitigating bank risk is essential in designing a sound regulatory framework for the banking sector.

2.1.1. Research Objectives

The key objective of the study is to explore how prudential regulations impact bank risk (stability) in SSA. The regulation-risk relationship is examined by focusing on two dimensions of bank risk: solvency risk and liquidity risk, and four prudential regulations: capital, activity restrictions, supervisory power, and market discipline. The specific objectives of the study are four-fold. These are to:

1. Examine the effect of capital regulation on bank risk;
2. Investigate the effect of activity restrictions on bank risk;
3. Examine how regulation pertaining to supervisory power affect bank risk; and
4. Investigate the effect of market discipline regulation on bank risk.

The study seeks to answer four research questions as follows:

1. Does a more stringent capital regulatory regime increase or decrease bank risk?
2. Are regulations that restrict bank activities effective in reducing bank risk?

3. Does a more supervisory mandate promote bank stability?
4. Does market discipline (disclosure regime) reduce bank risk?

Information from the World Bank Regulation and Supervision Survey (2019) was used to construct the regulatory indices on each of the four regulations. These indices are more informative and allow exploring how regulation affects bank risk-taking behaviour under different institutional and legal environments across countries. The importance of this study is that it highlights which regulations are effective in mitigating bank risk and enhancing financial stability. It specifically highlights which Pillars of Basel II ought to be prioritized to enhance banking sector stability in SSA. The study findings are thus relevant and important in informing and shaping future regulatory policies in the region. They are also relevant to various other stakeholders: bank managers, shareholders and directors, government, and academic scholars.

2.1.2. Research Contribution

The contribution of the study is two-fold: First, unlike other studies (e.g., Delis & Staikouras, 2011; Klomp & de Haan, 2015; Pasiouras et al., 2009), which use a single bank-risk measure (solvency or non-performing loan ratio), the current study utilises two risk indicators: solvency risk and liquidity risk[6]. The impact of regulations on liquidity risk has not received adequate attention in most empirical studies. The GFC however, demonstrated that liquidity risk could destabilise the banking system as evidenced by the failure of several banks during the crisis. The causes were largely attributed to liquidity rather than solvency problems per se (Almarzoqi et al., 2015). How regulations affects financial stability via the liquidity-risk dimension may thus be different from that of solvency risk. The methodological approach adopted in the current study thus allows for a more focused supervisory policy intervention by authorities based on the type of bank risk under consideration. Based on the review of relevant literature, I am unaware of a similar study that has examined bank risk-taking behaviour in this direction in SSA.

Second, unlike the above-cited studies in which the focus was largely on banks from economies that were affected by the GFC, the sample in the current study exclusively consists of developing

[6] I also employ two additional bank risk indicators (non-performing loan ratio and loan-loss provision ratio) for robustness.

countries in SSA. This distinction is important for three reasons: First, the institutional and legal framework for banks in SSA is different from that of developed or other emerging regions. According to Wachtel & Haselmann, (2007), banks behave differently depending on the institutional environment in which they operate. This means that regulatory policy implications are institution specific – policies from advanced economies cannot merely be replicated in the economies of developing countries like those obtained in SSA. Indeed, questions have been raised (Beck & Maimbo, 2013), as to whether developing countries like those in SSA need to adopt international regulatory standards indiscriminately – and whether the benefits arising from the adoption of such policies or standards (for instance, in terms of better risk management systems and business relationships with international correspondent banks), outweigh the costs (such as high costs of information technology). Second, the nature, objectives, and extent of bank regulatory reforms or initiatives in less developed economies are different from those implemented or undertaken in developed banking systems. For example, increasing efficiency in the banking sector could be a key objective of deregulation in developed countries. However, for developing countries such as those in SSA, stability and risk mitigation are often the key objectives of most regulatory reforms. Finally, very few empirical studies have focused on the SSA region, yet most of the countries in the region are integrated into the global financial system and have adopted international regulatory standards. Oduor et al., (2017) are the only authors to my knowledge that have investigated the regulation-bank risk relationship in Africa. However, their study is limited in two ways: (i) they focus on a single regulation (capital) but do not investigate the effects of the other regulations in the context of the three pillars of the Basel II; and (ii) they do not consider the liquidity risk dimension of financial stability. The current study addresses these shortfalls and thus offers new insights and evidence on the relevance of international regulations in developing countries.

The organisation of the entire chapter is as follows: The next section, Section 2.2, is a review of relevant theoretical and empirical literature. Section 2.3 describes the variables that have been used in the study. The methodological approach and empirical results are articulated in Section 2.4. The chapter concludes with Section 2.5

2.2. Review of the Literature

This section discusses the relevant literature pertaining to the four regulations that are the focus of the current study. First, the different theories deliberated in the literature that explain the origins, practice and rationale of regulation are presented. Thereafter, the study discusses the theoretical link and hypotheses between each regulation and bank risk-taking behaviour. The section concludes with a review of relevant empirical studies.

2.2.1. Theoretical Literature: Regulation Theories and Approaches

Public-interest Theory. This regulation theory traces its origin to (Pigou, 1933), who asserted that government seeks to maximize social welfare by correcting failures in the market. The Pigovian view is that market failure arises from two sources: externality costs and the presence of monopolies in the market. Under the public theory, regulation is considered a socially desired initiative by the government that is necessary to correct inefficiencies or inequities in the market. It ensures that resources are allocated more fairly and equitably – an outcome that would otherwise not have occurred in unregulated markets. In this regard, the regulatory agency serves and represents the interests of the public – not private entities or individuals. In other words, regulation is necessary because some forms of business or activities cannot function or perform well in the absence of regulation or government control (Uche, 2001). This view has been reinforced because, in most cases, regulation has followed some episode of market failure or crisis or public dissent of one form or the other (Uche, 2001). In short, public theory views regulation as a desirable social action that protects the public from the exploitation of some form.

Private Theory. The private interest theory (also referred to as the *Capture theory*) attempts to explain regulation from the perspective of individual interest groups. According to private theory, authorities use regulation mainly to serve the interests of some selected or smaller groups rather than the public (Barth et al., 2013) or, in the words of Stigler, 1971): *"as a rule, regulation is acquired by the industry and is designed and operated primarily for its benefit."* This view – that regulation is "acquired" by some specific businesses or industries – has been interpreted to imply that regulatory agencies are "captured" by the very entities or business industries whose activities or products the regulation was meant to control and manage. The regulator thus ends up serving the interests of a few sections of the society rather than the public.

Principal and Agent Theory. Under this theory, regulation is explained in the context of owners (principals) and agents (managers) of firms (Kareken & Wallace, 1978). The central argument is that the interests of the principals may differ from those of the agents. Instead of pursuing and prioritizing the interests of the owners, managers of firms may aim to promote their own interests, safeguard their positions, and compensate themselves. In this context, regulation is prescribed and imposed with the view to provide and align incentives for managers with those of shareholders (Alexander, 2006). In banking studies, this theory is also underpinned by the realization that banks hold customer deposits in trust. Because it is expensive and practically difficult for individual depositors to monitor bank operations and business decisions, regulation exists to safeguard the interests of depositors and other creditors by limiting the extent of risk that banks can assume or engage in. Diamond & Dybvig, (1983) explain the principal-agent paradigm in the context of bank runs which necessitate regulation to avoid bank runs.

In terms of approaches to bank regulation, the literature distinguishes between micro- and macro-prudential regulatory frameworks. These frameworks are distinguished in terms of their focus, objective, and risk classification (Borio, 2003). The micro-prudential framework focuses on individual banks, with the goal of lowering their default risk regardless of their overall systemic impact. As a result, the risks are exogenous and unrelated to bank choices. On the contrary, the macro-prudential framework is concerned with the overall system-wide soundness. The idea is to mitigate or minimize economic costs that could arise from a systemic failure. In this case, the risk in the system depends on the collective behaviour of banking institutions.

There are a few documented shortcomings of the micro-prudential framework in supervision literature. First, it is possible that the combined risks of individual banks are too small to pose a systemic concern (Borio, 2003). Second, the micro-prudential approach ignores connected lending in the financial system and does not capture the implications of large macro-economic shocks (Acharya & Richardson, 2009). This means that although the risk may be mitigated at the individual bank level, the systemic or aggregate risk at the industry wide level may not. The foregoing flaws notwithstanding, most supervisory authorities still apply the micro-prudential framework in which they primarily aim to mitigate risk at the bank level. Macro-prudential supervision is still relatively new and undeveloped in most developing countries, and the BCBS

has mainly focused on issuing regulatory guidance along the micro-prudential framework. Therefore, the empirical approach in the current study assumes a micro-prudential regulatory framework – as this is the framework that is customary in most countries in the SSA region.

2.2.1.1. Capital regulation and bank risk

Hellmann et al., (2000) theorise two opposing avenues through which capital regulation may shape or incentivise the manner in which banks assume risk. They argue that when banks operate using their own capital, they bear part of the risk for their activities and hence are more disciplined and cautious about engaging in excessive risk-taking behaviour – the so-called capital-at-risk effect. In this context, higher capital increases the incentives of shareholders to control risk and hence promotes more stability. In contrast, because holding capital is costly, higher capital requirements may decrease financial stability by inducing banks to take more risks to restore their profits and franchise – the so-called franchise-value effect (Tabak et al., 2012). Berger & Mester, (1997) argue that more stringent capital requirements can lead to banks becoming "too big to fail" or "too big to discipline" – which may not necessarily be more stable. Oduor et al., (2017) state that higher capital requirements "concentrate" the banking sector as new players find it difficult to enter the market. This results in less competition and increased market power. At the macro level, a higher capitalisation is viewed as an effective way of creating a systemic buffer in the sector (Borio, 2003). From the preceding analysis, capital regulation can either reduce or increase the risk-taking behaviour of banks.

2.2.1.2. Activity restrictions and bank stability

The theoretical literature justifies activity restrictions and discouragement of a universal banking model along three lines (Barth et al., 2004). First, if bank managers engage in a broad spectrum of non-traditional banking products such as banc-assurance, brokerage business or real estate, it may result in a conflict of interest on their part. The argument is that in such a situation, banks may be inclined to shift from holding securities for unsophisticated investors in favour of corporate customers who have larger outstanding loan obligations. Second, because moral hazard encourages risky behaviour, increasing the scope of activities for banks provides an opportunity for the banks to increase risk. Third, complex financial institutions are difficult to supervise and may grow "too big to regulate." These institutions may also result in increased market power and lower

competition (Barth et al., 2004) Based on the foregoing arguments, banking stability can thus be enhanced when supervisory authorities restrict banks from trading or offering a wide range of products. However, the contrasting view favours a universal banking model. There are basically two justifications for this view. First, the provision of more activities allows banks to benefit from diversified revenue streams (Claessens et al., 2001). The increased revenues enhance bank profitability and capital levels, and hence reduce risk. Secondly, because more activities entail more growth in terms of balance sheet size, it allows banks to engage in more activities thus potentially raising their franchise value. This can create incentives for lower risk (Hellmann et al., 2000), hence enhancing bank stability. Activity restrictions can thus affect bank stability in either direction.

2.2.1.3. Supervisory Power and bank stability

Stronger official and legislated mandates of regulatory authorities enable them to take proactive and timely supervisory action on banks, shareholders, directors, and management. This mitigates excessive risk-taking behaviour in banks (Danisman & Demirel, 2019). From a "public view perspective," a stronger supervisory mandate is necessary to correct market imperfections and failures. Other theoretical views justify the stronger supervisory mandate through different avenues – in that it is not feasible for individual depositors to practically monitor the operations and performance of banks on an ongoing basis (Alexander, 2006). This difficulty is more pronounced in countries that have established deposit insurance schemes (DIS) because of moral hazard issues that arise in the presence of deposit insurance safety nets. In such cases, depositors and other creditors have little incentive to monitor and discipline banks. Increased supervisory power, in this case, serves a "social" policy objective by ensuring that banks manage the various risks more prudently (Barth et al., 2004).

From a "private interest view'' however, supervisory authorities may be "captured" by the industries or businesses, or they may serve their "own" interests (Danisman & Demirel, 2019). In such a case, a stronger supervisory mandate is ineffective in enhancing financial system stability. It could instead breed corruption and retard, rather than promote financial stability and development (Quintyn & Taylor, 2002). In their model, Boot & Thakor, (2014) show that a strong official supervisory mandate may result in self-serving behaviour by the supervisors because they

get "captured" by the regulated banks. The situation becomes even worse in cases where the ability of taxpayers to monitor supervision is generally weak. Strong official supervision may thus not always serve the interests of the public in terms of enhancing bank stability.

2.2.1.4. Market Discipline and bank stability

There are also divergent views in the theoretical literature about whether the public and private sectors are active and effective in monitoring banks and whether their actions or decisions can deter banks from excessive risk-taking behaviour. The supporting argument is that regulation on market disclosure allows private investors and the public to make informed decisions, thereby helping "discipline" banks whose risk management practices are inept (*Basel II*, 2004). Pillar 3 of the Basel II accord is primarily based on these disclosure notions. Some supervisory agencies have prescribed specific requirements for banks to disclose information on their key operations or performance indicators. Bank directors and management are legally bound to make accurate disclosure with supervisory sanctions imposed in cases where the disclosures are found to be erroneous or misleading.

The countervailing argument, however, is that increased disclosures can result in bank runs – because some negative information about a bank's increased riskiness could create panic in the market (Semenova, 2009). If a bank's fundamentals demonstrate greater risks, the depositors have the option of requesting greater interest rates or withdrawing their money – making it even harder for the bank to attract new deposits or raise more funding. The effectiveness of disclosures is also hindered in most developing countries because literacy levels are low and legal systems are inadequate for the public to meaningfully "discipline'' banks through market disclosures (Barth et al., 2013). In addition, most banking products and transactions are sophisticated and complex – making it difficult for ordinary market players to comprehend and distinguish between risky banks and less-risky ones. Whether and how market discipline improves financial stability is, therefore, an empirical issue.

2.2.2. Empirical Evidence

Empirical studies that examine the regulation-risk relationship in banks yield mixed findings. Because the empirical studies on the regulation-risk relationship are scanty in SSA, most of the

studies are based on findings from regions outside Africa. The three relevant African studies are those by Oduor et al., (2017), Almarzoqi et al., (2015) and Triki et al., (2017), although the later mainly focused on examining the impact of regulations on bank efficiency. The study first summarises the findings from these African studies then subsequently reviews the studies at the global level.

Oduor et al., (2017) applied fixed effects and instrumental variable regressions to examine whether higher capital requirements improve financial stability in Africa. Their sample comprised banks from 37 African countries. The authors found that, except for big banks, financial instability increases when regulators impose higher capital requirements. This suggests that prescribing higher capital ratios for banks does not enhance banking sector stability. They also found that higher capital requirements mainly benefit foreign banks, which can offer more competitive pricing of their products than local domestic banks. The authors explain the latter finding in terms of how the cost of capital for foreign subsidiaries differs from that of local banks. Unlike domestic banks, foreign banks have access to relatively cheaper and strong capital sources due to group synergies. However, their study is limited in two ways: (i) they focused on a single regulation (capital) but did not investigate the effects of the other regulations; and (ii) they did not consider the liquidity risk dimension in their analysis of bank stability.

Almarzoqi et al., (2015) employed panel fixed effects estimator to explore the competition-stability link from three dimensions: solvency and competition, credit risk and competition, and liquidity risk and competition. Their focus was on the Middle Eastern and North African (MENA) banks from 1999 to 2013. The findings show that competition positively affects liquidity risk but has the opposite effect on solvency risk. The authors also observed that solvency risk increases when higher levels of competition result in reduced bank profitability. This study however did not examine the implications of capital, activity restrictions and market discipline regulations – its focus was limited to analysing the conditioning impact of market entry conditions and prudential supervision on bank risk. The scope of coverage was also on countries in the MENA region, not SSA.

Triki et al., (2017) used two-stage least squares and parametric methods to analyse nine different aspects of the regulations (supervision quality, availability of financial safety nets, price controls,

diversification and liquidity requirements, restrictions on exit from banking, transparency requirements, activity restrictions, restrictions on entry into banking, and capital stringency) and assess how each of these aspects affects the efficiency of banks Africa. The authors observed that entry limitations boost large banks' efficiency while tighter exit restrictions hurt small banks' efficiency. They also observed that small banks do not benefit from improved transparency and price regulations, whilst stricter capital requirements largely benefit bigger and low-risk banks. As highlighted in the summary above, this study mainly focused on efficiency, rather than stability, implications of bank regulations.

Danisman & Demirel, (2019) employed fixed-effects panel data estimation and instrumental variable (IV) techniques to investigate the implications of regulations and market power on bank stability. The authors considered capital, activity restriction and supervisory mandate. The study covered commercial banks from 25 developed economies between 2007 and 2015. The authors adopted a panel fixed effects estimator and an instrumental variable technique to examine the bank regulation-risk relationship. They report three findings: (i) capital regulation is effective in decreasing bank risk; (ii) regulations that restrict activities of banks do not reduce bank risk, and (iii) a stronger supervisory mandate reduces bank stability – and the effect is much higher when banks possess market power. This study, however, did not consider the implications of market discipline on bank stability, nor did it consider the liquidity risk stability dimension.

Gržeta et al., (2023) employed data envelopment analysis (DEA) and system GMM to examine the impact of the introduction of two major regulatory changes (Basel II and Basel III) on bank performance on a sample of 433 European commercial banks over the 2006–2015 period. The results showed a diverse impact of regulation on bank performance. For large and medium sized banks, regulation was found to positively affect both, efficiency and profitability, whereas, for small banks, it negatively affected performance. This study however only analysed the capital regulation – the other implications of the other regulations were not analysed.

Mateev et al., (2023) applied panel fixed effects and system GMM estimators to investigate the impact of bank regulation and ownership on the risk-taking behaviour of financial institutions in the MENA region. Their empirical focus of analysis was on examining whether the effect of regulation on bank risk depends on the type of ownership structure. The findings show that

increased official supervisory power is positively associated with bank credit risk – supporting 'private interest view' of bank regulation. The authors also found significant evidence that the effect of banking regulations on risk-taking behaviour strongly depends on the type of ownership structure prevailing in each banking system. This study however ignored the liquidity dimension of bank stability.

In their earlier paper Mateev et al., (2022), the authors examined the impact of capital requirements and market power on the risk of financial institutions in the same MENA region. They found that capital ratio has a strong positive impact on the credit risk of conventional banks, whereas this effect is insignificant in the sample of Islamic banks. However, for the conventional banks, the increase in the capitalization level imposed by the regulators was negatively linked to the credit risk level only for banks with high market power. Islamic banks on the other hand, were less sensitive to the conditions of market competition in the MENA countries. This study only focused on capital regulation, the implication of the other regulations was not explored.

Suljić Nikolaj et al., (2022) employed system GMM estimator to investigate the moral hazard implications of regulation on a sample of EU countries i.e. whether the impact of deposit insurance system on bank stability depends on the characteristics of banks between 2005 and 2015. Bank stability was analysed using the Z-score and ratio of NPLs to total loans. The results showed that large and systemically important banks behave in a riskier way, distorting the purpose of the deposit insurance scheme and jeopardising the safety of banking systems. This study did not explore the implications of prudential regulations pertaining to capital, supervisory power and activity restrictions.

Agoraki et al., (2011) explored how the level of competition may influence the impact of regulations in the banking system. Their interest was to assess whether the effects of regulations change when banks possess market power. The authors applied the system GMM estimator to a sample of banks in eastern and central Europe using data from 1998 to 2005. They focused on three regulations: capital, official supervisory power, and activity restriction and document three major findings: (i) banking risk decreases in the presence of a stringent capital regime. However, when they controlled for market power, this stabilizing effect of capital was significantly reduced and, in some cases, diminished altogether; (ii) regulations that increase restrictions on bank

activities reduce credit risk – but only if banks possess market power; and (iii) an increased supervisory mandate, directly reduces bank risk. Similar to the study by (Danisman & Demirel, 2019), this study did not consider how market discipline shapes the incentives of banks to manage risk, nor did it examine the liquidity risk dimension. The scope of the study was also confined to countries in central and Eastern Europe.

Klomp & de Haan, (2015) employed system GMM to examine the regulation-bank risk relationship in 94 developing countries from 2002 to 2008. Their key interest was to examine whether institutional factors and bank structure impede or facilitate the effect of regulations on bank risk. They found mixed results: First, higher capital requirements and supervisory mandates decrease bank risk. Second, higher restrictions on bank activities decrease bank risk but only for large and foreign banks. For listed banks, activity restrictions increase bank risk. In their earlier study (2012), the authors used the quantile regression technique and factor component analysis to examine the regulation-bank risk relationship. They found that only banks with high risk are affected by regulations, not lower risk banks. In both of their studies, the authors did not consider the implications of market disclosures, nor did they consider the liquidity risk dimension of bank stability.

Bermpei et al., (2018) explored how the institutional environment in a jurisdiction facilitates or obstructs the manner in which regulations affect bank risk. Their sample comprised over 1,000 banks from both developing and developed economies for the period 2004-2013. They applied system GMM to examine the conditioning effect of the institutional factors. Their findings show that the impact of capital is enhanced when there is political stability. However, contrary findings are observed when more efficient remedies are available to creditors and where the rule of law is more effective; i.e., these factors dampen the impact of capital regulation – suggesting that banks tend to over-rely on collateral (rather than borrower's cash-flow ability to repay loans) when institutional frameworks on creditor rights are present. The authors also found that stronger supervisory power negatively affects bank stability regardless of other institutional factors. This study is also limited in its scope of the risk dimension in banks and did not investigate the implications of market discipline regulations in shaping bank risk-taking behaviour.

Khurshid and Holscher (2016) utilised system GMM to analyse the stability impact of regulations in transition countries. Their sample comprised 370 banks from 20 transition countries (11 EU members and 9 are non-EU states) for the period 2001-2013. The authors observed that the manner in which regulations mitigate bank risk was largely conditional on the prevalence and level of market power in the market. Specifically, they noted that capital regulation, activity restrictions, and supervisory power were more effective when competition is low, i.e., when banks possess market power. The stability enhancing effect of capital was consistent across both groups of countries.

Djalilov & Piesse, (2019) assessed how regulations shape efficiency in banking systems of countries in central and Eastern Europe and some countries that belonged to the former Soviet Union. Their study period covered the period 2002–2014. In their empirical analysis, they employed both system GMM and quantile regression models. The results from system GMM show that higher activity restrictions are associated with higher efficiency, while those from quantile regression show that the effects of activity restrictions are different at different quantiles.

Saif-Alyousfi et al., (2020) employed system GMM to assess how competition affects the fragility of banks in the Gulf Cooperating Countries (GCC) during the period 1998 to 2016. In their study, they considered the effect of four regulations (capital, activity restrictions, supervisory power, and market discipline). They found that all the regulations increase bank stability. However, bank stability was significantly reduced in the presence of creditor protection rights – the latter finding being consistent with that reported by (Bermpei et al., 2018). The analysis by Saif-Alyousfi et al., 2020) was, however, limited to GCC countries. In addition, their empirical approach did not consider the implications of regulations on the liquidity risk dimension of bank stability.

Barth et al., (2004) utilised ordinary least squares (OLS) and logit regression to examine the various regulatory aspects and their inter-relationship with bank efficiency and fragility in 107 countries. They focused specifically on (i) government ownership; (ii) private-sector monitoring of banks and regulations fostering information disclosure; (iii) diversification, provisioning standards, and loan classification stringency; (iv) supervisory resources, independence, and power; (v) deposit insurance system design features; (vi) regulations on capital adequacy; (vii) regulations pertaining to the entry restrictions of new banks, and (viii) regulations pertaining to the scope of

bank products or activities. They did not find significant evidence that stronger supervisory power and government regulations are effective in promoting bank stability and efficiency. Only in countries where supervisory authorities were operationally independent, did the authors find a positive association between bank efficiency and an increased supervisory mandate. However, they found that market disclosures are effective tools to increase bank stability. In their 2013 study, the authors found that bank efficiency is negatively affected when supervisors impose higher restrictions on banks.

Fernandez & Gonzalez, (2005) employed OLS, probit and seeming unrelated regression (SUR) to examine whether accounting and auditing standards (market disclosure aspects) contribute to bank stability. Their sample, however, comprised only listed banks during the years 1995 and 1999. The authors found that: (i) in countries where accounting and auditing requirements are low, banking risk is high; (ii) banking risk is low when higher activity restrictions are imposed on banks; and (iii) more supervisory power mitigates bank risk. The authors also observed that international standards on accounting and audit reinforce the effect of capital regulation. They interpreted their overall findings as directly supporting the first and third pillars of the Basel Accord II.

Pasiouras et al., (2009) utilised stochastic frontier analysis to assess whether Basel II regulations increase or reduce bank efficiency. Their sample included commercial banks in 74 countries from 2000 to 2004. They document three mixed findings: (i) both, supervisory power and market discipline are associated with lower-cost efficiency; (ii) the same variables are also associated with lower profit efficiency; and (iii) higher capital requirements reduce profit efficiency but improve cost efficiency.

Laeven & Levine, (2009) applied OLS and instrumental variable (IV) estimators to investigate whether shareholding structure matters in the regulation-risk relationship. They found that a bank's risk appetite is positively correlated with more influential shareholders. The authors interpret their findings in two ways: (i) shareholders who own equity shares have a higher risk appetite than non-equity holders, and (ii) these shareholders can exert significant influence on management to increase risk-taking. The authors concluded that the extent to which regulations will shape risk-taking behaviour in banks largely depends on the shareholding structure. In other words, similar

regulatory policies might shape the risk appetite of bank managers in different ways depending on the ownership structure.

In summary, the theoretical literature presents different avenues through which regulations can affect bank risk taking behaviour. The findings in most studies on the effect of regulations on the stability of banks also remain inconclusive and mixed. Most of the studies on this topic have also been conducted for developed countries or developing countries outside the SSA region. In most of these studies, bank stability has been examined mainly in the context of either solvency risk (Z-score) or credit risk – with little or no consideration of liquidity risk. The hypothesis in the current study is that the manner, in which regulations affect financial stability via the liquidity-risk dimension, could be different from that via solvency risk. This could partly explain why solvent, but illiquid banks fail or cause instability in the system. The study thus contributes towards addressing this gap in the banking literature and hence provide a more comprehensive analysis of the bank regulation-risk relationship in SSA.

2.3. Variables and Data

This section describes the variables that were used in the study, their measurement, and sources.

2.3.1. Measuring Bank Risk

The study employs two measures of risk: *solvency risk* and *liquidity risk*. Solvency risk arises when a bank has a negative net worth – meaning that the value of liabilities is higher than that of its assets (Almarzoqi et al., 2015). Insolvent banks are unable to satisfy their obligations and, as a result, they default and lose their franchise value. The study follows other empirical studies and utilises the Z-score to measure solvency risk. The Z-score can be derived using the formula below (Beck et al., 2013; Schaeck & Čihák, 2012).

$$\text{Z-score}_{it} = \frac{\text{ROA}_{it} + \text{ETA}_{it}}{\sigma\text{ROA}_{it}} \tag{2.1}$$

In equation (2.1), the index is derived using three key bank performance indicators i.e. the sum of return on assets (ROA_{it}) and the equity to assets ratio (ETA_{it}) (i.e. leverage ratio) divided by the volatility in return on assets (σROA_{it}). The indices *i* and *t* show bank and time, respectively. Higher

values of the Z-score indicate less risk, i.e., more stability. A key merit of the Z-score is that it is relatively simple to compute, as it is derived using direct bank performance indicators. It can also be used to analyse the stability of different types of banks (large or small) as well as listed or unlisted institutions – unlike the distance to default and equity volatility, which can be calculated only for listed banks. This measure, however, has some drawbacks. First, the accuracy and reliability of the scores can largely be affected by the standards adopted by the accounting setting bodies in each particular jurisdiction (Chiaramonte et al., 2016). Second, it relies on historical data – as such, it does not provide a forward-looking view of bank stability (Chiaramonte et al., 2016). In spite of these flaws, several studies use the Z-score as a risk measure at the individual bank level (Beck et al., 2013; Chiaramonte et al., 2016; Jeon et al., 2011; Jimenez et al., 2013). It was thus adopted as a measure of bank risk (stability) in the current study. As the study utilises data from Bankfocus (an international database that allows comparability of individual bank-level data), the problem of different accounting standards is effectively mitigated. In addition, and as part of robustness checks, two further risk measures are employed: the ratio of impaired loans to gross loans (NPL ratio) and loss reserves to gross loans ratio (LLR ratio). Unlike the Z-score, a higher NPL or LLR ratio implies more risk and consequently less stability.

To capture liquidity risk, the study utilises the liquidity ratio, which is derived by dividing total liquid assets by the sum of total deposits and short-term borrowing. Liquidity risk arises if a bank cannot meet its short-term commitments (Basel II, 2004). This could mainly arise either because a bank may not be able to liquidate or convert its assets into cash without incurring a capital loss; or it may not be in a position to raise money to cover the gap. A higher ratio indicates less liquidity risk (greater stability), whilst a lower ratio indicates a deterioration in liquidity strength (less stability). As highlighted under the literature review section, the effects of regulations on liquidity risk are still substantially unexplored, particularly in SSA, and I am unaware of any specific studies on the same.

2.3.2. Bank Regulation Measures

To quantify the four regulations, the study derived the regulatory variables from the World Bank Regulation and Supervision Survey databases. For the years 2009 to 2011, scores from Survey IV compiled by (Barth et al., 2013) were used while for the years 2012 to2019, the scores were directly

derived from the BRSS, (2019). For each index, higher scores indicate more stringency of the regulation. Based on the theoretical literature, the effect of each of the four regulations on bank risk can take either direction. Below is a summary of each regulatory index and the expected relationship with bank risk. A full description and derivation of each index are provided in Table 2.8.

Capital Regulation Index (CAPR). This index captures the overall stringency of the capital regulatory framework. It mainly captures aspects such as: (i) whether regulatory authorities have prescribed minimum capital adequacy ratios that vary with a bank's level of risk; (ii) whether banks are directed to deduct losses (arising from market valued assets) from their capital before determining the minimum capital adequacy requirements; (ii) whether the regulator verifies the sources of start-up capital for banks; and (iv) whether borrowed funds are allowed as start-up capital. The index scores range from 0 to 8. A higher index implies that the regulatory capital regime is more binding, while a lower index shows less stringency. The hypothesis is that since capital serves as a cushion against unforeseen losses, a more stringent capital regulation regime should improve bank stability, and hence reduce both solvency and liquidity risks.

Activity Restriction Index (ACTR). This captures the degree to which regulators allow banks to offer other non-core or non-intermediation banking services and products such as brokerage business, banc-assurance, or property business (real estate). The scores for this index range from 3 to 12. Higher scores show that there are stricter activity restrictions, while lower scores depict a universal banking regime (with fewer restrictions). Higher activity restrictions can adversely shrink banks' income streams hence reducing stability (increase risk) or can improve the revenue streams by limiting diversification risk. It is thus hypothesised that the impact of higher activity restrictions on solvency and liquidity risk can be either positive or negative.

Supervisory Power Index (SUPP). The index measures the mandate of the regulatory agency – in terms of legislated formal powers to enforce certain actions or directions on a bank or its shareholders, directors, or senior management officials. The values for this index range between 0 and 14. A higher index shows that the supervisory agency has more official powers or mandate to regulate banks, while a lower index depicts low enforcement powers. The hypothesis is that a stronger supervisory mandate should reduce solvency risk because regulatory sanctions should

compel bank managers to manage risk more prudently. Its impact on liquidity risk can however take either direction due to the fluid and dynamic nature of bank liquidity. Too much regulation could impede flexibility in the management of bank liquidity and therefore increase, rather than reduce liquidity risk.

Market Discipline Index (MKTD). The index captures the adequacy of the disclosure regime that is enforced by the supervisory authorities i.e. the extent to which banks disclose their financial performance and risk appetite to allow the public to make informed decisions. Among other factors, the index captures the extent of disclosures of financial statement items such as unpaid interest, related party transactions, delinquent loans, consolidated financial statements, whether the banks are rated or not, and whether certified external auditors are mandatory for banks. The scores of the index vary from 0 to 14. A higher index implies that the disclosure regime is more transparent, i.e., regulators require banks to make more disclosures on their operations and performance to the public, while a low index shows fewer disclosures. Similar to activity restrictions, market discipline can impact bank risk positively (if the public and private stakeholders use the available information to make informed banking risk decisions) or negatively if literacy levels are low or the banking risks are predominantly outside the control of bank management.

2.3.3. Other determinants of bank risk

Several other factors, both at bank and country level that might affect bank risk are also considered in the study. The choice of these variables has largely been informed by economic theory and other empirical studies.

Size: this is proxied by the share of each bank assets to total banking system assets and captures the effect of size and economies of scale. Bigger banks own more advanced risk management skills and systems, and as such, they have the capacity to withstand shocks more than smaller banks, and hence are more stable. However, larger banks can be more unstable if they assume they are “too big to fail” (Fungáčová et al., 2013; Tabak et al., 2012). Credit risk can also build up quickly when banks expand their balance sheet too aggressively (Jeon et al., 2011). The effect of size is thus ambiguous and can take either direction.

Diversification: this is the extent to which banks rely on income from non-intermediation services. The index is derived by dividing non-interest income by total revenue. Diversification can increase stability if such income from non-core activities is significant and stable (Demirguc-Kunt & Huizinga, 2010). However, higher diversification could also increase risk (Molyneux et al., 2010) if banks venture into non-traditional activities where cash flows are unstable or unpredictable. Diversification can thus increase or decrease bank risk.

Lerner index: this index displays the market-wide pricing power of individual banks (a proxy for competition). Competition can reduce the margins of banks, which may compel managers to assume more risks (Allen and Gale, 2004). This has the potential to cause instability. However, it can also enhance bank stability by reducing credit risk due to lower interest rates associated with high competition (Martinez-Miera & Repullo, 2010). The impact of competition on bank risk is thus also an empirical issue. The methodological approach applied to derive the Lerner index in the current study is presented in Table 2.12 in the Appendix 1.

GDP growth rate: this measure captures how macro-economic cycles impact financial stability (Beck et al., 2013) and is proxied by the annual GDP growth rate. Increased economic activity can positively affect bank stability through increased income and profitability from the banking business. However, some studies show that banks adopt relaxed or liberal credit policies when the economy is expanding. As a result, bank fragility increases during boom periods (Jiménez et al., 2013).

Financial Freedom Index (FFINDEX): this index shows the extent to which there is government interference in the banking sector. Fewer government obstacles to bank operations or meddling in the financial system could boost efficiency and diversification, which is good for stability. Greater banking freedom, on the other hand, may result in disruptive competition (Jeon et al., 2011) and hence increase instability.

2.3.4. Data and Sample

The dataset comprised bank level variables based on the balance sheet and income statements of individual banks and country level variables. The bank-level data was sourced from the Bankfocus database for the period 2009 to 2019. The four regulatory variables were constructed and obtained

using information from the BRSS (2019), while the indices on the degree of financial freedom in each country were obtained from the Heritage Foundation. The country-specific GDP growth rate series were sourced from the IMF IFS. To allow for meaningful analysis, only commercial banks, which had, at a minimum, 3-year consecutive data were included in the sample. In addition, only countries, which had a minimum of four banks, were included in the sample. Finally, as the focus was at the bank level, the analysis was based on unconsolidated data. After the above filtering process, the final sample comprised 273 banks from 25 SSA countries – see Table 2.10. The choice of countries was therefore largely informed by the extent of availability of bank-level data. The panel was thus unbalanced.

2.3.5. Descriptive Statistics

A summary (number of observations and mean distribution) of key variables used in the study is presented in Table 2.1. The table shows that the Z-score and Liquidity ratio are distributed with mean values of 18.30 and 33.5 – with the minimum scores of -7.59 and 0.85 and highest scores of 114.9 and 106.5, respectively. The relatively wide range of the Z-scores and liquidity ratios indicate that there are material variations in the stability levels of banks across countries in the sample. The higher variation in diversification and financial freedom levels reflects the vast heterogeneity in-depth, sophistication, and extent of government control in banking systems across different countries in SSA. This is highlighted in chapter 1 of the thesis. The variations in regulatory frameworks across countries are, however, relatively smaller. This observation reflects the fact that almost all supervisory authorities in the region base their regulatory policies on the same Basel Core Principles (BCPs). Table 2.8 contains the full definitions and sources of all the variables while Table 2.9 shows the pairwise correlations among the variables. The correlation between the risk measures (Z-score and Liquidity ratio) and the four regulations is positive and significant for capital and market discipline and negative for activity restrictions. Overall, the correlations do not show any problem of multicollinearity among the explanatory variables. Table 2.10 provides a summary (average) of the regulations and risk indicators for each country.

Table 2.1: Summary statistics of the variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variables					
Z-score	2,644	18.30	16.56	-7.59	114.87
Liquidity ratio	2,625	33.49	20.32	0.85	106.54
Banking sector regulation measures					
Capital regulation	2,554	6.74	2.17	2	10
Activity restriction	2,609	7.67	1.56	5	12
Supervisory power	2,621	11.45	2.29	3	14
Market discipline	2,586	8.48	1.85	2.5	11
Other determinants of bank risk					
Lerner	2,499	0.24	0.24	-2.79	0.93
Size	2,648	0.10	0.11	0.03	62.66
Diversification	2,630	30.30	16.64	0.02	100
GDP growth rate	2,648	4.65	3.04	-7.70	19.70
FFINDEX	2,636	48.09	11.80	10	70

Notes: FFINDEX is an index on the financial freedom.

2.4. Methodology

This section presents the estimation method, empirical model and the identification strategy used to examine the regulation and bank risk relationship.

2.4.1. Estimation Method

Two considerations informed the identification strategy and selection of the estimation method: persistence of bank risk-taking behaviour (Agoraki et al., 2011), and potential endogeneity between bank risk and supervisory actions, i.e., regulation variables (Delis et al., 2016; Delis & Staikouras, 2011). Bank's risk-taking behaviour is generally dynamic and persistent over time. For example, bank performance in the current period, could partly be affected or influenced by past period's performance. Endogeneity, on the other hand, could arise due to an omitted variable bias and/or when causality is reversed. For instance, supervisory authorities will usually direct banks that are risky to hold more capital – in this case, the higher risk (instability) causes higher capital requirements and vice versa. The study thus adopted a dynamic panel model – the 2-step system Generalized Method of Moments (GMM) estimator by (Arellano & Bover, 1995) and (Blundell & Bond, 1998). System GMM addresses the persistency issue by using lags of the dependent variable as additional explanatory variables. Endogeneity is addressed by internally transforming the data – system GMM transforms two equations: one in level form with the first difference as instruments

and another in first difference form with levels as instruments. Endogeneity bias is thus reduced in this way by adding more instruments to increase efficiency and making the instruments uncorrelated with the fixed effects (Roodman, 2009).

The classification of exogenous and endogenous variables was informed by theoretical considerations and other bank risk-related empirical literature (Delis et al., 2016; Djalilov & Piesse, 2019). First, current and future bank strategic and business decisions are usually guided by or based on past bank performance. This implies that current and future bank-specific variables are correlated – the current bank performance can thus affect future performance. For this reason, bank-specific variables were treated as predetermined (weakly endogenous) and instrumented with their first and higher lags. On the other hand, supervisory authorities often enact new rules or policies when they observe fragilities in the banking system. Risk levels thus inform or drive regulatory initiatives. For this reason, the four regulations were treated as endogenous and instrumented with their second and higher lags. Year dummies, macro-economic and institutional legal framework variables were treated as exogenous. The key assumption under system GMM is that the lags of instrumented variables are the only available instruments (Roodman, 2009). However, to avoid instrument proliferation, the lag depth of the instruments was limited and the GMM estimates are reported with "collapsed" instruments. The Hansen statistic and the second-order autocorrelation (AR) test were then applied to verify whether the instruments are valid.

2.4.2. Theoretical Model

The model adopted in the study takes a dynamic panel form with a general specification as follows:

$$y_{it} = \delta y_{it-1} + \beta x_{it} + \varepsilon_{it} \quad (2.2)$$

where ε_{it} is the error component term given by:

$$\varepsilon_{it} = u_i + v_{it} \quad (2.3)$$

y_{it} is the dependent variable, *i* denotes bank, and *t*, denotes time. x_{it} is a vector of independent variables – some of which may be exogenous or endogenous, u_i is the panel fixed effects, and v_{it} are the idiosyncratic shocks with $E(u_i)=E(v_{it})=E(u_i v_{it}) = 0$ for all *i* and *t*. Under system GMM, the panel specific heterogeneity effect is removed by transforming equation (2.2) as follows:

$$\Delta y_{it} = \delta y_{it-1} + \beta \Delta x_{it} + \Delta v_{it} \quad (2.4)$$

Even though the fixed effects have been removed, there is still an element of endogeneity in the lagged dependent variable in equation (2.4) because the lagged term i.e. y_{it-1} in $\Delta y_{it-1} = y_{it-1} - y_{it-2}$, is correlated with the v_{it-1} in $\Delta v_{it} = v_{it} - v_{it-1}$. The situation also arises with the variables in the x_{it} vector: some or all of the variables in this vector may be endogenous (unless they are strictly exogenous) because of their correlation with v_{it-1} (Roodman, 2009). In system GMM, equation (2.2) is transformed into two equations, one in levels form with the first difference as instruments and another in first difference form with levels as instruments. Endogeneity bias is reduced in this way by adding more instruments to increase efficiency and making the instruments uncorrelated with the fixed effects (Roodman, 2009).

2.4.3. Empirical Model

Two dynamic models in relation to the two risk measures were estimated as follows:

$$Zscore_{it} = \delta Zscore_{it-1} + \varphi REG_{jt-1} + \sum_{k=1}^{3} \beta_k BANK_{it} + \theta COUNTRY_{jt} + \gamma_t + v_{it} \quad (2.5)$$

$$LRisk_{it} = \tau LRisk_{it-1} + \emptyset REG_{jt-1} + \sum_{k=1}^{3} \beta_k BANK_{it} + \theta COUNTRY_{jt} + \mu_t + \varepsilon_{it} \quad (2.6)$$

where *i, j* and *t* depict bank, country, and time, respectively. The dependent variables, Z-score$_{it}$, and LRisk$_{it}$ depict the bank-level measures of solvency risk and liquidity risk, respectively. REG$_{jt-1}$ represents the four regulations (capital, activity restriction, supervisory power, and market discipline). BANK$_{it}$ and COUNTRY$_t$ represent other factors that may also affect bank risk at the bank and country-level, respectively. The three bank specific factors are size (measured by share of bank assets to total banking system assets, diversification (other non-interest income to total income, and competition (Lerner index). γ_t and μ_t represent year fixed effects, while v_{it} and ε_{it} are the error terms. The lagged risk indices i.e. Zscore$_{it-1}$ and LRisk$_{it-1}$ capture the persistence in risk-taking behaviour of banks. If persistence is present, the coefficients of the lagged risk indices are expected to be positive and significant.

It should be highlighted that new regulatory reforms or regulations are unlikely to have an immediate impact on bank stability (Agoraki et al., 2011). In fact, there will usually be a lag between when regulatory authorities enact new regulations and when the policies are translated into a change in bank risk-taking behaviour. For this reason, in estimating equations (2.5) and (2.6), all the regulatory variables enter with their first lags. Because each regulation can impact bank risk differently (Klomp & de Haan, 2015; Delis & Staikouras, 2011), as a robustness check, the equations are also estimated by entering one regulatory variable at time. To allow for meaningful comparability in terms of economic significance (Beck et al., 2013), all explanatory variables were also normalized.

2.4.4. Results and Discussions

This section presents and discusses the results from the estimation of equations (2.5) and (2.6) as presented in the preceding section. As part of robustness checks, the section also presents the results from using alternative measures of bank risk: the non-performing loan ratio (NPL) and the loan loss reserve ratio (LLR). The results are shown in Table 2.2. Model 1 and 2 are the baseline results – which show the impact of each regulation on solvency risk (Z-score) and liquidity risk (liquidity ratio), respectively, while in Models 3 and 4, the dependent variable is the NPL ratio and LLR ratio, respectively. First, it is observed that all the lagged dependent variables, enter with positive coefficients and are statistically significant in all the models. This confirms the existence of persistence in the risk-taking behaviour of banks in SSA as has been observed in most papers that have employed dynamic bank stability models.

Second, capital and market discipline regulations increase the Z-score and liquidity ratio. In the baseline models (1 and 2), the coefficients for capital regulation and market discipline are positive and significant in both models. Since a higher Z-score and a higher liquidity ratio implies lower risk, these results show that more stringent capital and market discipline regulations reduce bank risk. Capital serves as a cushion against unforeseen losses and hence reduces the risk of insolvency. As discussed in chapter 1, banks in the SSA region generally maintain higher capital levels – well above the minimum recommended by the BCBS. A more stringent mandatory capital regulatory regime also compels management to manage bank liquidity more prudently since they must avoid transient liquidity shocks that could result in insolvency (Almarzoqi et al., 2015). Albaity et al.

2019; Agoraki et al., 2011; Danisman & Demirel, 2019; Klomp & de Haan, 2015; Saif-Alyousfi et al., 2020) report similar results with regard to the capital regulation-risk relationship. On the other hand, Delis & Staikouras, 2011; Fernandez & Gonzalez, 2005; Saif-Alyousfi et al., 2020) found that market discipline has a positive impact on bank stability. A plausible channel through which market discipline may enhance bank stability and reduce risk is through improved disclosures of bank performance information to the public. Increased disclosures incentivise bank management to manage solvency and liquidity risk more prudently. The findings thus support the effectiveness of Pillar 1 and 3 of Basel II in mitigating solvency risk in banks.

Third, activity restriction is negatively related to the Z-score and liquidity ratio – implying that higher restrictions reduce bank stability, i.e., they increase banking sector risk. Some studies (Agoraki et al., 2011; Barth et al., 2004; Klomp & de Haan, 2015) found similar results. Similarly, increased supervisory mandate negatively affects bank stability i.e. increases liquidity risk (negative co-efficient of supervisory power variable in Model 2). The former outcomes can be explained in terms of the negative impact on profitability and cash flow that arises when authorities limit the scope of activities and products that banks can offer. The negative impact of stronger supervision on the other hand, can be interpreted in terms of how strong supervision alters bank management's latitude or incentives for managing liquidity. Liquidity is a complex and dynamic facet of banking that cannot be effectively managed through supervisory rules or directions. Stronger supervision limits and impedes dynamism in the management of bank liquidity. This partly explains why some regulatory authorities opt for "guidelines" on bank liquidity management as opposed to "directives or regulations."

Finally, the impact of the supervisory power on solvency risk is insignificant – suggesting that regulations that give more powers to supervisors do not necessarily reduce solvency risk. This outcome appears to question the relevance and effectiveness of the supervisory review process (Pillar 2 of the Basel II framework) and could be explained in terms lack of adequate supervisory capacity (in terms of both, personnel and financial resources). Supervisory resources in most SSA regulatory agencies are significantly constrained. Thus, despite enhancements in banking legislations, implementation of such laws remain ineffective (Beck & Maimbo, 2013). Danisman & Demirel (2019) found that an increased supervisory mandate increases bank risk-taking behaviour – with the effect being worse when banks possess higher market power. Bace & Ferreira

(2020) found that policies that encourage official supervisory power do not enhance the efficiency of the banking sector.

The above results broadly remain consistent when using alternative risk measures – see Models 3 and 4. Capital regulation reduces bank risk while activity restrictions have the opposite effect i.e. they increase bank risk. Recall that unlike the Z-score and liquidity ratios, higher ratios of NPL and LLR imply higher risk i.e. less stability. The negative co-efficient of the capital regulation variable therefore shows that higher (more stringent capital regulation) reduces non-performing loans – hence improves stability of banks. On the hand, tighter restrictions increase credit risk i.e. reduce banking sector stability. The results also remain consistent when each regulation is employed one at a time in the regression as is employed in other studies (see for example, Klomp & de Haan, 2015; Delis & Staikouras, 2011) because each regulation can impact on bank risk differently – see Table 2.5 – 2.7 (for solvency, liquidity risk and credit risk, respectively, in Appendix 1.

With respect to the other factors that affect bank risk, there are contrasting effects of size on bank risk. While the negative coefficient of size in Models 1 and 2 show that overall, bigger banks are associated with more solvency and liquidity risk (i.e. too big to fail syndrome), those in Models 3 and 4 show that these banks are nevertheless, associated with less credit risk. The latter result may partly be attributed to possession of advanced credit risk management tools and frameworks that larger banks often employ which allow them better screening and risk profiling of borrowers (Wu et al., 2017). Most studies find contrasting effect of bank size (Albaity et al., 2019; Kasman & Kasman, 2015; Tabak et al., 2012; Wu et al., 2017). Less competition (i.e. more market power) reduces solvency risk (Model 1 – the finding is consistent with several other studies that examine the competition-solvency stability relationship (e.g.,Saif-Alyousfi et al., 2020; Beck et al., 2013; Hope et al., 2013; Turk-Ariss, 2009). Banks that possess more market power usually enjoy higher profitability that augment their solvency positions. The coefficients of the diversification index (Model 1) and GDP growth (Model 2) are both, positive and statistically significant – implying that higher diversification leads to more banking sector stability (lower solvency risk). Banks are also more stable when the economy is booming largely due to improved profitability arising from increased economic activity.

Table 2.2: Results of the impact of banking sector regulations on bank risk in SSA (2009-2019)

	(1) Z-score	(2) Liquidity ratio	(3) NPL ratio	(4) LLR ratio
Bank risk$_{t-1}$	0.789***	0.572***	0.611***	0.869***
	(0.049)	(0.054)	(0.153)	(0.034)
Capital regulation	0.615**	2.078**	-1.179*	-0.942*
	(0.282)	(0.981)	(0.717)	(0.556)
Activity restriction	-0.482*	-3.268***	1.781*	0.696**
	(0.265)	(1.146)	(1.044)	(0.350)
Supervisory power	-0.130	-2.046***	0.985	0.434
	(0.237)	(0.673)	(0.670)	(1.134)
Market discipline	0.484*	1.812**	-0.145	-0.759
	(0.291)	(0.915)	(0.798)	(1.380)
Competition	0.571**	-1.458	-1.725**	-0.619
	(0.246)	(1.207)	(0.747)	(0.447)
Size	-0.420**	-4.583***	-0.722**	-0.334*
	(0.163)	(1.626)	(0.346)	(0.176)
Diversification	0.605**	1.002	0.926	0.056
	(0.248)	(1.797)	(0.911)	(0.440)
GDP growth	0.263	1.616**	-1.036**	-0.012
	(0.170)	(0.766)	(0.486)	(0.193)
FFINDEX	0.298	1.182	0.239	0.621
	(0.248)	(0.846)	(0.551)	(0.578)
No. observations	2,082	2,059	1,306	1,692
No. banks	273	273	228	249
AR(2) statistic	-0.05	0.18	-0.26	-0.58
AR(2) p-value	0.957	0.856	0.797	0.564
Hansen statistic	25.08	6.54	15.98	14.01
Hansen p-value	0.293	0.587	0.454	0.830
No. instruments	42	28	36	64
F-statistic	458.2***	276.8***	68.12***	458.2***
Year dummies:	Yes	Yes	Yes	Yes

Notes: The table shows the effect of regulations on solvency risk (model 1) and liquidity risk (model 2) using a two-step system GMM estimator. Higher Z-scores and liquidity ratios imply low risk, while the opposite is true for NPL and LLR ratios. Models 3 and 4 show the results when using alternative risk indicators i.e. NPL ratio – model 4 and LR ratio – model 5. FFINDEX=Financial freedom index. The definitions of all the other variables are provided in Table 2.8. The p-values for the Hansen test show that all the models are appropriately identified while those for the autocorrelation test AR(2) depict no problem of second order autocorrelation. The statistical significance of each coefficient at the 1%, 5% and 10% level is shown by the asterisks ***, **and *, respectively. The numbers in the brackets are the robust standard errors.

2.4.5. Robustness Checks

In addition to using alternative measures of bank risk as shown in Table 2.2, the study also employed two robustness checks to validate the baseline results. First, it followed the approach by Klomp & Haan, (2012) and used regulatory indices, which were constructed using principal component analysis (PCA). The idea here was to examine the overall (composite) impact of regulations on bank risk. Principal component analysis is concerned with explaining the variance-covariance structure of a set of variables through a few linear combinations of these variables. The principal components of a set of variables are obtained by computing the eigenvalue decomposition of the observed variance matrix. Although more *(p)* components are required to reproduce the total system variability, often much of this variability can be accounted for by a small number *(k)* of the principal components as there is (almost) as much information in the *(k)* components as there is in the original *(p)* variables. Based on the Kaiser criterion, the study used one principal component as all factors with eigenvalues below one were dropped. The regression results based on PCA constructed regulatory variables are presented in Table 2.3 while the PCA eigenvalue decomposition matrices are shown in Table 2.11 in the Appendix 1. Overall regulations enhance banking sector stability – implying that they in general, reduce bank risk.

Table 2.3: Results of the impact of banking sector regulations on bank risk in SSA (2005-2019) when the regulatory indices are constructed using principal component analysis

	(1) Z-score	(2) Liquidity ratio	(3) NPL ratio	(4) LRR ratio
Bank risk$_{t-1}$	0.797***	0.562***	0.837***	0.870***
	(0.0430)	(0.053)	(0.092)	(0.035)
Regulation_PCA	0.681*	3.323***	-0.752*	-0.645
	(0.387)	(1.044)	(0.444)	(1.579)
Competition	0.168	-0.909	-0.354	-0.688*
	(0.240)	(2.363)	(0.946)	(0.395)
Size	-0.453***	-0.982	-2.119*	-0.365*
	(0.144)	(1.542)	(1.254)	(0.211)
Diversification	0.568**	3.575***	1.218**	0.228
	(0.252)	(1.037)	(0.546)	(0.425)
GDP growth	0.0400	0.114	-1.502**	-0.489
	(0.152)	(0.208)	(0.659)	(1.139)
FFINDEX	0.343	0.343	0.012	0.757
	(0.348)	(0.994)	(0.265)	(1.264)
No. observations	2,082	2,059	1,306	1,692
No. of banks	273	273	228	249
AR(2) statistic	0.02	-0.04	-0.07	-0.63
AR(2) p-value	0.987	0.969	0.943	0.532
Hansen statistic	11.17	7.53	37.45	22.87
Hansen p-value	0.131	0.582	0.710	0.154
No. instruments	24	26	60	58
F-statistic	549.7***	360.6***	158.4***	559.1***
Year dummies:	Yes	Yes	Yes	Yes

Notes: The table shows the overall (composite) effect of regulations on solvency risk (model 1) and liquidity risk (model 2) when the regulatory indices are constructed using principal component analysis (PCA). Models 4 and 5 show the results when using alternative risk indicators i.e. NPL ratio and LLR ratio, respectively. Regulation_PCA is the composite (overall) regulation index constructed through principal component analysis. All the regressions were estimated using a two-step system GMM. FFINDEX=Financial freedom index. The definitions of all the other variables are provided in Table 2.8. The p-values for the Hansen test show that all the models are appropriately identified while those for the autocorrelation test AR(2) depict no problem of second order autocorrelation. The F-statistic shows the joint significance of the coefficients in the model while the statistical significance of each coefficient at the 1%, 5% and 10% level is shown by the asterisks ***, **and *, respectively. The numbers in the brackets are the robust standard errors

Second, the study explored whether the impact of regulations on bank risk changes depending on level of competition in the market. Some studies (see for example, Agoraki et al., 2011) find evidence that suggest that regulation can impact on bank risk differently depending on the level of market power in the banking sector. To capture the conditioning effect, the PCA constructed composite regulation variables for each measure of banking risk, were interacted with the Lerner index (competition measure). Modified versions of equations (2.5) and (2.6) i.e. with interaction terms, were thus re-estimated using system GMM. In this way, the study was able to examine if the overall effect of the regulations on bank risk could change sign depending on the degree of competition in the market. The results are reported in Tables 2.4 and show that the overall effect of regulations on bank risk in all the models does not change in the presence of competition – consistent with the overall PCA results in Table 2.3.

Table 2.4: Results of the impact of banking sector regulation on bank risk when conditioned on market power (competition) in SSA (2005-2019)

	(1) Z-score	(2) Liquidity ratio	(3) NPL ratio	(4) LLR ratio
Bank risk$_{t-1}$	0.789***	0.561***	0.606***	0.855***
	(0.0434)	(0.053)	(0.160)	(0.0374)
Regulation_PCA	0.673*	3.348***	-3.468*	-0.954
	(0.383)	(0.995)	(2.073)	(1.163)
Competition	0.165	-0.898	-2.075**	-0.862**
	(0.216)	(2.541)	(0.999)	(0.431)
Lerner x	0.307	0.0715	1.134	0.248
Regulation_PCA	(0.204)	(0.791)	(1.012)	(0.197)
Size	-0.467***	-0.952	-0.694**	-0.377**
	(0.142)	(1.518)	(0.301)	(0.178)
Diversification	0.563**	3.570***	0.641	0.198
	(0.246)	(1.039)	(0.803)	(0.453)
GDP growth	0.0503	0.113	0.262	0.150
	(0.151)	(0.209)	(0.402)	(0.184)
FFINDEX	0.332	0.307	1.824*	1.381
	(0.336)	(0.903)	(1.055)	(0.868)
No. observations	2,082	2,059	1,306	1,692
No. banks	273	273	228	249
AR(2) statistic	0.06	-0.04	-0.31	-0.57
AR(2) p-value	0.953	0.966	0.760	0.566
Hansen statistic	10.11	7.52	4.25	14.91
Hanse p- value	0.183	0.583	0.834	0.458
No. instruments	25	27	26	57
F-statistic	510.6***	340.0***	67.75***	537.5***
Year dummies:	Yes	Yes	Yes	Yes

Notes: The table shows the overall effect of regulations on solvency risk (model 1) and liquidity risk (model 2) when conditioned on market power (competition) using a two-step system GMM estimator. Models 4 and 5, show the results when using alternative risk indicators i.e. NPL ratio and LLR ratio, respectively. Regulation_PCA is the composite (overall) regulation index constructed through principal component analysis. FFINDEX=Financial freedom index. The definitions of all the other variables are provided in Table 2.8. The p-values for the Hansen test show that all the models are appropriately identified while those for the autocorrelation test AR(2) depict no problem of second order autocorrelation. The statistical significance of each coefficient at the 1%, 5% and 10% level is shown by the asterisks ***, **and *, respectively. The numbers in the brackets are the robust standard errors.

2.5. Conclusion

This chapter investigated how prudential regulations affect bank risk in the banking systems of 25 SSA countries. Based on the 3 Basel II pillars and global supervisory practices, the empirical analysis was confined to examining four regulations: capital, activity restrictions, supervisory power, and market disclosures. The key objective was on examining whether regulations increase or reduce bank risk. The study utilised bank and country-level data for the period 2009 to 2019. Two measures of bank risk were used: Z-score (for solvency risk) and liquidity ratio (for liquidity risk). Robustness checks were performed by using alternative bank risk measures and principal component analysis to construct the regulatory indices. The regulation-risk relationship was explored by applying A two-step system GMM estimator.

The study finds three main results. First, regulations pertaining to capital and market discipline enhance banking sector stability, i.e. they reduce both, solvency risk and liquidity risk. The findings provide evidence in support of Pillars 1 and 3 of Basel II (minimum capital requirements and disclosure requirements) as effective approaches to enhance banking sector stability in SSA. Second, activity restrictions reduce bank stability i.e. they increase both, solvency and liquidity risk. Finally, increased supervisory power is an ineffective regulatory tool to mitigate solvency risk – on the contrary, it merely increases liquidity risk and hence reduces overall bank stability from that perspective.

The findings have important policy implications. First, bank supervisory agencies in SSA should prioritize the adoption of Pillars 1 and 3 of the Basel II framework as an effective policy response to enhancing the stability of banks. The positive effect of market discipline (over supervisory power) regulations in mitigating solvency risk suggests that supervisory authorities should also pay more attention to enhancing market disclosure requirements that allow private investors and the public to "discipline" banks. So far, few countries have implemented Pillar III of the Basel II framework in SSA. Second, the negative implications of increased activity restrictions on bank risk suggest that the adoption or continued implementation of universal banking (with few restrictions) appears a more appropriate regulatory policy to enhance bank stability in SSA. Finally, the finding that a stronger supervisory mandate increases liquidity risk i.e. reduces bank stability, implies that there is a trade-off (between increased supervisory power and liquidity stability) which needs to be properly managed whenever regulatory authorities opt to increase their supervisory mandate. Overall, the

results show that ignoring the dual dimension of bank stability would lead to erroneous policy conclusions on the impact of regulations in mitigating bank risk.

2.5.1. Appendix 1

Table 2.5: Results of the impact of regulation on solvency risk in SSA (2009-2019) when each regulation variable is entered one at a time

Model:	(1) CAPR	(2) ACTR	(3) SUPP	(4) MKTD
Z-score$_{t-1}$	0.853***	0.809***	0.736***	0.747***
	(0.057)	(0.048)	(0.051)	(0.056)
Regulation$_{t-1}$	0.564*	-0.511*	0.152	0.726*
	(0.311)	(0.308)	(0.307)	(0.442)
Competition	0.911***	0.381	0.280	0.467*
	(0.311)	(0.233)	(0.240)	(0.260)
Size	-0.433***	-0.553***	-0.508***	-0.473***
	(0.151)	(0.159)	(0.131)	(0.128)
Diversification	0.091	0.708***	0.806***	0.580**
	(0.286)	(0.261)	(0.250)	(0.272)
GDP growth	0.137	0.034	0.202**	0.265***
	(0.156)	(0.160)	(0.092)	(0.098)
FFINDEX	0.261	0.758***	0.467	0.450
	(0.229)	(0.266)	(0.317)	(0.348)
No. observations	2,106	2,160	2,172	2,148
No. banks	273	273	273	273
AR(2) statistic	0.02	-0.03	-0.01	-0.09
AR(2) p-value	0.982	0.973	0.988	0.928
Hansen statistic	10.54	8.21	3.69	13.24
Hansen p-value	0.160	0.315	0.719	0.211
No. instruments	24	24	47	51
F-statistic	582.2***	663.8***	330.3***	334.4***
Year dummies:	Yes	Yes	Yes	Yes

Notes: The table shows the effect of each regulation on solvency risk when one regulation is added at a time as explained in Section 2.4.3. All the regressions are estimated using a two-step system GMM estimator and in all the models, the Z-score is the dependent variable. The results in Model 1 are obtained after adding only capital regulation; in Model 2, only the activity restriction is used as a measure of regulation; in Model 3, only the supervisory power is used while in Model 4, only the regulation on market discipline is used. FFINDEX=Financial freedom index. The definitions of all the other variables are provided in Table 2.8. The p-values for the Hansen test show that the model is appropriately identified while those for the autocorrelation test AR(2) depict no problem of second order autocorrelation. The statistical significance of each coefficient at the 1%, 5% and 10% level is shown by the asterisks ***, **and *, respectively. The numbers in the brackets are the robust standard errors.

Table 2.6: Results of the impact of regulation on liquidity risk in SSA (2009-2019) when each regulation variable is entered one at a time

Model:	(1) CAPR	(2) ACTR	(3) SUPP	(4) MKTD
Liquidity ratio$_{t-1}$	0.618***	0.683***	0.716***	0.526***
	(0.054)	(0.044)	(0.047)	(0.053)
Regulation$_{t-1}$	8.722*	-3.664***	-4.326***	2.095*
	(4.443)	(1.219)	(0.961)	(1.262)
Competition	-3.977***	-3.285**	-2.589**	-2.162*
	(1.491)	(1.292)	(1.254)	(1.210)
Size	-4.119*	-4.203**	-5.722**	-2.523*
	(2.370)	(1.853)	(2.391)	(1.356)
Diversification	5.035*	2.623**	0.740	3.069***
	(2.830)	(1.081)	(1.173)	(0.999)
GDP growth rate	1.337	0.699	0.634	0.172
	(0.978)	(0.756)	(0.541)	(0.441)
FFINDEX	4.054*	2.820***	1.206**	0.543
	(2.120)	(0.733)	(0.505)	(1.114)
No. observations	1,611	1,890	1,897	2,125
No. banks	271	273	273	273
AR(2) statistic	0.92	-0.84	-1.19	0.23
AR(2) p-value	0.35	0.402	0.234	0.815
Hansen statistic	9.61	6.34	9.73	1.30
Hansen p-value	0.142	0.386	0.136	0.988
No. instruments	47	23	23	48
F-statistic	423.1***	481.9***	569.3***	333.6***
Year dummies	Yes	Yes	Yes	Yes

Notes: The table shows the effect of each regulation on liquidity risk when one regulation is added at a time as explained in Section 2.4.3. All the regressions are estimated using a two-step system GMM estimator and in all the models, the Liquidity ratio is the dependent variable. The results in Model 1 are obtained after adding only capital regulation; in Model 2, only the activity restriction is used as a measure of regulation; in Model 3, only the supervisory power is used while in Model 4, only the regulation on market discipline is used. FFINDEX=Financial freedom index. The definitions of all the other variables are provided in Table 2.8. The p-values for the Hansen test show that the model is appropriately identified while those for the autocorrelation test AR(2) depict no problem of second order autocorrelation. The statistical significance of each coefficient at the 1%, 5% and 10% level is shown by the asterisks ***, **and *, respectively. The numbers in the brackets are the robust standard errors.

Table 2.7: Results of the impact of banking sector regulations on credit risk (ratio of NPLs to gross loans) in SSA (2009-2019) when each regulation variable is entered one at a time

Model:	(1) CAPR	(2) ACTR	(3) SUPP	(4) MKTD
Liquidity ratio$_{t-1}$	0.635***	0.599***	0.579***	0.537***
	(0.180)	(0.194)	(0.109)	(0.145)
Regulation$_{t-1}$	-1.898**	2.949*	0.612	2.641
	(0.808)	(1.617)	(1.223)	(3.480)
Competition	-2.263***	-2.295**	-2.284***	-2.946**
	(0.785)	(0.955)	(0.796)	(1.161)
Size	-0.726**	-0.684*	-0.702*	-0.788*
	(0.286)	(0.407)	(0.371)	(0.434)
Diversification	0.224	0.470	1.037	1.824
	(0.885)	(0.961)	(1.312)	(1.578)
GDP growth rate	-0.490	-0.280	-0.779	-0.626
	(0.439)	(1.269)	(0.811)	(0.858)
FFINDEX	0.723	0.319	0.986	1.889
	(0.528)	(1.984)	(1.179)	(1.423)
No. observations	1,307	1,340	1,340	1,339
No. banks	228	228	228	228
AR(2) statistic	-0.21	-0.30	-0.35	-0.37
AR(2) p-value	0.833	0.764	0.727	0.711
Hansen statistic	3.71	7.45	19.33	35.62
Hansen p-value	0.716	0.590	0.781	0.152
No. instruments	23	50	66	69
F-statistic	115.0***	96.64***	99.61***	98.87***
Year dummies	Yes	Yes	Yes	Yes

Notes: The table shows the effect of each regulation on credit risk (NPL ratio) when one regulation is added at a time as explained in Section 2.4.3. All the regressions are estimated using a two-step system GMM estimator and in all the models, the dependent variable is the NPL ratio. The results in Model 1 are obtained after adding only capital regulation; in Model 2, only the activity restriction is used as a measure of regulation; in Model 3, only the supervisory power is used while in Model 4, only the regulation on market discipline is used. FFINDEX=Financial freedom index. The definitions of all the other variables are provided in Table 2.8. The p-values for the Hansen test show that the model is appropriately identified while those for the autocorrelation test AR(2) depict no problem of second order autocorrelation. The statistical significance of each coefficient at the 1%, 5% and 10% level is shown by the asterisks ***, **and *, respectively. The numbers in the brackets are the robust standard errors.

Table 2.8: Definitions and Data Sources

Variable	***Description***	***Source***
Risk Variables		
Z-score	The index is a proxy for bank risk at bank level. We derive the index first by summing the leverage ratio and return on assets (ROA). We then divide the sum by the volatility (standard deviation) of the ROA. A higher score means low risk – i.e. more stability	Bankfocus
Liquidity ratio)	The liquidity ratio is computed by summing all liquid assets on a bank's balance sheet and dividing them by the sum of total deposits and short-term liabilities. A high liquidity ratio means low risk i.e. more stability.	Bankfocus
Regulatory Variables	***World Bank Regulatory Survey Questions***	
Capital stringency (CAPR)	Capital regulation index quantifies the overall stringency of the capital regulation regime. The indicator is based on a sum of 8 questions that mainly capture the regulator's ability to: impose risk-based capital requirements for banks, verify bank sources of start-up capital, require banks to deduct losses arising from holdings of market-valued assets, and determine whether borrowed funds can be used as source of start-up capital for a bank. We derive the index by summing up responses from the following questions (i.e. yes=1 and no=0 for questions 1-6, and (i.e. yes=0 and no=1 for questions 7 and 8): (1). As at end 2016, which Basel capital framework was applicable in your country? (a) Basel 1; (b) Basel 2; (c) Basel 3? (2-3). Is (i) Credit risk; and (ii) Market risk covered by the existing regulatory capital framework in your jurisdiction? (4). Do banks deduct unrealised losses in fair valued exposures from Tier 1 regulatory capital? (5). What is the proportion (percentage) of gains arising out of revaluation of assets that is permitted to be treated as part of capital? (6). Do regulatory authorities verify start-up capital funds for banks? (7). Apart from cash and government securities, are other assets permissible to be used as start-up capital? (8). Are investors/shareholders allowed to use borrowed funds as start-up capital for a bank?	Barth et al., (2012) Database and World Bank Regulatory Surveys Database (2019)
Supervisory Power (SUPP)	The index on supervisory power captures the mandate of the supervisory authority to direct or impose certain actions or sanctions on a bank, its shareholders, directors, management officials or external auditors. The index ranges from 0-14 and is derived by summing up the responses from the following questions (yes=1, 0 otherwise): (1) Can external auditors report bank directors or senior managers to the supervisory authority in cases where the latter are suspected to be involved in financial crimes such as insider abuse or money laundering? (2) Can the supervisory agency meet and discuss bank examination reports with external auditors without the approval of the bank? (3) Can the supervisor impose sanctions or take action on an external auditor if the supervisor establishes that the scope or depth of external audit of a bank is inadequate? (4) Is it a requirement for banks to report and disclose off-balance sheet items to the regulator? For each of the following, please indicate if the regulator has the relevant mandate or powers: (5) Direct additional provisions to be made by banks on impaired loans or other potential losses? (6) Direct banks to reduce or suspend dividends to shareholders? (7) Direct banks to reduce or suspend bonuses and other remuneration to bank directors and managers? (8) Does the supervisory authority have powers to direct that the organisational structure of a bank be reviewed or changed? (9-11) In terms of problem bank resolution mandate, which agency or authority has powers: (a) declare insolvency; (b) supersede shareholder's rights; (c) direct the removal of bank senior management and directors?	Barth et al., (2012) Database and World Bank Regulatory Surveys Database (2019)
Activity Restrictions Index (ACTR)	Activity restriction index captures the extent of restrictions that are imposed on banks so as to limit them in offering other non-banking products such as brokerage business, banc-assurance, or real estate. The scores for the index range from 3-12 and they reflect the stringency of the restrictions in the following activities: (1) securities activities;	Barth et al., (2012) Database and World Bank

	(2) insurance activities; and (3) real estate activities. There are 4 categories of restrictions: unrestricted (whose score = 1), permitted (whose score = 2); restricted, (whose score = 3) or prohibited (whose score = 4). The overall score is derived by summing up the scores from all the three activity categories based on the level of regulatory restrictiveness in each category.	Regulatory Surveys Database (2019)
Market Disclosure (MKTD)	The index on market discipline captures the scope and adequacy of disclosures made by banks to allow the public and private stakeholders make informed decisions. The index ranges from 0-14 and captures aspects pertaining to: engagement of a certified external auditor, whether the 10 largest banks are rated by credit rating agencies, whether there is explicit deposit insurance, and whether banks adopt international accounting standards on treatment of unpaid interest, non-performing loans, and consolidated financial statements. The indicator is derived by summing up responses from the following questions (i.e. yes=1, no=0 for questions 1-10 and yes=0, no=1 for questions 11-14). (1a) Is it a regulatory requirement for every bank to have an external auditor in your country? (1b) If yes, does the external auditor have to obtain a professional certification or pass a specific exam to qualify as such? (2) Of the top 10 banks based on asset size, how many (in terms of percentage) are internationally rated? (3) Of the top ten banks based on asset size, how many (in terms of percentage) are rated by domestic credit rating agencies? (4) Does the country have an explicit deposit insurance system for banks? (5) In previous cases of bank failures, were insured depositors wholly compensated in line with the legal pay out coverage limits? (6) Is accrued, but not yet paid interest/principal recognised in the income statement of a bank when the loan is still performing? (7) Is accrued, but not yet paid interest/principal recognised in the bank's income statement while the loan is classified as non-performing? (8) Is preparation of consolidated accounts for accounting purposes mandatory for banks? (9) Are bank directors legally liable if information disclosed is erroneous or misleading? (10) Is subordinated debt allowed as part of Tier 1 capital and in what percentages? (11) Is subordinated debt allowed as part of Tier 2 capital and in what percentages? Do banks disclose to the public: (12) Off-balance sheet items? (13) Governance and risk management framework? (14) Are bank regulators/supervisors required to make public formal enforcement actions, which include cease and desist orders and written agreements between a bank regulatory/supervisory body and a banking organization?	Barth et al., (2012) Database and World Bank Regulatory Surveys Database (2019)
Other Control Variables		
Lerner Index	A proxy for competition (market power) at bank level derived using average price and marginal costs	Bankfocus
Size	The proportion of a bank's assets to total assets of the banking sector (%)	Bankfocus
Diversification (DIV)	A measure of the extent of a bank's reliance on other sources of income other than intermediation income – calculated by dividing non-interest income by total revenue (%)	Bankfocus
GDP growth rate	Annual growth in GDP (%) – to capture the effect of fluctuations in economic activity	IMF Financial Statistics
Financial Freedom Index (FFI)	The index captures the level of government interference in the banking system. The higher the value, the fewer the restrictions i.e. the more the banking freedom	Heritage Foundation

Table 2.9: Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Z-score	1.000										
(2) Liquidity ratio	-0.076*	1.000									
(3) Capital regulation	0.058*	0.240*	1.000								
(4) Activity restriction	-0.102*	-0.048*	0.152*	1.000							
(5) Supervisory power	-0.014	-0.040*	0.122*	0.331*	1.000						
(6) Market discipline	0.066*	0.140*	0.502*	0.237*	0.444*	1.000					
(7) Lerner	0.253*	0.030	0.078*	-0.003	-0.068*	0.022	1.000				
(8) Diversification	-0.111*	0.139*	-0.192*	-0.357*	-0.214*	-0.304*	0.063*	1.000			
(9) Size	-0.069*	-0.019	-0.063*	0.026	-0.020	-0.054*	-0.052*	-0.010	1.000		
(10) GDP growth	-0.126*	-0.096*	-0.169*	0.268*	0.167*	-0.128*	-0.082*	-0.004	0.242*	1.000	
(11) FFINDEX	0.096*	0.002	0.264*	0.367*	0.080*	0.401*	0.056*	-0.362*	0.024	0.029	1.000

Notes: FFINDEX=Financial Freedom Index. * indicates significance at 5% level.

Table 2.10: Average bank regulation and stability indices (2009-2019) by country

Country	CAPR	ACTR	SUPP	MKTD	Z-score	Liq.Ratio
Angola	7.95	6.00	11.38	9.38	10.13	36.61
Benin	3.96	6.24	9.27	6.10	8.07	25.41
Botswana	9.32	9.00	11.69	10.71	13.22	31.50
Burkina Faso	4.04	7.00	9.21	6.89	11.59	27.98
Cape Verde	6.00	9.00	12.00	7.50	17.37	38.53
Eswatini	7.00	7.53	3.92	3.57	39.28	27.98
Ghana	8.51	8.75	10.75	10.00	13.99	38.32
Ivory Coast	4.01	7.00	9.24	6.13	12.49	20.59
Kenya	5.72	8.53	14.00	9.25	20.55	20.19
Lesotho	4.60	8.23	10.61	7.38	19.28	60.16
Madagascar	4.55	6.83	9.67	8.50	18.62	51.12
Malawi	5.88	7.22	12.22	10.55	8.71	39.72
Mali	3.00	7.00	9.25	6.08	13.48	25.98
Mauritania	6.00	5.00	12.00	9.00	44.54	43.64
Mauritius	9.19	9.12	10.21	8.68	26.60	43.36
Mozambique	7.43	6.81	9.38	8.01	10.86	38.81
Namibia	5.27	6.73	10.00	9.45	44.72	18.91
Nigeria	9.49	7.00	12.16	10.00	16.89	19.13
Rwanda	9.00	11.00	13.83	8.24	14.63	32.48
Senegal	4.04	7.00	9.21	6.15	18.57	19.13
South Africa	8.31	5.17	11.84	9.93	42.51	40.21
Tanzania	6.21	8.12	13.21	8.55	15.97	29.82
Togo	3.84	7.00	8.57	3.66	12.05	42.05
Uganda	7.38	9.67	14.00	8.77	15.95	42.05
Zimbabwe	7.31	6.16	10.31	6.47	7.29	42.05
Sample Mean	6.74	7.67	11.45	8.48	18.30	33.49

Source: World Bank Regulatory Survey (2019), Barth et al., (2012) and Bankfocus database
Notes: CAPR=Capital regulation; ACTR=Activity restriction; SUPP=Supervisory power; MKTD=Market discipline, and LiqRatio= Liquidity ratio.

Table 2.11: Principal Component Analysis (PCA) eigenvalue decomposition matrices for regulatory indices

Principal components/correlation — Number of obs = 2,519
Number of comp.= 1
Trace = 4

Rotation: (unrotated = principal) — Rho = 0.4826

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.931	0.942	0.483	0.483
Comp2	0.989	0.297	0.247	0.730
Comp3	0.692	0.302	0.173	0.903
Comp4	0.389	–	0.097	1.000

Principal components (eigenvectors)

Variable	Comp1	Unexplained
Capital regulation	0.460	0.592
Activity restriction	0.424	0.653
Supervisory power	0.503	0.511
Market discipline	0.596	0.315

Table 2.12: Derivation of the Lerner Index

The Lerner index shows a bank's price mark-up over marginal costs. I derived the index using the following formula:

$$\text{Lerner Index} = \frac{P_{it} - MC_{it}}{P_{it}} \quad (2.7)$$

where P_{it} is the price of bank i's output (approximated by dividing total operating income by total assets) at time t, and MC_{it} is the marginal cost of bank i and time, t. The study assumed a production function with one output (total assets) and three inputs (labour, capital and funding) as in (Albaity et al., 2019b; Beck et al., 2013; Schaeck & Čihák, 2012). To estimate the Lerner index, a trans log cost function for each country was first estimated, and then the coefficient estimates of the cost function were used to estimate marginal costs. The trans log cost function was specified as follows:

$$\ln TC_{it} = \alpha_0 + \beta_1 \ln Q_{it} + \frac{1}{2}\beta_2 \ln Q_{it}^2 + \sum_{k=1}^{3} \alpha_{kt} \ln W_{k,it} + \sum_{k=1}^{3} \theta_k \ln Q_{it} \ln W_{k,it} + \frac{1}{2}\sum_{k=1}^{3}\sum_{j=1}^{3} \emptyset_k \ln W_{k,it} \ln W_{j,it} + \sum_{t=1}^{T-1} \gamma_t D_t + v_{it} \quad (2.8)$$

The letters i and t, respectively, denote bank and year. W_1 represents the cost of funding (interest expenses/total deposits and short-term liabilities). W_2 is the cost of labour (staff related costs divided by total assets), and W_3 is the cost of physical capital computed by diving non-interest expenses by total assets. (D_t) represents year dummies to capture changes in technology and the changing nature of business. The marginal costs are derived from equation (2.8) as follows:

$$MC_{it} = \frac{Cost_{it}}{Q_{it}} \left[\beta_1 + 2\beta_2 \ln\left(Q_{it}\right) + \sum_{k=1}^{3} \beta_{2j} \ln W_{k,it}\right] \quad (2.9)$$

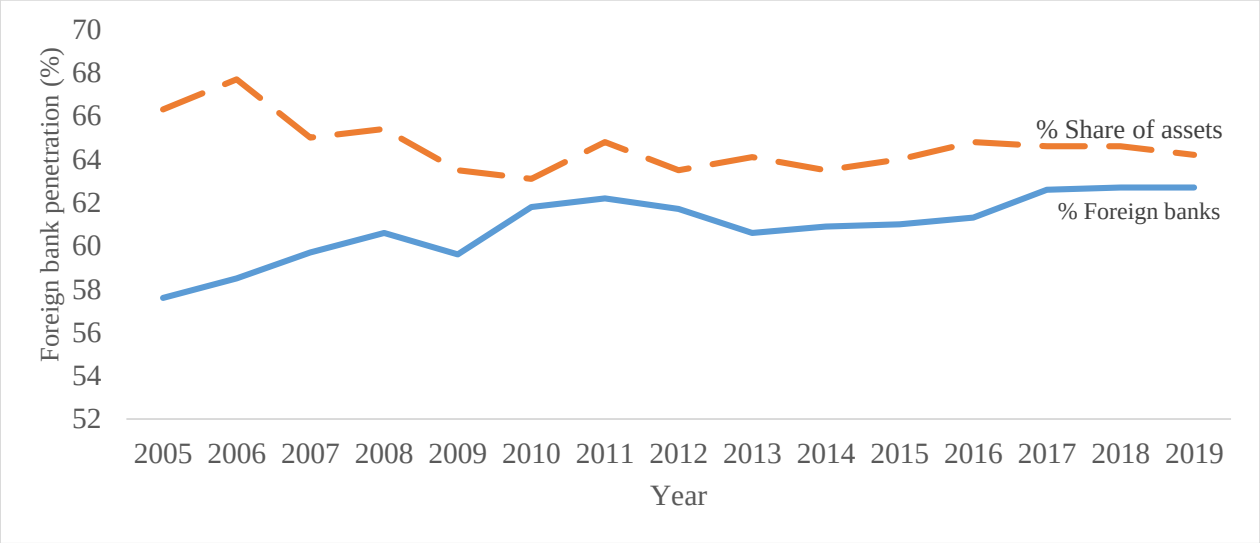
Using the MC_{it} derived from equation (2.9), the bank-specific Lerner index is then estimated using the formula in equation (2.7).

Chapter 3: Cross-Border Banking and Bank Stability: Evidence from Sub-Sahara Africa

3.1. Introduction

The presence of cross-border banks i.e. affiliates or subsidiaries or branches of foreign banks, particularly those with headquarters in Africa (Pan African Banks – PABs), is a prominent feature in most SSA countries. Statistics from the (GFDD, 2019), show that the relative share of cross-border banks (in terms of assets) in SSA substantially grew, from about 30.6% in 2000 to 66.3% in 2005, and stood at around 64.2% in 2019[7]. Figure 3.1 shows the evolution of foreign banks in SSA since 2005 in terms of percentage of assets held by foreign banks to total banking system's assets (% share of assets) and the percentage number of foreign banks to total banks in the host country (% foreign banks). The share of assets held by the foreign banks moderately declined after the global crisis following de-risking by most international banks from advanced countries.

Figure 3.1: Trend in foreign banks' penetration in SSA (2005-2019)



Source: Own compilation using data from GFDD (2019) and Bankfocus

The high prevalence of foreign banks in SSA implies that they continue to shape the financial landscape in many countries. The traditional view has been that these banks bring benefits to host countries, such as increasing competition and access to financial services, stabilizing credit

7

See Tables 3.15 and 3.16 for a detailed trend in cross-border banking in each country from 2005-2019.

quantity during domestic turmoil, fostering efficiency, and enhancing small to medium enterprises (SMEs) access to finance (Bruno & Hauswald, 2014; G. Clarke et al., 2001). Foreign banks may also improve credit intermediation in host jurisdictions by enhancing the quality of financial regulations, imparting specialized knowledge and expertise and introducing modern technology (L. S. Goldberg, 2007). However, the geographical spread and coverage of foreign banks also imply that risks can easily be transmitted across borders. Foreign banks, in this case, could thus serve as a channel of contagion among countries – especially in cases where these banks are considered systemically important. The increased penetration and dominance of cross-border banks in SSA thus raises relevant questions about the role played by these banks, specifically, whether allowing their participation introduces more (in)stability in the host country's banking sector.

3.1.1. Study Objectives

The primary objective of the study is to investigate the impact of cross-border banks on banking sector stability in SSA. The focus on SSA is relevant for two reasons: First, the region is among those with the highest penetration of foreign banks (GFDD, 2019). Second, supervisory capacity in the area of consolidated supervision is limited and under-resourced in most countries (Beck & Maimbo, 2013). The study findings therefore, have important implications for cross-border coordination and consolidated supervision arrangements between domestic (host) and foreign (home) regulatory authorities. The specific objectives of the study are two-fold:

1. To investigate the impact of cross-border banking on banking sector stability in SSA; and
2. To assess whether the impact in (1) differs across banks of different sizes, efficiency and capitalization levels.

The study seeks to answer the following research questions:

1. Does increased presence of cross-border banks increase or reduce banking sector stability in host countries where they operate?
2. Is the impact of cross-border banks heterogeneous across banks of different characteristics in terms of size, efficiency and capitalization levels?

The study is important in shaping supervisory policy and approach to foreign banks in host countries where they operate. It is also important in providing a basis for home-host coordination arrangements on cross-border banking. The latter is a critical issue among SSA supervisory authorities for two reasons: First, most subsidiaries of foreign banks are systemically important in the host countries where they operate. In these countries, the foreign subsidiaries also account for over 30% of the banking system's deposit base (Mlachila et al., 2017). Financial stability risks in this case are elevated in two ways: first, the financial sectors of home countries of some PABs may be fragile and vulnerable – for instance, due to changes in commodity prices arising from limited economic diversification (Enoch et al., 2015).[8] This implies that the parent banks may not be in a position to provide the required financial support to their subsidiaries in times of need. Second, the increased cross-border banking connectivity has, in some cases, resulted in the creation of complex, interrelated banking structures – some of which are non-bank financial institutions and which may not be adequately supervised due to a lack of appropriate legal frameworks on consolidated supervision (Beck & Maimbo, 2013). The true financial condition of the foreign banking groups may therefore not be known or ascertained. Despite the limited effects of the global financial crisis (GFC) on SSA banking systems, the crisis laid bare the challenges and constraints that supervisory authorities can face to resolve cross-border shocks that simultaneously disrupt banking systems in multiple countries.

3.1.2. Study contribution

The study makes two contributions to banking literature. First, it focuses on bank stability implications of foreign banks. Ensuring a stable and sound banking system remains a central policy objective for supervisory and monetary authorities in SSA as most firms are bank dependent for capital financing given the underdeveloped capital markets in the region. Most empirical studies at global level on this topic largely focus on performance related issues such as interest spreads or profitability or lending behaviour (see, for instance, Ukaegbu & Oino, 2017; Luo et al., 2014; Barajas et al., 2000; De Haas & van Lelyveld, 2014; Claessens et al., 2001; Gormley, 2007) or examine the patterns, size and trends in foreign banks (Beck &Cull, 2015) or merely provide

[8] The case of Nigeria is a good example. The decline in oil revenues significantly affected Nigeria's economic performance between 2014 and 2018 resulting into severe banking fragility. Out of the 22 banks that were in operation in 2017, four were officially diagnosed as undercapitalised, one of which was internationally active with cross-border affiliates.

narrative assessment of the regulatory policy implications of cross-border banks (Ngwu et al., 2019). The few studies that have focused on SSA (Saidane et al., 2021a; Sulemana et al., 2018); and Mathieu et al., 2019) are also limited in several aspects. For instance, the study by Sulemana et al., (2018) focused on actual banking crises (based on banking crises of the early and mid-1990s using a dummy variable approach) and not on how international banks induce risk/instability in the host jurisdiction. The aspect of cross-border banking from the perspective of market share was also not considered in this study. The study by Mathieu et al., (2019) on the other hand, focused on analysing the drivers, trends and patterns in cross-border banking – rather than examining their effect on stability in the domestic market. Second, the empirical approach adopted in the current study allows for heterogeneous analysis of foreign bank implications on bank stability as well as the conditioning effect of the quality of governance institutional factors. The current study shows that the stability implications of foreign banks vary across banks of different characteristics in terms of size, efficiency, and capitalisation levels. This distinction has important policy implications for supervisory authorities – both, in terms of cross-border supervisory cooperation, as well as informing the appropriate approach to regulating banks in the host country.

The organisation of the chapter is as follows. Section 3.2 presents the evolution and geographical spread of foreign banks in SSA and how their performance compares to that of locally owned banks. The literature review is provided in Section 3.3. Section 3.4 explains the variables and data that were used in the study. Section 3.5 covers the methodology and empirical results. The study conclusion is presented in Section 3.7.

3.2. Evolution and Trends in Cross-Border Banking in Africa

This section examines the evolution, trend, and performance of foreign banking groups operating in SSA. In performing the assessment, the study mainly utilises data from financial statements of individual banks and other relevant information from the individual bank's websites and annual reports.

3.2.1. Evolution and Trend

The origins of cross-border banking in SSA can be traced to the colonial era in which banks from Europe dominated most countries in Africa in line with the colonial ties (Beck & Cull, 2015; Cull et al., 2017). After independence, most African governments nationalized foreign-owned banks –

resulting in the creation of government-owned banking entities (Cull et al., 2018). However, following the World Bank and IMF initiated structural adjustment reforms of the early 1980s and 1990s – the so-called Structural Adjustment Programs (SAPs), the trend significantly changed. Most government-owned banks were privatized or directed to operate on commercial lines as part of the financial structural reforms. Consequently, several countries liberalized their banking sector – resulting in a resurgence of foreign-owned banks. Apart from the adoption of the SAPs, (Mathieu et al., 2019) attribute the high prevalence of foreign banks in SSA to four other factors: (i). enhanced political stability in most countries; (ii) the demise of the apartheid system in South Africa; (iii) increased regional integration; and (iv) implementation of more stringent capital regulation policies as most supervisory authorities adopted international standards based on the Basel Core Principles (BPCs).

There have mainly been two categories of foreign banks operating in SSA: those originating from jurisdictions outside Africa and those emanating from within Africa – the so-called Pan African Banks (PABs). The first group of banks had significantly strengthened its presence in the region during the period prior to the GFC and mainly originated from Europe, the USA and other emerging markets such as India, China, Portugal and Pakistan. Their footprint has, however, significantly reduced after the GFC. Included in this category are banking groups such as Barclays Group, Standard Chartered, BNP Paribas and Société Générale – predominantly British and French banking groups. Apart from banking groups from China and Pakistan, these banks have established a presence mostly in countries that were former colonies of either Britain or France or Portugal – although, over time, they have also expanded beyond their colonial roots. From the USA, Citibank appears to be the only significant international bank with a large presence in SSA – although it mainly operates via branches in most countries.

The second group consists of African cross-border banks, commonly referred to as PABs. The holding companies of these banks are headquartered in an African country with various subsidiaries spread across different countries in Africa. Most of the PABs expanded after the GFC when most European banks pulled back as part of de-risking due to stringent regulations and capital requirements imposed by their home regulators.

In terms of supervisory oversight, the banking model in most countries is such that the foreign subsidiaries are licensed as separate banking entities – making them subject to regulatory rules independent from their parent holding companies. Although this arrangement helps to ring-fence domestic risk, it also has implications for cross-border banking supervision, especially in times of crisis management or resolution. If collaboration is absent or weak between home and host regulatory agencies, the resolution of cross-border banks could become problematic. The situation could be aggravated if the distressed bank is considered systemically important in the host market but not within the banking group itself.

3.2.2. Geographical Footprint

Based on publicly available information, the banking systems in SSA are dominated by 7 international banking groups from outside Africa and 14 PABs whose headquarters are domiciled within the continent. By end of 2015, the number of subsidiaries of the 14 largest PABs in Africa was estimated to have increased to 169 – up from 53 reported in 2006 (Mathieu et al., 2019). Most of the PABs originate from South Africa, Nigeria, the ECOWAS, and Kenya. Three banking groups (Bank of Africa Group, Attijariwafa Banking Group and Banque Centrale Populaire) have their headquarters in Morocco; however, these Moroccan banking groups are predominantly present in North Africa. As at the end of 2019, the PABs were the dominant foreign banks in Africa. The subsidiaries of these PABs were also considered systemically important in most host countries. Tables 3.1 and 3.2, respectively, provide a list of major international and Pan-African banking groups and their geographical presence in SSA in 2019.

Table 3.1: List of major Global Banks in Africa

Name	Location of Headquarters	Number of African countries where they are operating
Société Générale	France	17
Citi Group	USA	15
Standard Chartered	UK	14
BNP Paribas	France	13
Bank of Baroda	India	9
Albaraka Bank Group	Bahrain	5
Habib Bank Group	Pakistan	5

Source: Bankfocus & Annual Reports

Table 3.2: Major Pan-African Banks in Africa

Name	Location of Headquarters	Number of African countries where they are operating
Ecobank Group	Togo	36
OraBank Group	Togo	12
Barclays Africa Group (ABSA)	South Africa	11
Standard Bank Group (Stanbic)	South Africa	20
First Rand Group	South Africa	8
Nedbank Group	South Africa	6
First Rand Group	South Africa	8
United Bank for Africa (UBA)	Nigeria	20
Guaranty Trust Bank Ltd	Nigeria	11
Access Bank Group	Nigeria	10
Zenith Bank	Nigeria	4
Kenya Commercial Bank Group	Kenya	6
Bank of Africa Group	Morocco	18
Attijariwafa Banking Group	Morocco	12
Banque Centrale Populaire	Morocco	12

Source: Mathieu et al., (2019)

The level of cross-border banking penetration across countries in SSA varies significantly. For instance, there are no foreign banks in some countries such as Ethiopia and Eritrea. On the other hand, some banking systems in countries such as Zambia, Mozambique, Madagascar, Lesotho, Burkina Faso, and Benin are largely dominated by foreign banks. The rest of the countries in the region have a relatively moderate foreign bank footprint, with foreign subsidiaries accounting for about 30-50% of total banking system assets. As previously stated, Nigeria, South Africa, Morocco and Kenya are home to most of the region's significant PABs. Consequently, the share of foreign banks in these countries is considerably lower – ranging between 20-30%. However, given the ownership linkages, these countries are the main sources of the possible transmission of cross-border banking risks to different parts of the continent and beyond. Specifically, Moroccan and South African banking groups have a major presence outside of Africa, making them potential contagion conduits in case of crises, both within and outside the African financial system.

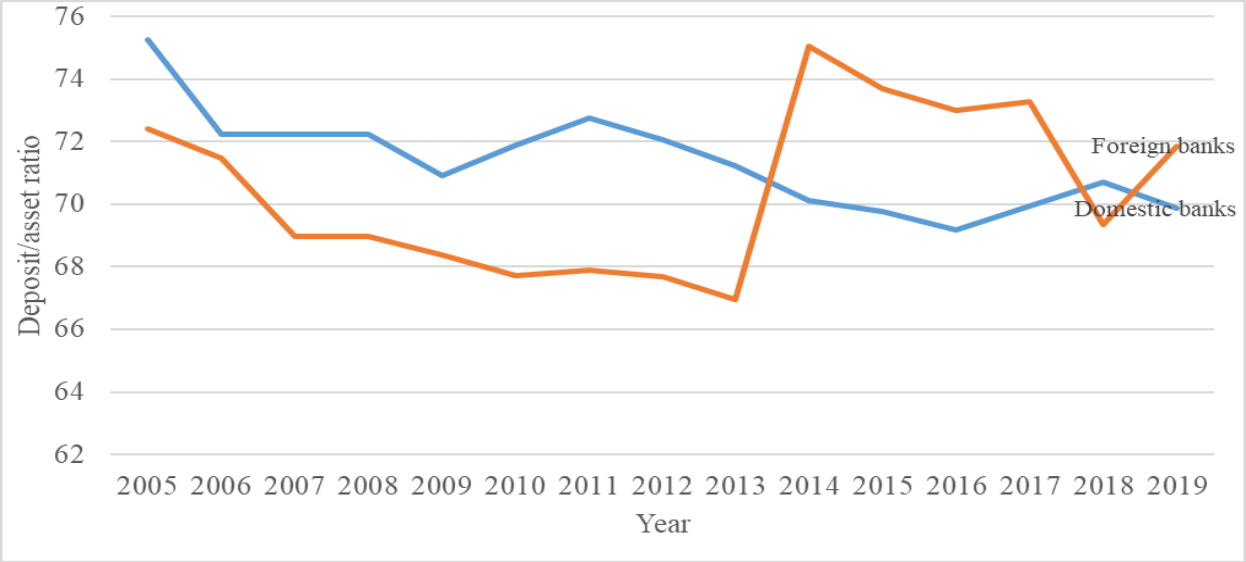
3.2.3. Financial performance

In conducting a comparative assessment of foreign and domestic banks in SSA, the study follows the approach by (Barajas et al., 2000) and focuses the analysis on selected bank performance

indicators: funding structure (deposits to total assets), reliance on other income, interest margin and share of credit to non-financial firms. These indicators, although not exhaustive, allow for isolation of the overall performance of foreign banks and also comparison in terms of lending behaviour between domestic and foreign banks (Bruno & Hauswald, 2014; De Haas & van Lelyveld, 2007). It also allows for ascertaining whether the presence of foreign banks in the host market causes customers to transfer their deposits or savings away from local banks due to better service quality that is often perceived to be offered by foreign banks (Chen et al., 2019).

Figure 3.2 shows that for the period up to 2014, domestic banks relied more on deposits for funding (average deposit-asset ratio of 72.1%) than foreign banks (69.5%). The opposite trend after 2014 can partly be explained by a moderate decline in foreign bank penetration in SSA after the GFC due to de-risking – which included a reduction in external funding and lines of credit from their home parents. The latter aspect appears to have compelled foreign banks to alter their funding structure more towards domestic deposits. For the entire period, Figure 3.2 shows that the deposit-asset ratio stood at about 71.3% for domestic banks and 70.4% for foreign banks – providing almost no anecdotal evidence of "deposit or savings flight" to foreign banks over the period.

Figure 3.2: Average deposit to asset ratio in SSA (2005-2019)

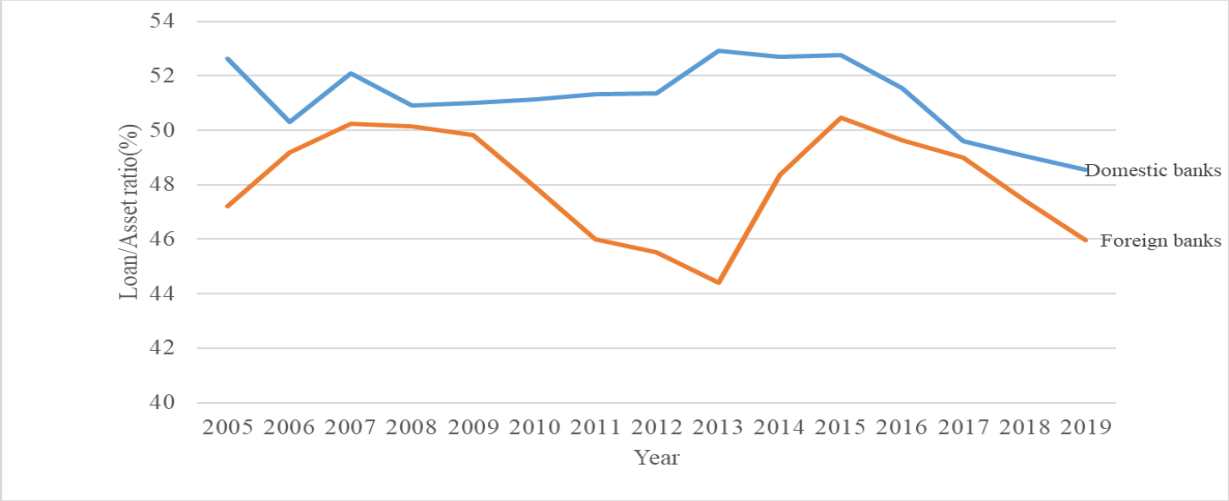


Source: Own compilation using data from GFDD (2019) and Bankfocus

Figure 3.3 reflects that overall, foreign banks had lower intermediation than domestic banks – suggestive of the "cherry-picking" hypothesis (Gormley, 2007). The reduction in lending was

significantly higher after the GFC – consistent with the view that foreign banks significantly reduced their lending during and after the crisis partly because of the de-risking phenomenon.

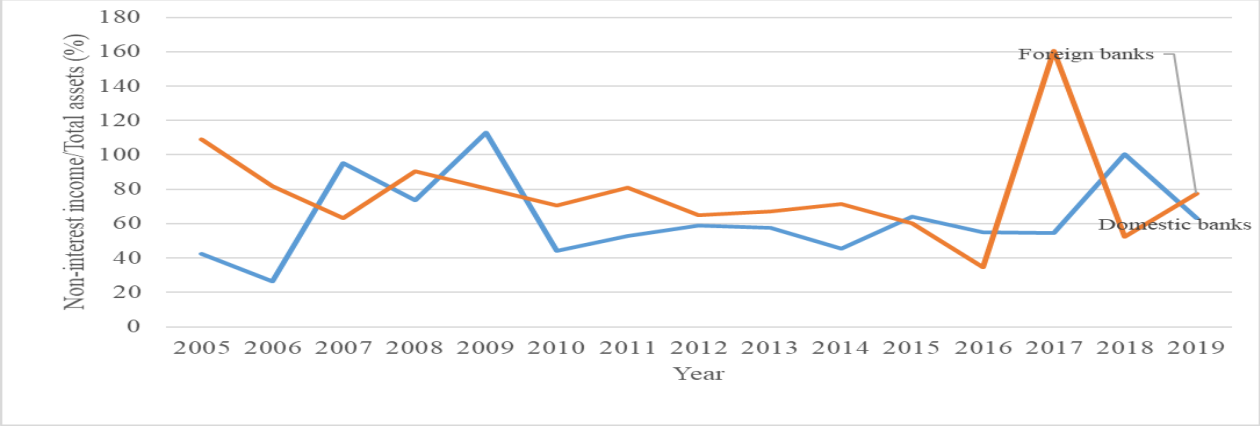
Figure 3.3: Average loan to asset ratio in SSA (2005-2019)



Source: Own compilation using bank data from GFDD (2019) and Bankfocus

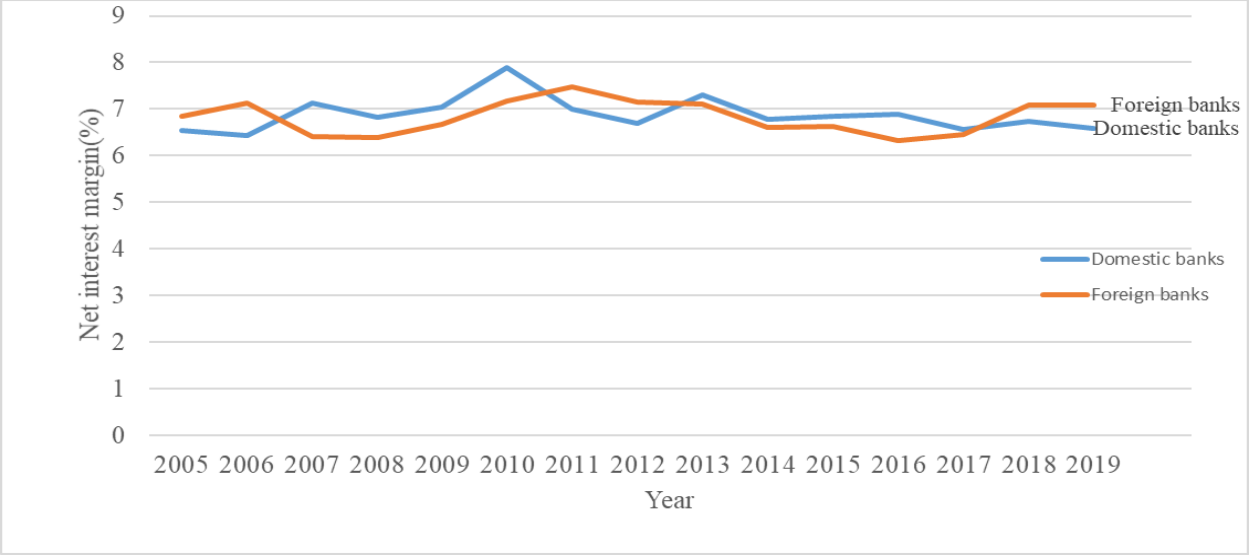
Figure 3.4 shows that overall (i.e. for both types of banks), income from non-intermediation activities (such as commissions and foreign exchange operations) represented between 44.9% and 160.0% of total operating income on average from 2005 to 2019. These activities appear however, to be more significant in the case of foreign-owned banks (average 77.7%) compared to those of domestic banks (63.1%). Interest margins are however, generally similar for both groups (on average, 7.3% for domestic banks and 7.2% for foreign-owned) – see Figure 3.5.

Figure 3.4: Average non-interest income to asset ratio (2005-2019)



Source: Own compilation using bank data from GFDD (2019) and Bankfocus

Figure 3.5: Net-Interest Margin (average) in SSA (2005-2019)



Source: Own compilation using bank data from GFDD (2019) and Bankfocus

3.3. Review of the Literature

This part of the chapter presents some theoretical and empirical views on foreign bank studies and their implications for the domestic financial system.

3.3.1. Theoretical Framework

Studies of the implications of cross-border banks are frequently analysed in the theoretical literature from three perspectives: (i) the impact of cross-border banks on financial stability and/or shock transmission into the domestic market, (ii) the implications of cross-border banks on efficiency and competitiveness of banking sector in the host market; and (iii) (ii) the impact of cross-border banks on financial intermediation and outreach. The current study is mainly related to the first strand of the literature.

Foreign banks contribute toward financial stability in the host market because they are more liquid, better capitalised, and offer valuable diversification benefits in the host market (De Haas & van Lelyveld, 2014; Vogel & Winkler, 2010). The liquidity position in the host country is improved because depositors have more trust and confidence in foreign banks. This enhanced confidence reduces panic, and hence, the likelihood of local bank runs in the domestic market (Moreno and

Villar, 2005). Furthermore, parent banks frequently provide liquidity to their subsidiaries during times of macro-economic disruptions, which allows their foreign subsidiaries to serve as providers of liquidity on the interbank market in host countries – and hence moderating liquidity challenges in the local market. Foreign banks are also better capitalised than local banks largely because they have access to relatively cheaper sources of capital as part of the international banking group (Moreno & Villar, 2005). This increases banking sector solvency and shields the foreign bank subsidiaries from capital shocks that may arise due to adverse conditions in the host countries. Finally, foreign bank entry may also enhance financial stability through diversification of exposures (Moreno & Villar, 2005). This is possible because, in general, foreign banking groups have operations in several countries. They thus enjoy diversification benefits and make them less vulnerable to host country business or macro-economic shocks. In this way, the foreign banks can moderate and stabilize the degree of bank intermediation (loan supply) in the domestic market.

There are however contrasting views in the literature that suggest other mechanisms or forces through which the beneficial effects of foreign banks in the host market could potentially be off-set. First, domestic banks may be adversely affected by the shift of customers after the entry of foreign banks (Wu et al., 2017). On one hand, foreign banks may "cherry-pick" good, less risky customers – leaving the domestic banks with mainly high risky clients (Gormley, 2007). If the domestic banks' advantage over 'soft information" in the market is not adequate to shield them from customer defaults, their asset quality would then decline, resulting in increased financial instability in the host country. On the other hand, because foreign banks have superior service and global reputation, depositors may transfer their savings out of domestic banks and into the foreign ones – the so called "flight-to-quality" effect (Chen and Zhu, 2019). As a result, domestic banks may have to incur higher costs in order to either attract more deposits or replace deposits with other sources of funding. The rising cost of raising deposits could in turn, thus, compel domestic banks to increase their lending rates – resulting in adverse selection (Wu et al., 2017). Increased foreign bank penetration may therefore make domestic banks more vulnerable because of pressure from both sides. Second, higher presence of foreign banks may increase competition in the host market and reduce banks' franchise value due to lower profitability (Jeon et al., 2011). The traditional view that higher franchise value would limit banks' incentive to take excessive risk (Keeley, 1990) would no longer be effective under such circumstances as banks are induced to

assume more risk and search for “higher yield” to restore their profits. Increased competition from foreign bank entry could thus result in worsening of the quality of the asset portfolio in the domestic market and hence exacerbate instability.

Foreign banks can increase access to credit because they have access to more capital and liquidity Vogel & Winkler, (2010). This makes them more stable credit providers in case of shocks or disruptions in the host country. Foreign banks also possess superior credit evaluation platforms and risk management systems (L. S. Goldberg, 2007) – all of which facilitate lending. On the other hand, foreign banks can positively impact on financial inclusion by increasing firms’ and households’ access to credit and bank services (Detragiache et al., 2008). However, foreign bank presence can be detrimental for financial inclusion if a cream-skimming effect occurs and reduces the global access to credit (Léon & Zins, 2020). Such phenomenon happens if foreign banks cherry pick more profitable and transparent clients, pushing domestic banks to reduce their activities.

Regarding efficiency, the argument in the theoretical literature is that foreign banks may transform domestic savings more efficiently into investments (De Haas & van Lelyveld, 2014). Overall banking efficiency and competitiveness are also enhanced because foreign banks usually bring superior lending technologies, management experience, and governance structures that exert pressure on domestic banks to increase their operational efficiency as well (Arakelyan, 2018; Luo et al., 2014). However, the counter-argument to these claims is that while such larger efficiency gains may be attained, the foreign banks are likely to lose out on the client base because of their "cherry-picking" behaviour, that is, they pick creditworthy customers and leave out the more risky ones (such as SMEs) to local banks (Detragiache et al., 2008; Gormley, 2007; Mian, 2006). This cherry-picking behaviour may also result in increased bad debts (NPLs) for local banks as they are predominantly left with more risky customers (Wu et al., 2017; Barajas et al., 2000).

3.3.2. Empirical Review

Empirical studies on cross-border banking generally test different hypotheses and either take a cross-country, regional or country-specific approach. In line with the theoretical approach, this section reviews and presents the relevant empirical literature on cross-border banking in three categories: *(i) studies that explore the impact of cross-border banks on financial stability* (e.g. Kusi et al., 2021; Kimunio et al., 2020; Ozili, 2018; Sulemana et al., 2018; Mathieu et al., 2019;

Vazquez et al., 2007;. Cull & Martinez Peria, 2007; Goldberg et al., 2000; De Haas & van Lelyveld, 2007; Kalemli-Ozcan et al., 2012; Peek & Rosengren, 1995; Peria et al., 2002; Popov & Udell, 2010; Puri et al., 2011; Wu et al., 2017; Yin, 2019) Vogel & Winkler, 2010; Dwumfour, 2017); *(ii) studies that focus on efficiency and competition* (e.g.Yin, 2021; Cull et al., 2018; Luo et al., 2014; Ukaegbu & Oino, 2017; Haber, 2005; Hermes & Lensink, 2004; Claessens et al., 2001; Claessens & Laeven, 2004; Beck et al., 2014; Barajas & Stein, 2003; Podpiera et al., 2005); and (iii) *studies that focus on financial depth and outreach* (e.g. (Beck & Brown, 2015; Claessens & van Horen, 2015; De Haas & van Lelyveld, 2014; Detragiache et al., 2008; Gormley, 2007; Mian, 2006; Clarke et al., 2006; Cull & Spreng, 2011; Berger et al., 2001).

3.3.2.1. Cross-border banking and bank stability

The empirical findings on the stability implications of foreign banks are mixed. A review of the few SSA empirical studies is first presented, before providing a review of studies at the global level.

Kusi et al., (2021) examined the effect of foreign banks on banking stability in the economies with strong and weak country-level corporate governance in Africa between 2006 and 2015. Using a Prais–Winsten panel data model of 86 banks in about 30 African economies, the findings showed that foreign bank presence is associated with higher banking sector stability. However, the positive effect of foreign banks is only enhanced in economies with strong governance institutions, but is weakened in countries with weak institutions. This study however did not explore the heterogeneity in stability implications of foreign banks in the host country.

Kimunio et al., (2020) examined the effect of increased foreign bank penetration on financial stability in Kenya. The empirical focus of analysis was on whether or not foreign-owned banks enhanced financial stability in Kenya. To ascertain this, the authors used binary regression approach involving a logit model. The results showed that foreign-owned banks had no important direct effect on financial stability in Kenya. Instead, financial stability was observed to be more depended on the credit policies of the banks and their balance sheet structures, regardless of the ownership type. This study was however at country level and did not consider the conditioning impact of quality of governance institutions.

Ozili, (2018) employed panel fixed effects estimator to investigate the determinants of banking stability in Africa. Bank stability was measured using four indices: loan loss coverage ratio, insolvency risk, asset quality ratio, and level of financial development. The findings showed that among other factors, foreign bank presence, political stability, regulatory quality, investor protection, and corruption control were significant determinants of banking stability in Africa. However, the significance of each determinant depended on (i) the banking stability proxy employed (ii) and the period of analysis: pre-crisis, during-crisis or post-crisis. Similar to the study by Kusi et al., (2021), this study did not explore the heterogeneity in stability implications of foreign banks in the host country.

Sulemana et al., (2018) examined the impact of foreign bank inflows on the banking sector stability in SSA, using available data for the period 1995 to 2009. The study employed two econometric estimators: the multivariate logit and the two-step system generalised method of moment (GMM). The results from the two methods showed that the presence of foreign banks in the domestic banking sector significantly reduces the probability of bank crisis. The authors also found that improvement in political institutions reduces the probability of bank crisis. The study however is limited in two aspects: first, it focused on actual banking crises (based on banking crises of the early and mid-1990s using a dummy variable approach) and not on how international banks induce risk/instability in the host jurisdiction. Second, the aspect of cross-border banking from the perspective of market share was also not considered in the analysis.

Mathieu et al., (2019) explored some key patterns of cross-border investment in bank subsidiaries by key banking groups in SSA. The study analysed and discussed some of the determinants of this investment. Using a gravity model relating the annual value of a banking group's investment in the net equity of its subsidiaries to a set of explanatory variables, the analysis found that cross-border banking is in part driven by a search for yield, diversification, and expansion for strategic reasons. The focus of the study was however on exploring the key drivers of cross-border banking and not its implications on banking sector stability in the host countries.

At global level, most pre-crisis cross-country studies find that credit risk is significantly moderated during times of turmoil in the local market when more foreign banks are present. For instance, in a study of 20 emerging countries between 1989 and 2001, Vazquez et al., (2007) observed that

lending by foreign banks was more susceptible to macro-economic conditions compared to that by local banks. The authors also found that during crisis times, there was less volatility in loan and deposit rates of foreign banks compared to those of local banks, although the differences were noted to be not very strong. In another cross-country study covering 100 developing countries between 1995 and 2002, Cull & Martinez Peria, (2007) found that during crises, lending was more stable in jurisdictions that are dominated by foreign banks. Similarly, Goldberg et al., (2002) in their analysis of the performance of foreign and local banks in six Latin American countries (Peru, Argentina, Mexico, Venezuela, Brazil and Chile), found that the growth in loans was more stable for foreign bank affiliates than local banks. They also observed that the foreign bank affiliates demonstrated a higher ability to manage credit risk and cushion against losses – findings that are in line with the stability enhancing impact of foreign banks.

De Haas & van Lelyveld, (2007) used bank-level data from central and eastern Europe between 1993 and 2000 to explore whether the reaction of foreign banks to business cycles is different from that of domestic banks. They found that in times of local crises, domestic banks substantially reduced their credit supply compared to foreign banks, which maintained their supply of credit – an indication that foreign banks stabilise the credit market in times of crises. (L. Goldberg et al., 2000) also employed bank-level data on various types of loans for both, foreign and domestic banks, to analyse the risk pattern in lending in Argentina and Mexico between 1994 and 1999. They found that loan growth was much more stable in the case of foreign banks than with local banks. Peria et al., (2002) on the other hand, used data on claims of international banks from six countries (USA, Germany, UK, Canada, Spain, France and Japan) which had extended loans to 10 Latin American countries between 1985 and 2000. They found that foreign banks did not cease lending during crises in the host countries – supporting the credit stabilisation role of cross-border banks.

A larger body of post-crisis empirical studies, however – both, at cross-country and country level, find a negative relationship between increased presence of foreign banks and financial stability. For example, (Yin, 2019) found that foreign bank presence was linked to increased credit risk and that the likelihood of bank failures increased with higher levels of cross-border banking. (Wu et al., 2017) found that higher levels of cross-border banking negatively affect the stability of banks in the host jurisdictions. Their analysis was based on 35 developing countries for the period 2000

to 2014. De Haas & van Lelyveld, (2014) found that foreign banks substantially curtailed lending compared to local banks during the global financial crisis – and the decline in lending was much stronger for those subsidiaries whose parent banks mainly relied on wholesale funding sources. Their assessment was based on the largest international banks with over 200 operations in over 53 countries across the globe.

Other post-crisis studies analyse the stability impact of foreign banks through transmission of shocks across-borders. For example, Kalemli-Ozcan et al., (2012) found that countries that had stronger connections with the US financial market appeared to have their business cycles more synchronized with those of the U.S. during the GFC – a finding that supports shock transmission and propagation through cross-border banking integration. Using a similar analytical framework, (Puri et al., 2011) found that German savings banks which had shareholding in Landesbanken – a US savings bank that had substantial subprime exposures during the GFC – substantially contracted their loan supply compared to those that had no connection with the US financial market. The savings banks that had a connection with the US financial market also registered substantially higher amounts of rejected loan applications than those savings banks that had no connections. (Popov & Udell, 2010) observed that geographical regions that were predominantly populated by foreign banks in central and eastern Europe, reported higher credit constraints than those populated by local banks during the early stages of the GFC. They interpreted the finding as an indication of the liquidity shock transmission mechanism from the foreign parent banks to their subsidiaries abroad. In their earlier work, (De Haas & van Lelyveld, 2010) also found that cross border banks increased instability in the host market by transmitting shocks from their parent companies into the host market.

Some studies establish that the impact of foreign banks is context-specific. For instance, Dwumfour (2017) observed that although increased cross-border banking increased domestic bank stability in Africa, this was the case only in periods of crises. In normal times, the author observed that a higher level of cross-border banking was associated with low capital ratios and higher NPLs – both of which are indicators of higher banking risks. Saidane et al., (2021) in their assessment of the implications of PABs on bank stability and competition in the ECOWAS, observed that the increased presence of PABs was linked to increased banking sector volatility. However, the authors found different results when the analysis was disaggregated: banks with a French origin

appeared to be more stable when competition is high. The World Bank in its 2013 Financial Sector Assessment Program (FSAP) for countries in the EAC, documents that the performance of foreign banks in these countries also differed based on their origin. Subsidiaries of banks with headquarters in EAC had reported smaller lending-deposit spreads than subsidiaries whose headquarters were outside the EAC. The former category of banks also reported strong profitability performance compared to subsidiaries of foreign banks from other regions. Vogel & Winkler, (2010) found that the stability implications of foreign banks are not uniform – that is, they differ by location. In SSA for instance, the enhanced stability impact of foreign banks during the GFC was also associated with more stable loan growth. This was, however, not the case in Eastern Europe. In that region, foreign banks were only associated with enhanced stability but not stable lending.

3.3.2.2. Cross-border banking, competition and efficiency

In terms of how cross-border banking shapes the efficiency and competitiveness of the banking sector, evidence in most empirical studies generally is in the affirmative. The explanation in most studies is that when foreign banks enter the host market, they tend to introduce superior lending technologies, management experience, and governance structures, which in turn compel local banks in the domestic market to also improve their operational efficiency. The domestic banks are also pressured to lower their costs and spreads – aspects that promote competition in the sector.

Yin, (2021) investigated the impact of foreign bank entry on bank competition in the host countries. Using data for 148 countries over 1987–2015, the findings showed that although on average an increase in the number of foreign banks was associated with more competition in the host country, competition increased in developed economies but decreased in developing countries. Stringent capital requirements, higher market entry barriers, and effective credit information sharing were found to mitigate the impact of foreign bank entry, while better supervision and external governance strengthened the link between foreign bank presence and competition.

Luo et al., (2014) in his assessment of impact of foreign banks in China between 2002 to 2011, found that domestic branches that were closer to foreign bank branches reported improved profitability performance and income from non-traditional banks activities than those that were located far away. The authors interpreted their findings as evidence in support of knowledge

transfer from foreign banks. Ukaegbu & Oino, (2017) find that in Kenya, increased cross-border banking improved overall efficiency in the banking system including lowering of loan rates – although the latter was found to mainly benefit big corporate clients as foreign banks preferred to lend to such borrowers. Cull & Spreng, (2011) found that the performance of one of the largest privatised banks in Tanzania – the Tanzania National Bank of Commerce – that was initially state-owned, substantially improved in terms of profitability and loan quality following its acquisition by a foreign bank; although the growth in the loan portfolio was noted to be rather slow. Using Mexican banking data, Haber, (2005) found evidence that an increased level of cross-border banking was associated with a decline in operational expenses and improved credit quality – indicators of improved efficiency in the banking sector. Barajas & Stein, (2003) found that the entry of foreign banks in Colombia improved operational efficiency and competition in the banking sector – although the latter resulted in higher risk and a decline in credit quality, especially among domestic banks.

Similar evidence is found in cross country-level analyses. Cull et al., (2018) in their review of cross-border banking in developing countries, found evidence that the domestic banking sector becomes more competitive and efficient when more foreign banks are present. Podpiera et al., (2005) in their review of the banking sectors in Uganda, Kenya, and Tanzania following the adoption of financial liberalisation policies, found that cross-border banking improves overall efficiency. Beck et al., (2014), however, observed that the experiences in Mozambique and Uganda show that foreign banks that acquired state-owned banks turned out to be financially weak with limited resources and capacity. This ultimately led to the re-nationalisation of these banks. Claessens et al., (2001) found that profitability, operational costs and non-interest income all declined, when foreign bank presence increased in the host market. The authors interpreted the results as indications of greater efficiency and competition due to foreign bank participation. In their subsequent study on banking systems of 58 less-developed countries, the authors found that financial intermediation costs were lower in domestic banks as a result of increased foreign bank penetration.

3.3.2.3. Cross-border banking and financial outreach

On this strand of literature, there is less empirical consensus. Some studies show that foreign banks mainly serve large corporates in host countries and their contribution towards financial inclusion is very limited. These studies highlight the fact that foreign banks are generally selective in their lending i.e. they "cherry pick" borrowers that are more creditworthy and leave the risky ones to local banks. The study first highlights evidence from such studies and then subsequently present those that document contrary findings.

Beck & Brown, (2015) utilised survey data for over 16,500 households in 19 countries in central and Eastern Europe in 2010 and found that foreign banks practised "cherry-picking" in their lending behaviour. Unlike domestic banks, foreign banks mainly lent to formal or employed customers and based their lending decisions mainly on value of collateral and adequacy of financial information of the borrower. Claessens & van Horen, (2015) found that in 2009, the growth in loans recorded by foreign banks was 6% lower than that reported by local banks. Similar findings are reported by De Haas & van Lelyveld, (2014) in their analysis of the lending behaviour of the largest multinational large banks. Gormley, (2007) found that in India, the number of loans that were financed by foreign banks was substantially smaller, and the likelihood of a firm obtaining credit had dropped by about 8 percentage points on average, following the entry of foreign banks. In their model, Detragiache et al., (2008) show that in general, loans granted by foreign banks in less developed nations were lower, and associated with high operational costs due to the use of sophisticated technology for monitoring loans. Based on 1998 loan data for different firms, Berger et al. (2001) found that the likelihood of small firms getting credit from foreign banks in Argentina was very low. Mian (2006) noted that foreign banks in Pakistan displayed "cream-skimming" behaviour – that is, the foreign banks shunned lending to rural, small and medium-size firms, especially those that had no prior credit history.

Contrary to the above findings, some empirical evidence show that increased cross border banks positively affects financial inclusion and credit availability in developing countries. For instance, based on data from World Bank Enterprise Surveys, Léon & Zins, (2020) found that in general, the presence of Pan-African banks increased access to credit to firms in Africa – regardless of the firm size. Similar findings were reported by (Clarke et al., 2006; Gopalan & Rajan, 2018) who in

their review of firm loan data from developing and emerging economies, found that access to financial services improved when there was higher foreign bank penetration.

In conclusion, the theoretical literature provides contrasting avenues through which foreign bank penetration can affect banking sector stability in the host country. The impact of foreign banks may also depend on macro-economic shocks in either the host or home country and the behaviour of the parent company under such circumstances. The empirical evidence on the stability implications of cross border banks remains inconclusive and in some cases, is context-specific. There are also some notable differences in the impact of cross-border banking across the different global regions. Overall, most studies on cross-border banking mainly pertain to developed countries or emerging economies of eastern Europe, Asia, and South America and the focus in almost all the studies is either on bank lending behaviour or performance or credit intermediation during times of financial crises. The few studies that have focused on SSA (e.g. Dwumfour, 2017; Mathieu et al., 2019; Saidane et al., 2021; Sulemana et al., 2018) are also limited in several aspects as highlighted in section 3.1.2. The overall gap in empirical literature on this topic in SSA thus limits supervisory policy on consolidated supervision between or among regulators. The current study helps to fill the above highlighted gaps and hence makes a contribution towards banking literature and bank supervisory policy in that regard.

3.4. Variables and Data

3.4.1. Bank Stability

Bank stability is measured in terms of solvency, using the Z-score. The Z-score has been used in several studies as a measure of bank stability (Albaity et al., 2019; Beck et al., 2013; Kasman & Kasman, 2015; Laeven & Levine, 2009; Wu et al., 2017). The formula for the Z-score is expressed as:

$$\text{Z-score}_{it} = \frac{ROA_{it} + ETA_{it}}{\sigma ROA_{it}} \tag{3.0}$$

where ROA_{it}, ETA_{it} and (σROA_{it}) are respectively, the return on assets, equity to assets ratio (leverage ratio) and the volatility in return on assets i.e. the standard deviation. Larger indices of the Z-score indicate more stability. In order to account for the time volatility in the denominator

of the Z-score, the standard deviation of ROA are calculated based on a three-year rolling window (Beck et al., 2013; Schaeck & Čihák, 2012). The Z-score has the advantage of being relatively easy to calculate and better capturing the likelihood of collapse of a bank because it is developed using direct bank performance indicators. It also allows for easy comparison of banks of different sizes including listed or unlisted banks – unlike other measures (such as the distance to default and equity volatility), which can be calculated only for listed banks. Its major drawback is that it is derived based on historical information (Chiaramonte et al., 2016). In addition, because the information largely depends on accounting standards adopted in each country, comparison across banks of different countries may not be reliable (Chiaramonte et al., 2016) . In the current study, however, the latter weakness is mitigated because supervisory authorities in SSA require banks to adopt international accounting standards in line with the Basel core principles. The Z-score is also a more suitable indicator of bank stability in my case because the majority of the banks in the sample are not listed.

3.4.2. Cross-border Banking

In line with extant literature, three proxies were employed to measure cross-border banking: (i) the percentage of assets held by foreign banks in the host country, (ii) the percentage of foreign banks to total banks in the host country, and (iii) a foreign ownership dummy that takes a value of one for each foreign-owned bank in the sample at each point in time and zero otherwise in line with the approach adopted by (Delis et al., 2016). The first two measures, though related, allow for capturing two slightly different dimensions of foreign banks. For instance, the argument in literature that foreign banks enhance competition in host markets (De Haas & van Lelyveld, 2007) could better be explained if these banks control a bigger share of the banking market in the domestic country. In that case, the foreign banks would be in direct competition with domestic banks. The latter measure on the other hand, can be more insightful in explaining the "cherry-picking" behaviour of foreign banks (Gormley, 2007) or shifting of customers from domestic to foreign banks even when the latter do not have a larger market share (Chen et al., 2019). The third indicator allows for observing the impact of cross-border banking at bank level (as opposed to the first two measures that are both measured at the country level). This variable thus identifies the direct effect of foreign ownership on the stability of individual banks in the host market (Delis et al., 2016).

3.4.3. Other determinants of bank stability

The study considered several other factors (both bank and country-specific) that may affect bank stability, namely size, bank concentration, funding structure (ratio of non-deposit funding to total funding), leverage ratio (equity to assets ratio), GDP growth and the regulatory environment. These variables were selected among the most popular indicators employed in other empirical studies on the foreign bank-stability relationships (Tabak et al., 2012; Dwumfour, 2017; Sulemana et al., 2018; Wu et al., 2017). Below is a brief description of each determinant and its expected theoretical impact on bank stability.

Size: this variable is employed to capture the impact of economies of scale. The share of a bank's assets to total banking assets is used to capture size. Large banks are likely to benefit more from competition because they have more market power and the ability to diversify their assets (Tabak et al., 2012). In comparison to smaller banks, they also have more advanced risk management systems. As a result, large banks are likely to post and enjoy more stable earnings and hence be more financially stable. Some studies however, (e.g.Jimenez et al., 2013; Molyneux et al., 2010), note that when larger banks behave in a way that they are "too-big-to-fail", they are more likely to assume more risk, and hence result in less stability.

Concentration: this is a measure of the dominance in the banking system proxied by the share of assets that are owned by the three largest banks in the country. There are two competing theories on how bank concentration may affect financial stability (Corvoisier & Gropp, 2002): the "structure–conduct–performance" hypothesis and the "efficient-structure" hypothesis. The idea behind the "structure–conduct–performance" hypothesis is that increased market concentration is associated with unfavourable prices (e.g. lending rates) due to bank collusion. The higher lending rates may increase default in the banking system. Therefore, a higher concentration is related to less stability in this scenario. The "efficient-structure hypothesis," on the other hand, suggests that concentration would improve the banking sector's overall stability because concentration is a result of more efficient banks outperforming the less efficient ones or efficient banks acquiring less efficient banks. In this regard, more efficient banks grow bigger, gain market power and are more profitable (Corvoisier & Gropp, 2002) – hence more stable. The implication of bank concentration on banking sector stability is thus an empirical issue.

Funding structure: this is the extent to which a bank relies on other short-term funding sources, calculated by diving non-deposit short-term funding to total funding. Higher reliance on non-deposit funding may increase bank stability if the sources are less volatile. However, it could increase instability if deposits are more stable than other short-term borrowing.

Capitalisation: this captures the effect of regulatory capital and the bank's risk-taking behaviour. According to Diamond & Rajan, (2011), when regulatory authorities employ lower interest rate policies, banks increase risk taking – resulting in more leverage (low capital ratios), which leads to increased bank instability. Banks with significant leverage were mostly implicated in bankruptcy during the global financial crisis (Vazquez & Federico, 2015). The equity to assets ratio is used as a proxy for bank capitalisation.

GDP growth rate: this is an indicator of how macro-economic cycles impact financial stability (Beck et al., 2013; Wu et al., 2017) proxied by the annual GDP growth rate. Due to a general improvement in income levels in a country, a higher GDP growth rate may boost bank profitability, implying a positive association with bank stability. Some studies, however, find that bad debts increase when the economy is doing well because bank managers tend to relax credit underwriting practices during such times (Jimenez et al., 2013). There are two plausible explanations for this. First, when the economy is booming quickly, banks feel overconfident in borrowers' capacity to repay loans and lower credit criteria (Molyneux et al., 2010). This type of lending behaviour is more likely to result in impaired loans and borrowers' default in the long run. Second, during boom periods, excessive competition can erode margins and compel bank managers to search for high yield, hence increase bank risk (Wu et al., 2017).

Regulatory environment: the index captures the breadth of legal standards and the effectiveness of regulations in the financial sector. Improved regulatory quality can help to support banking stability by providing the banking industry with more effective and efficient incentives (Jalilian et al., 2007). On the other hand, complicated and onerous rules can adversely affect the economic performance and stability of banks since they cause economic waste and reduce productivity (Jalilian et al., 2007). Higher scores for this index indicate more effective and supportive regulation. The regulatory variable was sourced from the WBGIs database where indices on

quality of governance for all countries are available. Table 3.14 contains a summary of all the variables that were used in the study and their sources.

As part of the robustness and exploratory analysis, the study also includes three other country governance institutional factors from the WBGIs, namely control of corruption, political stability and the voice of accountability. The idea is to ascertain whether the impact of foreign banks on banking sector stability is conditioned on the quality of governance in the host country. Some studies (see for example, Bermpei et al., 2018; Mutarindwa et al., 2018; Wu et al., 2017) adopt a similar approach. To examine the conditioning impact of governance factors, interaction terms of each governance indicator and either measure of cross-border banking are employed. A significant co-efficient of the interaction term variable would render evidence to the view that the quality of governance in the host country conditions the impact of foreign banks (Kusi et al., 2021; Mutarindwa et al., 2018). To examine the overall conditioning impact of governance institutional factors, a composite index is also constructed through principal component analysis (PCA).

3.4.4. Data description

Bank level data was sourced from Bankfocus while the country level data variables (GDP growth rate and regulatory indices) were obtained from IMF IFS and WBGIs database, respectively. The data on foreign banks in each country was sourced from the GFDD (2019), Bankfocus and Claessens and van Horen (2014) database. The sample comprised of 270 banks from 29 SSA countries for the period 2005 to 2019.

Table 3.3 presents a descriptive summary of the variables. There are material variations in the presence of foreign banks across the region. The average foreign bank penetration is 56.8% (% number of foreign bank presence) and 60.3% (% share of assets). The highest penetration is 100%. The distribution of the Z-scores also highlights some significant variations in banking sector stability levels in the sample, including technically insolvent banks, as evidenced by some negative Z-scores.

Table 3.3: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Z-score	3,427	5.24	2.916	-8.16	25.72
Foreign banks	3,418	56.82	0.23	13.0	100
Foreign assets	3,368	60.35	0.26	6.0	100
Foreign ownership	3,455	0.61	0.48	0	1
Size	3,455	0.12	0.12	0	0.69
Leverage	3,440	13.15	7.33	-9.44	62.00
Fund structure	3,423	0.10	0.12	0	0.98
Concentration	3,398	60.45	17.39	28.93	100
GDP growth	3,453	4.95	3.03	-7.70	19.7
Regulatory quality	3,445	-0.39	0.57	-2.26	1.13

Table 3.4 shows the pairwise variable correlations. The Z-score and cross-border banking measures are negatively correlated with each other and statistically significant at 5%. There is little correlation however among the explanatory variables themselves – multicollinearity should thus not be a problem in the estimations.

Table 3.4: Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Z-score	1.000									
(2) Foreign banks	-0.215*	1.000								
(3) Foreign assets	-0.177*	0.912*	1.000							
(4) Foreign dummy	-0.113*	0.397*	0.386*	1.000						
(5) Size	-0.216*	0.201*	0.199*	0.045*	1.000					
(6) Leverage	0.395*	-0.213*	-0.188*	-0.110*	-0.309*	1.000				
(7) Fund structure	-0.134*	0.074*	0.059*	0.083*	0.075*	-0.131*	1.000			
(8) Concentration	-0.076*	0.232*	0.224*	0.109*	0.424*	-0.092*	0.053*	1.000		
(9) GDP growth	0.000	0.141*	0.161*	0.031	-0.045*	-0.012	0.068*	-0.153*	1.000	
(10) Regulation	-0.043*	0.010	-0.004	0.030	-0.097*	-0.060*	-0.086*	-0.078*	-0.043*	1.000

Notes: * indicates a 5% significance level

3.5. Methodology

3.5.1. Estimation Method

Most empirical studies employ fixed effect (FE) models to analyse panel data relationships in case of large panels and relatively long periods due to their desired statistical properties. Panel fixed effects control for unobserved country-specific time-invariant effects (Gopalan & Rajan, 2018).

However, in cases where the random effect (RE) model gives more consistent results than the FE model, the former estimator is adopted for analysis. The choice between the FE and RE model in this case, is based on the outcome of the Hausman test (Ammari, 2007). The assumption in the RE model is that the unique errors are not correlated with the regressors. If this assumption is rejected, it implies that the FE model is more efficient and should be used. Table 3.5 shows the results of the Hausman specification test for both measures of cross-border banking.

Table 3.5: Hausman test specification results

Model	Chi-square statistic	Probability (p-value)
Foreign banks' equation	230.94	0.000
Foreign assets' equation	220.90	0.000

Based on the specification test results in Table 3.5, the FE model is more appropriate. However, regression models do not show their true effects if both fixed effects and random effects have problems with autocorrelation and heteroscedasticity (Woodbridge, 2002). In this context, the study tested for the presence of autocorrelation and heteroscedasticity in the error term using the Woodbridge (2002) test and the Wald test, respectively. The null hypothesis in both tests is that there is no serial autocorrelation and heteroscedasticity. The results are shown in Table 3.6. They show that the null of no serial autocorrelation and heteroscedasticity are both strongly rejected at the 1% level.

Table 3.6: Tests for autocorrelation and heteroscedasticity

	Autocorrelation test		Group-wise heteroscedasticity	
Model	F-statistic	P-value)	Chi-square statistic	P-value
Foreign banks	61.239	0.001	79032.09	0.000
Foreign assets	49.095	0.003	92766.49	0.000

Since the Hausman specification test in Table 3.5 does not support non-default standard errors, the study employed the over-identification test by (Woodbridge, 2002) and (Arellano, 1993) to verify whether the fixed effects model is still the preferred estimator in the presence of autocorrelation and heteroscedasticity. Table 3.7 shows the specification results using the over-identification test. The results confirm that the FE is still the preferred estimator in the presence of autocorrelation and heteroscedasticity and was thus adopted for the current study.

Table 3.7: Model specification using over-identification test

Model	Sargan-Hansen Statistic	Probability (p-value)
Foreign banks	78.736	0.000
Foreign assets	80.311	0.000

Since autocorrelation and heteroscedasticity were present, a panel fixed effects estimator with Driscoll–Kraay standard errors was applied – these standard errors are robust to heteroscedasticity and within-panel serial correlation (Hoechle, 2007). The panel fixed effect estimator with Driscoll–Kraay standard errors is also robust to possible correlation of regression disturbances over time and between subjects, i.e. cross sectional dependence. Although the period is shorter than the number of cross-section panels in the current study (i.e. T=15 years and N=29), one could argue that the panel may be considered a relatively large micro-econometric panel where cross-sectional dependence could arise. In the current study, cross-sectional dependency could for instance emerge because of, among other factors, trade between nations, common financial integration, commodities and monetary shocks, and other unobserved cross-border spill over effects. The study thus adopted an estimator that also adjusts the standard errors of the coefficient estimates for possible cross-sectional dependence in the residuals to ensure the validity of the statistical results. The bank-specific panel fixed-effects estimator was also chosen because of some of its merits as commonly adopted in extant research. First, as the study uses bank-level panel data, fixed effects model allows unobservable bank-level individual effects, which may be heterogeneous across banks and constant over time. Second, fixed effects model allows the bank-level time-invariant effects to be correlated with explanatory variables, which is supported by the result of Hausman test as shown in preceding section.

3.5.2. Theoretical and Empirical Model

A general panel model takes the following specification (Ammari, 2007):

$$Y_{it} = \beta_1 X_{1,it} + \cdots + \beta_k X_{k,it} + \delta_2 T_2 + \cdots + \delta_t T_t + v_i + u_{it} \qquad (3.1)$$

Where *i* and *t* depict bank and time, respectively. $X_{k,it}$ captures the explanatory variables with β_k showing their coefficients. v_i represents the time-invariant entity-specific effect and u_{it} is the error term. The baseline empirical model was estimated at the bank level and specified as follows:

$$STAB_{it} = \alpha_0 + \alpha_1 FBP_{jt-1} + \beta_1 BFO_{it} + \sum_{k=2}^{N} \theta_k \, BANK_{it-1} + \sum_{k=1}^{2} \gamma_k \, COUNTRY_{jt} + v_i + \mu_{it} \quad (3.2)$$

where *i*, *j* and *t* represent bank, country, and time, respectively. $STAB_{it}$, represents stability (Z-score), FBP_{jt} is the magnitude of foreign banks in each country that is observed at the country-year level (i.e. % number foreign banks to total banks in the host market and the share (%) of assets held by foreign banks in the host country). As the impact of foreign bank penetration on domestic banking risk more likely emerges after a time lag, one-year lagged values of foreign penetration is used in the estimation. BFO_{it} is a foreign bank ownership dummy (observed at the bank-year level and takes the value of one when a bank is foreign-owned and zero otherwise); $BANK_{it}$ are bank-specific characteristics; $COUNTRY_{jt}$ represents country-specific factors; and μ_{it}, is the error term. Equation 3.2 was estimated with one-year lags of bank-specific variables to mitigate endogeneity (Beck et al., 2013). Heteroscedasticity and within and across panel correlation were controlled for by applying Driscoll–Kraay robust standard errors as described in Section 3.51.

It can however be argued that in estimating equation (3.2), identification issues could arise due to the dynamic nature of bank stability and the potential endogeneity of the foreign ownership variables (Delis et al., 2016). Banking systems might be characterised by information opacity, regulatory reforms, market power, and relationship lending – all of which may cause persistence in the cost structure and profitability of banks – and hence, on stability. Endogeneity of the two foreign bank ownership variables can arise from both; reverse causality and omitted variable bias. For instance, foreign banks may also be more inclined to enter markets where domestic banks are more fragile, since they incur lower costs for mergers and acquisitions. This reverse causality would lead to biased results. To account for these dynamics and endogeneity problems, an alternative econometric methodology is employed to serve as a robustness check to the baseline results – the two-step system Generalised Method of Moments (GMM) in which equation (3.2) is estimated in its dynamic form by including the lag(s) of the dependent variable as an additional explanatory variable. Endogeneity is addressed by internally transforming the data – system GMM transforms two equations: one in levels form with the first difference as instruments and another in first difference form with levels as instruments. Endogeneity bias is thus reduced in this way by

adding more instruments to increase efficiency and making the instruments uncorrelated with the fixed effects (Roodman, 2009).

3.5.3. Results and Discussion

The results from the baseline regression model (3.2) are reported in Table 3.8. Four sets of regressions are estimated: Model 1 uses ratio of the number of foreign banks over the number of all banks in the host country; Model 2 uses a foreign ownership dummy at bank-level (equal to one, if a bank is foreign owned); Model 3 uses share of assets held by foreign banks in the host country; and Model 4 includes both, the bank foreign ownership dummy and percentage number of foreign banks. By using the % number of foreign banks in the host country in the same equation with bank foreign ownership (Model 4), the study is thus able to identify whether the impact of cross-border banking on bank stability differs based on whether the measure is at country or bank level (Delis et al., 2016). Models 1 – 3, thus differ from each other by using different cross-border banking measures. The dependent variable in all the models is the Z-score.

The results show that the coefficient of cross-border banking is negative and statistically significant in all the models. Because higher Z-scores indicate more stability, the results show that increased cross-border banking reduces banking sector stability in the host country. The findings are in line with the hypothesis that the risk-increasing effect attributable to cross-border banking in the domestic market outweighs its potential beneficial impact. This could partly reflect the shifting of customers or more intensive competition or disadvantages on innovative financial services. The significance of the foreign bank presence variable (% number of foreign banks in host country) and the foreign ownership dummy, suggests that the mere presence of foreign banks – even without controlling a larger market share, is a strong factor to induce risk taking behaviour in the host market. Yin, (2020); Wu et al., (2017) and Saidane et al., (2021) report similar findings.

As for control variables, it is first observed that bigger banks are less stable (negative co-efficient of size in all the models) – supporting the too-big-to-fail hypothesis (Molyneux et al., 2010). The impact of capital is positive and significant in all the models – suggesting that higher capitalisation reduces insolvency risk. As discussed in chapter 2, the relatively higher equity to assets ratios in most SSA countries help to cushion bank losses and hence improve overall bank stability. Albaity et al., (2019) found similar results. A diversified funding base increases bank stability as evidenced

by positive and significant coefficient of the fund structure variable. The coefficient of bank concentration is negative and significant in all the models – interpreted as evidence that increased concentration in the banking market is associated with less banking sector stability. This finding is consistent with the structure-conduct-performance hypothesis. Kasman & Kasman, (2015) and Jimenez et al., (2013) report similar findings. Finally, banks are less stable when the economy is booming as evidenced by a negative and significant coefficient of GDP growth in all the models. The outcome is consistent with the view that bad debts in the banking system increase when the economy is doing well because bank managers tend to relax credit underwriting practices during such times (Jimenez et al., 2013).

Table 3.8: Baseline results of the impact of foreign bank penetration on banking sector stability in SSA (2005-2019)

Model:	(1)	(2)	(3)	(4)
Dependent variable	Z-score	Z-score	Z-score	Z-score
Foreign banks$_{t-1}$	-0.812***			-1.025***
	(0.122)			(0.247)
Foreign ownership		-2.159***		-1.948***
		(0.298)		(0.260)
Foreign assets$_{t-1}$			-0.743**	
			(0.310)	
Size$_{t-1}$	-0.509*	-0.622**	-0.801*	-0.628*
	(0.283)	(0.259)	(0.380)	(0.325)
Leverage$_{t-1}$	0.200***	0.200***	0.201***	0.198***
	(0.015)	(0.018)	(0.020)	(0.018)
Fund structure$_{t-1}$	0.408**	0.383**	0.244	0.482**
	(0.146)	(0.177)	(0.218)	(0.170)
Concentration$_{t-1}$	-0.012***	-0.011***	-0.012**	-0.012***
	(0.003)	(0.003)	(0.004)	(0.003)
GDP growth	-0.018**	-0.021**	-0.018*	-0.017**
	(0.007)	(0.008)	(0.010)	(0.008)
Regulation	0.159	0.125	0.206	0.150
	(0.113)	(0.165)	(0.168)	(0.133)
No. observations	3,026	3,059	2,981	3,032
No. banks	270	270	270	270
R-squared	0.27	0.27	0.27	0.27
F-statistic –value	0.000	0.000	0.000	0.000
Year dummies	Yes	Yes	Yes	Yes

Notes: The table shows the results on the impact of cross-border banking on banking sector stability in the host country. In all the four models, the dependent variable is the Z-score. *Foreign banks* is % number of foreign banks among all banks in the country; *Foreign ownership* is foreign ownership dummy at bank level, and *Foreign assets* is the share of assets held by foreign banks in the host country. All the other variables are defined in Table 3.14. All the models are estimated using a panel fixed-effects estimator with Driscoll- Kraay standard that are robust to heteroscedasticity and within and cross-panel serial correlation. The p-values for the F-statistic show that the coefficients in the model are jointly significant. The statistical significance of each coefficient at the 1%, 5% and 10% levels is shown by the asterisks ***, ** and *, respectively.

3.5.4. Robustness Checks

As explained in section 3.5.1, there is possibility of reverse causality between bank stability and foreign banks. For instance, foreign banks may be more inclined to enter markets where domestic banks are more fragile, since they incur lower costs for mergers and acquisitions. In this case, (in)stability in the host country's banking sector may cause foreign bank penetration as much as increased foreign banks can cause (in)stability in the host market. In addition, stability in the current period could partly be dependent on bank performance in the previous period – implying some persistence in bank risk-taking behaviour (Agoraki, et al., 2011). To account for the stability dynamics and endogeneity problems, equation (3.2) was also estimated in its dynamic version using 2-step system GMM estimator. Exogenous and endogenous variables were classified based on theoretical considerations and other bank risk-related empirical literature (see for example, Delis and Staikouras, 2011; Agoraki, et al, 2011; Djalilov and Piesse, 2019). Current and future bank strategic and business decisions are usually guided by or based on past bank performance. This implies that current and future bank-specific variables are correlated – the current bank performance can thus affect future performance. For this reason, the bank-specific variables were treated as weakly endogenous and instrumented with their first or higher lags. On the other hand, and as stated above, there is possibility of reverse causality between bank stability and foreign bank variables. Supervisory authorities also often enact new rules or policies when they observe fragilities in the banking system – risk levels thus inform or drive regulatory initiatives. For these reasons, the cross-border banking and regulatory variables were treated as endogenous and instrumented with their second and higher lags. Year dummies and the macro-economic variable are treated as exogenous. The key assumption under system GMM is that the lags of instrumented variables are the only available instruments (Roodman, 2009). However, to avoid instrument proliferation, the lag depth of the instruments is restricted and the GMM estimates are reported with "collapsed" instruments. The Hansen statistic and the second-order autocorrelation (AR) test was then applied to verify the validity of the instruments. The results are reported in Table 3.9. The stability impact of cross-border banking is still negative in Model 1 and 2 – similar to the baseline results in Table 2.

Table 3.9: Results of the impact of cross-border banks on banking sector stability in SSA (2005-2019) using system Generalised Method of Moments (GMM) estimator

Model:	(1)	(2)	(3)
Dependent variable	Z-score	Z-score	Z-score
$Z\text{-score}_{t-1}$	0.244*	0.613***	0.369**
	(0.130)	(0.233)	(0.171)
$\text{Foreign banks}_{t-1}$	-1.535*		
	(0.846)		
$\text{Foreign assets}_{t-1}$		-1.999**	
		(0.834)	
Foreign ownership			-0.008
			(0.109)
Size_{t-1}	-1.110	-4.383*	-1.539
	(2.445)	(2.466)	(1.679)
Leverage_{t-1}	0.189***	0.033	0.134*
	(0.056)	(0.111)	(0.081)
$\text{Fund structure}_{t-1}$	0.597	0.023	0.656
	(1.429)	(1.239)	(0.595)
$\text{Concentration}_{t-1}$	-0.001	-0.002	-0.004
	(0.009)	(0.007)	(0.010)
GDP growth	-0.013	-0.010	-0.023*
	(0.013)	(0.012)	(0.013)
Regulation	0.197	0.922	0.156
	(0.605)	(0.746)	(0.218)
No observations	3,017	2,972	3,050
No. banks	270	270	270
AR(2) statistic	1.38	1.72	1.32
AR(2) p-value	0.168	0.086	0.186
Hansen statistic	18.68	20.48	38.13
Hansen p-value	0.133	0.116	0.146
No instruments	63	64	80
F-statistic	619.7***	606.4***	825.4***
Year dummies	Yes	Yes	Yes

Notes: This table shows results of the impact of cross-border banking on banking sector stability using the two-step system GMM estimator. The dependent variable in all the models is the Z-score. *Foreign banks* is % number of foreign banks among all banks in the country; *Foreign ownership* is foreign ownership dummy at bank level, and *Foreign assets* is the share of assets held by foreign banks in the host country. The definitions of all the other variables are found in Table 3.14. The p-values for the Allerano-Bond autocorrelation tests are shown as AR(2) while those for the validity of the over-identifying restrictions are shown by the Hansen p-value. The results show that there is no second-order autocorrelation and the over-identifying restrictions are valid. The standard errors are shown in parentheses while asterisks (1, 2 and 3) show significance levels at 10%, 5% and 1%, respectively.

3.5.5. Further exploratory analyses

After finding a consistent negative relationship between bank stability and foreign bank penetration, two additional exploratory analyses were performed to interrogate whether the negative stability implication of foreign banks is: (i) conditioned on the quality of governance in the host country; and (ii) is heterogeneous across banks of different characteristics. Some studies (see for example, Bermpei et al., 2018; Mutarindwa et al., 2018; Wu et al., 2017) adopt a similar approach. First, the study employed three additional governance institutional factors, namely; the voice of accountability, control of corruption and political stability are included. These variables were selected based on their relevance to banking sector stability and are among the most popular indicators employed in other empirical studies. Voice of accountability reflects the extent of freedom enjoyed or expressed by the citizens and investors (including the freedom to participate in economic and business activities). The index on control of corruption depicts how those in power or authority use their power or mandate for private benefit at the expense of the public. Political stability depicts the possibility of political unrest and/or violent acts driven by politics. Each factor is measured as an index on a scale of -2.5 to 2.5, with lower values showing poor quality of governance and vice versa. To capture their conditioning impact, each factor was interacted with either indicator of cross-border banking. As the indicators are highly correlated with each other, they were employed one at a time. A composite index to capture the overall conditioning impact of the quality of regulation and the governance on banking stability in the host country was then constructed through principal component analysis (PCA) – the PCA eigenvalue decomposition matrices are shown in Tables 3.17 in the Appendix 2. The idea here was to examine the overall (average) conditioning impact of the institutional governance factors. As explained in chapter 2, PCA is concerned with explaining the variance-covariance structure of a set of variables through a few linear combinations of these variables. The regression results showing the conditioning impact of governance institutional factors are shown in Table 3.10 (when using % number of foreign banks); Table 3.11 (when using foreign ownership dummy); and Table 3.12 (when using share of foreign banks' assets). A consistently negative impact of foreign banks penetration on domestic banking stability is observed in all the regressions – similar to those reported in Table 3.8. The coefficients of the interaction terms in (*political stability x foreign banks/foreign ownership dummy)* in Table 3.10 and 3.11; (*accountability x foreign banks/foreign dummy*) in Table 3.10 and 3.11; and (*corruption x foreign banks/foreign assets*) in Table 3.11 and

3.12 are all found to be negative and statistically significant. The coefficient of the interaction term in the last column in Table 3.10 and 3.12 (i.e. the PCA constructed variable), is also significant in both tables. The results can be interpreted to mean that higher quality of governance enhance the effect of cross-border banking. In other words, the negative impact of increased foreign bank penetration on banking sector stability in the host country is more pronounced when there is more political stability, less corruption and investors/citizens express or enjoy more economic freedom.

Table 3.10: Results of the impact of cross-border banking (measured using % number of foreign banks) on banking sector stability in SSA (2005-2019) when conditioned on institutional factors

Model:	(1)	(2)	(3)	(4)
Dependent variable	Political stability	Corruption	Accountability	Overall-PCA
Foreign banks$_{t-1}$	-0.497***	-0.638**	-0.762***	-0.673***
	(0.111)	(0.228)	(0.214)	(0.101)
Size$_{t-1}$	-0.692	-0.723	-0.575	-0.599
	(0.467)	(0.714)	(0.731)	(0.449)
Leverage$_{t-1}$	0.199***	0.198***	0.199***	0.199***
	(0.0251)	(0.026)	(0.026)	(0.024)
Fund structure$_{t-1}$	0.402*	0.399	0.409*	0.422*
	(0.227)	(0.230)	(0.231)	(0.205)
Concentration$_{t-1}$	-0.012**	-0.013*	-0.012	-0.013**
	(0.005)	(0.007)	(0.007)	(0.004)
GDP growth	-0.018*	-0.0175	-0.016	-0.019**
	(0.009)	(0.012)	(0.013)	(0.008)
Institutional factor	0.150*	0.120	0.331*	0.099*
	(0.074)	(0.220)	(0.159)	(0.055)
Institutional factor x Foreign banks	-0.149***	-0.075	-0.096*	-0.082***
	(0.039)	(0.065)	(0.050)	(0.027)
No. observations	3,021	3,021	3,021	3,011
No. banks	269	269	269	269
R-squared	0.26	0.26	0.26	0.26
F-statistic p-value	0.000	0.000	0.000	0.000
Year dummies:	Yes	Yes	Yes	Yes

Notes: This table presents the results of the impact of cross-border banking using the indicator of *foreign banks* (i.e. ratio of foreign banks to total banks in the host country) on banking sector stability when conditioned on quality of governance institutional factors. In all the models, the dependent variable is the Z-score. One governance indicator and the interaction of *foreign banks* and the governance indicator is added at a time. For instance, Model 1 shows the results when the political stability index and the interaction between the political stability index and *foreign banks* is used; Model 2 shows results when using control of corruption index and the interaction between the corruption index and *foreign banks*; Model 3 shows results when using voice of accountability index and the interaction between accountability index and *foreign banks*. The last column (Model 4) shows the overall (average) impact of the institutional factors – an index that is derived through principal component analysis of all the institutional factors as explained in the preceding section. All the models are estimated using a panel fixed-effects estimator with Driscoll-Kraay robust standard errors. The asterisks (1, 2 and 3) show the significance levels at the 10%, 5% and 1%, respectively. The definitions of the governance institutional factors are explained in section 3.5.5 while the rest of the variables are defined in Table 3.14

Table 3.11: Results of the impact of cross-border banking (measured using a foreign ownership dummy) on banking sector stability in SSA (2005-2019) when conditioned on institutional factors

Model:	(1)	(2)	(3)	(4)
Dependent variable	Political stability	Corruption	Accountability	Overall-PCA
Foreign ownership$_{t-1}$	-2.197***	-2.200***	-2.190***	-1.398*
	(0.295)	(0.309)	(0.298)	(0.657)
Size$_{t-1}$	-0.667*	-0.684**	-0.677*	-0.544**
	(0.323)	(0.315)	(0.315)	(0.247)
Leverage$_{t-1}$	0.198***	0.198***	0.198***	0.200***
	(0.018)	(0.018)	(0.018)	(0.015)
Fund structure$_{t-1}$	0.491**	0.461**	0.457**	0.305*
	(0.176)	(0.161)	(0.170)	(0.155)
Concentration$_{t-1}$	-0.012***	-0.013***	-0.012***	-0.011***
	(0.004)	(0.004)	(0.003)	(0.003)
GDP growth	-0.018**	-0.0171**	-0.019**	-0.022***
	(0.007)	(0.006)	(0.007)	(0.006)
Institutional factor	0.095*	0.050	0.268***	0.109
	(0.051)	(0.131)	(0.059)	(0.062)
Institutional factor x Foreign banks	-0.257**	-0.246**	-0.264**	-0.070
	(0.096)	(0.089)	(0.089)	(0.065)
No. observations	3,031	3,031	3,031	3,048
No. banks	269	269	269	269
R-squared	0.26	0.26	0.26	0.26
F-statistic p-value	0.000	0.000	0.000	0.000
Year dummies:	Yes	Yes	Yes	Yes

Notes: This table presents the results of the impact of cross-border banking using the indicator of *foreign ownership dummy* at bank level on banking sector stability when conditioned on quality of governance institutional factors. In all the models, the dependent variable is the Z-score. One governance indicator and the interaction of *foreign dummy* and the governance indicator is added at a time. For instance, Model 1 shows the results when the political stability index and the interaction between the political stability index and *foreign dummy* is used; Model 2 shows results when using control of corruption index and the interaction between the corruption index and *foreign dummy*; Model 3 shows results when using voice of accountability index and the interaction between accountability index and *foreign dummy*. The last column (Model 4) shows the overall (average) impact of the institutional factors – an index that is derived through principal component analysis of all the institutional factors as explained in the preceding section. All the models are estimated using a panel fixed-effects estimator with Driscoll- Kraay robust standard errors. The asterisks (1, 2 and 3) show the significance levels at the 10%, 5% and 1%, respectively. The definitions of the governance institutional factors are explained in section 3.5.5 while the rest of the variables are defined in Table 3.14.

Table 3.12: Results of the impact of cross-border banking (measured using share of foreign assets) on banking sector stability in SSA (2005-2019) when conditioned on institutional factors

Model:	(1)	(2)	(3)	(4)
Dependent variable:	Political stability	Corruption	Accountability	Overall-PCA
Foreign assets$_{t-1}$	-0.667**	-0.604*	-0.653**	-0.636*
	(0.278)	(0.292)	(0.285)	(0.351)
Size$_{t-1}$	-0.807**	-1.060***	-1.074***	-0.925**
	(0.354)	(0.229)	(0.246)	(0.343)
Leverage$_{t-1}$	0.200***	0.208***	0.209***	0.208***
	(0.016)	(0.013)	(0.014)	(0.022)
Fund structure$_{t-1}$	0.238	0.447**	0.452**	0.498*
	(0.199)	(0.180)	(0.183)	(0.243)
Concentration$_{t-1}$	-0.013***	-0.012***	-0.012***	-0.012**
	(0.004)	(0.003)	(0.004)	(0.005)
GDP growth	-0.016*	-0.021**	-0.019**	-0.019
	(0.008)	(0.008)	(0.009)	(0.011)
Institutional factor	0.073	0.204	0.165	0.121*
	(0.060)	(0.133)	(0.099)	(0.066)
Institutional factor x Foreign assets	-0.031	-0.152**	-0.023	-0.110**
	(0.032)	(0.060)	(0.037)	(0.039)
No. observations	2,980	2,954	2,954	2,944
No. banks	269	269	269	269
R-squared	0.27	0.29	0.29	0.29
F-statistic p-value	0.000	0.000	0.000	0.000
Year dummies	Yes	Yes	Yes	Yes

Notes: This table presents the results of the impact of cross-border banking using the indicator of *foreign assets* on banking sector stability when conditioned on quality of governance institutional factors. In all the models, the dependent variable is the Z-score. One governance indicator and the interaction of *foreign assets* and the governance indicator is added at a time. For instance, Model 1 shows the results when the political stability index and the interaction between the political stability index and *foreign assets* is used; Model 2 shows results when using control of corruption index and the interaction between the corruption index and *foreign assets*; Model 3 shows results when using voice of accountability index and the interaction between accountability index and *foreign assets*. The last column (Model 4) shows the overall (average) impact of the institutional factors – an index that is derived through principal component analysis of all the institutional factors as explained in the preceding section. All the models are estimated using a panel fixed-effects estimator with Driscoll- Kraay robust standard errors. The asterisks (1, 2 and 3) show the significance levels at the 10%, 5% and 1%, respectively. The definitions of the governance institutional factors are explained in section 3.5.5 while the rest of the variables are defined in Table 3.14.

Next, the study explored whether different types of banks in the host country are impacted differently by the presence of foreign banks. The study followed the approach by Wu et al., (2017) and focused on three aspects: size, efficiency, and capitalization. The banks were first, categorised into large and small based on whether their size is beyond the median of the sample distribution. Banks whose assets are above the median, were classified as large while those below the median were classified as small. Second, the banks were categorised into two sub-samples based on their efficiency level using the same criteria as before. Efficiency was measured as the ratio of total operating costs to total assets (Molyneux et al., 2010; Ahi and Laidroo, 2019). Ratios above the median indicate less efficiency, while those below the median indicate higher efficiency. Finally, the banks were classified based on their capitalisation levels (equity to assets ratio) using the same criteria as before. In each of the above three categories, a binary dummy variable was constructed, which is equals to 1 (0) if a bank is classified as a large (small), efficient (less efficient) and capitalised (less capitalised). Including the interaction of this dummy with the indicators of foreign bank penetration, the estimations of equation (3.2) were repeated. The results are reported in Table 3.13 – Part 1 (for larger versus small banks); Part 2 (for efficient versus less-efficient banks); and Part 3 for (capitalised versus less capitalised banks).

The results show that the coefficient of the stand-alone penetration indicator is negative and statistically significant in all the regressions i.e. for all the three bank categories. However, the coefficient of the well-capitalised dummy is positive and statistically significant in Part 3 – a finding that is interpreted in the subsequent section below. There are two interpretations to the former results: first, the risk of small, less-efficient and less-capitalised banks in the host market increases with the entry of foreign banks; and second, the increase of foreign banks' market share and their mere presence exert similar impact on small and less-efficient banks. Smaller banks usually possess less market power – they are thus mostly affected by competition arising from the entry of, and loss of market share to foreign banks. The smaller banks therefore lose their profit share at a relatively larger rate than bigger banks. The less-efficient banks are also the most vulnerable and disadvantaged when foreign banks enter the domestic market as they find it difficult to manage and contain operational costs (Wu et al., 2017). Foreign banks have an overall advantage in terms of operating more efficiently than domestic banks – because group synergies in part, allow the foreign banks to access relatively cheaper advanced banking technology and resources.

The results in Part 3 of Table 3.13 can also be interpreted in two ways: First, the consistent negative coefficient of the penetration variable in all the models shows that both, capitalised and well capitalised banks are vulnerable to the adverse risk effect arising from increased presence of foreign banks in the host market. However, the positive coefficient of the capitalised dummy shows that foreign banks' market share and their mere number seemingly exert differential impact on capitalised and less capitalised banks. Capitalised banks' risk is more significantly sensitive to share of assets, while the variation of less-capitalised banks' risk is more closely associated with mere presence (ownership) of foreign banks[9]. A possible explanation for this outcome is that the market dominance of well-capitalised banks would only be seriously threatened when foreign banks effectively capture a sizeable portion of the market (higher share of assets or % number of foreign banks). Because foreign banks boost competition in the host market (Chen et al., 2019), profitability of well capitalised banks would decline at a higher pace relative to less-capitalised banks. However, the mere increase in the presence of foreign competitors – even without having to change the market structure by considerably increasing their asset share, might still cause a significant "cherry-picking" and/or "flight-to-quality" effect on the clients of less-capitalised banks – hence the significantly higher adverse impact still observed in Model 3.

[9] Take for example Models 1 & 2 respectively, (when foreign penetration is measured using number of foreign banks and share of assets). The overall impact of foreign penetration on capitalised banks is larger than that on less capitalised banks – and statistically significant (-1.774+2.476=0.702 for model 1; and -1.778+2.266=0.488 for model 2). The opposite is true when using mere foreign bank ownership dummy (presence) in Model 3 where the impact on capitalised banks is smaller than that on less-capitalised banks (-3.202+1.663=1.539).

Table 3.13: What types of domestic banks are more affected by foreign penetration?

In all the Parts, Model 1 uses *foreign banks* i.e. the % number of banks in host country as a measure of cross-border banking (penetration); Model 2 uses *foreign assets* (share of assets held by foreign banks) and Model 3 uses *foreign ownership* i.e. a foreign ownership dummy at bank level. All the models are estimated using a panel fixed-effects estimator with Driscoll- Kraay standard errors. ***, **and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Part 1: Large versus small banks

Model:	(1)	(2)	(3)
	Foreign banks	Foreign assets	Foreign ownership
Penetration	-1.098***	-1.127***	-2.186***
	(0.275)	(0.231)	(0.497)
Penetration x dummy	-0.020	-0.033	-0.122
(Large banks)	(0.096)	(0.090)	(0.088)
$Size_{t-1}$	-0.625	-1.120**	-0.495
	(0.542)	(0.403)	(0.531)
$Leverage_{t-1}$	0.198***	0.207***	0.199***
	(0.027)	(0.024)	(0.027)
Fund $structure_{t-1}$	0.445*	0.608***	0.459*
	(0.243)	(0.197)	(0.229)
$Concentration_{t-1}$	-0.012**	-0.012*	-0.012**
	(0.005)	(0.006)	(0.005)
GDP growth	-0.017	-0.020	-0.019
	(0.012)	(0.013)	(0.012)
Regulation	0.157	0.100	0.123
	(0.189)	(0.164)	(0.210)
No. observations	3,032	2,980	3,032
R-squared	0.27	0.29	0.26

Part 2: Efficient versus less-efficient banks

Model:	(1)	(2)	(3)
	Foreign banks	Foreign assets	Foreign ownership
Penetration	-1.130***	-1.137***	-2.143***
	(0.302)	(0.237)	(0.513)
Penetration x dummy	0.0384	-0.004	-0.066
(Efficient banks)	(0.081)	(0.076)	(0.114)
$Size_{t-1}$	-0.650	-1.152**	-0.612
	(0.557)	(0.445)	(0.446)
$Leverage_{t-1}$	0.198***	0.207***	0.200***
	(0.027)	(0.024)	(0.026)
Fund $structure_{t-1}$	0.433	0.603**	0.397
	(0.255)	(0.212)	(0.271)
$Concentration_{t-1}$	-0.012**	-0.012*	-0.011*
	(0.005)	(0.006)	(0.005)
GDP growth	-0.018	-0.021	-0.020
	(0.012)	(0.013)	(0.012)
Regulation	0.155	0.100	0.131
	(0.190)	(0.166)	(0.233)
No. observations	3,032	2,980	3,059
R-squared	0.27	0.29	0.27

Part 3: Capitalised versus weakly capitalised banks

Model:	(1)	(2)	(3)
	Foreign banks	Foreign assets	Foreign ownership
Penetration	-1.774***	-1.778***	-3.202***
	(0.215)	(0.335)	(0.380)
Penetration x dummy	2.476***	2.266***	1.663***
(Capitalised banks)	(0.183)	(0.152)	(0.116)
$Size_{t-1}$	-0.210	-0.352	0.161
	(0.743)	(0.587)	(0.616)
$Leverage_{t-1}$	0.165***	0.174***	0.176***
	(0.026)	(0.023)	(0.023)
Fund $structure_{t-1}$	0.450*	0.632**	0.456*
	(0.235)	(0.228)	(0.253)
$Concentration_{t-1}$	-0.009	-0.007	-0.010
	(0.006)	(0.007)	(0.006)
GDP growth	0.001	-0.005	-0.009
	(0.011)	(0.014)	(0.011)
Regulation	0.421***	0.302*	0.220
	(0.139)	(0.141)	(0.201)
No. observations	3,032	2,992	3,059
R-squared	0.36	0.38	0.34

3.6. Conclusion

The focus in this chapter was on how foreign banks affect banking sector stability in SSA. In line with other empirical studies, the study employed three indicators of foreign bank penetration: the number (%) of foreign banks, the share (%) of assets held by foreign banks in host market and a foreign ownership dummy at bank level – taking a value for one if a bank is foreign owned and zero otherwise. The study period was from 2005 to 2019 and the sample comprised banks from 29 countries. The foreign bank–stability relationship was analysed by employing panel fixed effects and system GMM estimators. Three key results were found: (i) A higher penetration of cross-border banks decreases banking sector stability in the domestic market. The findings remained consistent even after further exploratory analyses and robustness examinations. They also remained consistent even after taking into account the conditioning effect of country specific institutional factors; (ii) small and less efficient banks are the ones that are most negatively impacted with increased entry of cross-border banks; and (iii) strong governance (institutional factors) enhances the stability impact of cross-border banks.

The first result is explained in terms of the increased competition, cherry-picking and flight-quality hypotheses – a scenario whereby foreign banks pick or choose only credit-worthy customers in the host market, leaving the risky ones to the domestic banks. The risk (i.e. instability) in the host market is thus increased as domestic banks end up searching for higher yields (by accepting more risky customers) to cover up for the lost business or income. The second result can be explained from two perspectives: First, smaller banks usually possess less market power – they are therefore most affected by competition arising from increased foreign bank presence. The smaller banks thus become more vulnerable to loss of business and profits than bigger banks that possess large market power and share in the market. Second, less efficient are the most vulnerable and disadvantaged when foreign banks enter the domestic market as they find it difficult to manage and contain operational costs. Foreign banks have an overall advantage in terms of operating more efficiently than domestic banks – because group synergies in part, allow the foreign banks to access relatively cheaper advanced banking technology and resources.

Two significant policy implications flow from the findings. First, the overall finding that cross-border banks decrease banking sector stability in the host country, suggests that host regulatory authorities need to establish proper channels of collaboration with the home regulatory authorities

of foreign subsidiaries. This collaboration is more important in cases where foreign bank affiliates pose systemic risk in both the host and home markets – because in that case, the threat to financial stability and potential economic costs is significantly heightened in both jurisdictions. Supervisory collaboration is even more important in cases where the foreign subsidiary is systemically important only in the host market – and not in the banking group itself. The latter scenario is what is commonly obtained in most countries in SSA. In either case, the findings call for enhanced consolidated supervision of banking groups in SSA as an effective remedy to mitigating cross-border contagion and systematic failures.

Second, the finding that banks of different characteristics in the host country are affected differently by the presence of foreign banks, suggests that purposeful regulatory strategies are needed to offset the negative effects of cross-border banking. Three regulatory policy initiatives may be relevant in this regard. First, measures or policies that improve bank efficiency (for instance through cost minimisation) are critical in mitigating the negative effect of foreign banks in the local market. Second, given that the smaller and less capitalised banks are also negatively impacted when foreign banks enter the market, supervisory authorities could consider adopting or prescribing different capitalization levels or licensing requirements for domestic and international banks. A two-tier banking system is currently applied in very few countries in the region (e.g. Zambia and Mozambique) where different start-up capital requirements are applied to domestic and foreign banks. Lastly, policy consideration should be given to the adoption of a systemic risk capital add-on or buffer. Such a policy could serve as a vital tool in mitigating systemic risk, especially in jurisdictions where the foreign subsidiaries are systemically important. It could also complement the consolidated supervision efforts proposed in the preceding section. The systemic capital add-on is currently a requirement under Basel III – however, the implementation of such an element is feasible even when a country has not formally migrated to Basel III.

3.6.1. Appendix 2

Table 3.14: List of variables, definitions, and sources

Variable	Definition	Source
Dependent Variable		
Z-score	Return on assets (ROA) plus the ratio of equity to assets (ROE) divided by the standard deviation on ROA	Own computation based on bank-level data from Bankfocus
Foreign bank variables		
Foreign bank Foreign assets Foreign ownership	The percentage number of foreign banks to total banks in the host country – measured at country level The share of assets of foreign banks to total banking sector assets – measured at country level. Dummy variable (at bank-level) equal to one if bank is foreign owned (50% or more of their assets)	GFDD (2019), Bankfocus & Claessens and Van Horen (2014)
Other variables		
Size	The proportion of a bank's assets to total assets of the banking sector (%)	Own computation based on data from Bankfocus
Concentration	The percentage of the country's total assets owned by the country's three largest banks.	GFDD (2019) and Bankfocus
Capitalisation	Ratio of equity to total assets. It measures the adequacy of shareholder funds to cushion the bank against risk and support growth	GFDD (2019) and Bankfocus
Funding structure	The ratio of non-deposit funding to total short-term funding	Own computation based on bank-level data from Bankfocus
Lerner index	A measure of market power (competition) at the bank level	Own calculation based on bank-level data from Bankfocus
GDP growth rate	Real GDP annual growth rate (%)	IMF - IFS
Regulatory quality	An indication of the government's ability to implement policies and laws that facilitate and encourage private sector development. The index ranges from -2.5 (weak and ineffective regulatory environment) to +2.5 (strong regulatory and supportive regulation)	WBGI

Table 3.15: Trend in foreign bank penetration (% number) of foreign banks in SSA (2005-2019)

Country	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Angola	50.0	50.0	55.0	55.0	45.0	46.0	46.0	46.0	46.0	34.8.0	30.4	30.4	30.4	30.4	30.4
Benin	78.0	78.0	78.0	78.0	89.0	89.0	89.0	89.0	89.0	85.7	85.7	85.7	85.7	85.7	85.7
Botswana	63.0	56.0	56.0	60.0	60.0	60.0	60.0	60.0	60.0	70.0	89.0	70.0	70.0	70.0	70.0
Burkina Faso	88.0	89.0	89.0	100	100	100	100	100	100	86.7	86.7	86.7	86.7	86.7	86.7
Cameroon	56.0	60.0	64.0	73.0	80.0	82.0	73.0	73.0	73.0	61.5	61.5	61.5	61.5	61.5	61.5
Cape Verde	-	-	-	-	33.3	37.5	37.5	50.0	54.5	54.5	54.5	54.5	54.5	54.5	54.5
DR Congo	-	-	-	-	55.6	61.1	61.1	61.1	61.1	61.1	66.7	66.7	66.7	66.7	66.7
Ivory Coast	69.0	71.0	71.0	73.0	71.0	71.0	71.0	71.0	71.0	89.7	89.7	89.7	89.7	89.7	89.7
Eswatini	80.0	80.0	80.0	60.0	60.0	60.0	60.0	60.0	60.0	100	100	100	100	100	100
Ghana	61.5	52.0	48.0	48.0	50.0	55.0	62.0	63.0	63.0	52.0	51.9	55.2	63.0	73.7	60.9
Kenya	28.0	28.0	25.0	31.0	31.0	29.0	29.0	29.0	32.0	32.6	33.3	35.7	35.7	35.7	48.1
Lesotho	100	100	100	100	100	100	100	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Madagascar	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Malawi	43.0	43.0	43.0	25.0	25.0	25.0	25.0	25.0	25.0	40.0	40.0	40.0	60.0	60.0	62.5
Mali	38.0	44.0	44.0	56.0	56.0	67.0	67.0	67.0	67.0	75.0	75.0	75.0	75.0	75.0	75.0
Mauritania	14.0	14.0	25.0	38.0	38.0	29.0	38.0	38.0	38.0	23.1	23.1	23.1	23.1	23.1	23.1
Mauritius	71.0	73.0	69.0	64.0	64.0	60.0	60.0	60.0	60.0	47.1	47.1	52.9	52.9	52.9	52.9
Mozambique	90.0	90.0	90.0	83.0	83.0	85.0	85.0	85.0	85.0	76.5	82.4	82.4	82.4	82.4	82.4
Namibia	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	50.0	50.0	60.0	60.0	60.0	60.0
Niger	83.0	86.0	86.0	86.0	86.0	86.0	86.0	71.0	71.0	71.4	71.4	71.4	71.4	71.4	71.4
Nigeria	10.0	15.0	15.0	15.0	15.0	15.0	20.0	28.0	28.0	13.3	13.3	13.3	13.3	13.3	13.3
Rwanda	38.0	38.0	38.0	50.0	50.0	50.0	50.0	50.0	50.0	61.5	61.5	61.5	61.5	61.5	61.5
Senegal	64.0	77.0	85.0	83.0	83.0	83.0	83.0	83.0	83.0	84.6	84.6	84.6	84.6	84.6	84.6
South Africa	23.0	24.0	24.0	24.0	23.0	24.0	24.0	24.0	24.0	29.4	29.4	29.4	29.4	29.4	29.4
Tanzania	63.0	63.0	62.0	62.0	63.0	65.0	67.0	67.0	67.0	34.0	36.0	38.0	38.0	40.0	38.0
Togo	40.0	33.0	33.0	33.0	17.0	-	-	-	17.0	50.0	50.0	50.0	50.0	50.0	50.0
Uganda	71.0	79.0	79.0	76.0	83.0	83.0	79.0	83.0	83.0	76.0	76.0	76.0	76.0	76.0	76.0
Zambia	70.7	70.0	80.0	90.0	92.0	93.0	94.0	94.0	94.0	73.7	73.7	72.2	82.4	72.2	72.2
Zimbabwe	21.0	23.0	31.0	31.0	31.0	31.0	31.0	31.0	38.0	31.3	31.3	37.5	37.5	37.5	37.5
Average	**57.6**	**58.5**	**59.7**	**60.6**	**59.6**	**61.8**	**62.2**	**61.7**	**60.6**	**60.9**	**61.0**	**61.3**	**62.6**	**62.7**	**62.7**

Source: GFDD

Table 3.16: Trend in foreign bank penetration (% share of assets) of foreign banks in SSA (2005-2019)

Country	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Angola	48.0	49.0	50.0	52.0	54.0	53.0	54.0	54.0	54.0	42.0	33.8	34.3	35.2	34.8	39.9
Benin	90.0	92.0	92.0	92.0	89.0	96.5	100	100	98.4	98.9	99.1	99.3	100	100	100
Botswana	94.0	94.0	93.0	93.0	90.0	88.0	84.0	79.0	78.0	79.2	82.5	81.8	82.0	82.4	82.8
Burkina Faso	79.0	80.0	76.0	100	100	100	100	90.0	93.7	93.8	94.1	94.4	95.1	95.1	95.8
Cameroon	71.0	74.0	71.0	82.0	80.0	75.0	77.0	76.0	52.3	53.2	57.9	67.9	56.6	57.1	53.7
Cape Verde	-	-	-	-	51.7	47.1	46.2	45.9	45.9	44.7	48.5	45.1	46.3	46.0	43.6
DR Congo	-	-	-	-	68.9	69.7	76.5	57.9	52.8	67.4	67.5	69.6	71.4	69.9	69.5
Ivory Coast	90.0	100	-	-	84.7	85.1	83.5	81.4	81.6	82.3	82.8	84.0	83.4	83.0	83.5
Eswatini	82.0	82.0	82.0	82.0	82.0	82.0	78.0	78.0	100	100	100	100	100	100	100
Ghana	53.7	58.0	61.0	64.0	61.0	64.0	67.0	69.0	65.2	62.5	59.5	63.9	62.0	63.2	63.5
Kenya	46.0	46.0	39.0	38.0	38.0	35.0	33.0	31.0	34.0	31.0	30.9	30.9	31.7	33.0	35.7
Lesotho	100	100	100	100	100	100	100	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Madagascar	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Malawi	46.0	43.0	37.0	31.0	29.0	28.0	29.0	34.0	33.0	39.6	38.3	43.8	59.1	65.6	63.9
Mali	28.0	30.0	40.0	52.0	48.0	61.0	100	100	95.1	95.6	95.4	90.0	90.1	90.6	95.2
Mauritania	3.0	-	4.0	10.0	4.0	7.0	18.0	4.0	23.0	17.2	38.0	36.9	15.4	13.1	7.7
Mauritius	44.0	58.0	74.0	66.0	66.0	68.0	63.0	63.0	59.0	59.1	53.1	49.2	45.3	42.2	40.2
Mozambique	99.0	99.0	100	99.0	99.0	99.0	98.0	96.0	94.0	91.6	91.0	92.9	93.4	90.4	89.8
Namibia	73.0	59.0	58.0	53.0	54.0	54.0	49.0	52.0	47.0	69.7	67.5	71.6	71.8	69.9	71.4
Niger	72.0	74.0	69.0	-	91.2	91.8	89.8	90.3	80.8	82.8	81.3	84.1	83.1	82.0	84.2
Nigeria	-	4.0	6.0	4.0	3.0	4.0	17.0	20.0	16.0	16.7	16.0	15.8	15.6	14.4	13.9
Rwanda	53.0	54.0	39.0	43.0	24.0	16.0	13.0	62.8	65.7	65.7	64.9	61.4	65.3	45.7	43.4
Senegal	62.0	68.0	93.0	93.0	86.0	85.0	94.0	94.0	92.2	92.8	92.5	91.3	90.4	90.0	95.4
South Africa	22.0	22.0	25.0	24.0	22.0	22.0	25.0	24.0	23.0	15.9	16.7	16.4	15.3	16.0	28.9
Tanzania	92.0	93.0	87.0	56.0	54.0	45.0	40.0	39.0	46.0	47.4	47.3	43.5	42.6	42.6	40.6
Togo	50.0	48.0	46.0	51.0	10.7	8.5	9.7	9.0	29.3	22.7	27.7	33.3	35.3	33.6	37.4
Uganda	89.0	95.0	95.0	86.0	89.0	89.0	80.0	81.0	85.0	89.3	88.9	89.6	84.7	85.8	87.3
Zambia	71.0	70.0	88.0	99.0	100	99.0	99.0	99.0	99.0	65.8	69.9	70.8	74.9	73.0	73.4
Zimbabwe	-	-	-	-	61.0	57.0	55.0	36.0	39.0	38.3	37.1	43.3	51.4	78.2	46.9
Average	**66.3**	**67.7**	**65.0**	**65.4**	**63.5**	**63.1**	**64.8**	**63.5**	**64.1**	**63.5**	**64.0**	**64.8**	**64.6**	**64.6**	**64.2**

Source:GFDD

Table 3.17: Principal Component Analysis (PCA) eigenvalue decomposition matrices for governance institutional factors

Principal components/correlation — Number of obs. = 3,433
Number of comp. = 1
Trace = 4

Rotation: (unrotated = principal) — Rho = 0.7839

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.136	2.694	0.784	0.784
Comp2	0.441	0.220	0.110	0.894
Comp3	0.221	0.019	0.055	0.950
Comp4	0.202	–	0.050	1.000

Principal components (eigenvectors)

Variable	Comp1	Unexplained
Corruption	0.517	0.161
Regulatory quality	0.503	0.205
Voice of Accountability	0.503	0.207
Political stability	0.475	0.291

Chapter 4: The Impact of Bank Competition and Capital Regulation on Interest Rate Pass-Through in Sub- Saharan Africa

4.1. Introduction

The competitive and regulatory environment in SSA in which banks operate has fundamentally evolved over the past two decades. In several countries, policy reforms such as deregulation, financial liberalization, as well as bank consolidations have all contributed to changes in the competitiveness of the banking systems. Among the key policy objectives of the liberalisation program in SSA was to promote competition in the banking sector by removing entry controls (Harvey et al., 1998). The policy expectation was that increased competition would promote efficiency in the banking sector – and by implication (and among other things), the sector would serve as a better catalyst and conduit for monetary policy transmission to the real economy. The role of competition in dampening or amplifying the IRPT i.e., how changes in the official monetary policy rate are transmitted to commercial banks rates, has drawn increasing interest from researchers particularly after the global financial crisis (GFC) (see, for example, (Leroy & Lucotte, 2015; van Leuvensteijn et al., 2008; Gropp et al., 2007; van Leuvensteijn et al., 2013). The interest has partly arisen from the realization that competition may not always be stability enhancing, and that disruptions in the banking system also cause disruptions in monetary policy transmission.

After the global financial crisis (GFC), SSA supervisory agencies also adopted stringent regulatory capital requirements aimed at enhancing the stability of the banking sector (BRSS, 2019). Although there is broad consensus that a stringent capital regulation enhances the stability of banks (Basel II, 2004) and improve market confidence in banks' solvency and thus reduce their cost of funding (Noss & Toffano, 2016), concerns have been raised that adoption of higher capital requirements might impose significant costs on the banking system and the broader economy as banks pass over the cost to borrowers and pay less on deposits to compensate for the high cost of capital (Fidrmuc & Lind, 2020; Heuvel, 2002; Basel II, 2004). Some studies (see for example, Eickmeier et al., 2018; Imbierowicz et al., 2021; Bridges et al., 2014; Noss & Toffano, 2016; Takáts & Temesvary, 2019) establish that with a binding risk-based capital ratio (as is the case under the current Basel standards), banks cannot simply expand credit without obtaining additional capital. In this context, although stringent capital regulation can be effective in limiting financial stability risks, it can also have the unintended consequences of limiting economic expansion by

curtailing credit growth. Capital regulation is thus projected to change how banks react to a monetary policy stimulus.

Given that competition and capital regulation have both been prominent reform areas in SSA, an analysis of both aspects on the IRPT raises interesting questions for policy analysis. However, of the several studies that have examined the IRPT, not many have focused on SSA and even fewer have attempted to explore the implication of competition and/or capital regulation on the IRPT. The few documented studies to my knowledge that examine the IRPT at cross country level in SSA, namely, (Nel et al., 2011) and (Sander & Kleimeier, 2006), are both limited in scope and do not assess how competition and capital regulation affects the IRPT. This gap in the literature is surprising given the harmonisation initiatives that have been under way for some time in the different regional blocks and the various enhancements that have been made to the regulatory capital regime in several SSA countries since the introduction of Basel 1 in 1988. The gap also poses a critical problem in terms of the design or implementation of a monetary policy approach that balances growth and supervisory policy objectives.

4.1.1. Objectives of study

The primary objective of the study is to examine how competition and capital regulation affect the IRPT in SSA. Specifically, the study seeks to achieve three specific objectives as follows:

1. To determine if there is complete or incomplete long-run IRPT in SSA;
2. To investigate how competition (market power) affects the IRPT in the long-run; and
3. To investigate how capital regulation affects the IRPT in the long run.

The study seeks to answer the following research questions:

1. Is the IRPT complete or incomplete in SSA?
2. Does competition enhance or reduce the size of the long-run IRPT to commercial banks in SSA? and
3. Do higher capital requirements enhance or reduce the effectiveness of monetary policy transmission in the long-run IRPT in SSA?

The study is important in two ways. First, the key focus of monetary authorities (central banks) is to control and influence short-term market interest rates. The decisions of the central bank, in turn, can thus affect the pricing practices of commercial banks and consequently, the financing requirements of companies and households in the entire ecosystem. In this context, how successful monetary policy is in stimulating economic activity is largely gauged by how commercial banks adjust their rates when the monetary policy rate is adjusted i.e. the size of the pass-through (Gregor & Melecký, 2018). Since most firms in SSA largely rely on bank credit for capital financing (due to undeveloped capital markets in most jurisdictions), understanding how competitive conditions in the banking market impacts monetary policy transmission to commercial bank rates is critical for central banks to implement their policies. Second, to improve banking sector stability, most SSA supervisory agencies have adopted more stringent capital regulations for banks – which in turn could have potential implications on the cost of banking as banks pass over the higher cost of capital to borrowers and depositors. In some cases, the higher capital requirements have also led to bank consolidations – reforms that can in turn affect banking sector competitiveness as the market becomes more concentrated with few players. Examining how regulatory capital requirements impact the IRPT can thus provide important policy insights to central banks – for instance, whether there is a trade-off between supervisory and monetary policies. To my knowledge, this is the first work in SSA to look at the competition/capital–monetary policy nexus in this way, even though competition and IRPT have each been studied separately in a number of empirical investigations.

4.1.2. Contribution of the Study

The study makes three contributions to the banking and monetary policy-related literature. First, unlike the studies by (Nel et al., 2011) and (Sander & Kleimeier, 2006) that focused only on determining the size of the IRPT in four selected African countries, the current study analyses the implications of competition and capital regulation on the IRPT and is based on an expanded sample. Given the economic integration initiatives currently underway in most trading blocks in SSA, observations from a larger cross-country sample may be more informative to policymakers. The two studies also utilised relatively old data (1994-2007) – the current study takes into account post-crisis developments by using latest data up to 2019. In this way, the current work adds to literature on contemporary banking issues by generating fresh evidence on the implications of

competition and capital regulation on the IRPT in developing nations. The new evidence could directly inform monetary and bank supervisory policies of central banks. For instance, the finding that competition improves the IRPT implies that regulatory policies that result in bank consolidations – due to either higher capital requirements or mergers and acquisitions – need to be implemented in a manner that does not result in increased market power in the financial system.

Second, the current study uses a more robust analytical approach to examine the competition/capital–IRPT relationship from two perspectives: first, it explicitly takes into account the existence of cross-sectional dependence in the sample; and second, it employs a more realistic approach to treating parameter coefficients as heterogeneous. The two studies cited above, as well as most other IRPT-related studies at global level (see, for example, Marotta, 2009; Sopp, 2018; van Leuvensteijn et al., 2013; Kok & Werner, 2006) ignore either or both of these aspects. Because the SSA region comprises countries with significant disparities in banking systems and income levels, assuming parameter homogeneity could be misleading. Also given the possibility of some common unobserved factors – arising for instance from financial integration, common commodities and monetary shocks and cross-border banking interactions – the aspect of cross-section dependence, if not accounted for, could seriously impact the precision and reliability of the estimated coefficients (Ditzen, 2019). As applied economic research is used to inform policy, such errors can thus lead to incorrect policy inferences. The current study addresses these gaps and thus contributes towards a more robust analysis of the competition/capital-IPRT relationship. Finally, the study quantifies and documents the different sizes of the IRPT for the different countries in SSA. Such documentation can feed into assessments on macroeconomic convergence at regional level and inform member countries' policy decisions on the integration process[10].

The rest of the chapter is arranged as follows: Section 4.2 provides an overview of monetary policy implementation in SSA including certain trends in policy and bank rates. Section 4.3 is a literature review – focusing on the theoretical framework of the IRPT, the theories that explain commercial banks' interest rate adjustment and pricing behaviour, and the related empirical studies. The study

[10] SSA sub-regions have used a variety of approaches to achieving macroeconomic convergence. Indicators of monetary and banking soundness are essential for evaluating the development of integration and harmonisation.

variables, their definition and sources are described in Section 4.4, while the methodological framework, findings, and discussion appear in Section 4.5. Section 4.6 is the conclusion.

4.2. A Synopsis of Monetary Policy in SSA

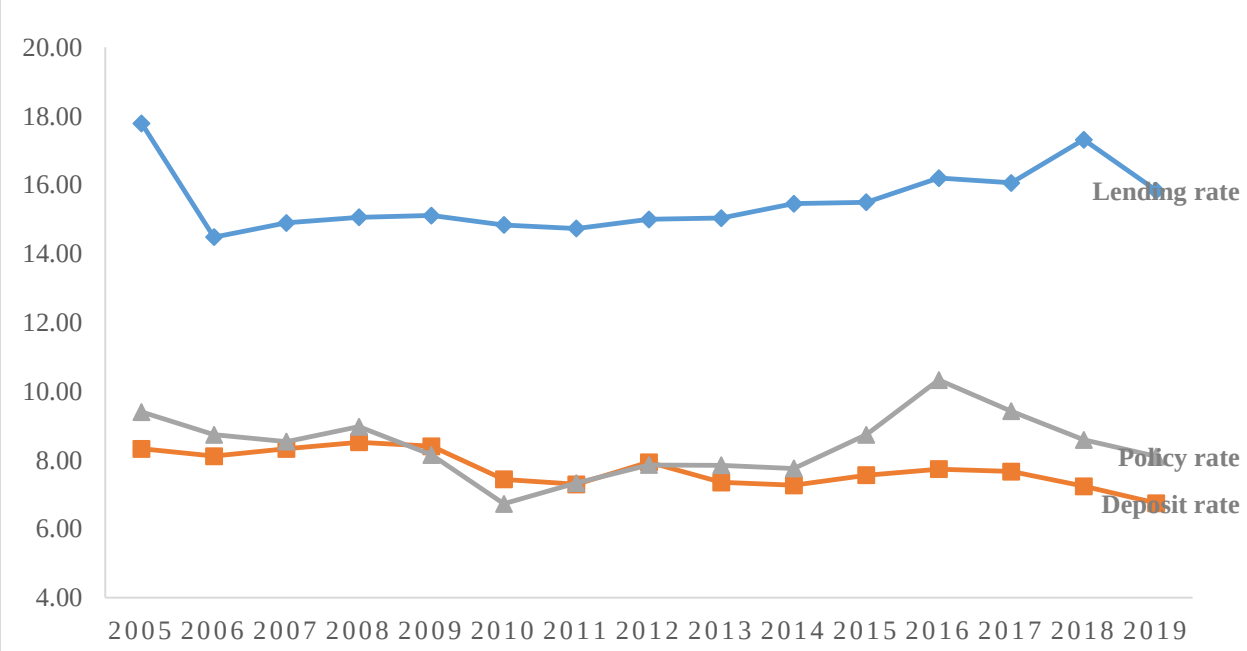
Monetary policy objectives in almost all SSA countries are generally similar and can be summarised in two-fold: first, to maintain price stability; and second, to create and preserve a conducive environment for economic growth (Nel et al., 2011). However, despite similar objectives, a review of selected central banks' annual reports indicates that the targets of monetary policy and the transmission mechanisms differ across countries. For instance, in terms of operational targets, most countries still use reserve money or the monetary base, while others (e.g., South Africa and Ghana) formally adopted an inflation-targeting framework. A few other countries have adopted just elements of inflation targeting while retaining a policy role for exchange rate or monetary targets. Botswana and Mauritius are good examples of the latter category. Nevertheless, interest rates remain the key focus of monetary policy intervention in all countries, regardless of the monetary policy framework. This is because of their influence on economic activity through their effect on various prices in the economy. As a result, commercial banks' lending and deposit rate setting behaviour remains central to the analysis of monetary policy in the region.

In terms of instruments, most countries use a combination of direct instruments (for example, reserve requirements) as well as indirect instruments such as foreign exchange interventions and open market operations. Historically, commercial banks in most SSA countries have routinely held nearly double the amount of legally required reserves against deposits, although that trend has significantly changed in most countries over the past decade (IMF Regional Outlook Report, 2018). Unlike the Euro area, there is no common monetary union in SSA. However, two active monetary unions/blocks are present, mostly covering French-Anglophone African (CFA) countries: the Central African Economic and Monetary Community (CEMAC) and ECOWAS. Besides these two unions, there is a Common Monetary Area (CMA) comprising Lesotho, Eswatini, Namibia, and South Africa, in which the South African Rand is essentially the legal tender. Even though the other member states have their own currencies, they are all exchanged at the same rate as the Rand. As a result, monetary policy in the CMA continues to be influenced by the South African Reserve Bank. Aside from these unions and the CMA, monetary policy in other

SSA countries is essentially the responsibility of the respective national central banks but harmonisation and macro-economic convergence remain key aspirations for the continent.

Figure 4.1 shows how commercial banks' lending and deposit rates have on average, tracked the official policy rate in SSA from 2005 to 2019. To allow for a more disaggregated view, the study also presents the movements in monetary policy rates, lending rates, and deposit rates in each country in the sample in Figures 4.20 to 4.24 in Section 4.6.2 in Appendix 3. The overall picture is that lending and deposit rates in almost all the countries closely follow movements in the policy rate although the picture is slightly less conspicuous for countries belonging to the ECOWAS (Benin, Burkina Faso, Ivory Coast, Mali, Senegal and Togo). This is partly due to certain interest rate controls that are prevalent in these countries.

Figure 4.1: Average policy rates, lending, and deposit rates in SSA (2005-2019)



Source: Own compilation using data from IMF, IFS

In terms of the regulatory capital regime, SSA countries have adopted Basel capital standards and most of them are fully compliant with Basel I framework (BRSS, 2019). The minimum regulatory capital ratios (tier 1 and total capital) in most SSA countries are however, on average, substantially higher than those recommended by the BCBS. This partly reflects the high credit risk prevalent in

the SSA region. Given the high cost of raising equity in most countries, the high regulatory capital requirements compel banks to operate just within or slightly above the regulatory minimum. In other words, the "capital buffer" i.e. gap between the regulatory minimum and the actual capital held by banks is relatively small. Out of the 30 countries surveyed by the World Bank in Africa between 2009 and 2019, over half increased their regulatory capital requirements; 16 countries fully migrated to Basel II; while a few others (South Africa, Mauritius, Kenya, Nigeria and Namibia) are either in the process of migrating to Basel III or partially implemented some elements of Basel III. Apart from the stability enhancement objective, the adoption of Basel capital standards by SSA countries has also been dictated by the need to maintain international correspondent banking relationships. Correspondent banks in developed countries require banks operating in developing countries to ascribe to, and maintain the same international regulatory standards – failure which risks isolating these countries from global trade.

4.3. Review of the Literature

In terms of the review of existing literature, the study first discusses the theoretical foundations of the IRPT mechanism, interest rate stickiness, and the models that explain the price setting behaviour of banks. It then reviews some empirical IRPT-related studies, including those that analyse the implications of competition and capital regulation on the IRPT to commercial banks' rates.

4.3.1. Theoretical Literature

4.3.1.1. Interest Rate Adjustment: Conceptual Framework

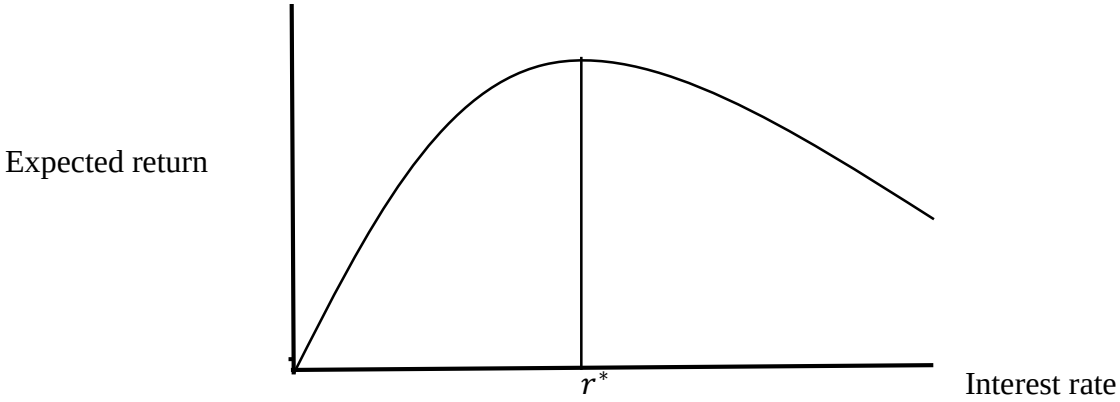
The theoretical literature documents the interest rate channel as the initial step and most direct relationship to commercial bank interest rates. Within this framework, the banking system is the conduit through which decisions of the central bank on monetary policy stance i.e. adjustments in the official policy rate are transmitted to the different sectors of the economy. This implies that the degree of monetary policy effectiveness will largely depend on the magnitude of adjustment of bank lending and deposit rates. In a market where there is perfect information, commercial banks' responses to policy rate changes are supposed to be immediate and one-for-one (Kwapil & Scharler, 2006). In such a scenario, there is what is called "complete" IRPT to commercial banks' rates. In practice, however, the IRPT process to loan and deposit rates is not immediate, and the

magnitude is not one-to-one. The size of the pass-through itself also tends to vary significantly across markets and time periods.

The literature also distinguishes between short-term and long-term adjustments (Cottarelli & Kourelis, 1994). In the long run, the theoretical expectation is that bank rates will adjust by a relatively larger degree or indeed adjust completely to changes in the policy rate. The same however, is not expected in the short term, because most investors and customers may not be aware of alternative investment sources to deposits and other financing options. In general, lending and deposit rates may adjust very slowly – or show sluggish adjustment – both in the short run and long run. Many theories have attempted to explain this phenomenon. Below is a summary of each of these theories.

Information Asymmetry Theory. This theory by Stiglitz & Weiss, (1981), postulates that the market is usually characterised by incomplete information – because only one or few participant(s) in an economic transaction has/have more information or knowledge than the other(s). Stiglitz & Weiss, (1981), show that banks may not respond to excess loan demand or high cost of funds through upward adjustments in their pricing. For instance, there is stickiness in upward adjustment of lending rates because such a decision can result in adverse selection (a situation where riskier borrowers with riskier projects are disproportionately more attracted to borrow even at high lending rates) and moral hazard (a situation in which customers have an incentive to invest in risky projects over safer ones). The authors argue that riskier borrowers get motivated to borrow at higher interest rates because not only do they anticipate higher returns from the risky projects, but also because they knowingly can default on their debts when the business environment becomes adverse. Graphically, the credit rationing and information asymmetry model can be illustrated as follows:

Figure 4.2: Credit rationing in the Stiglitz and Weiss (1981) model



Source: Stiglitz and Weiss (1981)

From figure 4.2, if lending rates increase beyond the optimum rate r*, credit-worthy (less risky) customers will shun borrowing – leaving only the riskier customers who are willing to borrow at such high rates. Banks will thus desist from further lending when lending rates exceed the optimum level and instead will opt to ration credit. If a bank decides to extent credit by charging a lending rate beyond the optimum rate r*, the expected return will be reduced because risks from adverse selection and moral hazard creep in. This theory has, however, been criticized mainly for its simplicity that the market comprises only two sets of borrowers and the assumption that banks always ration credit (Bondt, 2005).

The Collusive Behaviour Hypothesis. This theory describes the slow response of bank interest rates in terms of market concentration and competition levels and how banks behave under such circumstances (Hannan & Berger, 1991). The central argument is that banks are generally keen to preserve their collusive pricing arrangements in the market. As a consequence, they are unlikely to lower lending rates when there is a downward adjustment of the policy rate – because when interest rates are lowered, the bank's revenue stream from interest income is also reduced. Banks, on the other hand, are reluctant to raise deposit rates when the policy rate is raised because doing so would result in greater costs for interest payments on deposits. Therefore, while lending rates will exhibit some stickiness to go down, as banks are afraid to lose revenue, deposit rates will have upward rigidity because management fear higher costs.

The Customer Reaction Hypothesis. The idea behind this hypothesis is that banks fear that customers may respond adversely when monetary authorities adjust the official policy rate.

Because of this fear and uncertainty, banks may not increase their lending rates when authorities adjust the policy rate upwards (Neumark & Sharpe, 1992). Related to this hypothesis is the switching cost theory – where customers do not find it cost-effective to search for banks that offer better yield on investments or lower loan rates because searching or changing between banks entails incurring costs. The management of banks will thus exploit this inertia in the switching behaviour of customers and opt not to adjust their pricing when the policy rate is adjusted.

Menu Costs Theory. The argument behind this theory of bank pricing behaviour is that when prices fluctuate, banks suffer some expenses. There may also be some fixed costs associated with pricing changes (Rotemberg & Woodford, 1999). As a result, even after authorities adjust the policy rate, price stickiness will still be prevalent in the market. In particular, banks may leave their rates unchanged in cases when they perceive the change in policy rate to be temporary (Cottarelli & Kourelis, 1994). Banks will also not adjust or adjust very sluggishly if they perceive the change in policy rate to be insignificant or negligible because in such a case, the costs associated with changing the pricing menu are higher than the potential benefits that may arise from adjusting the rates.

4.3.1.2. Theories of Bank Pricing

Three major theories with respect to bank pricing behaviour are discussed in the literature: (Bondt, 2005) Mark-up model[11]; (Klein, 1971)-(Monti, 1972) model and (Ho & Saunders, 1981) Dealership model.

4.3.1.2.1. The Mark-Up Model

Bondt, (2005) applies the competition and marginal cost pricing theory to explain how banks price their loans and deposits. Under competitive markets, the model applies the equality of prices and marginal costs principle. However, in the case of imperfect markets, this equality no longer holds – the derivative of prices with respect to marginal costs is less than unity in that case. The specification of the model can be presented as:

[11] The Bondt (2005) Model is basically an extension of (Rousseas, 1985) Mark-up Pricing Theory.

$$br = \gamma_0 + \gamma_1 MMr \quad (4.0)$$

where br represents the commercial bank lending/deposit rate, MMR represents any related market rate which reflects the marginal cost faced by banks pertaining to funding, and γ_0 is a constant (i.e. mark-up over the marginal cost) (Bondt, 2005). The responsiveness of the demand for loans and deposits affects the size of γ_1. Because the demand for loans and deposits will be inelastic in an imperfect market, parameter γ_1 will be smaller than one. The demand for deposits will be more elastic in relation to bank deposit rates only if other substitute products for deposits exist in the market. The responsiveness of loans to changes in loan rates will on the other hand be largely determined or influenced by other available sources of funding or their accessibility to borrowers. In a case where banks exert market power, parameter γ_1 will similarly be less than one. The implication is that bank rates in oligopolistic and less competitive markets change partly and slowly, whereas rates in fully competitive markets adapt swiftly and totally (Bondt, 2005).

4.3.1.2.2. The Klein-Monti Model

The Klein-Monti model is largely based on the industrial-organizational theory of firm pricing behaviour where banks are viewed as profit-maximising entities that essentially offer two products: loans and deposits (Freixas & Rochet, 2008). The difference between the amount of deposits and loans i.e. the net funding position, determines whether the bank will lend or borrow from the interbank market. In its basic original form, the Klein-Monti model assumes a single, monopolistic bank in the market, but several authors have extended it to analyse bank behaviour in monopolistic, oligopolistic or competitive banking markets (see for example, (Freixas & Rochet, 2008 and (Toolsema-Veldman & Schoonbeek, 1999).

In the extreme case of a monopoly (with one bank in the market) or under monopolistic competition, the Klein-Monti model assumes that the bank has the power to dictate loan and deposit pricing, but it does not have such pricing power in the interbank money market – where it resorts to in case of a funding gap or excess liquidity. The bank thus determines on how much loans (L) to issue and Deposits (D) to accept – thereby influencing the relevant interest rates. The loan demand function $L(r_L)$, for an individual bank is downward sloping while the supply curve for deposits $D(r_D)$ is upward sloping. When these functions are inverted, they can then be

expressed as r_L (L) and r_D (D), respectively. The bank's production costs (C) comprise deposit costs and loan costs. The profit maximisation function for a bank can thus be expressed as:

$$P = P(L, D) = P(r_L(L) - r)L + \big(r(1-\alpha) - r_D(D)\big)D - C(D, L) \quad (4.1)$$

Where P is bank profit, r is the interbank rate; and α is the mandatory central bank reserve requirement. Taking the first derivative from equation (4.1), results in:

$$\frac{\partial P}{\partial L} = r'_L(L)L + r_L - r - C'_L(D, L) = 0 \quad (4.2a)$$

$$\frac{\partial P}{\partial D} = -r'_D\,(D)D + r(1-\alpha) - r_D - C'_D(D, L) = 0 \quad (4.2b)$$

Based on the above equations, the Klein-Monti model in a monopolistic market predicts that the bank's lending decision $(r_L(L)$ is determined independently of deposits, $(r_D(D)$. The loan demand elasticity and deposit supply elasticity can be derived from equation (4.2b) as follows:

$$\varepsilon_L = -\frac{r_L L'(r_L)}{L(r_L)} > 0 \quad and \quad \varepsilon_D = \frac{r_D D'(r_D)}{D(r_D)} > 0 \quad (4.3)$$

Re-arranging (4.3) and using the equilibrium solutions r_L^* and r_D^*, we get:

$$\frac{r *_L - (r + C'_L)}{r_L^*} = \frac{1}{\varepsilon_L(r_L^*)}, and \quad (4.4a)$$

$$\frac{r(1-\alpha) - C'_D - r *_D)}{r_D^*} = \frac{1}{\varepsilon_D(r_D^*)} \quad (4.4b)$$

Equation (4.4a) shows the Lerner index for loans while of equation (4.4b) shows the Lerner index for deposits rates. The equations show that the higher the bank's market power (i.e., higher Lerner indices), the lower the elasticities, resulting in low deposit rates and very high lending rates (higher intermediation margins). The Klein-Monti model, therefore, shows that a bank that has some monopoly power in the market will adjust its loan and deposit volumes to match the Lerner index to inverse elasticities.

Under competitive markets, the assumption in the model is that banks still seek to maximise profits but are price takers in the market. The banking market itself is comprised of a large number of banks (N), with identical production costs, depicted as (C). The production costs still comprise deposits costs (D) and loan costs (L) such that:

$$C = C(D,L) \tag{4.5}$$

Since banks are price takers in the market, the implication is that the market rate (r), loan rate (r_L) and deposit rate (r_D) are all given – banks have no control over these prices. The relationship between loan demand L(r_L) and interest rates is negative – i.e., loan demand is high when interest rates are low. The reverse is true for deposit supply D(r_D): depositors are willing to save more in banks when interest rates are high. The loan demand function for an individual bank is thus downward sloping while the supply curve for deposits is upward sloping. Under the model, the bank can also participate in the interbank market. The banks' profit maximization function can thus be specified in terms of loan and deposit intermediation margins, less production costs (Misati et al., 2011):

$$P(L,D) = (r_L - r_c)L + [r_c(1-\alpha) - r_D]D - C\ (D,L) \tag{4.6}$$

where π represent bank profits. The first-order condition of equation (4.6) can be expressed as follows:

$$\frac{\partial P(L,D)}{\partial L} = (r_L - r) - C'_L(L,D) = 0, \text{ and} \tag{4.7a}$$

$$\frac{\partial P(L,D)}{\partial D} = r\ (1-\alpha) - r_D - C'_D(L,D) = 0 \tag{4.7b}$$

Where: $(r_L - r)$ is the intermediation margin; $r(1-\alpha) - r_D$ is the deposit margin (difference between the deposit rate and the market rate). C'_L and C'_D depict the marginal costs for generating loans and maintaining deposits, respectively. Equations (4.7a) and (4.7b) show that in a perfectly competitive market, a bank will modify the number of its loans and deposits until interest rate margins match the marginal costs of creating loans and servicing deposits. Solving for r_L in equation (4.7a) and re-arranging the terms results in:

$$r_L = \alpha r + r_D + C'_L(L,D) + C'_D(L,D) \tag{4.8a}$$

The interest spread can then be derived from equation (4.8a) as:

$$r_L - r_D = \alpha r + C'_L(L, D) + C'_D(L, D) \quad (4.8b)$$

Equation (4.8b) shows that intermediation margins ($r_L - r_D$) are driven by reserve requirements and marginal costs for producing loans and deposits. Competition should thus reduce the prices of banking products, i.e., the margins, while increasing quantity.

4.3.1.2.3. The Dealership Model

The "Dealership model," by Ho & Saunders, (1981), treats loans and deposits as a single commodity with a single maturity. Under the model, the bank acts as a dealer (i.e., an intermediary who buys deposits from savers and sells them to borrowers as loans). The model also assumes that banks are unable to predict when a new loan will be requested or when more deposits will be required. As a result, banks will strive to match these by borrowing (when they have insufficient deposits) or lending (when they have excess deposits) on the interbank. The former condition provides additional funding but increases refinancing risk, whereas the latter situation increases reinvestment risk. The pricing of loans and deposits can be presented as follows:

$$P_L = p - b \quad (4.9a)$$

$$P_D = p + a \quad (4.9b)$$

where P_L and P_D are loan and deposit prices, respectively; p depicts what in the opinion of the bank is the "true" price of the loan or deposit; and a and b are fees for the provision of the intermediary service. The sum of these fees represent the mark-up margin i.e. the interest spread. In the model, p, P_L and P_D are all prices that are inversely related to deposit and loan rates, i.e., a high deposit price implies a low deposit rate and vice versa. The authors show that banks manage their loan and deposit rates by manipulating these fees. For instance, in the case of the deposit supply exceeding loan demand, banks will increase a – i.e., deposit fees lead to a rise in deposit price and a consequent decrease in deposit interest rate. In this way, the banks will discourage a further new deposit supply. Similarly, if a bank wishes to reduce its lending rate, it reduces the fees b – thereby increasing loan demand. Based on this framework, Ho & Saunders, (1981) demonstrate hat the interest spread depends on among other factors, bank market structure.

4.3.1.3. Capital regulation and monetary policy

The theoretical literature identifies two distinct ways in which capital regulatory requirements can change the impact of monetary policy shocks to banks: through the "bank lending channel" and "bank capital channel" (Heuvel, 2002). In terms of the former, capital regulation affects monetary policy transmission because, in addition to deposits, banks also finance loans in part with equity. An increase in regulatory capital requirements is thus viewed as an increase in funding cost to the bank – which could induce management to raise interest rates and/or lower deposit rates[12]. This channel may however, be less potent when most banks in the system operate below or barely at the regulatory minimum. This is because with a binding risk-based capital regulatory regime, banks cannot simply expand their lending without additional capital – otherwise, they would breach the regulatory requirements and incur supervisory costs (Phi et al., 2019). This suggests that the effects of monetary policy will be smaller when more banks in the market have low capital levels relative to the regulatory minimum. Under the capital channel, banks with low equity will cut back lending by more than well-capitalised banks for fear of breaching the minimum regulatory capital requirement. Therefore, unlike the lending channel, the conditioning impact of higher regulatory capital requirements would in this case be more pronounced when the sector has a relatively large proportion of low-capitalised banks (Heuvel, 2002). To capture the conditioning effect of capital regulation, we incorporate an interaction term of the product of the capital ratio and the market rate.

The pass-through from capital regulation is theoretically modelled along the (Bondt, 2005) model i.e. equation 4.1 but augmented with the capital adequacy ratio. Following Ehrenbergerová et al., (2022) and allowing for γ to have both, a constant (γ_0) and a time varying constant ($\gamma_{2,t}$) component, equation (4.1) can thus be re-written as:

$$B_r = (\gamma_0 + \gamma_{2,t}) + \beta MPR \qquad (4.10)$$

[12] If the banks resorts to paying a higher premium on deposits because equity has become more expensive, more stringent regulatory capital requirements would be associated with higher deposit rates in that case as banks try to attract more funding.

Several studies document the various factors that influence ($\gamma_{2,t}$) i.e. the mark-up component that varies with time (see for example, Leroy & Lucotte, 2015; van Leuvensteijn et al., 2013). Loading these factors into a vector X, we obtain:

$$\gamma_{2,t} = \alpha X_t + \in_t \quad (4.11)$$

where X depicts all other factors that may affect loan/deposit pricing including capital cost, credit risk premium, and other operational expenses. $\in_t$ is the noise component. The above specification conforms to the theoretical pricing mechanism based on risk-adjusted return on capital – where the pricing of an asset takes into account the bank's funding cost plus some adjustments for other cost factors as mentioned above. Higher (stringent) capital regulation thus increases the cost of capital allocation and hence increases the overall funding costs (Ehrenbergerová et al., 2022). Incorporating the capital cost, z_t in equation (4.11), results in the following:

$$B_r = \gamma_0 + \beta MPR + \alpha X_t + \delta z_t + \in_t \quad (4.12)$$

Equation (4.12) shows that the capital regulation can affect lending/deposit rates charged to borrowers (and by implication, the interest rate margin).

4.3.2. Empirical Studies

Cross-country studies specifically investigating competition and IRPT are generally very limited in SSA. Only two studies appear to have examined the competition-IRPT at cross country level: (Nel et al., 2011) and (Sander & Kleimeier, 2006). The former study examined how bank concentration impeded or facilitated the IRPT in four SSA countries (South Africa, Botswana, Zambia, and Nigeria) for the period 1994 to 2007. In all four nations studied, the findings showed that: (i) the IRPT was significantly impacted in a concentrated banking system, and (ii) commercial bank rates adjusted asymmetrically to changes in monetary policy rates. There was however very weak evidence to support the view that the asymmetries were as a result of bank concentration. This study, however, is limited in three ways. First, its scope did not include the implications of capital regulation and competition on the IRPT – it only focused on the bank concentration-IRPT relationship. As observed in the literature, both competition and concentration could simultaneously exist in the market (Berger et al., 2008). Second, it covered only four countries and

utilised old data (1994-2007). Given the economic integration initiatives currently underway in most trading blocks in SSA, observations from a larger cross-country sample may be more informative to policymakers. Finally, the study ignored cross-sectional dependence and the possibility of different slope coefficients – aspects that may have serious implications for the reliability of estimated coefficients and hence policy inferences. The study's methodological approach was thus limited in this respect.

Sander & Kleimeier, (2006) on the other hand, investigated the IRPT in the four countries that make up the South African Customs Union's Common Monetary Area (CMA). In their approach, the authors also explored whether the pass-through adjustment is asymmetric in each country. They found that in all CMA countries, the IRPT to lending rates is homogeneous and complete. The authors, however, observed variations in the magnitude of interest rate stickiness and asymmetric adjustment. Similar to the study by (Nel et al., 2011), this study did not consider competition and capital effects on the IRPT. The adopted empirical approach in this study also ignored cross-sectional dependence. At global level, very few studies (e.g. Ahmed, 2020; Talib et al., 2021) adopt empirical approaches that take into account cross-sectional dependence – however the focus and scope of these studies is not on competition/capital-IRPT nexus. The approach by De Graeve et al., (2007) also only considered parameter heterogeneity.

At the global level, empirical studies on the IRPT adopt different approaches. Some studies first analyse the IRPT within an error correction framework and then regress the coefficients on some structural and bank-specific factors to explain the IRPT size. Below, I present some of the studies that adopted such an approach.

Gigineishvili, (2011) examined the IRPT by analysing bank data from both, advanced and undeveloped economies. The sample coverage period was from 2005 to 2010. The author included several other factors to capture the macro and financial market structure characteristics and how these factors determine the size of the IRPT. The study found evidence that more competition strengthens the pass-through. The paper also found that per capita GDP, credit quality, overhead expenses and inflation have significant effects on the pass-through.

Horváth & Podpiera, (2012) analysed the IRPT in the Czech Republic between 2004 and 2008. They assessed the IRPT process for bank rates from the market rate and employed the panel integration methodology that allows for different slope parameters at bank-level. The authors also examined which bank-specific characteristics contribute to IRPT heterogeneity. They found that: (i) there are variations in bank pricing in the short term but not in the long-term; (ii) portfolio loan risk and the degree of efficiency are among the key factors that explain the size of the IRPT; and (iii) for banks that have a higher degree of relationship lending, the lending rates are found to be much smoother compared to those banks with a lower degree of relationship lending.

Saborowski & Weber, (2013) explored the determinants of the IRPT in the different global regions. They employed a structural panel Vector Autoregressive (VAR) model and examined both bank-specific and structural country characteristics and policies as determinants of the IRPT. Their framework also allowed for the inclusion of interaction terms. The authors observed that for advanced countries, the average size of the pass-through was relatively higher compared to less-developed countries. They attributed the outcomes partly to deep financial systems and an exchange rate system that is more flexible in advanced economies. They also noted that between 2003 and 2008, the mean pass-through in their sample increased from 30% to 60%, but that this trend was reversed after the GFC.

Avci & Yucel, (2017) studied the IRPT in Turkey by employing an interacted vector autoregressive approach. In their study, they utilised several other factors to determine their impact on the pass-through. They found a complete IRPT to commercial bank rates within eight months. Among the other factors, the authors found that competition, liquidity, and profitability all positively affect the size of the pass-through. However, regulatory quality had the opposite effect.

Hülsewig et al., (2009) explored how bank costs shape the transmission of monetary policy in the Eurozone. Similar to the approach by (Horváth & Podpiera, 2012), the authors used the market rate as the basis for investigating the IRPT to bank rates and employed a New Keynesian Dynamic General Equilibrium (DGE) model in their empirical analysis. The key assumption in their analysis was that the bank loan market is characterised by monopoly power – implying that lending rates exhibit sticky behaviour to a monetary policy stimulus. They document three findings: (i) the cost channel is partly mitigated when banks smoothen their lending rates; (ii) changes in bank prices

(lending rates) significantly explain changes in firm prices; and (ii) structural rigidities in the market hinder the IRPT.

Sander & Kleimeier, (2003) investigated the IRPT in the Eurozone between 1993 and 2002. In their empirical framework, the authors included structural factors as potential determinants of the IRPT. They also examined whether there is an asymmetric or symmetric adjustment of bank retail rates. Their findings are varied: (i) competition increases the magnitude of the IRPT in the Eurozone; (ii) the size of the IRPT to loan rates is positively impacted by market volatility; (iii) in markets where the volatility in deposits is low, the size of the pass-through is significantly reduced; (iv) the dampening impact of inflation on the pass-through is more pronounced in deposit and not loan markets; and (v) the level of financial development positively affects the IRPT.

Gropp et al., (2007) explored the implication of competition on the IRPT on different bank interest rates in the Euro region. Their information enabled a disaggregated examination of bank products. The main question was whether the IRPT is accelerated by financial market innovation and development. The authors observed that: (i) the pass-through happens more swiftly in countries where other products directly compete with bonds and stocks; (ii) in more competitive banking systems, the pass-through is substantially larger; and (iii) bank rates adjust slowly to policy rates both, in the short run and long.

Kok & Werner, (2006) studied the IRPT in 10 EU countries. They based their analysis on the pass-through from market rates to retail rates of different products between 1999 and 2004. They adopted a 2-stage approach: In the first stage, they analysed the pass-through to six different bank products. In the second stage, they regressed competition and the different macroeconomic and financial variables on the pass-through. They found that when there is less competition, the response to bank rates is slower – suggesting that higher levels of competition enhance the pass-through to bank rates.

Bondt, (2005) used bank-level data from selected EU countries between 1996 and 2001 to examine the IRPT using three econometric approaches. The long-term transmission of official policy rates to market interest rates was the main emphasis of the study. The market rate was viewed as the opportunity cost when it comes to attracting deposits or making loans. The findings show that the

IRPT is complete only for market rates that have a maturity of 3 months or less. For market rates of longer maturities, i.e., greater than 3 months, the pass-through is incomplete. In terms of size, the author found that the pass-through to lending and deposit rates ranges between 50-60%, respectively.

Perera & Wickramanayake, (2016) investigated how different structural factors affect the IRPT using panel data from 122 countries. They found that structural, institutional, as well as macro-economic factors are all significant determinants of the IRPT. In particular, the authors isolated banking competition, the degree of transparency of the monetary authorities and depth of financial system as the major explanatory factors of the pass-through. Their findings remain consistent even when the sample was split to account for cross-country heterogeneity.

Havranek et al., (2015) focused on the Czech banking system to examine the IRPT. Their focus of empirical analysis was to examine how bank policies pertaining to cost efficiency affects the pass-through. To calculate cost effectiveness scores, the authors used parametric (stochastic frontier) and non-parametric (data envelopment analysis) techniques. The findings were three-fold: (i) the pass-through for most bank products was noted to be complete for the period prior to the GFC. The size of the pass-through however was significantly reduced after the GFC; (ii) banks that pay high interest on deposits also price their loan highly; and (iii) banks that are more cost-efficient are slow to reprice their loans – thereby smoothing the lending rates for their clients.

Another approach that is also observed in the literature when examining the impact of structural factors on the IRPT is to directly include these variables or their interactions in the error-correction model. Some of the notable studies that adopted such an approach are summarised below:

Van Leuvensteijn et al., (2013), investigated how competition condition the size of the pass-through on loan rates in selected countries in the Euro from 1994 to 2004. The findings show that when competition is high: (i) bank loan rates are lower; (ii) there is a stronger pass-through to bank retail rates, and (iii) deposit rates are lower. The authors explain the third result in terms of bank income compensation, i.e., banks offer lower deposit rates to compensate for income losses caused by increasing loan market competition.

Leroy & Lucotte, (2015) explored the implication of competition on the IRPT in 11 European countries using monthly data from 2003 to 2011. They looked at the effects of pass-through on a variety of bank products. The authors extended their model to consider the effects of additional structural elements on IRPT. They found that competition boosts the IRPT to retail bank rates. They also noted that a sizeable percentage of the fluctuation in the IRPT in the Euro area is explained by the growth of the financial markets.

Holton & Rodriguez d'Acri, (2018) studied the fragmentation in monetary policy transmission in 12 Eurozone markets using individual bank data. Their investigation was conducted within the context of an error correction framework. The authors considered several factors, including bank size, capital, liquidity, risk, and asset quality. The findings indicate that: (i) the IRPT to bank lending rates is incomplete; (ii) higher loan asset impairment dampens the pass-through; and (iii) for smaller loans, the IRPT size largely depends on bank size and the source of funding. However, for larger loans, the IRPT size is largely affected by the bank's capital.

Gregor & Melecký, (2018) used a co-integration approach to analyse the IRPT in the Czech Republic. The IRPT was analysed based on the policy rate and the focus was on investigating its transmission to four types of bank loans: SME, consumer, mortgage, and corporate loans. They also examined if the pass-through was stable or if it varied depending on bank capital, the proportion of delinquent loans and foreign exchange transactions. They report two major outcomes: (i) the IRPT to SME loans rates was complete and significant; and (ii) foreign exchange interventions largely affected the mark-ups for corporate and SME rates.

De Graeve et al., (2007) applied an error correction framework to investigate the IRPT in the Belgian banking sector. They focused on the period between 1993 and 2003 and analysed monthly interest rate data for 31 banking institutions. Their empirical model took into account bank heterogeneity, allowing for changes in the slope parameters of particular banks. They found that the IRPT was incomplete in the majority of Belgian banks with evidence of asymmetric adjustment of bank rates.

Using a panel of 57 nations, Gopalan & Rajan, (2018) investigated whether the presence of international banks increased the IRPT to bank retail rates. They found that the IRPT was strong

in countries where the penetration of foreign banks was high compared to where the degree of foreign banks was low. They also noted that the strength of the IRPT to bank rates substantially declined in cases where these foreign banks resulted in a more concentrated banking sector in the host market.

With respect to the effect of capital regulation on the IRPT and monetary policy effectiveness in general, empirical findings are also mixed. Most studies analyse the impact of capital either on lending rates or directly on the lending volumes. We first review some empirical studies that adopt the former approach and subsequently highlight those that focus on how capital affects the lending channel directly.

Phi et al., (2019) applied a Vector Error Correction Model (VECM) to examine the impact of capital on loan rates in the Vietnamise banking industry over the period 2008 to 2016. The key focus of analysis was on the implications of Basel II on lending rates and output. They found no evidence that a more stringent capital regulation induces higher lending rates in the long run.

Fischer et al., (2012) studied how loan margins on syndicated loans in the USA changed when banks adjusted their capital ratios. They focused on the period 1988-2007 and reported mixed results: for the period 1988-1992 (a period when regulatory changes and market pressures forced banks to hold higher capital ratios), the authors found a negative relationship between capital ratio and loan rates. The opposite was noted for the period 1993-2007 when banks operated in a more relaxed regulatory environment.

The BCBS in its study of several internationally active banks from 13 OECD countries, found positive association between higher capital ratios and lending rates – albeit marginally. Specifically, the study reported that lending spreads in banks increased by a median of about 13 basis points (0.13%) when the capital ratio was adjusted upwards by one percent (100 basis points).

Slovik & Cournede, (2011), in their study of how the Basel III capital rules would impact GDP growth and bank lending spreads in the medium term in the USA, Euro area and Japan, found that banks passed on the higher cost of capital to customers. The authors specifically predicted that if the three economies met the increased capital requirements of (7% for the common equity ratio

and 8.5% for the Tier 1 capital ratio) that would take effect in 2019, lending spreads would, on average, rise by around 50 basis points.

With regard to the capital-lending channel transmission, most pre-crisis studies examine the link based on the credit turmoil and crunches of the early and mid-1990s (see, for example, (Hancock et al., 1995; Peek & Rosengren, 1995; Bernanke & Gertler, 1995). Several post-crisis empirical evidence also show that higher capital requirements are negatively associated with the amount of loans granted by banks. For example, Albertazzi & Marchetti, (2010) explored how the GFC influenced bank lending behaviour i.e. the availability of loans in Italy following the collapse of Lehman Brothers. They observed indications of loan supply contraction linked to low bank capitalization and insufficient liquidity.

Aiyar et al., (2014) analysed changes in cross-border lending when regulatory capital requirements changed. They focused on UK banks for the period 1999 to 2006. They observed that increased bank capital requirements negatively affected cross-border lending. If capital requirements were increased by 1%, cross-border credit growth would decline by about 5.5%. They also noted that between 1998 and 2007, regulated banks in the UK cut lending in response to tightened capital requirements. A different observation was noted however on those foreign entities, which were not formally subjected to minimum capital requirements. For these entities, tightened capital requirements were associated with higher loan levels.

Imbierowicz et al., (2021) assessed the interplay between prudential capital and the IRPT in the short term in Europe. They found that for banks that are weakly capitalised, upward adjustment of regulatory capital requirements resulted in lower lending in the short term. The authors also observed that an upward adjustment of the policy rate was associated with an increase in loan rates. The conditioning effect of capital was however negative: the pass-through was reduced when capital requirements were increased.

Takáts & Temesvary, (2019) analysed how macro-prudential policies of higher capital requirements legislated in the home country interacted with monetary policy. Among the findings, was the observation that tight macro-prudential policy (higher capital requirement) mitigates

monetary policy effectiveness. On the contrary, a relaxation of capital requirements had an amplifying lending effect of monetary policy.

De Marco et al., (2021) investigated how investment by the corporate sector in the UK is impacted by changes in capital regulation and monetary policy. They focused on SME data for the period 1988 to 2006 – a period when different agencies were responsible for banking supervision and monetary policy, respectively. The authors found that higher capital requirements resulted in decreased corporate investment and debt. They also noted that the size of capital and creditworthiness of the borrowing firms largely shaped monetary policy effectiveness.

Kashyap et al., (2008) examined how capital requirements affect bank lending, spreads, and cost of capital. They found evidence that lower bank lending was linked to greater short-term capital needs. They also observed that when supervisors imposed higher capital requirements, banks preferred to restrict lending rather than issue stock or raise retained earnings by reducing dividend distributions.

Mésonnier & Monks, (2014) evaluated the effect of the capital regulation that was introduced by the European Banking Authority's (EBA) on the volume of loans granted by banks using monthly balance sheet data for a group of Euro-area banks. Their main goal was to examine the effect of the directive, which mandated greater capital ratios in the transition to Basel III than had been expected. They discovered that increasing regulatory capital by 1% reduced lending growth by roughly 1.2%.

Fraisse et al., (2017) focused on assessing how adjustments in minimum capital ratios affect the amount of borrowing by corporate customers in France. They analysed loans made by French banks to French business customers between 2008 and 2011. They also looked at how capital affected bank lending under Basel 1 and Basel 2 by examining how responsive bank lending was to changes in regulatory capital requirements. They observed that bank lending was reduced by about 10% when capital requirements were raised by 1%.

Noss & Toffano, (2016) studied how changes in the equity to assets ratio and other macro-financial factors in the UK banking sector affect bank-lending decisions. The authors calculated the capital effects at different thresholds – by analysing how lending volume changed at different levels of

capital during boom periods. They observed a correlation between rising capital requirements and loan volume: lending fell by around 1.4 percent when capital requirements rose by one standard deviation with corporate loans declining most. The authors explain the latter conclusion in terms of the different rules on Basel II capital requirements for credit risk that apply differently for each industry.

Eickmeier et al., (2018) used the US capital regulation regime to assess how changes in prudential regulation for banks affect macro-economic performance. Their focus of applying empirical analysis was on examining how the historical evolutions in capital requirements affects bank lending. They found a significant reduction in lending when higher capital requirements were imposed on banks – with substantial negative spill-overs to the real economy. However, the spill-over effects were noted to be transitory and short-lived – with no evidence of long-run implications on bank lending and economic activity.

Cozzi et al., (2020) studied how macro-prudential policies interact with monetary policies in Euro countries. They observed that a 1% adjustment in minimum capital ratio resulted in a short-term decline in GDP of about 0.15-0.35%. When the impact of monetary policy was deemed strong, the authors observed that GDP fell by about 0.05-0.25%. In general, the authors observed that insufficient capitalization in the banking industry raised systemic vulnerabilities and undermined monetary policy's ability to mitigate them.

Overall, the findings from IRPT empirical studies vary significantly. While some empirical findings found evidence of complete pass-through, others found incomplete pass-through. The studies also adopted different approaches and used different interest rates to examine the IRPT effects. What is also noticeable from the literature is the absence of competition/capital regulation-IRPT empirical studies that focus on SSA – even though both aspects (competition and capital regulation) have been key regulatory reform areas in most countries in the region. In this study, I seek to close this gap and so contribute to the creation of fresh empirical evidence on the competition/capital-IRPT nexus in developing countries.

4.4. Variables and Data

This section explains the variables and the data that were employed to investigate the competition/capital – IRPT relationship.

4.4.1. Interest rates

The dependent variables are average monthly lending and deposit rates. A more appropriate approach would have been to investigate the pass-through effect on the different types of lending and deposit rates, but because lending/deposit rate data is not disaggregated for the different loan and deposit products in most countries, such an approach is not feasible. The average interest rate on loans represents the typical cost of borrowing for businesses and people in the economy. Thus, it is utilized in this study since it serves as the conduit for the dissemination of monetary policy decisions to the real sector. The deposit rate, on the other hand, reflects the compensation that a bank pays on savings and deposits placed by firms and households. It also transmits monetary policy decisions into the real sector.

Two approaches are commonly adopted in empirical literature in determining the basis of the IRPT. In the first approach – the so-called monetary policy approach – the IRPT is analysed using the official central bank rate or another operating target rate adopted by the central bank (such as discount rate, Lombard rate or repurchase rate) (e.g. (Borio & Gambacorta, 2017). In the second approach – also known as the cost of funds approach (Bondt, 2005), the basis is either the market rate or a rate that has a maturity period similar to that of the bank rates under investigation or the one whose correlation with the bank rates under investigation is the highest. The current study adopted the latter approach. The theoretical link between money market rates and bank lending rates emerges from the fact that in implementing monetary policy, central banks often target and aim to influence changes in short-term money market rates. In addition, banks also borrow from the money market to supplement the funding sources for loans. In a similar vein, depositors have the option of making bank deposits or buying securities on the money market. The opportunity cost of lending to banks is represented in this instance by the money market rate.

4.4.2. Competition (Market power)

The study employed the Lerner index as the measure of competition. The index shows the pricing power of individual banks in the market (Berger et al., 2008). The index was calculated using the following formula:

$$\text{Lerner Index} = \frac{P_{it} - MC_{it}}{P_{it}} \quad (4.13)$$

The indices *i* and *t* represent bank and year, respectively. P_{it} represents the output price (derived by dividing total revenue by total assets) and MC_{it} is the marginal. Consistent with other studies, labour, physical capital and funding were employed as inputs and assets as the single output of banks (Albaity et al., 2019b; Beck et al., 2013). The Lerner index was derived by first estimating a translog cost function and then the coefficients from the estimation were used to derive marginal costs. Thereafter, equation 4.13 above was used to derive the index. Based on the conduct-performance theory (Corvoisier & Gropp, 2002), deposit rates are expected to be lower when there is less competition. The opposite is true for lending rates: less competition is associated with higher lending rates due to collusion. On the contrary, the efficient structure hypothesis asserts that concentration (less competition) will improve the banking sector's overall efficiency – because it concentration occurs because certain banks are more efficient than others. The efficient banks will thus grow and expand much quickly than the less-efficient banks. If the efficiency hypothesis holds, then we can expect both, loans and deposit rates to be priced more competitively even if the market is less competitive.

4.4.3. Capital Regulation

The equity to assets ratio was used to measure capital regulation. As highlighted under section 4.3.2, there are theoretically two possible scenarios on how capital regulation could affect monetary policy transmission to commercial bank rates. First, an increase in regulatory capital requirements is viewed as an increase in a bank's funding as equity capital becomes more expensive (Heuvel, 2002; Phi et al., 2019). In order to offset the greater capital cost, banks are therefore likely to pass on this expense to customers by increasing lending rates while decreasing deposit rates. On the other hand, because equity funding has become more expensive, banks would rely more on deposits and thus pay higher deposit rates to attract more deposit funding (Phi et al., 2019).

The main empirical focus of analysis was on the conditioning impact of competition and capital regulation on the IRPT. In this regard, two interaction terms were employed in the analysis: the product of the Lerner index and market rate (proxy for policy rate); and the product of capital ratio and market rate to analyse the conditioning influence of competition and capital regulation on the IRPT, respectively. A list of all the variables that were included in the study is presented in Table 4.19.

4.4.4. Data and Descriptive Statistics

The study utilised an unbalanced panel of monthly data covering the years 2005 to 2019. The monthly country data on the market rate, lending, and deposit rates were obtained from the IMF IFS. The capital ratios were obtained from IMF FSIs and (GFDD, 2019). The Lerner index was derived using bank-level data from Bankfocus. As both the Lerner index and capital ratios are available on an annual basis, the study followed the literature (Leroy & Lucotte, 2015; van Leuvensteijn et al., 2013) and linearly interpolated the indices into monthly series. Regulatory capital requirements are in practice rarely adjusted within the year – a linear interpolation of the series is thus more realistic. Similarly, the degree of competition in the banking sector rarely changes from month to month – so a simple linear interpolation of the Lerner index is also more realistic. However, for robustness and validity check purposes, the study also utilised annual data and obtained consistent results – see Section 4.5.4. The sample comprised 22 SSA countries. The choice of the countries was largely informed by three considerations: data availability, regional representation under a common economic or trading block, and a proportionate mix in terms of countries belonging to different income levels as per criteria of the World Bank – see Table 4.18. A summary of the descriptive statistics of the variables is presented in Table 4.1. The table shows significant differences in interest rate structure across countries, particularly for lending and policy rates – partly reflecting the differences in macro-economic conditions and depth of financial markets. Table 4.2 shows the degree of correlation among the variables.

Table 4.1: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Lending rate	4,092	15.316	11.18	4.37	81.64
Deposit rate	4,092	7.64	3.14	1.02	23.85
Policy rate	4,091	8.23	5.37	0.63	42.19
Lerner	4,092	0.27	0.09	-0.36	0.709
Capital	4,092	11.96	3.73	-0.92	24.05
Lerner x policy rate	3,912	2.24	1.81	-3.71	14.20
Capital x policy rate	3,912	108.24	87.20	-7.36	680.52

Table 4.2: Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Lending rate	1.000						
(2) Deposit rate	0.497*	1.000					
(3) Policy rate	0.542*	0.482*	1.000				
(4) Lerner	0.084*	-0.110*	-0.040*	1.000			
(5) Capital	0.251*	0.169*	0.326*	-0.085*	1.000		
(6) Lerner x policy rate	0.079*	0.092*	0.083*	0.189*	-0.020	1.000	
(7) Capital x policy rate	0.003	0.221*	0.366*	-0.023	-0.020	-0.135*	1.000

Note: ** shows significance at the 5% leve1

4.5. Methodology

4.5.1. Estimation and Theoretical Framework

The study employed a dynamic heterogeneous panel auto-regressive distributive lag (ARDL) model in the estimation framework. The heterogeneous panel ARDL can be estimated empirically using a variety of methods depending on assumptions made about parameter heterogeneity. The commonly used panel ARDL estimators are the Mean group (MG), Pooled Mean Group (PMG), and the Dynamic Fixed Estimator (DFE). The key distinguishing feature of these estimators is the treatment of parameter coefficients. In the MG model, the slopes are allowed to vary among the panel observations both, in the short run and long run. On the other hand, the PMG only allows variation of slope intercepts in the short run – but these are all assumed to be equal in the long run. Finally, in the DFE, all the parameters are constrained to be equal, except the intercepts. All the above estimators assume that the residuals in the cross-panel observations are independent i.e., there is no cross-panel correlation in the error residuals. However, if cross-sectional dependence

is present, the above estimators are inappropriate and may produce biased and inconsistent results (Chudik & Pesaran, 2015; Ditzen, 2021).

To overcome the cross-section dependence problem (Chudik & Pesaran, 2015) developed a cross-sectionally augmented distributed lag model (CS-ARDL). The idea behind the model is to account for cross-sectional dependence by including cross-sectional averages of the independent and dependent variables. Cross-sectional dependency could for instance emerge because of, among other factors, trade between nations, common financial integration, commodities and monetary shocks, and other unobserved cross-border spill-over effects. The study thus adopted the CS-ARDL approach in the current study. The approach also has the advantage of being re-parameterised into an error correction model (ECM) in which both, short and long-run coefficient estimates are obtained in a single estimation (Ditzen, 2019). Chudik et al., (2013) established that the dynamic CS-ARDL estimator is consistent even if the residuals have unit roots. The estimator also takes into account omitted variable bias, and the weak exogeneity among the regressors is taken into account through its dynamic specification with appropriate lags. On the other hand, Pesaran et al., (1999) established that the conventional ARDL estimator is valid even in cases where the variables are only stationary after first difference i.e., I(1s), as long as the variables are cointegrated. A key requirement of the CS-ARDL estimator is that both the time period (*T*) and cross-sectional units (*N*) should be relatively large – a condition that is satisfied in the current study with T=180 and N=23. The CS-ARDL model can be specified as follows (Ditzen, 2019):

$$br_{it} = \alpha_i + \sum_{j=1}^{p_y} \lambda_{ij}\, br_{it-j} + \sum_{j=0}^{p_x} \beta_{ij}\, Pr_{it-j} + \sum_{j=0}^{p_n} \delta_{ij}\, \bar{b}_{t-j} + \sum_{j=0}^{p_n} \Phi_{ij}\, \bar{p}_{t-j} + \mu_{it} \; ; \; \mu_{it} = \gamma_i f_t + \varepsilon_{it} \qquad (4.14)$$

In equation (4.14), br_{it} is either the loan rate or deposit rate. Pr_{it} represents the official monetary policy rate. Parameter β_i represents the long-run IRPT to bank rates. If $\beta_i = 1$, the IRPT is regarded as complete, while $\beta_i < 1$ shows incomplete pass-through. The coefficient on the lagged dependent variable λ_i, captures the extent to which short-run effects have long-run consequences – in this case, for the lending or deposit rate. The problem of cross-sectional dependence is addressed by the inclusion of cross-sectional lags of br_{it} and Pr_{it}, denoted by $\bar{b}_{ij}$and $\bar{p}_{ij}$, respectively, with p_n showing the number of the cross-sectional lags. Chudik and Pesaran (2015)

suggest determining the minimum number of cross-sectional lags according to $p_n = (\sqrt[3]{T})$. However, other authors allow for different lag orders for $\bar{b}_{it}$ and $\bar{p}_{it}$ (Talib et al., 2021; Li and Ingham, 2020). In the current study, cross-sectional lags were chosen so that the cross-sectional dependence in the residuals is not statistically significant at 5% level, according to the cross sectional dependence test of (Pesaran, 2004). The term $\gamma_i f_t$ depicts the effect of time-varying factors that could be common across countries but not observable. The use of subscript *i* in equation (4.14) implies that heterogeneous coefficients are applied i.e. estimation of separate country specific time series regressions and subsequently averaging them. Parameter heterogeneity in the confirmed in the subsequent empirical framework section below.

The empirical analysis of interest is to investigate the implication of competition and regulatory capital on the IRPT to commercial bank lending and deposit rates. To do this, two interaction terms are incorporated in equation (4.14): (Lerner x policy rate) and (capital x policy rate) as in (Holton & Rodriguez d'Acri, 2018; Leroy & Lucotte, 2015; van Leuvensteijn et al., 2013):

$$br_{it}=\alpha_i+\sum_{j=1}^{p_y}\lambda_{ij}\, br_{it-j}+\sum_{j=0}^{p_x}\beta_{ij}\, Pr_{it-j}+\gamma_i(Pr_{it-j}*V_{it-j})+\rho_i V_{it-j}+\sum_{j=0}^{p_n}\delta_{ij}\,\bar{b}_{t-j}+\sum_{j=0}^{p_n}\Phi_{ij}\,\bar{p}_{t-j}+\mu_{it} \qquad (4.15)$$

where V_{it} is either the Lerner index or capital ratio. γ_i is a parameter that captures the effect of competition or capital regulation on the IRPT. If γ_i is negative, it shows that competition/capital regulation reduces the size of IRPT – i.e. reduces monetary policy effectiveness. The overall size of the IRPT to bank rates in the presence of competition/capital regulation is given by $\beta + \gamma.V_{it}$ (Leroy & Lucotte, 2015). All other variables and coefficients have the same definitions as in equation (4.14). Equations (4.14) and (4.15) were estimated separately for loan and deposit rates. As explained in the preceding section, to mitigate the problem of cross-section dependence, the lags of cross-sectional averages of the dependent and independent variables were incorporated in all the estimations. In total, six regressions were estimated as follows:

1. Regression 1: Lending rate and policy rate;
2. Regression 2: Deposit rate and policy rate;
3. Regression 3: Lending rate, policy rate, Lerner and Lerner x policy rate;
4. Regression 4: Deposit rate, policy rate, Lerner and Lerner x policy rate;

5. Regression 5: Lending rate, policy rate, capital and capital x policy rate; and
6. Regression 6: Deposit rate, policy rate, capital and capital x policy rate.

The dependent variable in regressions 1, 3 and 5 is the lending rate while in regressions 2, 4 and 6 is the deposit rate. The number of lags for each regression was determined by applying the Bayesian Information Criterion (BIC).[13] Specifically, the lag structure for each country was first identified and then the average number of lags obtained for each variable was applied. This resulted in obtaining ARDL models (3 0) and (4 0) for regressions 1 and 2; (3 0 0 0) for regressions 3 and 5; and (4 0 0 0) for regressions 4 and 6. However, for robustness purposes, regressions with different lag structures were run – specifically, the study followed (Chudik et al., 2013) and imposed the same lag structure for all the variables in each model up to a maximum of 2 lags.

4.5.2. Empirical Analysis

4.5.2.1. Cross-sectional Dependence

The starting point in the empirical analysis was to test for cross-section dependence in the errors. As indicated in the preceding section, if cross-sectional dependence is not taken into account, estimation results might be distorted and inconsistent. In this regard, the study employed the tests developed by (Pesaran, 2004) and (Bersvendsen & Ditzen, 2021). The Pesaran test has a null hypothesis of cross-sectional independence while the (Bersvendsen & Ditzen, 2021) test, on the other hand, tabulates exponent (alpha) values that indicate the degree of cross-sectional dependence. Alpha scores of between 0.5 and 1 indicate that cross-sectional dependency is high. The results are reported in Table 4.3. The null hypothesis of no cross-sectional dependence is rejected for all the variables under both tests except for the competition variable (Lerner index) and its interaction with the policy rate.

[13] Different approaches are applied in the literature for ARDL lag selection. Some authors apply the same lag order for all variables (e.g.Chudik et al., 2013) while others apply different lag structures (e.g. Ahmed, 2020; Loayza & Rancière, 2006).

Table 4.3: Results of the cross-sectional dependency (CD) tests

Variables	Pesaran CD test	P-value	Bersvendsen and Ditzen, 2021 test (Alpha value)
(1) Lending rate	12.76	0.000	0.886
(2) Deposit rate	14.79	0.000	0.859
(3) Policy rate	34.10	0.000	0.868
(4) Lerner	1.75	0.080	0.829
(5) Capital	5.64	0.000	0.987
(6) Lerner x policy rate	0.17	0.862	0.758
(7) Capital x policy rate	14.64	0.000	0.921

4.5.2.2. Unit root tests

Although the long-run estimates in the ARDL model are consistent irrespective of whether the underlying variables are integrated of order one or zero (Chudik and Pesaran, 2015), unit root tests are still performed to ensure that no series are integrated of order two. Due to presence of cross-sectional dependence, second generation tests are employed to check for the presence of unit roots because the so called first generation tests are considered in appropriate under such circumstances (Herzer & Nagel, 2017). As the sample was unbalanced, the Cross-sectionally Augment Dickey Fuller (CADF) test by (Pesaran, 2007) was used. The problem of cross-section dependence was mitigated by adding lags of cross-sectional averages of the individual series. The null hypothesis is that the series have unit roots i.e. are non-stationary. The CADF test regression can be stated as follows (Pesaran, 2007):

$$\Delta Y_{it}=\Phi_i + \gamma_i Y_{i,t-1}+ \beta_i \overline{Y_{it-1}} + \sum_{l=0}^{q} \rho_{it} \Delta Y_{it-1} \overline{Y_{it-1}} + \sum_{l=0}^{q} \delta_{it} Y_{it-1} + u_{it} \qquad 4.16$$

The cross-sectional dependence is captured by $\bar{Y}_{it}$ while the lags of the variables are captured by q. $\Delta\overline{Y_{it-1}}$ shows the averages of lagged first differences. Two specifications were considered: one where only the intercept is included and another where both, the intercept and a linear trend are included. In line with the literature, the number of lags in the CADF test was determined based on $T^{1/3}$ – in the current case T = 180, the chosen the lag length was 5. The results are presented in Table 4.4. For variables in levels, the results are mixed: some variables (lending rate, deposit rate, capital and capital x policy rate) have unit roots while the others are stationary. However, when first difference is performed, the former series also became stationary. These variables (lending

rate, deposit rate, capital and capital x policy rate) were thus treated as I(1s). As there were both, I(1) and I(0) series, one of the key conditions for adoption of a panel ARDL model was also ascertained (Pesaran, 2007).

Table 4.4: Results of the unit root tests

Variables	Level		First Difference	
	Intercept only	Intercept and trend	Intercept only	Intercept and trend
Lending rates	-2.373	-0.674	-2.373	-17.959
	(0.009)	(0.250)	(0.009)	(0.000)
Deposit rate	0.459	1.999	-22.661	-22.851
	(0.677)	(0.977)	(0.000)	(0.000)
Policy rate	-1.866	-4.121	-1.866	-4.121
	(0.031)	(0.000)	(0.031)	(0.000)
Lerner	-4.525	-2.770	-4.525	-2.770
	(0.000)	(0.003)	(0.000)	(0.003)
Capital	0.932	2.677	-5.162	-2.984
	(0.824)	(0.996)	(0.000)	(0.001)
Lerner x policy rate	-4.729	-2.700	-4.729	-2.700
	(0.000)	(0.003)	(0.000)	(0.003)
Capital x policy rate	-1.403	0.643	-16.713	-15.545
	(0.080)	(0.740)	(0.000)	(0.000)

Notes: The p-values of the CADF estimations are shown in parentheses. The last column (intercept and trend), shows that the null hypothesis of non-stationarity is now rejected after the first difference for all the series.

4.5.2.3. Test for cointegration

The next step was to check whether a long-run cointegration relationship existed between lending/deposit rates and policy rates. Engle & Granger, (1987) define cointegration as the existence of a meaningful long-run relationship between two or more non-stationary variables. The authors showed that if a linear combination between two or more non-stationary variables is stationary, then cointegration could be inferred. Unlike in normal regression analysis where the inclusion of an additional variable can significantly change the current estimates, the property of cointegration is invariant to model extensions (Herzer & Nagel, 2017) – meaning that if two or more variables are cointegrated, there is no requirement for additional variables to obtain long-run unbiased estimates of the parameters.

To test for cointegration, the study applied the four cointegration tests developed by (Westerlund, 2007), which take into account the problem of cross-sectional dependence. Two of the tests are

designed to test the alternative hypothesis that the panel is cointegrated as a whole, while the other two test the alternative that at least one unit is cointegrated. The cointegration equation can be specified as follows:

$$\Delta y_{it}=\delta'_i d_t+\alpha_i y_{it-1}+\lambda'_i x_{it-1}+\sum_{j=1}^{p_i}\alpha_{ij}\,\Delta y_{it-j}+\sum_{j=-q_i}^{p_i}\gamma_{ij}\,\Delta x_{it-j}+\varepsilon_{it} \qquad (4.17)$$

The parameter α_i shows how the system corrects itself from disequilibrium shocks. If $\alpha_i < 0$, it means that there is error correction – i.e. y_{it} and x_{it} are cointegrated. If $\alpha_i = 0$, there is no error correction, hence no cointegration. The null hypothesis of no cointegration can thus be written as: Ho: $\alpha_i = 0$, for all *i*. The alternative hypothesis depends on what is being assumed about the homogeneity of α_i. The first two of Westerlund's tests (called group mean tests), do not require the $\alpha_i s$ to be equal. In this case, the alternative hypothesis is that α_i is less than zero for at least one panel, *i*. The alternative hypothesis in the other the other two tests (called panel tests) is that $\alpha_i = \alpha < 0$ for all *i*. The parameter d_t is the deterministic trend (there are three cases: either no trend, constant or constant and trend). The cointegration tests were performed with bootstrapped p-values to account for cross-sectional dependence and report the results in Table 4.5. The null of no cointegration is rejected in almost all the specifications. It was thus concluded that these variables have a long-run cointegration relationship.

Table 4.5: Table: Cointegration Tests

Cointegration test between:	G_τ	G_α	P_τ	P_α
Lending rate and policy rate	-8.156 (0.000)	-9.947 (0.000)	-12.391 (0.000)	-9.470 (0.000)
Deposit rate and policy rate	-4.733 (0.000)	-11.477 (0.000)	-8.428 (0.000)	-15.721 (0.000)
Lending rate, policy rate, Lerner and Lerner x policy rate	-5.185 (0.000)	-5.185 (0.000)	-6.439 (0.040.)	-5.180 (0.240)
Deposit rate, policy rate, Lerner and Lerner x policy rate	-4.287 (0.000)	-9.056 (0.000)	-7.368 (0.000)	-11.447 (0.000)
Lending rate, policy rate, capital and capital x policy rate	-5.291 (0.000)	-6.547 (0.010)	-9.635 (0.190)	-5.498 (0.330)
Deposit rate, policy rate, capital and capital x policy rate	-5.329 (0.000)	-9.541 (0.000)	-8.516 (0.000)	-13.314 (0.000)

Notes: The table shows the results from the Westerlund, (2007) cointegration tests. G_τ, G_α, P_τ and P_α are the four Westerlund cointegration test statistics. Because of cross section dependence, the bootstrapped p-values (in parentheses) are reported. The results reject the null hypothesis of no cointegration in almost all the models.

4.5.2.4. Slope Heterogeneity test

The final step was to test for equality of slope parameters in the sample. Although theory predicts tendency for convergence among countries in the long run, in practice, countries are impacted by shocks differently and may also respond differently to such common shocks. In addition, country specific factors may also create heterogeneity – not just in the short run, but also in the long run. Therefore, assuming parameter homogeneity across countries may be misleading and give deceptive estimator outcomes (Wang et al., 2021). To test for equality of slopes in the sample, the study employed the (Hashem Pesaran & Yamagata, 2008) test and report the results in Table 4.6. In all the regression relationships, the null hypothesis of slope homogeneity is rejected at 1%. Changes in the policy rate thus affect bank interest rates differently for different countries in the sample. The adoption of the dynamic heterogeneous CS-ARDL model is thus appropriate.

Table 4.6: Slope heterogeneity tests

Model relationship	**Delta**	**p-value**
Lending rate and policy rate	26.95	0.000
Deposit rate and policy rate	13.05	0.000
Lending rate, policy rate, Lerner and (Lerner x policy rate)	15.66	0.000
Deposit rate, policy rate, Lerner and (Lerner x policy rate)	8.26	0.000
Lending policy rate, capital and (Lerner x policy rate)	14.36	0.000
Deposit rate, policy rate, capital and (Lerner x policy rate)	7.28	0.000

4.5.3. Results and Discussions

This part presents and discusses the results on the size of the IRPT and how it is affected by competition and regulatory capital requirements. The results based on the CS-ARDL model are provided in Tables 4.7 – 4.12. As indicated in Section 4.5.1, in total, six regressions are estimated. In all the tables, both; long-run results (upper part) and short-run results (lower part) are presented. For robustness purposes, the tables also show the results from estimating the CS-ARDL model when a fixed lag structure is applied on all the variables in each regression. In addition, the results from using a dynamic Common Correlated Effects Mean Group (CCEMG) estimator are also presented. Recall that unlike the CS-ARDL estimator, in the dynamic CCEMG model, no lags of cross-sectional averages are added in the estimations. In this way, the study is able to show how the inclusion of lags of cross-sectional averages improves consistency of the estimates in the CS-ARDL compared to the conventional CCEMG model (Chudik and Pesaran, 2015). Finally, in all

the estimations, the Delta p-values of the slope coefficient equality test across countries are reported.

First, the IRPT to bank rates is estimated in the absence of competition and capital regulation based on the CS-ARDL equation (4.14). The baseline results are shown in Table 4.7 (Model 1) for IRPT to lending rates and Table 4.8 (Model 1) for IRPT to deposit rates. The results show a positive and significant long-run coefficient of the policy rate at 10% and 1% levels, for lending rate and deposit rate, respectively. In the long run, a 100 basis-point rise in the policy rate would increase lending rates by about 36 basis points and deposit rates by about 48 basis points. The results imply that in SSA, the IRPT is incomplete in the long run. Some studies (e.g. De Graeve et al., 2007; Gropp et al., 2007; Holton & Rodriguez d'Acri, 2018; Hülsewig et al., 2009) also found incomplete IRPT in the respective banking markets under investigation. The incomplete pass-through could be attributed to a less than perfect elasticity of demand for banking products, the low levels of competition (high market power), switching costs, or information asymmetries and collusive behaviour in most SSA banking markets (Sander & Kleimeier, 2006).

The findings also show a slow speed of convergence of interest rates in the long run as evidenced by relatively lower values of the error correction term (ECT) i.e. only about 23% and 19% of the disequilibrium in lending and deposit rates, respectively, is corrected in the subsequent month. A summary of the average long-run country specific pass-through coefficients is tabulated in Table 4.18 and show significant heterogeneity across countries. These differences may typically be attributed to the divergent structures of the national financial systems. On average, the size of the pass-through to deposit rates is higher than that to lending rates – reflecting a relatively more elastic demand for deposits in relation to bank deposit rates. An explanatory conjecture to this outcome is that in almost all SSA countries, government securities (treasury bills/bonds) serve as substitutes for deposit products particularly for corporate customers – unlike the loan market where other available sources of funding or their accessibility to borrowers is very limited. Overall, the long-run pass-through sizes (for both, lending and deposit rates) are higher for upper-income countries (South Africa, Botswana and Namibia). This could be attributed to relatively developed financial markets in these countries with less information opacity (Perera & Wickramanayake, 2016; Saborowski & Weber, 2013).

The average IRPT to lending rates (both, in the long run and short run) is negative for countries belonging to ECOWAS. This could partly be explained by the presence of *in-duplum law* legislation in these countries that cap or control lending rates. In most of these countries, sharia banking is also prevalent – a banking model that considers higher lending rates as usury or exploitative. In fact, in most ECOWAS countries, the interest spreads are essentially negative for most of the years under investigation. On the other hand, the pass-through to lending rates is almost complete in countries belonging to the Common Monetary Area (CMA) i.e. South Africa, Namibia, Swaziland and Lesotho. As observed by (Sander and Kleimeier, 2004), the single currency in the CMA tends to be a unifying force by making the pass-through faster, more complete and more homogeneous. In some countries (Zambia, Lesotho, Malawi, Mali, Kenya and Botswana), the long-run pass-through to lending rates is found to be over-shooting i.e. greater than one. This could be interpreted to mean that banks in these markets price the higher default probabilities into lending rates to compensate for higher risks instead of rationing credit. Finally, given that the overall size of the pass-through in each country is influenced by other structural factors and banks in different countries may operate at different internal capital levels relative to the regulatory minimum, it is not possible to conclusively attribute or affirm (from Table 4.18) that countries with higher capital requirements, *de facto*, should have lower IRPT. In other words, the pass-through would still be higher even in a country with higher regulatory capital requirement if banks operate with large capital buffers.

Table 4.7: Results of the interest rate pass-through (IRPT) to commercial banks' lending rates in SSA (2005-2019)

Model:	(1)	(2)	(3)	(4)
Estimator:	CS-ARDL	CS-ARDL	CS-ARDL	CCEMG
No. of Lags	(3 0)	(2 2)	(1 1)	(3 0)
Long run				
Policy rate	0.359*	0.958	4.544	0.203
	(0.212)	(0.752)	(4.284)	(0.201)
Short run				
Error Correction Term (ECT)	-0.229***	-0.229***	-0.243***	-0.143***
	(0.045)	(0.050)	(0.049)	(0.027)
Policy rate	0.0276	0.084	0.061	0.010
	(0.043)	(0.074)	(0.059)	(0.036)
No. observations	3,780	3,802	3,824	3,846
No. countries	22	22	22	22
CD test	0.335	0.739	0.535	0.000
Delta statistic	0.000	0.000	0.000	0.000

This table shows the IRPT results to lending rates in the long-run (upper part) and short-run (lower part) from estimating equation 4.14 using CS-ARDL estimator (Model 1). The model lag structure is chosen using the Bayesian Information Criteria (BIC), while the minimum number of cross-sectional lags are set at 1 (for the dependent variable) and 3 (for the independent variable). For robustness and comparison purposes, I also present in Models 2 and 3, the CS-ARDL results obtained when a fixed lag structure is applied on all the variables i.e. lags 2 and 1, respectively. Model 4 shows the results when using a dynamic CCEMG estimator but without lags of cross-sectional averages. The CD test statistic is the cross-sectional dependence test of (Pesaran, 2004) on the model residuals with the null of cross-sectional independence. With the inclusion of additional cross-sectional lags in the CS-ARDL Model 1, the cross-sectional dependence is alleviated with the p-values of CD tests statistics increased, exhibiting more cross-section independence as compared to the CCEMG estimations in Model 4. The Delta p-value is the (Pesaran and Yamagata, 2008) test for slope homogeneity – equality of slope parameters is rejected in all the models. The standard errors are shown in parentheses and 1, 2 and 3 asterisks show significance level at 10%, 5% and 1%, respectively.

Table 4.8: Results of the interest rate pass-through (IRPT) to commercial banks' deposit rates in SSA (2005-2019)

Model:	(1)	(2)	(3)	(4)
Estimator:	CS-ARDL	CS-ARDL	CS-ARDL	CCEMG
No. of Lags	(4 0)	(2 2)	(1 1)	(4 0)
Long run				
Policy rate	0.484***	0.499***	0.444***	1.076***
	(0.060)	(0.053)	(0.061)	(0.328)
Short run				
Error Correction Term (ECT)	-0.193***	-0.253***	-0.268***	-0.124***
	(0.016)	(0.016)	(0.021)	(0.019)
Policy rate	0.093***	0.012	0.006	0.077***
	(0.015)	(0.028)	(0.026)	(0.014)
No. observations	3,714	3,692	3,714	3,824
No. countries	22	22	22	22
CD test p-value	0.525	0.471	0.041	0.000
Delta statistic	0.000	0.000	0.000	0.000

This table shows the baseline IRPT results to deposits rates in the long-run (upper part) and short-run (lower part) from estimating equation 4.14 using CS-ARDL estimator (Model 1). The model lag structure is chosen using the Bayesian Information Criteria (BIC), while the number of cross-sectional lags is set according to $p_n = (\sqrt[3]{T})$. For robustness and comparison purposes, I also present in Models 2 and 3, the CS-ARDL results obtained when a fixed lag structure is applied on all the variables i.e. lags 2 and 1, respectively. Model 4 shows the results when using a dynamic CCEMG estimator but without lags of cross-sectional averages. The CD test statistic is the cross-sectional dependence test of (Pesaran, 2004) on the model residuals with the null of cross-sectional independence. With the inclusion of additional cross-sectional lags in the CS-ARDL Model 1, the cross-sectional dependence is alleviated with the p-values of CD tests statistics increased, exhibiting more cross-section independence as compared to the CCEMG estimations in Model 4. The Delta p-value is the (Pesaran and Yamagata, 2008) test for slope homogeneity – equality of slope parameters is rejected in all the models. The standard errors are shown in parentheses and 1, 2 and 3 asterisks show significance level at 10%, 5% and 1%, respectively.

Second, the study investigated the impact of competition (market power) on the IRPT to commercial bank rates by estimating equation (4.15). Two regressions were also estimated for this purpose: (i) lending rate, policy rate, Lerner index, and competition x Lerner index; and (ii) deposit rate, policy rate, Lerner index, and competition x Lerner index. The focus of the analysis in both regressions was on the sign of the interaction term (Lerner x policy rate) which shows the conditioning impact of competition on the IRPT. If the coefficient is negative and significant, it would mean that competition reduces the IRPT. The results are shown in Table 4.9 (Model 1) for lending rates and Table 4.10 (Model 1) for deposit rates. It is found that the long-run coefficient of the interaction term is negative and statistically significant only for lending rates – at 10% level. Recall that since the Lerner index was used to quantify competition, this result means that increased market power (low competition) reduces IRPT to lending rates – implying that higher competition (low market power) improves the effectiveness of monetary policy. Similar findings have been reported by (Chileshe & Akanbi, 2016; Gropp et al., 2007; Leroy & Lucotte, 2015; van Leuvensteijn et al., 2013). The size of the long-run IRPT when conditioned on competition was obtained by calculating $\beta+\gamma.V_{it}$ from equation 4.15, where V_{it} = unconditional sample mean of the Lerner index. The size of the obtained a pass-through is 0.121 – a lower size compared to 0.553 which is the size of the pass-through in the absence of competition.

Table 4.9: Results of the impact of competition (market power) on the IRPT to lending rates in SSA (2005-2019)

Model:	(1)	(2)	(3)	(4)
Estimator:	CS-ARDL	CS-ARDL	CS-ARDL	CCEMG
No. of Lags:	(3 0)	(2 2)	(1 1)	(3 0)
Long run				
Policy rate	0.553***	0.580***	0.684*	0.614***
	(0.209)	(0.198)	(0.350)	(0.231)
Lerner	6.713*	10.50**	18.50	4.197
	(3.950)	(4.856)	(14.44)	(3.236)
Lerner x policy rate	-1.632*	-0.794	-1.109	-1.301
	(0.889)	(1.162)	(0.994)	(0.838)
Short run				
Error Correction Term (ECT)	-0.272***	-0.319***	-0.334***	-0.288***
	(0.054)	(0.066)	(0.057)	(0.047)
Policy rate	0.079*	0.022	0.010	0.072
	(0.045)	(0.063)	(0.067)	(0.045)
Lerner	0.584	-3.736	-4.840	0.582
	(0.664)	(3.741)	(4.107)	(0.625)
Lerner x policy rate	-0.201*	-0.259	-0.040	-0.202
	(0.115)	(0.240)	(0.245)	(0.144)
No. observations	3,736	3,758	3,780	3,846
No. countries	22	22	22	22
CD test p-value	0.529	0.229	0.8350	0.000
Delta statistic –value	0.000	0.000	0.000	0.000

Notes: This table shows the results of the conditioning impact of competition on the IRPT to lending rates in the long run (upper part) and short-run (lower part) from estimating equation 4.15 using the CS-ARDL estimator (Model 1). The model lag structure is chosen using the Bayesian Information Criteria (BIC), while the number of cross-sectional lags is set according to $p_n = (\sqrt[3]{T})$. For robustness and comparison purposes, I also present in Models 2 and 3, the CS-ARDL results obtained when a fixed lag structure is applied on all the variables i.e. lags 2 and 1, respectively. Model 4 shows the results when using a dynamic CCEMG estimator but without lags of cross-sectional averages. The CD test statistic is the cross-sectional dependence test of (Pesaran, 2004) on the model residuals with the null of cross-sectional independence. With the inclusion of additional cross-sectional lags in the CS-ARDL Model 1, the cross-sectional dependence is alleviated with the p-values of CD tests statistics increased, exhibiting more cross-section independence as compared to the CCEMG estimations in Model 4. The Delta p-value is the (Pesaran and Yamagata, 2008) test for slope homogeneity – equality of slope parameters is rejected in all the models. The standard errors are shown in parentheses and 1, 2 and 3 asterisks show significance level at 10%, 5% and 1%, respectively.

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Table 4.10: Results of the impact of competition (market power) on the IRPT to deposit rates in SSA (2005-2019)

Model:	(1)	(2)	(3)	(4)
Estimator:	CS-ARDL	CS-ARDL	CS-ARDL	CCEMG
No. of Lags:	(4 0)	(2 2)	(1 1)	(4 0)
Long run				
Policy rate	0.365***	0.430***	0.341***	0.389***
	(0.066)	(0.061)	(0.062)	(0.063)
Lerner	-6.682	-5.431	-7.098*	-9.215*
	(4.791)	(3.352)	(3.632)	(5.588)
Lerner x policy rate	0.329	0.125	0.474	0.471
	(0.969)	(0.795)	(0.979)	(1.341)
Short run				
Error Correction Term (ECT)	-0.279***	-0.314***	-0.332***	-0.244***
	(0.023)	(0.020)	(0.027)	(0.023)
Policy rate	0.101***	-0.058	-0.034	0.094***
	(0.022)	(0.065)	(0.064)	(0.019)
Lerner	-2.039*	-0.816	-1.765	-1.787*
	(1.126)	(2.063)	(2.487)	(1.036)
Lerner x policy rate	0.021	0.196	0.281	0.112
	(0.160)	(0.289)	(0.265)	(0.170)
No. observations	3,714	3,758	3,780	3,824
No. countries	22	22	22	22
CD test p-value	0.205	0.116	0.001	0.000
Delta statistic p-value	0.000	0.000	0.000	0.000

Notes: This table shows the results of the conditioning impact of competition on the IRPT to deposit rates in the long run (upper part) and short-run (lower part) from estimating equation 4.15 using the CS-ARDL estimator (Model 1). The model lag structure was chosen using the Bayesian Information Criteria (BIC) while the number of cross-sectional lags was set at 5, according to $p_n = (\sqrt[3]{T})$ For robustness and comparison purposes, I also present in Models 2 and 3, the CS-ARDL results obtained when a fixed lag structure is applied on all the variables i.e. lags 2 and 1, respectively. Model 4 shows the results when using a dynamic CCEMG estimator but without lags of cross-sectional averages. The CD test statistic is the cross-sectional dependence test of (Pesaran, 2004) on the model residuals with the null of cross-sectional independence. With the inclusion of additional cross-sectional lags in the CS-ARDL Model 1, the cross-sectional dependence is alleviated with the p-values of CD tests statistics increased, exhibiting more cross-section independence as compared to the CCEMG estimations in Model 4. The Delta p-value is the (Pesaran and Yamagata, 2008) test for slope homogeneity – equality of slope parameters is rejected in all the models. The standard errors are shown in parentheses and 1, 2 and 3 asterisks show significance level at 10%, 5% and 1%, respectively.

Finally, the study examined the implication of increased regulatory capital requirements on the IRPT – again by estimating equation 4.15 but with the interaction term of policy rate x capital. Two regressions were also estimated for this purpose: (i) lending, policy rate, capital, and capital x policy rate; and (ii) deposit, policy rate, capital and capital x policy rate. The focus of analysis in both regressions is on the sign of the interaction term (capital x policy rate) which shows the conditioning effect of capital regulation on the IRPT. If the coefficient is negative and significant, it would mean that higher capital requirements reduce the size of the IRPT. The results for lending rates are presented in Table 4.11, while those for deposit rates are presented in Table 4.12. The long-run coefficient of the interaction term is negative and statistically significant for both, lending and deposit rates. This shows that monetary policy is less successful when capital requirements are increased. As highlighted under Section 1, the regulatory capital requirements in SSA are generally more stringent (higher) than in other developing regions. Because "idle capital" is costly, banks will in such an environment generally choose to operate within or just slightly above the regulatory minimum. Unless the banks are able to raise additional equity (which is costly), the lending channel becomes less effective under such circumstances – because with a binding capital regulatory regime, banks cannot simply expand their lending; if they did, they would breach the minimum regulatory capital requirement and face supervisory sanctions. As a consequence, the effectiveness of monetary policy is dampened when capital requirements are high and most banks operate just within the regulatory minimum. Noss and Toffano (2014) and Fraisse et al., (2015) report similar findings. The size of the long-run IRPT in the presence of higher regulatory capital requirements is calculated as $\beta+\gamma.V_{it}$ from equation 4.15 – where V_{it} = unconditional sample mean of the capital-asset ratio. The obtained obtain pass-through sizes are 0.782 and 0.146 for lending and deposit rates, respectively – far much smaller sizes compared to 3.357 and 0.838 (models 1 in Table 4.11 and 4.12) – which are the sizes of the IRPT to lending and deposit rates, respectively, in the absence of capital regulation. To calculate the value of capital where the pass-through becomes hindered, I take the first derivative with respect to the policy rate in equation 1.7 and set it to zero. This yields 15.6 for lending rates and 14.6 for deposit rates – implying that for regulatory capital ratios above these values, the impact on the pass-through to lending and deposit rates is dampened – suggesting that monetary policy is less effective at relatively high levels of regulatory capital. In the study sample, seven countries had an average regulatory capital requirement in excess of 14.0 percent over the study period.

Table 4.11: Results of the impact of regulatory capital requirements on the IRPT to commercial banks' lending rates in SSA (2005-2019)

Model:	(1)	(2)	(3)	(4)
Estimator:	CS-ARDL	CS-ARDL	CS-ARDL	CCEMG
No. of Lags:	(3 0)	(2 2)	(1 1)	(3 0)
Long run				
Policy rate	3.357**	1.092	0.904	1.925**
	(1.681)	(1.286)	(3.278)	(0.958)
Capital	3.223**	0.858	0.370	2.406*
	(1.621)	(1.316)	(3.334)	(1.336)
Capital x policy rate	-0.214**	-0.065	-0.030	-0.094*
	(0.102)	(0.084)	(0.206)	(0.055)
Short run				
Error Correction Term (ECT)	-0.349***	-0.412***	-0.422***	-0.364***
	(0.053)	(0.067)	(0.063)	(0.057)
Policy rate	0.278*	0.790*	0.798*	0.107
	(0.148)	(0.463)	(0.482)	(0.155)
Capital	0.253*	0.870	0.889*	0.138
	(0.134)	(0.537)	(0.533)	(0.112)
Capital x policy rate	-0.021	-0.068	-0.071	-0.006
	(0.013)	(0.042)	(0.044)	(0.014)
No. observations	3,736	3,758	3,780	3,846
No. countries	22	22	22	22
CD test p-value	0.728	0.292	0.896	0.000
Delta statistic p-value	0.000	0.000	0.000	0.000

Notes: This table shows the results of the impact of capital regulation on the IRPT to lending rates in the long run (upper part) and short-run (lower part) from estimating equation 4.15 using the CS-ARDL estimator (Model 1). The model lag structure is chosen using the Bayesian Information Criteria (BIC) while the number of cross-sectional lags is set according to $p_n = (\sqrt[3]{T})$. For robustness and comparison purposes, I also present in Models 2 and 3, the CS-ARDL results obtained when a fixed lag structure is applied on all the variables i.e. lags 2 and 1, respectively. Model 4 shows the results when using a dynamic CCEMG estimator but without lags of cross-sectional averages. The CD test statistic is the cross-sectional dependence test of (Pesaran, 2004) on the model residuals with the null of cross-sectional independence. With the inclusion of additional cross-sectional lags in the CS-ARDL Model 1, the cross-sectional dependence is alleviated with the p-values of CD tests statistics increased, exhibiting more cross-section independence as compared to the CCEMG estimations in Model 4. The Delta p-value is the (Pesaran and Yamagata, 2008) test for slope homogeneity – equality of slope parameters is rejected in all the models. The standard errors are shown in parentheses and 1, 2 and 3 asterisks show significance level at 10%, 5% and 1%, respectively.

Table 4.12: Results of the impact of regulatory capital requirements on the IRPT to commercial banks' deposit rates in SSA (2005-2019)

Model:	(1)	(2)	(3)	(4)
Estimator:	CS-ARDL	CS-ARDL	CS-ARDL	CCEMG
No. of Lags:	(4 0)	(2 2)	(1 1)	(5 0)
Long run				
Policy rate	0.838**	0.566***	0.458	1.014**
	(0.336)	(0.193)	(0.437)	(0.419)
Capital	0.415*	0.139	0.174	0.446*
	(0.223)	(0.138)	(0.248)	(0.254)
Capital x policy rate	-0.057*	-0.019	-0.021	-0.067*
	(0.031)	(0.017)	(0.036)	(0.039)
Short run				
Error Correction Term (ECT)	-0.321***	-0.381***	-0.400***	-0.262***
	(0.023)	(0.019)	(0.028)	(0.019)
Policy rate	0.262**	-0.227	-0.132	0.302**
	(0.103)	(0.419)	(0.467)	(0.134)
Capital	0.127*	-0.123	-0.016	0.146**
	(0.066)	(0.144)	(0.156)	(0.075)
Capital x policy rate	-0.017*	0.010	0.002	-0.020
	(0.009)	(0.031)	(0.034)	(0.013)
No. observations	3,648	3,692	3,714	3,824
No. countries	22	22	22	22
CD test p-value	0.292	0.292	0.000	0.000
Delta statistic p-value	0.000	0.000	0.000	0.000

Notes: This table shows the results of the conditioning impact of capital regulation on the IRPT to deposit rates in the long run (upper part) and short-run (lower part) from estimating equation 4.15 using the CS-ARDL estimator (Model 1). The model lag structure was chosen using the Bayesian Information Criteria (BIC) while the number of cross-sectional lags is set according to $p_n = (\sqrt[3]{T})$. For robustness and comparison purposes, I also present in Models 2 and 3, the CS-ARDL results obtained when a fixed lag structure is applied on all the variables i.e. lags 2 and 1, respectively. Model 4 shows the results when using a dynamic CCEMG estimator but without lags of cross-sectional averages. The CD test statistic is the cross-sectional dependence test of (Pesaran, 2004) on the model residuals with the null of cross-sectional independence. With the inclusion of additional cross-sectional lags in the CS-ARDL Model 1, the cross-sectional dependence is alleviated with the p-values of CD tests statistics increased, exhibiting more cross-section independence as compared to the CCEMG estimations in Model 4. The Delta p-value is the (Pesaran and Yamagata, 2008) test for slope homogeneity – equality of slope parameters is rejected in all the models. The standard errors are shown in parentheses and 1, 2 and 3 asterisks show significance level at 10%, 5% and 1%, respectively.

4.5.4. Robustness Checks

In addition to presenting the results obtained from an alternative estimator, the dynamic Common Correlated Effects Mean Group (CCEMG) and applying fixed lag structures, three robustness checks were carried out to validate our findings. First, the study followed the approach by Eberhardt & Presbitero, (2015) and Cavatorta & Smith, (2017) and employed an error correction version of the dynamic common correlated effects estimator. Equations 4.14 and 4.15 were thus re-estimated using a cross-sectionally augmented error correction model (CS-ECM). As depicted in equation 4.17, this approach also allows for testing for cointegration by testing the significance of the error correction coefficient. The results from the CS-ECM are reported in Table 4.13 and 3.14 and are consistent with those from our baseline CS-ARDL regressions as reported in Tables 4.7 – 4.12.

Second, the study utilised annual data and estimated the long-run pass-through effects using the Augmented Mean Group (AMG) estimator Eberhardt & Teal, (2010). The use of annual data allows for examination of whether the baseline results are robust to data aggregation – and not merely a mechanical consequence of the interpolation of the capital regulation data. Though a static model, the AGM estimator is robust to cross sectional dependence and includes cross-section averages of the dependent and independent variables as additional regressors. The AMG approach first estimates a pooled OLS regression model by first difference augmented with year dummies. The coefficients of the year dummies are referred to as a common dynamic process – and represent the estimated cross-group average of the evolution of unobservables over time (Eberhardt and Teal, 2010). In the second stage, the country-specific regressions are augmented by this estimated common dynamic process. In Monte Carlo simulations, Eberhardt & Bond, (2009) show that the AGM performed similarly well in terms of bias or root mean squared error in panels with nonstationary variables regardless of whether there was cointegration or not. The results of the AGM are shown in Tables 4.15 and are consistent with the baseline results reported in Tables 4.7 – 4.12. In particular, it is observed that the common dynamic process is highly significant in all the models – indicating that common factors over time significantly affect bank lending and deposit rates in SSA.

Finally, South Africa was excluded from the analysis on the basis that it may be considered an outlier as it has a deep and sophisticated financial system with a well-developed capital market. Some studies (Perera & Wickramanayake, 2016; Saborowski & Weber, 2013), observe that the pass-through is higher in more developed countries with deep financial systems. The exclusion of South Africa from the analysis allowed for examination of whether the baseline results are biased or significantly influenced by its inclusion in the sample. The results are reported in Tables 4.16 and 4.17 and they remain unchanged. The capital regulation reduces the size of the IRPT even when South Africa is excluded from the sample.

Table 4.13: Results of the IRPT and impact of competition on the IRPT in SSA (2005-2019) using Cross-Sectionally augment Error Correction Model (CS-ECM)

Model:	(1)	(2)	(3)	(4)
Dependent variable:	Δ Lending rate	Δ Deposit rate	Δ Lending rate	Δ Deposit rate
Long run				
Policy rate	0.293**	0.533***	0.312**	0.365***
	(0.143)	0.056	(0.144)	(0.081)
Lerner			0.329	-1.933
			(2.285)	(6.393)
Lerner x Policy rate			-0.544*	-1.356**
			(0.325)	(0.562)
Short run				
Error correction	-0.211***	-0.208***	-0.218***	-0.577***
	0.039	(0.018)	(0.040)	(0.057)
Δ Policy rate	0.102*	0.024	0.052	-0.024
	(0.063)	(0.027)	(0.059)	(0.057)
Δ Lerner			-3.080	7.803
			(4.084)	(8.092)
Δ Lerner x policy rate			-0.529	0.491
			(0.311)	(0.310)
No. observations	3,560	3,758	3,494	3,812
No. countries	22	22	22	22
CD test statistic	1.594	-1.585	1.222	-1.584
CD p-value	0.111	0.113	0.222	0.113

Notes: This table shows the results of the IRPT (Models 1 and 2) as well as the conditioning impact of competition on the IRPT to lending and deposit rates (Models 3 and 4) using CS-ECM. The dependent variable in models 1 and 3 is the first difference (Δ) of lending rate while in models 2 and 4 is the first difference (Δ) of deposit rate. The CD test statistic is the cross-sectional dependence test of (Pesaran, 2004) on the model residuals with the null of cross-sectional independence. The standard errors are shown in parentheses and 1, 2 and 3 asterisks show significance level at 10%, 5% and 1%, respectively.

Table 4.14: Results of the IRPT and impact of capital regulation on the IRPT in SSA (2005-2019) using Cross-Sectionally augment Error Correction Model (CS-ECM)

	(1) Δ Lending rate	(2) Δ Deposit rate	(3) Δ Lending rate	(4) Δ Deposit rate
Long run				
Policy rate	0.293**	0.533***	1.346***	1.030***
	(0.143)	0.056	(0.563)	(0.346)
Capital			0.856**	0.445**
			(0.416)	(0.216)
Capital x Policy rate			-0.091**	-0.059*
			(0.046)	(0.032)
Short run				
Error correction	-0.211	-0.208***	-0.031***	-0.321***
	0.039	(0.018)	(0.063)	(0.029)
Δ Policy rate	0.102*	0.024	0.431	-0.344
	(0.063)	(0.027)	(0.317)	(0.380)
Δ Capital			0.676	-0.207
			(0.500)	(0.131)
Δ Capital x policy rate			-0.031	0.021
			(0.256)	(0.027)
No. observations	3,560	3,758	3,494	3,812
No. countries	22	22	22	22
CD test statistic	1.594	-1.585	1.423	-1.109
CD p-value	0.111	0.113	0.155	0.268

Notes: This table shows the results of the IRPT (Models 1 and 2) as well as the conditioning impact of capital regulation on the IRPT to lending and deposit rates (Models 3 and 4) using CS-ECM. The dependent variable in models 1 and 3 is the first difference (Δ) of lending rate while in models 2 and 4 is the first difference (Δ) of deposit rate. The CD test statistic is the cross-sectional dependence test of (Pesaran, 2004) on the model residuals with the null of cross-sectional independence. The standard errors are shown in parentheses and 1, 2 and 3 asterisks show significance level at 10%, 5% and 1%, respectively.

Table 4.15: Results of the IRPT and impact of competition and capital regulation on the IRPT using the Augmented Mean Group (AGM) estimator

Model:	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Lending rate	Deposit rate	Lending rate	Deposit rate	Lending rate	Deposit rate
Policy rate	0.453***	0.389***	0.558***	0.348***	1.078***	1.140***
	(0.090)	(0.071)	(0.105)	(0.121)	(0.413)	(0.360)
Lerner			9.398**	-9.864*		
			(4.778)	(5.738)		
Lerner x policy rate			-0.112	-1.722**		
			(0.639)	(0.718)		
Capital					0.395	0.426**
					(0.295)	(0.210)
Capita x policy rate					-0.075*	-0.061*
					(0.042)	(0.032)
Common dynamic	1.045	0.791**	1.391**	0.433	1.211*	0.911***
process	(0.657)	(0.326)	0.681)	0.344)	0.698)	(0.210)
No. observations	325	325	318	318	317	317
No. countries	22	22	22	22	22	22
CD p-value	0.293	0.604	0.224	0.462	0.321	0.550
Wald test p-value	0.000	0.000	0.000	0.000	0.000	0.000

Notes: The table shows the long-run results of the IRPT to lending rates (Model 1) and deposit rates (Model 2); the conditioning impact of competition on the IRPT to lending rates (Model 3) and deposit rates (Model 4); and the conditioning impact of capital regulation on the IRPT to lending rates (Model 5) and deposit rates (Model 6), using the Augmented Mean Group (AGM) estimator. The CD test shows the cross sectional dependence test of (Pesaran, 2004) with the null of cross sectional independence. The Wald p-value shows the joint significance of the model coefficients. The standard errors are shown in parentheses and 1, 2 and 3 asterisks show significance level at 10%, 5% and 1%, respectively.

Table 4.16: Results of the IRPT to lending and deposit rates and the conditioning impact of competition on the IRPT when South Africa is excluded

Model:	(1)	(2)	(3)	(4)
Estimator:	CS-ARDL	CS-ARDL	CS-ARDL	CS-ARDL
No. of Lags	(3 0)	(4 0)	(3 0)	(4 0)
Long run				
Policy rate	0.341	0.447***	0.557**	0.439***
	(0.222)	(0.054)	(0.218)	(0.071)
Lerner			7.614*	-9.820**
			(4.440)	(4.382)
Lerner x policy rate			-1.798*	-0.474
			(0.925)	(0.637)
Short run				
Error Correction Term (ECT)	-0.205***	-0.201***	-0.258***	-0.264***
	(0.041)	(0.016)	(0.053)	(0.021)
Policy rate	0.006	0.093***	0.060	0.116***
	(0.033)	(0.016)	(0.045)	(0.023)
Lerner			0.452	-2.293**
			(0.639)	(1.165)
Lerner x policy rate			-0.251**	-0.066
			(0.113)	(0.144)
No. observations	3,606	3,543	3,564	3,564
No. countries	21	21	21	21
CD test statistic	1.66	-0.08	0.89	-0.32
CD p-value	0.098	0.934	0.376	0.676

Notes. This table shows the results of the IRPT to lending rates (Model 1) and deposit rates (Model 2); and the conditioning impact of competition on the IRPT to lending rates (Model 3) and deposit rates (Model 4), when South Africa is excluded from the analysis. The dependent variable in models 1 and 3 is the lending rate while in models 2 and 4 is the deposit rate. The CD test statistic is the cross-sectional dependence test of (Pesaran, 2004) on the model residuals with the null of cross-sectional independence. The standard errors are shown in parentheses and 1, 2 and 3 asterisks show significance level at 10%, 5% and 1%, respectively. All the models are estimated using CS-ARDL.

Table 4.17: Results of the IRPT to lending and deposit rates and the conditioning impact of capital regulation on the IRPT when South Africa is excluded

Model:	(1)	(2)	(3)	(4)
Estimator:	CS-ARDL	CS-ARDL	CS-ARDL	CS-ARDL
No. of Lags	(3 0)	(4 0)	(3 0)	(4 0)
Long run				
Policy rate	0.341	0.447***	2.899**	0.972***
	(0.222)	(0.054)	(1.410)	(0.297)
Capital			2.918**	0.522***
			(1.389)	(0.195)
Capital x policy rate			-0.176**	-0.067**
			(0.084)	(0.028)
Short run				
Error Correction Term (ECT)	-0.205***	-0.201***	-0.324***	-0.321***
	(0.041)	(0.016)	(0.051)	(0.024)
Policy rate	0.006	0.093***	0.248*	0.299***
	(0.033)	(0.016)	(0.148)	(0.095)
Capital			0.257**	0.155**
			(0.130)	(0.061)
Capital x policy rate			-0.019	-0.020**
			(0.013)	(0.009)
No. observations	3,6,06	3,543	3,585	3,480
No. countries	21	21	21	21
CD test statistic	1.66	-0.08	0.79	-0.39
CD test p-value	0.098	0.934	0.429	0.697

Notes. This table shows the results of the IRPT to lending rates (Model 1) and deposit rates (Model 2); and the conditioning impact of capital regulation on the IRPT to lending rates (Model 3) and deposit rates (Model 4), when South Africa is excluded from the analysis. The dependent variable in models 1 and 3 is the lending rate while in models 2 and 4 is the deposit rate. The CD test statistic is the cross-sectional dependence test of (Pesaran, 2004) on the model residuals with the null of cross-sectional independence. The standard errors are shown in parentheses and 1, 2 and 3 asterisks show significance level at 10%, 5% and 1%, respectively. All the models are estimated using CS-ARDL

4.6. Conclusion

The objective in this chapter was to examine the interest rate pass-through (IRPT) to commercial banks' lending and deposit rates in SSA. To do this, the study utilised monthly-level data from 22 countries and applied a heterogeneous dynamic CS-ARDL panel estimator. The focus of the empirical analysis was to investigate whether the size of the pass-through increases or decreases in the presence of competition (market power) and higher regulatory capital requirements. The CS-ARDL was thus enhanced in two ways: First, a pass-through model to lending and deposit rates that integrated competition (Lerner index) was estimated i.e. a model, which included the interaction of Lerner index and policy rate as an explanatory variable. Second, a model that incorporated capital regulation (proxied by the equity to assets ratio) and its interaction with the policy rate was also estimated. In both models, cointegration techniques were applied that allowed for examination of both, short run and long run relationships between lending/deposit rates and the policy rate. The analysis was based on data obtained from the IMF IFS, IMF FSIs, Bankfocus and (GFDD, 2019).

Three key findings emerge from the investigation: (i) the average IRPT in SSA is incomplete in the long run; (ii) the size of IRPT to lending rates is smaller when banks possess market power (low competition) – implying that competition increases the size of the pass-through to lending rates; and (iii) stringent (higher) regulatory capital requirements reduce the size of the pass-through to both, lending and deposit rates. The results are similar to those reported in other studies (Chileshe & Akanbi, 2016; Gropp et al., 2007; Leroy & Lucotte, 2015; van Leuvensteijn et al., 2013) on impact of competition; and (Fraisse et al., 2017; Noss & Toffano, 2016; Slovik & Cournede, 2011) on the impact of capital regulation. In terms of heterogeneity, it was observed that the size of the pass-through, both, in the long run and short run, vary significantly across countries. Consistent with theoretical predictions, the pass-through is relatively smaller in the short run than in the long run.

The results are relevant and useful for economic policy and further academic work in three ways: First, the finding that increased competition strengthens the size of the IRPT to lending rates in the long run, implies that monetary policymakers in SSA have an incentive to promote banking sector competition. Given that in a number of countries, the banking sector regulatory reforms have also resulted in amalgamations or acquisitions of weak banks by strong banks, these reforms have

potential implications on the degree of competition in the market – particularly where the reduced number of banks results in a more concentrated banking sector that is not a direct result of more efficient banks dominating the market. The findings thus raise important insights into this aspect, namely that bank consolidation reforms need to be implemented in a manner that does not increase market power in the banking sector.

Second, the finding that tighter capital regulation reduces the effectiveness of monetary policy, suggests that there is the need for a better balance between prudential supervision and monetary policy implementation in SSA. Although higher regulatory capital requirements are a key macro-prudential tool for enhancing banking sector stability, the findings suggest that they could also have the unintended consequences of limiting economic expansion when most banks in the system operate within the regulatory minimum requirement i.e. hold less "capital buffers". This trade-off, therefore, calls for a careful analysis and balance in the implementation of bank regulatory and monetary policies. If the authorities' policy objective is to unlock bank lending to the real sector, then ensuring that banks are adequately capitalised i.e. that they hold capital significantly in excess of the regulatory minimum is vital – because such banks would be able to lend more even when the regulatory capital requirements are deemed more stringent. Given that bank profitability (return on equity) is comparatively higher in SSA as shown in chapter 2, while raising of equity is generally costly owing to undeveloped capital markets in most countries, an important source of capital in this regard is retained earnings. Supervisory policy should in this case encourage internal capital augmentation by ensuring that banks' dividend policies support internal capital growth – there by increasing the "capital buffer" for banks.

Finally, by documenting the individual country's average sizes of the IRPT (for both, long-run and short-run), the study could serve as a basis for future research. In particular, the pass-through sizes can feed into broader empirical policy work, including when assessing macro-economic convergence and regulatory harmonisation under the various integration initiatives currently under way in the different blocks in SSA. The study also allows for the examination of how other financial sector structural factors may affect the pass-through sizes in the different countries in the region.

Table 4.18: Average long run and short-run pass-through coefficients to lending and deposit rates by country (2005-2019)

Country	Region	Income level	IRPT-Lend rates LR	IRPT-Dep rates LR	IRPT-Lend rates SR	IRPT-Dep rates SR
Angola	SADC	Lower middle	0.292	0.329	0.058	0.109
Benin	ECOWAS	Lower middle	-0.677	0.337	-0.204	0.073
Botswana	SADC	Upper middle	1.755	0.854	0.041	0.083
Burkina Faso	ECOWAS	Lower	-0.757	-0.193	-0.198	-0.038
Ivory Coast	ECOWAS	Lower middle	-0.551	0.402	-0.237	0.056
Eswatini	SADC	Lower middle	0.938	0.879	0.442	0.308
Ghana	ECOWAS	Lower middle	0.385	0.399	0.059	0.125
Kenya	EAC	Lower middle	1.037	0.541	0.084	0.061
Lesotho	SADC	Lower middle	1.152	0.562	0.094	0.049
Madagascar	SADC	Lower	-0.879	0.471	-0.079	0.076
Malawi	SADC	Lower	1.179	0.327	0.117	0.054
Mali	ECOWAS	Lower	-1.331	0.366	-0.268	0.065
Mozambique	SADC	Lower	0.502	0.304	0.082	0.055
Namibia	SADC	Upper middle	0.904	0.759	0.055	0.179
Nigeria	ECOWAS	Upper middle	-0.153	0.293	-0.016	0.037
Rwanda	EAC	Lower	-0.004	0.385	-0.001	0.118
Senegal	ECOWAS	Lower middle	-0.105	0.762	-0.090	0.157
South Africa	SADC	Upper middle	0.944	1.083	0.613	0.119
Tanzania	EAC	Lower middle	0.084	0.371	0.007	0.058
Togo	ECOWAS	Lower	-0.512	0.635	-0.162	0.149
Uganda	EAC	Lower	0.6562	0.722	0.138	0.139
Zambia	SADC	Lower	3.085	0.228	0.039	0.031
Average			0.377	0.514	0.027	0.094
CMA			0.985	0.821	0.301	0.164
ECOWAS			-0.463	0.375	-0.140	0.078
EAC			0.443	0.505	0.057	0.094
Upper middle			0.862	0.747	0.173	0.105
Lower middle			0.284	0.509	0.023	0.110
Lower			0.298	0.364	-0.025	0.075

Notes: Lendrate =lending rate; Deprate=deposit rate long-run; LR=long run; SR=short run

4.6.1. Appendix 3

Table 4.19: Description of variables and sources

Variable	Definition	Source
Lending rate	Average monthly lending rate for commercial banks for all types of loans	IMF IFS
Deposit rate	Average monthly deposit rate for all types of deposits	IMF IFS
Monetary policy rate	Short-term money market rate (monthly series). This is the basis for measuring the speed and magnitude of the interest rate pass-through (IRPT)	IMF IFS
Lerner index	A measure of the pricing power (competition) at the bank level in the market	Own calculation from Bankfocus data and GFDD
Capital ratio	Proxy for capital regulation requirement – derived by dividing equity by total assets	IMF FSIs
Lerner x policy rate	An interaction term of Lerner index and policy rate to capture the conditioning effect of competition on the IRPT	Own calculation
Capital x policy rate	An interaction term of capital ratio and policy rate to capture the conditioning effect of capital on the IRPT	Own calculation

4.6.2. Trend in individual country policy, lending, and deposit rates (2005-2019)

Figure 4.3 Policy, lending, and deposit rate (Angola)

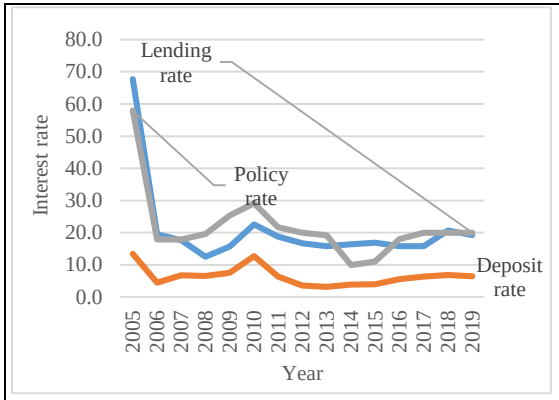


Figure 4.4: Policy, lending, and deposit rate (Benin)

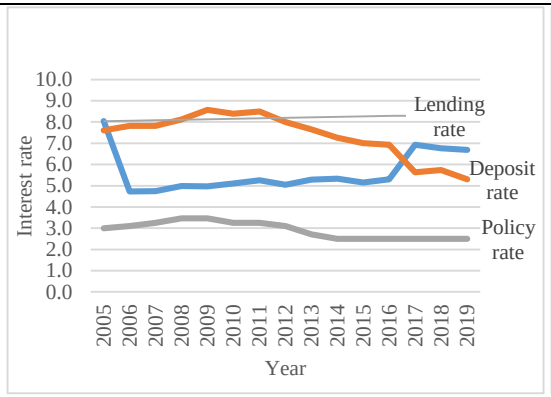


Figure 4.5: Policy, lending, and deposit rate (Botswana)

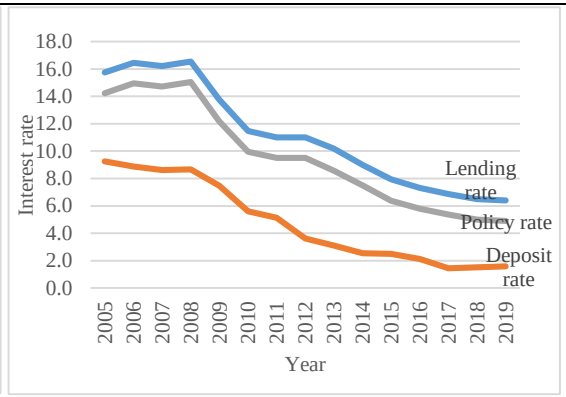


Figure 4.6: Policy, lending, and deposit rate (Burkina Faso)

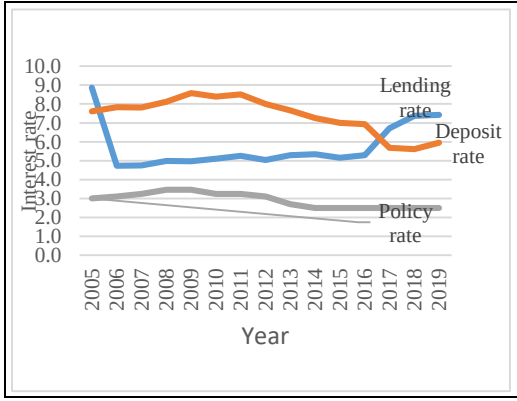


Figure 4.7: Policy, lending, and deposit rate (Ivory Coast)

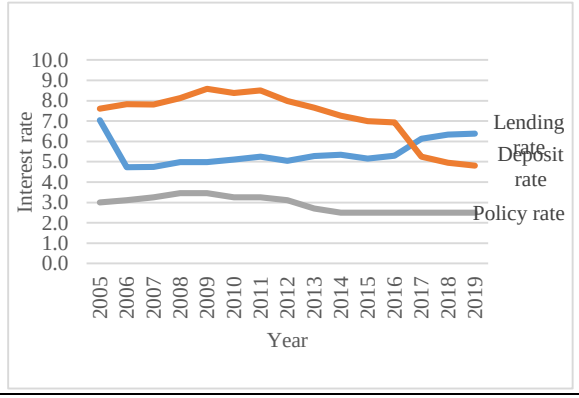


Figure 4.8: Policy, lending, and deposit rate (Eswatini)

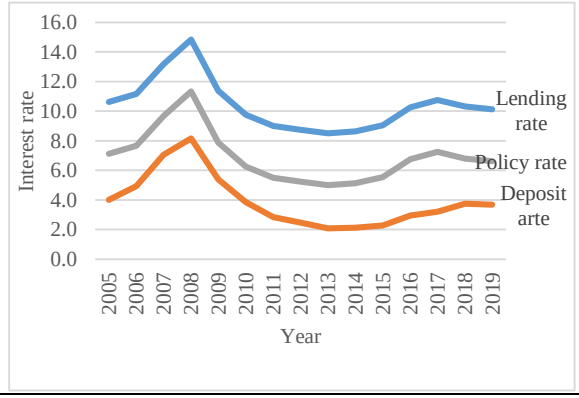


Figure 4.9: Policy, lending, and deposit rate (Ghana)

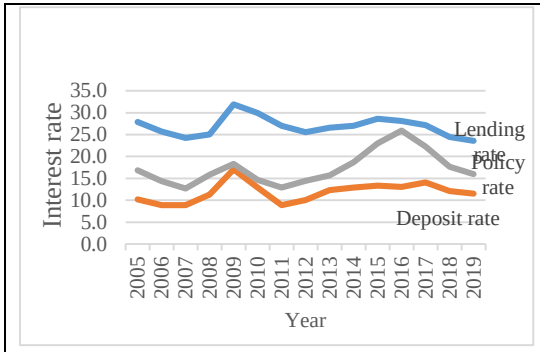


Figure 4.10: Policy, lending, and deposit rate (Kenya)

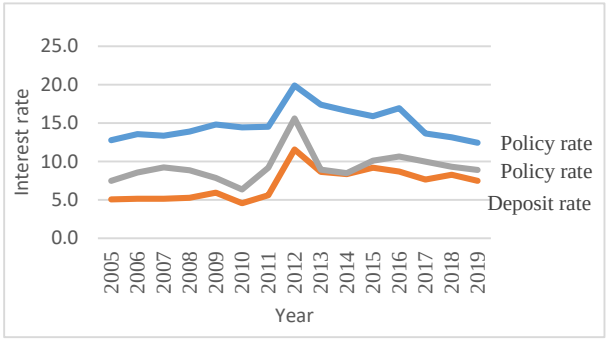


Figure 4.11: Policy, lending, and deposit rate (Lesotho)

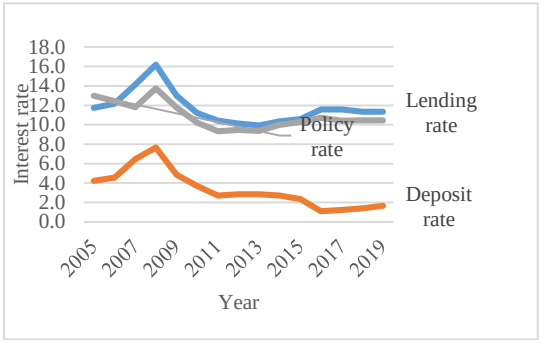


Figure 4.12: Policy, lending, and deposit rate (Madagascar)

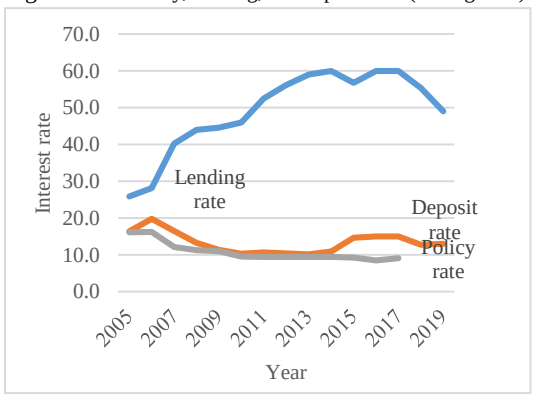


Figure 4.13: Policy, lending, and deposit rate (Malawi)

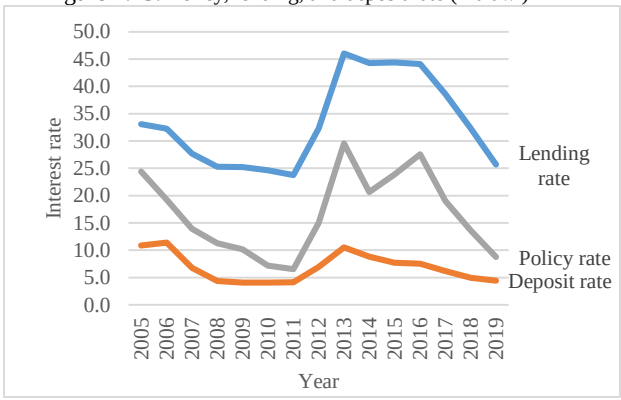


Figure 4.14: Policy, lending, and deposit rate (Mali)

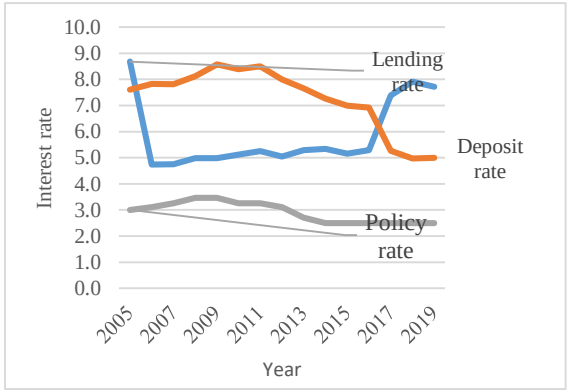


Figure 4.15: Policy, lending, and deposit rate (Mozambique)

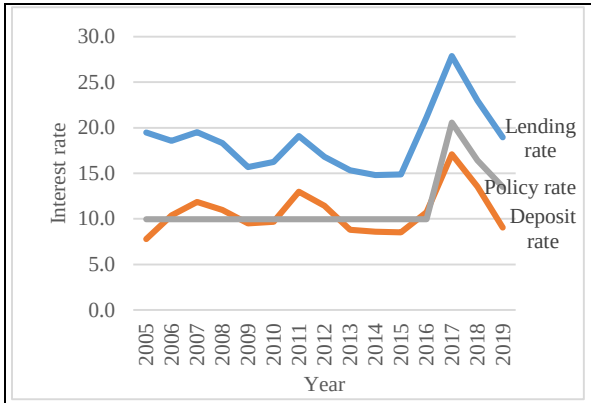


Figure 4.16: Policy, lending, and deposit rate (Namibia)

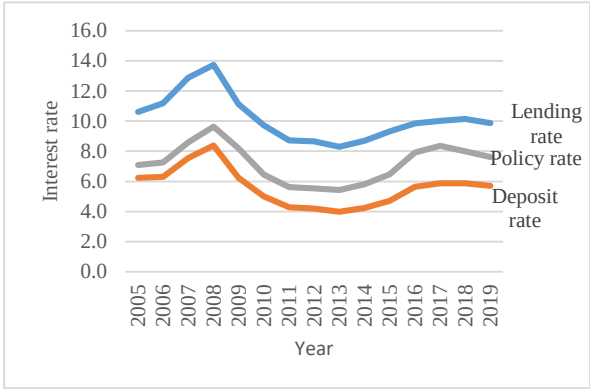


Figure 4.17: Policy, lending, and deposit rate (Nigeria)

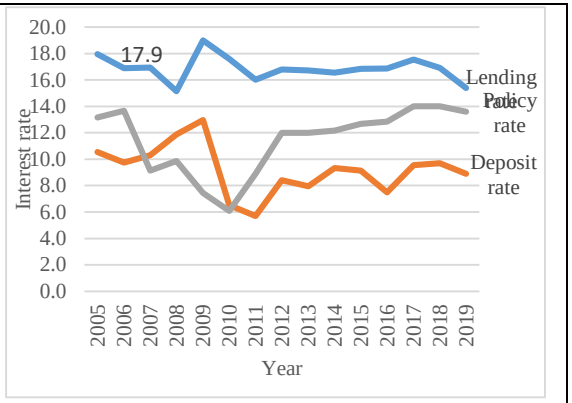


Figure 4.18: Policy, lending, and deposit rate (Rwanda)

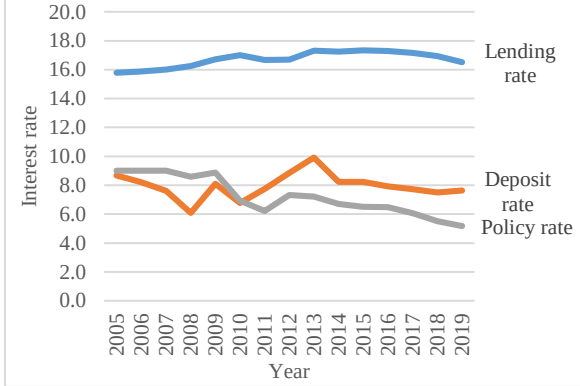


Figure 4.19: Policy, lending, and deposit rate (Senegal)

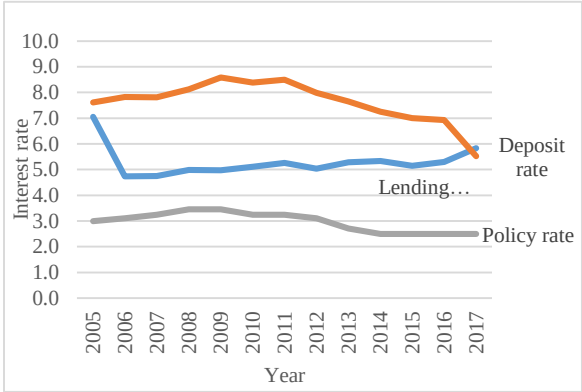


Figure 4.20: Policy, lending, and deposit rate (South Africa)

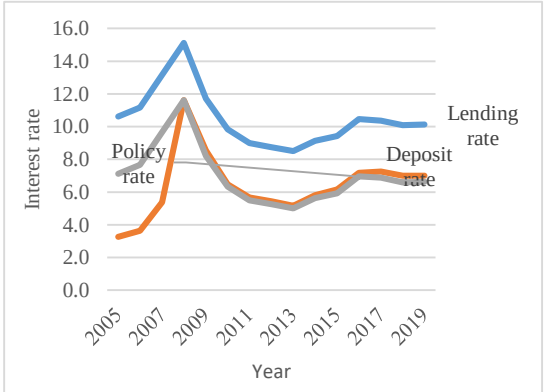


Figure 4.21: Policy, lending, and deposit rate (Tanzania)

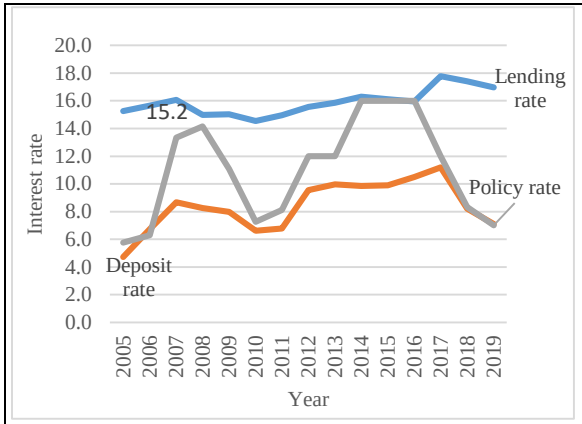


Figure 4.22: Policy, lending, and deposit rate (Togo)

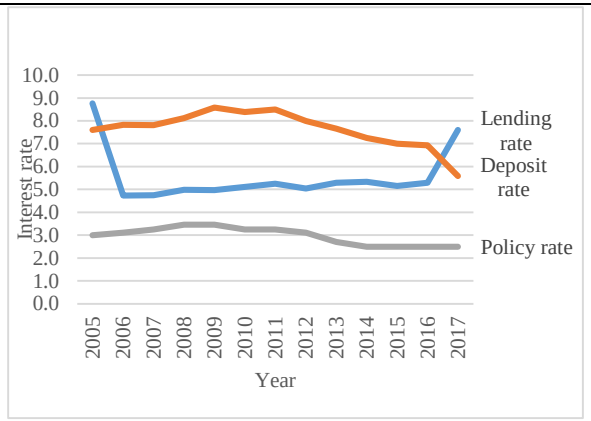


Figure 4.23: Policy, lending, and deposit rate (Uganda)

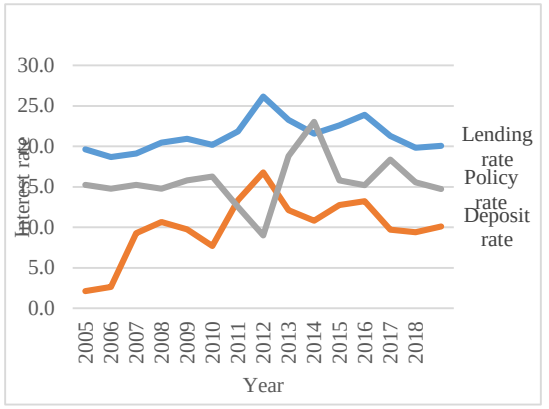
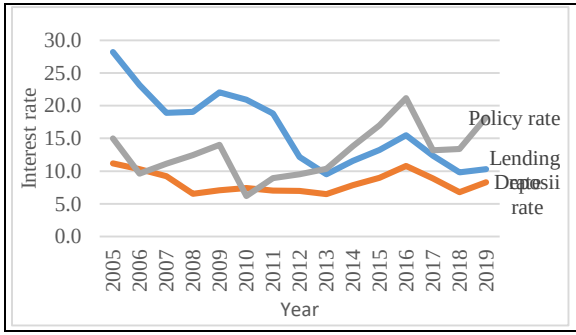


Figure 4.24: Policy, lending, and deposit rate (Zambia)



Chapter 5: Conclusion and Policy Options

5.1. Introduction

Following the global financial crisis, most SSA supervisory agencies adopted international bank regulatory standards and practices based on the Basel Core Principles (BCPs) for effective bank supervision. The policy objective was to strengthen the stability of banks by ensuring that risks are prudently managed and mitigated. However, the effectiveness of these internationally based regulations in mitigating bank risk in developing countries has not been empirically ascertained. The SSA region has also experienced increased penetration of foreign banks over the last two decades most of which are systemically important in the host markets where they operate. These banks have in some cases resulted in the creation of complex, interrelated banking structures – some of which are non-bank financial institutions and which may not be adequately supervised due to a lack of appropriate legal frameworks on consolidated supervision (Beck & Maimbo, 2013). So far, studies on how cross-border banks affects domestic financial stability in developing countries are much less numerous, and to my knowledge, in the SSA region, this issue remains comparatively unexplored. Finally, most SSA countries have seen considerable changes in the design and implementation of monetary policy. These changes have triggered a considerable debate on whether and how regulatory and structural factors in the financial system impede or facilitate monetary policy transmission – a debate that, as yet, is not fully settled.

This thesis explores and examines the aforesaid three issues and presents some policy options. To explore the key research question on each issue, the study employed both, bank and country-level data, which was obtained from various, sources, namely: Bankfocus, the World Bank Regulatory Surveys, the International Financial Statistics, the Financial Soundness Indicators of the International Monetary Fund, and the Global Financial Development Database. In terms of methodology, novel estimation techniques were employed, namely two-step system GMM and CS-ARDL estimators that are dynamic and at the same time, respectively, address problems of endogeneity and cross section dependence in the error residuals. Below, is a summary of the key findings from each area and some possible policy insights.

5.2. Regulation and bank risk (stability)

This essay examined the impact of regulations on bank risk-taking behaviour in SSA. Based on theoretical considerations and the applicability of the Basel II framework, the focus was on the implications of four regulations: capital, activity restrictions, supervisory power and market discipline. Bank risk was analysed from two perspectives: solvency risk and liquidity risk. A large body of empirical literature on this topic focuses on developed economies, even though banks in developing regions like SSA have also embraced international regulations based on the Basel Core Principles. The literature also ignores the liquidity risk dimension of bank stability. Three key lessons are drawn from this study. First, regulations pertaining to capital and market discipline enhance banking sector stability by reducing both, solvency risk and liquidity risk. This finding supports the "capital-at-risk" effect hypothesis by (Hellmann et al., 2000) as highlighted in chapter 2. Second, regulatory policies that restrict or limit the scope of bank activities and products increase both, solvency risk and liquidity risk – hence reduce overall banking sector stability. This is consistent with the hypothesis by (Barth et al., 2004) and supports the view that restricting the scope of activities limit profitability and funding avenues for banks and hence increase bank fragility. Finally, increased supervisory power is an ineffective tool to reduce solvency risk – it instead, increases liquidity risk and hence reduces bank stability from that perspective. The overall findings are consistent with those reported by (Almarzoqi et al., 2015; Barth et al., 2004; Danisman & Demirel, 2019; Klomp & de Haan, 2015; Saif-Alyousfi et al., 2020; Delis & Staikouras, 2011; Fernandez & Gonzalez, 2005; Agoraki et al., 2011).

5.3. Cross-border banking and financial stability

This study examined whether the increased presence or penetration of cross-border banks in SSA enhances banking sector stability in the host market. Three indicators of cross-border banking were employed: % (number) of foreign banks, share (%) of assets held by foreign banks in the host country and a foreign ownership dummy at bank level. Most empirical studies on this topic largely focus on performance related issues such as interest spreads or profitability or lending behaviour (see, for example, (Barajas et al., 2000; Claessens et al., 2001; De Haas & van Lelyveld, 2014; Gormley, 2007; Luo et al., 2014; Ukaegbu & Oino, 2017) or examine the patterns, size and trends in foreign banks (Beck & Brown, 2015; Mathieu et al., 2019) or merely provide narrative assessment of the regulatory policy implications of cross-border banks (Ngwu

et al., 2019). Previous experiences of the collapse of some regional cross-border banks in multiple SSA countries resulted in substantial economic costs and slowed down economic development. Ensuring a stable and sound banking system thus remains a central policy objective for supervisory and monetary authorities in SSA as most firms are bank dependent for capital financing given the underdeveloped capital markets in the region.

Three interesting results are found: First, increased penetration of foreign banks decreases banking sector stability in the host market. Second, the impact of cross-border banking is more pronounced for banks that are small and less efficient. Third, the quality of governance institutional factors – specifically, the level of political stability, voice of accountability and control of corruption, enhance the impact of cross-border banks on bank stability. The overall findings that higher presence of foreign banks is associated with lower banking sector stability is consistent with those reported by (Saidane et al., 2021a; Wu et al., 2017b; Yin, 2019).

5.4. Competition, capital regulation and interest rate pass-through

In this study, the key focus was to investigate whether structural factors relating to competition and regulatory capital requirements enhance or impede the transmission of monetary policy to commercial banks' lending and deposit rates. As highlighted in chapter 2, most SSA supervisory agencies adopted more stringent capital regulations for banks after the global financial crisis. In addition, following the liberalisation policies of late 1980s and early 1990s and as articulated in chapter 3, most countries opened up the banking sector to foreign investors with a view to enhance competition. It is unclear to date how these reforms shape monetary policy transmission in the region – in particular, whether there is a trade-off between supervisory (capital regulation) and competition policies on one hand, and monetary policy transmission on the other.

The study findings are also three-fold. First, competition enhances the transmission of monetary policy to commercial banks' lending rates. This implies that increased market power in the banking sector (i.e. less competition) retards the effectiveness of monetary policy. Second, the pass-through to both, lending and deposit rates is incomplete in the long run in SSA. Finally, higher regulatory capital requirements reduce the size of the IRPT to both, lending and deposit rates. The findings on the conditioning effect of competition on the pass-through are similar to those reported by

(Chileshe & Akanbi, 2016; Gropp et al., 2007; Leroy & Lucotte, 2015; van Leuvensteijn et al., 2013) while those of capital regulation are consistent with the findings of (Fraisse et al., 2017; Noss & Toffano, 2016; Slovik & Cournede, 2011).

5.5. Policy Implications

The study findings have important policy implications. First, the finding that capital and market discipline regulations reduce bank risk provide evidence in support of Pillars 1 (minimum capital requirements) and 3 (disclosure requirements) of the Basel II framework in SSA. Bank supervisory agencies in the region should thus prioritize the adoption of Pillars 1 and 3 of the Basel II framework as an effective policy response to enhancing the stability of banks. The positive effect of market discipline (over supervisory power) regulations in mitigating solvency risk suggests that supervisory authorities should also pay more attention to enhancing market disclosure requirements that allow private investors and the public to "discipline" banks. So far, few countries have implemented Pillar III of the Basel II framework in SSA. On the other hand, the destabilising effect of higher activity restrictions implies that adoption or continued implementation of a universal banking model (which allows banks to diversify their revenue streams) by supervisory authorities, appears to be a more appropriate regulatory policy to enhance banking sector stability in SSA.

Second, the finding that strong supervision is associated with higher liquidity risk (low stability) implies that there is a trade-off (between increased supervisory powers and liquidity management in banks) that needs to be properly managed whenever regulatory authorities opt to increase their supervisory mandate. Overall, the results from the second chapter show that ignoring the dual dimension of bank stability would lead to erroneous policy conclusions on the impact of regulations in mitigating overall bank risk.

Third, the overall finding that cross-border banks decrease banking sector stability in the host country suggests that host regulatory authorities need to establish proper channels of collaboration with home regulatory authorities of foreign subsidiaries. This collaboration is more important in cases where the foreign banks pose systemic risk in the host market because, in that case, the threat to financial stability and potential economic costs is significantly elevated. The finding that foreign

banks affect banks in the host country differently depending on their characteristics also suggests that purposeful regulatory strategies are needed to offset the negative effects of cross-border banking. For instance, regulatory interventions or policies that improve bank efficiency could be effective in insulating host countries from the negative effects of foreign banks. In this regard, supervisory measures that encourage cost-minimization or prescription of different licensing requirements for domestic and international banks could be vital tools that can help to cushion the negative impact of foreign banks on bank stability.

Finally, monetary policymakers in SSA have an incentive to promote banking sector competition as it enhances monetary policy effectiveness. In particular, bank consolidation reforms need to be implemented in a manner that does not increase market power (reduce competition) in the banking sector. On the other hand, the finding that higher regulatory capital requirements reduce the transmission of monetary policy to commercial banks' rates suggests the presence of a potential trade-off between monetary and supervisory policy. So far, higher capital requirements have been a key macro-prudential tool for enhancing banking sector stability in most countries in the region. The findings thus call for a better balance between prudential supervision and monetary policy implementation in this regard.

5.6. Areas for further research

There are a few areas that have not been fully addressed in the thesis. Going forward, it would be imperative for example to further explore the following issues. First, it would be more informative for policy purposes to unpack the supervisory power index (regulation) into aspects that capture capacity, financial resources and on-site examination of banks. In other words, which aspects of enhanced supervisory mandate dominates or materially contributes towards the overall non-significance of this regulation on bank risk in SSA? Second, given the importance of banks in providing capital finance in most SSA countries, future research could focus on quantifying the contribution of foreign banks to private sector credit intermediation in the region. Finally, although the current study has documented the pass-through sizes for each country in the sample, it would be more informative to examine how other structural factors (such as credit risk, liquidity risk or exchange rate movements) affect monetary policy transmission in SSA – given the high NPLs and liquidity ratios as highlighted in chapter 2.

5.7. Limitations of the study

The thesis is limited in two ways. First, adequate data for analysis, particularly at the bank level, was only available for selected countries. Although the majority (over 60% on average) of the countries in the region were covered in the study, it is possible that the exclusion of the few countries whose data was not available could have had an impact on the study findings. Secondly, literature identifies several channels of monetary policy transmission to the real sector. The fourth chapter of my study only focused on the interest rate channel. The thesis is thus limited in these two aspects.

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