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Studies on Financial Development and Economic Growth in sub–Saharan Africa

By

Muazu Ibrahim

Doctoral thesis submitted in fulfilment of the requirements for the award of Doctor of Philosophy

The Graduate School of Business Administration, Wits Business School
University of the Witwatersrand

Supervisor: Professor Paul Alagidede

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LIST OF PUBLICATIONS AND RESEARCH OUTPUTS

Prior to submission, portions of the thesis and other related areas have been published in peer reviewed journals and working papers while others are under review.

Peer reviewed journal publications

1. **Ibrahim, M.,** and Alagidede, P., (2017). Financial sector development, economic volatility and shocks in sub-Saharan Africa, *Physica A: Statistical Mechanics and its Applications*, *484*, 66–81.
2. Alagidede, P., and **Ibrahim, M.,** (2017). On the causes and effects of exchange rate volatility on economic growth: Evidence from Ghana, *Journal of African Business, 18*(2), 169–193.
3. Boako, G., Acheampong, I. A., and **Ibrahim, M.,** (2017). Determinants of bank credit in Ghana: A bounds–testing cointegration approach, *African Review of Economics and Finance, 9*(1), 34–62.
4. Adam, I. O., Musah, A., and **Ibrahim, M.,** (2017). Putting the cart before the horse? Re–examining the relationship between domestic savings and economic growth in sub-Saharan Africa, *Journal of African Business*, *18*(1), 102–123
5. **Ibrahim, M.,** and Musah, A., (2015). Gold as an investment hedge against inflation and exchange rate? Evidence from a former Gold Coast, *International Journal of Business and Economic Research*, *10*(2), 148–166

Working paper publications

1. Kumi, E., **Ibrahim, M.,** and Yeboah, T., (2017). Aid volatility and structural economic transformation in sub–Saharan Africa: Does finance matter?, *Economic Research Southern Africa Working Paper* 655.

2. **Ibrahim, M.,** and Alagidede, P., (2016). Financial sector development, economic volatility and shocks in sub-Saharan Africa, *Economic Research Southern Africa Working Paper* 648.
3. Alagidede, P., and **Ibrahim, M.,** (2016). On the causes and effects of exchange rate volatility on economic growth: Evidence from Ghana, *International Growth Centre Working paper series,* London School of Economics and Political Science, UK.

Papers under review

1. **Ibrahim, M.,** and Alagidede, P., Effect of financial development and economic growth in sub–Saharan Africa: Does sectoral growth matter? *Empirical Economics*
2. **Ibrahim, M.,** and Alagidede, P., Nonlinearities in financial development–economic growth nexus: Evidence from sub–Saharan Africa, *World Development*
3. **Ibrahim, M.,** and Alagidede, P., Financial development, growth volatility and information asymmetry in sub-Saharan Africa: Does law matter? *South African Journal of Economics*
4. Kumi, E., **Ibrahim, M.,** and Yeboah, T., Aid, aid volatility and sectoral growth in sub–Saharan Africa; Does finance matter, *Journal of African Business, [Revised and re-submitted]*

Conference Presentations

1. **Ibrahim, M.,** and Alagidede, P., Effect of financial development and economic growth in sub–Saharan Africa: Does sectoral growth matter? *African Review of Economics and Finance Conference, August 11 to 12, 2016, KNUST, Kumasi, Ghana.*

2. **August, 2017 (*forthcoming*):** Financial sector development, economic volatility and shocks in sub-Saharan Africa, *African Review of Economics and Finance (AREF) Conference, August 30 to 31, 2017, GIMPA,* Accra, Ghana.
3. **August, 2017 (*forthcoming*):** Financial development, growth volatility and information asymmetry in sub-Saharan Africa: Does law matter? *African Review of Economics and Finance (AREF) Conference, August 30 to 31, 2017, GIMPA,* Accra, Ghana.

ABSTRACT

Financial sector development has been projected to play a very significant role in economic growth through the provision of improved quality and quantity of financial services. While financial development–growth nexus has received much attention in the literature, important research gaps still remain largely in areas such as financial–real sector interaction in growth trajectory, threshold effects, finance–volatility–shocks linkages; and legal system–information asymmetry nexus. Knowledge of these relationships is extremely crucial in regulating the financial sector and conducting prudent macroeconomic policy more generally. Using sub–Saharan Africa (SSA) as a case, this thesis consists of four self–contained empirical essays each investigating a critical gap relying on several advanced econometric techniques.

In the first essay, we examine the effect on economic growth when financial sector growth outstrips the solvency needs of the real sector. In this context, we find that more than two–thirds of our sampled countries in SSA have experienced at least one episode of excessive credit growth relative to real sector needs. While financial development supports economic growth, the extent to which finance helps growth depends crucially on the simultaneous growth of real and financial sectors. The elasticity of growth to changes in either size of the real sector or financial sector is higher under balanced sectoral growth. We also show that rapid and unbridled credit growth comes at a huge cost to economic growth with consequences stemming from financing of risky and unsustainable investments coupled with superfluous consumption fuelling inflation. However, the pass–through excess finance–economic growth effect via the investment channel is stronger. A good understanding of the optimal level of credit consistent with long run economic growth is needed as existence of an undisturbed equilibrated growth of real and financial sectors is a necessary condition for a

smooth economic growth. By introducing a previously missing link, our findings resolve the seemingly conflicting and highly contested results in the finance–growth literature.

The second essay investigates whether the impact of finance on growth is conditioned on the initial levels of countries' income per capita, human capital and financial development. While financial development is positively and significantly associated with economic growth, our evidence suggests that, in almost all the threshold variables, below a certain estimated threshold, financial sector development is positively and insignificantly related to growth. In other words, below the threshold level of per capita income, human capital and the level of finance, economic growth is largely insensitive to financial development while significantly influencing economic activity for countries above the thresholds. The main conclusion drawn is that higher level of finance drives long run growth and so is the overall level of income and human capital.

In the third essay, we disaggregate volatility into its various components in examining the effect of financial development on volatility as well as channels through which finance affects these volatility components. What emerged is that while financial development affects business cycle volatility in a non–linear fashion, its impact on long run fluctuation is imaginary. More specifically, well–developed financial sectors dampen volatility. The findings also revealed that while monetary shocks have large magnifying effect on volatility, their effect in the short run is minuscule. The reverse, however, holds for real shocks. The channels of manifestation shows that financial development dampens (magnifies) the effect of real shocks (monetary shocks) on the components of volatility with the dampening effects consistently larger only in the short run. A key implication emanating from this essay is that, strengthening financial sector supervision and cross–border oversight may be very crucial in

examining the right levels of finance and price stability necessary to falter economic fluctuations.

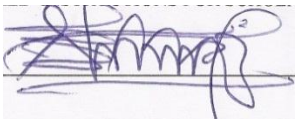
In the final essay, the study re–interrogates the role of law in financial development in the light of evolving legal systems in SSA as well as how legal origin explain cross–country differences in economic volatility through its effect on information asymmetry. Our evidence suggests that legal origin significantly explains cross–country differences in financial development and economic volatility. More importantly, relative to civil law, English common law countries and those in Southern Africa have higher financial sector development both in terms of financial activity and banking efficiency on the back of lower volatility. While private credit bureau positively (negatively) affects financial development (economic volatility) with economically large impact for English legal legacy countries, the latter effect is contingent on the form of legal origin suggesting that, the establishment of information sharing offices per se may be insufficient in taming growth vagaries. The effectiveness of law is exceedingly relevant. At the policy front, maintaining more agile and effective legal systems that are responsive to changing financial landscape while forcing economic agents to improve information infrastructure is healthy for both financial sector development and macroeconomic stability.

Keywords: Financial development, economic growth, volatility, shocks, law, threshold, GMM

JEL Classifications: O16; C33; F4; F31; G1; K42; C32; O43

DECLARATION

I, **Muazu Ibrahim** with student number 1270500, hereby declare that this research report is my own work except as shown in the references and acknowledgements. It is submitted in fulfillment of the requirements for the award of Doctor of Philosophy at the University of the Witwatersrand, Johannesburg, South Africa. It has not been submitted before for any degree or examination in this or any other university.



Muazu Ibrahim

Signed on the 21st day of June, 2017

DEDICATION

To my family

ACKNOWLEDGEMENT

Like they say, the beginning of a journey is not usually smooth but that does not impede on the intended destination. I am very grateful to the Almighty God for guiding and seeing me through my PhD journey. Indeed, *which of the favours of your Lord will you deny?* I owe it a duty to extend my sincere appreciation to my supervisor, Prof. Paul Alagidede for all his unflinching support and brotherly love throughout this study. His profound encouragement at every stage of my study provided the yardstick that kept me going even when the going was tough. His unselfish mentorship and quick constructive feedback on every draft brought me this far. Your suggestions were superb and words alone cannot show my appreciation to you but to pray to the Almighty to shower his bountiful blessings on you and your family.

I have received vast support from several people that I cannot afford to ignore. I have benefitted from the useful feedback from Dr. George Adu (Senior Lecturer, Department of Economics, Kwame Nkrumah University of Science and Technology, Ghana) who also doubles as one of my main referees. He has been exceptionally dependable since my undergraduate level and played a key role in my academic and career development. I am very grateful for all your support Igwe!

I also like to extend my sincere gratitude to my mother, Martha Yakubu whose support in my life has been phenomenal. My father, Ibrahim Haruna and my auntie, Hajia Lawru Haruna also played important roles in my educational ladder. I cannot pay you back but to say may the Almighty bless you all. In fact, there were times my father thought I had abandoned my PhD studies because I got married midway. On this score, let me thank my wife, Anifa Mohammed for her support during my doctoral studies. Yes! It was tough but she eventually had to sacrifice part of our marital life so I could focus on my studies.

I have also received diverse support from some special people I need to acknowledge. Alhassan Musah (Senior Lecturer, Department of Accountancy and Commence, University

for Development Studies, UDS, Wa, Ghana) has played significant role in both my academic and social life. His sense of humor and words of encouragement have contributed significantly to the completion of my doctoral degree. Being a Liverpool fan, I know he will never walk alone. Similarly, I extend my sincere gratitude to Ibrahim Osman Adam (Lecturer, Department of Accountancy and Commence, UDS, Wa, Ghana), Abdul Latif Bavug (EcoBank, Tamale branch, Ghana), Dr. Sulemana Abudulai (Prof. Venn), Yakubu Awudu Sare (Senior Lecturer, Department of Banking and Finance, UDS, Wa, Ghana), Dr. Abdul–Wahid Mohammed (ICT Department, Central Administration, UDS, Tamale, Ghana), Yakubu Mohammed Saani (Deputy Country Director/Head of Programmes and Policy, ActionAid Ghana) and Alhassan Abdul–Fatawu (RAINS, Tamale, Ghana).

My thanks go to Dr. Gideon Boako (Lecturer, KNUST School of Business) for the quality coaching and support offered me throughout this journey. Many thanks also go to Mrs. Mmabatho Leeuw (PhD Programme Coordinator, Wits Business School) and Mrs. Vanishree Pillay (Faculty Manager, Postgraduate Affairs) for all their administrative support. Let me also thank the following people for their various roles and peer–to–peer support: Emmanuel Kumi (PhD Candidate, University of Bath, UK), Thomas Yeboah (PhD Candidate, University of Cambridge, UK) and Dr. Jones Odei Mensah (Post–doctoral Fellow, Wits Business School). Numerous friends and family members have also been helpful. I would like to mention Uncle Mashoud Kaleem, Naeem, Imranah, Abdul Aziz (Moyoyo), Sheikh Zakaria, Mubarik, Kamal and Shamsu.

Finally, through my supervisor, the financial assistance of the National Research Foundation (NRF) towards this research is hereby acknowledged.

To all those I have inadvertently left out who are worth mentioning, I say *mpag-ya* (thank you).

The usual caveats apply.

TABLE OF CONTENTS

LIST OF PUBLICATIONS AND RESEARCH OUTPUTS....ii
Peer reviewed journal publications....ii
Working paper publications....ii
Papers under review.... iii
Conference Presentations iii
ABSTRACT....v
DECLARATION viii
DEDICATION....ix
ACKNOWLEDGEMENT....x
TABLE OF CONTENTS....xii
LIST OF TABLES....xvi
LIST OF FIGURES xvii
LIST OF APPENDICES.... xviii
LIST OF ACRONYMS xix
CHAPTER ONE....1
INTRODUCTION 1
1.1 Background to the study 1
1.2 Statement of the problem....4
1.3 Research objectives....7
1.4 Research questions....8
1.5 Significance of the study and contributions to knowledge....8
1.6 Structure of the thesis 10
CHAPTER TWO....12
FINANCIAL DEVELOPMENT, REAL SECTOR AND ECONOMIC GROWTH....12
2.1 Introduction....12
2.2 Stylized facts about finance–growth nexuses in SSA....15

2.3 Finance–growth nexus: A review 21
2.4 Does the relative speed of growth in finance and real sector matter? 25
2.5 Data and methodology 31
2.5.1 Data 31
2.5.2 Identifying episodes of credit boom 37
2.5.3 Empirical strategy 45
2.6 Empirical results 50
2.6.1 Sensitivity analysis 58
2.7 Policy implications and recommendations 62
2.8 Conclusion 71
CHAPTER THREE 73
THRESHOLDS IN FINANCIAL DEVELOPMENT–ECONOMIC GROWTH NEXUS 73
3.1 Introduction 73
3.2 Literature review 75
3.3 Data and methodology 83
3.3.1 Data 83
3.3.2 Empirical strategy: Identifying nonlinearities: A threshold estimation approach 86
3.4 Findings on the estimated threshold values and finance–growth nexus 89
3.5 Policy implications and recommendations 97
3.6 Conclusion 99
CHAPTER FOUR 101
FINANCIAL DEVELOPMENT, ECONOMIC VOLATILITY AND SHOCKS 101
4.1 Introduction 101
4.2 Contextualizing financial development, shocks and volatility linkages 104
4.3 Financial development, shocks and volatility: An empirical review of literature 108
4.4 Data and methodology 112

4.4.1 Data 112
4.4.2 Empirical strategy 118
4.5 Empirical results 131
4.5.1 Estimation and interpretation of the long and short run relationships 135
4.5.2 Sensitivity analysis 149
4.6 Policy implications and recommendations 155
4.7 Conclusion 159
CHAPTER FIVE 161
FINANCIAL DEVELOPMENT, VOLATILITY AND INFORMATION ASYMMETRY: DOES LAW MATTER? 161
5.1 Introduction 161
5.2 Legal origin, finance and information asymmetry: Drawing the linkages 164
5.3 Literature review 169
5.4 Data and methodology 174
5.4.1 Data 174
5.4.2 Empirical strategy 179
5.5 Findings and discussions 185
5.6 Policy implications and recommendations 197
5.7 Conclusion 199
CHAPTER SIX 201
SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS 201
6.1 Introduction 201
6.2 Summary and conclusions 201
6.2.1 Finance–economic growth relationship under unbalanced sectoral growth 202
6.2.2 Thresholds in financial development and economic growth nexus 202
6.2.3 Effect and channels through which finance affects economic volatility 203
6.2.4 Finance–legal origin–volatility linkages and the role of information sharing 203

6.3 Policy implications and recommendations 204
6.4 Areas necessitating further research efforts 208
References 210
Appendices 236

LIST OF TABLES

Table 2.1: 5–year averages of growth variables, financial development, real sector productivity and inflation……..19

Table 2.2: Summary statistics.....34

Table 2.3: Credit boom incidence.....42

Table 2.4: Finance, real sector growth and economic growth based on GMM.....51

Table 2.5: Finance, real sector growth and economic growth based on FEIV.....60

Table 3.1: Summary statistics.....84

Table 3.2: Results when per capita income is the threshold variable.....90

Table 3.3: Results when human capital is the threshold variable.....93

Table 3.4: Results when financial development is the threshold variable.....95

Table 4.1: Summary statistics.....114

Table 4.2: Correlation coefficients.....116

Table 4.3: Panel unit root tests.....132

Table 4.4: Panel cointegration tests results.....134

Table 4.5: Financial development, shocks and volatility.....136

Table 4.6: Transmission channels, shocks and growth volatility.....144

Table 4.7: Financial development, shocks, volatility and transmission channels.....152

Table 5.1: Summary statistics.....176

Table 5.2: Correlation coefficients.....178

Table 5.3: Legal origins, financial development and information asymmetry.....186

Table 5.4: Legal origins, growth volatility and information asymmetry.....190

LIST OF FIGURES

Figure 2.1: GDP growth rate and industrial value added (1980–2014) 18

Figure 2.2: Financial development and economic growth (1980–2014) 36

Figure 2.3: Country–by–country credit boom incidence 40

Figure 4.1: Real and monetary shocks 113

Figure 4.2: Financial development and economic growth 117

Figure 4.3: Business cycle and long run volatilities 120

LIST OF APPENDICES

Appendix 1: List of countries, legal origin and credit boom 23636

Appendix 2: List of countries and legal origin 23737

LIST OF ACRONYMS

Augmented Dickey–Fuller	ADF
Autoregressive Distributed Lag	ARDL
Bayesian Information Criterion	BIC
Coefficient of Variation	CV
Constant Elasticity of Substitution	CES
Economic Recovery Programme	ERP
Fixed Effect Instrumental Variable	FEIV
Generalised Autoregressive Conditional Heteroskedasticity	GARCH
Generalized Methods of Moments	GMM
Global Agro Industries Forum	GAIF
Gross Domestic Product	GDP
Hodrick–Prescott	HP
Instrumental Variables	IV
International Monetary Fund	IMF
Lagrange Multiplier	LM
Likelihood Ratio	LR
Mean Group	MG
Non–Performing Loans	NPLs
Ordinary Least Squares	OLS
Over–Identifying Restrictions	OIR
Pooled Mean Group	PMG
Private Credit Bureaus	PCB

Sub–Saharan Africa	SSA
Two-Stage Least Squares	2SLS
United Nations Industrial Development Organization	UNIDO
World Development Indicators	WDI

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

A critical measure of economic prosperity and growth in countries is the growth rate of real Gross Domestic Product (GDP) per capita and has been used as a close proxy of economic growth. This is because GDP measures the total market value of economic activities within a country and as such, an increase in economic activities means higher growth. Following this, extant studies – both theoretically and empirically – have been done to determine factors that drive economic growth and those that cause growth disasters. Theoretically, Schumpeter's (1911) pioneering work shows that the financial sector plays a significant role in influencing growth through the provision of improved quality and quantity of financial services. This finding suggests that, the level of financial development plays a crucial role in economic growth. Levine (1997; 2005) opine that financial development by far improves the production of *ex ante* information about possible investments, monitors investments and implementation of corporate governance, trading, diversification and risk management, mobilizes and pools savings as well as facilitate the exchange of goods and services. Thus, the growth–enhancing effect of financial development is based on its ability to mobilize productive savings and allocate resources efficiently. Furthermore, financial services improve productivity by promoting technological innovation (King and Levine, 1993b; Beck et al., 2000; Nguena, 2012).

At the same time, capturing the impact of these five functions depend on the quality of finance rather than quantity. The efficiency of financial systems cannot be taken for granted, especially as information gathering is one of their key functions. Asymmetric information and externalities in financial markets (Stiglitz and Weiss, 1992) can lead to sub-optimal

levels of financing and investment and an inefficient allocation of capital with dire consequences on economic growth. Market imperfections in the financial sector may be best addressed through appropriate oversight by public registries. But the effect of legal system is also crucial in this debate. The view is that since finance is attained by a series of contracts/agreements stipulated by regulatory and legal enforcement, the financial system cannot work effectively without a competent legal system as investors' and lenders' rights are not secured. Typical of this argument is the work (see La Porta et al., 1997, 2000; Levine, 1997) on the impact of the legal system on financial development and operation, which argues that a well-functioning legal system improves the way the financial system allocates resources and hence promotes economic growth.

The burgeoning empirical literature has documented the importance of financial deepening for growth. For instance, utilizing data on 71 countries over the period spanning 1960–1995, Levine et al. (2000) examine the effect of financial development on economic growth relying on liquid liabilities to GDP ratio, ratio of assets of deposit money banks to assets of deposit money banks plus Central Bank domestic assets; and credit issued to private enterprises to nominal GDP ratio as indicators of financial development. The authors found a positive nexus between financial development and economic growth in the countries investigated.

Becsi and Wang (1997) argue that well–developed domestic financial sectors, such as those of developed countries, can significantly contribute to increasing savings and investment rate and ultimately economic growth. Following this assertion, most developing countries have instituted and redesigned their economic and financial systems aimed at improving financial sector development and growth. The development of the financial sector entails the institutionalisation of policies governing the sector. Thus financial development reacts to changes in the workings of the system and so is the effect of financial development on growth

overtime. For instance, Loayza and Ranciere's (2006) cross–country study found evidence of co–existence of a positive long run effect of financial depth on growth and a short run negative effect induced by financial volatility. Beck et al. (2014) opine that larger financial sector reduces long run volatility while improving growth albeit weakly overtime. While in the short run, expansion of financial sector stimulates growth at the cost of higher volatility, neither the size of the financial sector nor intermediation is associated with higher growth in the medium term. Kaminsky and Reinhart (1999) argue that financial development penalizes growth by triggering financial instability. More recently however, Adu et al., (2013) note that the overall effect of financial development on growth is highly sensitive to the choice of indicators. They found that while credit to the private sector and total domestic credit is growth–enhancing, broad money supply to GDP is growth–damaging.

From the foregoing, it can be inferred that the ability of financial system to mobilize productive savings, allocate resources efficiently, smooth volatility and increase growth depends on how well financial intermediaries carry out their functions and this by far explains differences in growth rates across countries. Failure to empirically establish the right and healthy level of financial development, channels through which financial development affect growth volatility, how the legal system and information asymmetry play out in financial development and volatility have severe consequences. First, it presents problems of high systemic risk, sub–optimal allocation of capital and overheated economic capacity with the preeminent effect on economic growth. Second, financial development can dampen or magnify shocks to the economy depending on the nature of shock. Thus failure to empirically quantify the relative extent and effect of financial development on economic shock may have dire implications.

1.2 Statement of the problem

The problem statement presented here is carved around four thematic areas in the finance–growth nexus in accordance with identified gaps in the literature. These are *finance–real sector growth nexus; threshold effects; shocks; and legal system–information asymmetry nexus*. These problems are individually discussed below.

a. Finance–real sector growth nexus: Following Schumpeter's (1911) work, extant studies have been done on the relationship between financial deepening and economic growth culminating in two possible directions: the "supply–leading" hypothesis and the "demand–following" approach. The "supply–leading" hypothesis as noted by Patrick (1966) opines that the development of a robust financial sector contributes to economic growth. This view presupposes that institutionalisation of functional financial markets ahead of their demand will spur the growth of real or non–financial sector and consequently growth. On the other hand, the "demand–following" approach contends that the growth of real economic activities increases demand for financial services and consequently the development of financial sector.

Bencivenga and Smith (1991) elaborate the liquidity management role of banks. Financial intermediaries reduce low return investment due to premature liquidation and redirect funds into longer term, high yield projects, leading to faster growth. Levine et al.'s (2000) cross–country study show a positive relationship between financial intermediary development and economic growth while cautioning that such positive link is not only due to growth influencing financial development but also on account of the effect of exogenous component of financial development on growth. For instance, given that labour is an important input in production process, the fast–growing financial sector will attract much of the skilled labour who would contribute significantly to its growth at the expense of other sectors.

Consequently, the absence of efficient human resources will undoubtedly suffocate total output and growth. In this regard, the thesis will deepen our understanding on the effect on growth when finance is more than growth in real sector and vice versa. With this, the study will uncover the optimal level of financial development that supports the prevailing real sector characteristics.

b. Threshold effects: Admittedly, the link between financial development and economic growth might be too complex than what the simple relationships portray (Rousseau and Wachtel, 2009). Extant literature has highlighted on the non–linearities in the financial–growth nexus (Favara, 2003; Aghion et al., 2005; Arcand et al., 2012; Cecchetti and Kharoubi, 2012; Manganelli and Popov, 2013; Adeniyi et al., 2015) albeit inconclusive results. While theoretical studies (Saint–Paul, 1992; Berthelemy and Varaudakis, 1996; Acemoglu and Zilibotti, 1997) have espoused that the overall effect of finance on growth may be mediated by some key threshold variables below or above which the impact of finance changes signs. Yet, empirical studies have not rigorously examined the finance–growth nexus in the face of threshold variables. More importantly, the precise impact of financial development on growth when economies' initial conditions such as their per capita income, human capital accumulation and the level of finance is below or above their respective threshold is unclear.

c. Shocks: Volatility, regardless of its source, is a natural source of worry in a world of imperfect information. This holds with particular force in developed economies where the financial sectors are relatively well developed. Some studies (see for instance Caprio and Honohan, 1999) have long revealed greater forms of volatilities in high income countries on account of greater economic concentration. Legitimately as it is, if volatility matters in

developed economies, then it must pose an even greater source of concern for developing countries.

While the empirical and theoretical literature has established a positive impact of financial sector development on economic growth (King and Levine, 1993a,b; Levine and Zervos, 1998; Rousseau and Wachtel, 2000; Beck et. al., 2000), the potential links between financial development and growth volatility in developing countries and SSA in particular have been understudied despite the apparent shocks they face. Specifically, the channels through which financial development potential affects growth volatility even remain unknown how much more the manifestations of financial development on the relative types of shock. This necessitates further research efforts in this direction as it presents a serious challenge to policy makers in the conduct of monetary policy and mitigation of shocks in the face of financial development.

d. Legal systems and information asymmetry: There has been a considerable volume of theoretical studies positing that information asymmetry between lenders and borrowers affects financial development via reduction in the efficient allocation of capital (Jappelli and Pagano, 2002). Indeed, lenders are most often left with issues of adverse selection on account of their lack of information on borrower quality particularly on risks associated with investment needing the borrower to mobilize financial resources. This concern is even more pronounced when lenders are intrinsically unable to control the direction of borrowers in post–credit grant. Given this understanding, a borrower may conceal returns from an underlying investment in order to reduce the possibility of default or amount of repayment at agreed times. This behaviour of borrower is paramount and evident in countries with legal weak system culminating in sub-optimal resource allocation, financing of unproductive projects thus exacerbating growth volatility. This dynamic therefore underscores the primary

motivation of this study as it seeks to empirically model the linkages between legal systems and information asymmetry and their effect on growth volatility. From a policy perspective, such an understanding will shed light on precise role of law which by far would guide decision on information sharing for enhanced growth.

1.3 Research objectives

The central objective of the thesis is to evaluate the interrelationships in the financial development–economic growth nexus in SSA. Specifically, the study explores the dynamic linkages between growth in finance and real sector; finance–growth nexus given threshold variables mediating the relationship; pass–through effects of financial development on shocks and ultimately growth volatility; as well as the role of law and information sharing in finance–economic volatility nexus. Specifically, the following seeks to achieve the study objectives:

1. To investigate the overall effect on economic growth when the relative speed of growth in finance and real sector is disproportionate. This objective seeks to extensively analyze the effect of unbalanced growth in real and financial sectors on economic growth in SSA.
2. To establish the precise nonlinearities in financial development–economic growth nexus in the presence of threshold effects. This objective explores the impact of finance on economic activity when countries' initial conditions are below or above important mediating variables within a sample splitting framework.
3. To examine the effect of financial development on volatility components as well as channels through which finance affects economic volatility. Since financial development affects volatility through its various components, this research objective decomposes volatility into business cycle and long run component in examining the

link between financial sector development and volatility. It also establishes how financial development affects volatility components through its interaction with real and monetary shocks.

4. To determine law–finance–volatility nexuses and how law shapes volatility through its impact on information asymmetry. In essence, beyond the effect of legal origin on financial sector development and economic volatility, this objective also unearths the impact of law on volatility through its influence on information sharing in the financial markets.

1.4 Research questions

The above discussion naturally yields the following research questions:

1. Is the effect of financial development on economic growth contingent on the relative speed of growth in finance and real sector?
2. To what extent is the overall impact of finance on growth threshold specific?
3. What is the nature and channels through which financial development affects growth volatility?
4. How do the legal system and information asymmetry play out in financial development and volatility?

1.5 Significance of the study and contributions to knowledge

Indeed, literature on finance–growth nexus have increasingly been on direction on effect (De Gregorio and Guidotti, 1995; Levine et al., 2000; Masten et al., 2008; Khan, 2008; Mishra and Narayan, 2015), causality (Abu–Bader and Abu–Qarn, 2008; Odhiambo, 2004; Shan et al., 2001) and (non)linearity (Huang and Lin, 2009; Cecchetti and Kharroubi, 2012; Shen and

Lee, 2006). Although there exist abundant literature on finance–growth relationship, we argue that the link is much more complex than previously thought. The exact effect of the relative speed of finance and real sector output on overall growth in the sub–region remains unknown. More so, the complex relationship between the finance and economic growth may be refereed by some important threshold variables below or above which the effect of finance on growth changes sign. Also, considering the shocks countries in SSA are exposed to, it is imperative to systematically examine how financial development relates with the various forms of shocks and how these impact of economic volatility. Apart from this, the extent to which SSA's legal system is evolving deserves some special analysis especially on how this impacts on information asymmetry and quality of financial deepening as well as growth volatility.

The relevance of this study is self–evident in the light of its compelling contributions to existing literature. First, while extant literature have investigated the finance–growth nexus, to the best of my knowledge, the effect of unbalanced growth in real and financial sectors on overall economic growth has not been studied especially in SSA. Particularly, it explores dearth of empirical studies and introduces a previously missing but critical link in the finance–growth literature. In particular, the study presents empirical evidence from the lenses of developing countries of what would be the effect on economic growth when growth in finance and growth in real sector are disproportionate. This is a critical gap in the literature which on one hand will resolve the seemingly conflicting results in the finance–growth literature and on the other hand will also provide insights into the effects of unbridled financial development and crucial policy implications necessary for the conducting effective monetary policy aimed at propelling growth. Second, this study empirically examines the theoretical literature on nonlinearities in finance–growth which hitherto have not seen much

attention. Specifically, the study reveals the precise growth effect of finance under different threshold variables. Of immersed contribution is the estimation of the thresholds below (above) which finance hurts (enhances) long run growth and vice versa. Third, we show how financial development impacts on the different volatility components and whether finance amplifies or dampens the effects of real and monetary shocks on volatility. With this, we are able to proffer specific policy recommendations in taming the incessant economic volatility facing SSA and other developing economies of similar characteristics.

The last contribution rests on the application of a variety of econometric techniques which have not seen considerable usage in the finance–growth literature constitutes an important evidential milestone in the studies. This is because the robustness of results by far depends on quality of the empirical strategy at various stages. Varying the estimation approaches is expected to produce fresh evidence that inspires the extension of frontiers of research in other areas within the sub–region.

In the nutshell, it is anticipated that this thesis will provide the springboard on how to conduct an effective monetary policy in SSA so as to avert growth disasters and benefit from their financial deepening. Findings from this study are thus expected to inform policy guidelines aimed at attenuating growth vagaries.

1.6 Structure of the thesis

The entire thesis report which consists of six chapters is organized as follows: Chapter two conducts an extensive review of both the theoretical and empirical literature on the relationship between financial development and economic growth. It also presents fresh evidence by introducing a previously missing link in the finance–growth literature by

critically evaluating the effect of unbalanced growth in real and financial sectors on economic growth from the lenses of developing countries. Chapter three reviews the literature on threshold effects of finance on growth while empirically examining the impact of finance on economic growth under different threshold variables. In chapter four, the study re–examine the relationship between financial development and economic volatility with reference to the channels through which former affects economic volatility via the different components. Chapter five provides an empirical touch to role of legal origins in the level of finance and growth vagaries while revealing how law shapes information asymmetry in macroeconomic fluctuations. Chapter six concludes the research with some key implications and recommendations for policy. It also presents avenues for further research efforts.

CHAPTER TWO

FINANCIAL DEVELOPMENT, REAL SECTOR AND ECONOMIC GROWTH

2.1 Introduction

The significance of the relationship between financial development and economic growth has received much attention both in growth and financial literature. Early writers combine the endogenous growth theory and the economics of financial systems to examine the interactions between the two. Theoretically, Schumpeter's (1911) pioneering work shows that the financial sector plays a significant role in influencing growth through the provision of improved quality and quantity of financial services. This finding suggests that, the level of financial development plays a crucial role in economic growth. Levine (1997; 2005) opine that financial development by far improves the production of *ex ante* information about possible investments, monitors investments and exerts corporate governance thereby enabling the financial system function efficiently. Thus, the growth–enhancing effect of financial development is based on its ability to mobilize productive savings and allocates resources efficiently. Furthermore, financial services improve productivity by promoting technological innovation (King and Levine, 1993b; Beck et al., 2000; Nguena, 2012).

Becsi and Wang (1997) argue that well–developed domestic financial sectors, such as those of developed countries, can significantly contribute to increasing savings and investment rate and ultimately economic growth. Following this assertion, most developing countries have instituted and redesigned their economic and financial systems aimed at improving financial sector development and growth. The development of the financial sector entails the institutionalization of policies governing the sector. Thus financial development reacts to changes in the workings of the system and so is the effect of financial development on growth

overtime. Loayza and Ranciere's (2006) cross–country study found evidence of co–existence of a positive long run effect of financial depth on growth and a short run negative effect induced by financial volatility. Beck et al. (2014) opine that larger financial sector reduces long run volatility while improving growth albeit weakly overtime. While in the short run, expansion of financial sector stimulates growth at the cost of higher volatility, neither the size of the financial sector nor intermediation is associated with higher growth in the medium term. Calderon and Liu (2003) on the other hand argue that financial deepening propels growth through both capital accumulation and productivity growth. Consistent with Calderon and Liu (2003), Méon and Weill (2010) show that financial intermediary development exerts a positive effect on aggregate productivity contingent on the levels of economic and financial development.

Given the growth–enhancing effects of financial development, some authors remain pessimistic and argue that development of the financial sector does not necessarily translate into higher growth and may even distort sustained path towards development. For instance, Kaminsky and Reinhart (1999) argue that financial development penalizes growth by triggering financial instability. More recently, however, Adu et al., (2013) note that the overall effect of financial development on growth is highly sensitive to the choice of indicators. They found that while growth of credit to the private sector and total domestic credit is growth–enhancing, increases in the ratio of broad money supply to GDP is growth–damaging.

Extant studies in the literature on finance–growth remain inconclusive and little is also known on the overall effect on growth via the interaction of the real and financial sector. Empirical studies are silent on the unbalanced sectoral effect on overall economic growth. While the supply–leading hypothesis asserts that development of the financial sector drives

growth, the central theme of this thesis is that the extent to which finance helps growth depends crucially on the simultaneous growth of real and financial sectors. Specifically, this thesis argues that a fast–growing financial sector retards output and overall growth by damaging investment rates, magnifying macroeconomic instability as well as exacerbating economic fragility and resource misallocation. The balanced growth path contends that all sectors grow at constant rate and so should the financial and real sector in order for the latter to have any positive effect on economic growth. Whenever the growth rate of one sector exceeds that of the other sector(s), total output suffers and to prevent overall reduction in sustained growth rates, the real sector should grow sufficiently large enough to maintain the demand as well consume all the financial resources supplied by the fast–growth financial sector. This chapter thus hypothesizes that financial development lowers growth if the growth in finance and real sector output is unbalanced. In other words, the threshold effect of financial development on growth depends on the relative speed of growth in finance and real sector. The chapter thus aims to critically investigate this relationship in sub–Saharan Africa (SSA) given the region's renewed interest in enhancing growth by boosting financial sector development.

The study significantly contributes to existing finance–growth literature in so many ways: First, to the best of my knowledge, this perhaps represents the first attempt to specifically focus on SSA in its investigation of the overall growth effect when growth in finance and real sector is disproportionate. With this, it presents crucial findings on the effect of disproportionate sectoral growth on the economy from the lenses of developing economies. The second contribution is self–evident in the light of the robust techniques employed in the estimations. Needless to say, we proffer key policy implications based on the findings of the study. We found that while financial development is growth–enhancing, there exist threshold

effects beyond which further increases in credit hurts growth. By and large, growth rates suffer when growth in finance is not accompanied by growth in real sector. Specifically, excess finance destroys capital formation while exacerbating macroeconomic instability. This evidence we believe by far resolves the seemingly conflicting and highly contested results in the finance–growth literature and provides crucial policy implications for conducting effective monetary policy aimed at propelling growth.

The rest of this chapter is structured as follows: the next section provides a background on the financial sector development and economic growth in SSA; Section 2.3 reviews an extensive literature on finance–growth relationship while Section 2.4 presents the testable hypothesis. Section 2.5 specifies the methodology while Section 2.6 discusses the findings. Section 2.7 analyzes the policy implications and recommendations while Section 2.8 concludes the chapter.

2.2 Stylized facts about finance–growth nexuses in SSA

This section briefly discusses the growth trajectory and financial sector development in SSA where most of the countries' financial systems remain relatively underdeveloped and shallow in the CFA franc zone (David et al., 2014). The relative backwardness of the region's financial sector has been attributed to lack of institutional quality (Singh et al., 2009), informality, weak governance, political and economic instability (Beck and Honohan, 2007) and sparse population density (Allen et al., 2012). More recently, David et al., (2014) suggest financial integration as an important conduit to financial development especially in countries with better institutional quality.

More so, the region's financial intermediation and inclusion remain significantly lower relative to other developing and emerging economies reflecting a combination of number of factors. Andrianaivo and Yartey's (2009) study find that income level, creditor rights protection, financial repression and political risk significantly drive banking sector development in Africa. Rajan and Zingales (2003) on the other hand, suggest that trade and financial openness are a necessary condition for a genuine financial development.

The region's impetus for industrial development is greatly influenced by several factors including whether countries are resource rich or poor, large or small in terms of land size, coastal or landlocked, financial sector development and more generally how they are governed both politically and economically. At the same time, the countries in the sub–region show a number of homogeneities which do not significantly differ from few other low income economies but bifurcates the region from most developed economies. These commonalities include a high share of agriculture and commodities and a low proportion of manufacturing in GDP; self-employment of a large percentage of the workforce; widespread informality of economic activities; weak linkages between some modern economic sectors and the traditional small–scale economy; and particularly low productivity and incomes (Altenburg and Melia, 2014).

Mlachila, et al., (2013) argue that the robust growth rates recorded in the mid–1990s were partly on account of policy reversals, post–conflict recovery, foreign aid inflows and aggressive debt reliefs. Evidently, growth rate in SSA increased from 1.72% in 1980–1989 to 1.90% in the 1990s. From the mid–1990s to late 2000s, an aggressive structural transformation defined as the shift of workers from low to high average productivity activities and sectors was pursued in several SSA countries and this led to a rise in growth

rate from the 1.9% to 4.74% between the period 2001 to 2009. However, IMF (2012) notes that such structural transformation and progress occurred at different speeds and different paths. For instance, agricultural labour productivity growth has been very weak among many low–income countries except in Burkina Faso and Malawi. The services sector also stimulated output, exports, labour productivity growth, and some countries like Kenya and Mauritius have even moved up the value added chain.

Manufacturing remains the main driving force of economic growth, largely attributable to its higher productivity and scope for innovation (UNIDO, 2016). However, evidence abounds that growth of manufacturing value added as a proportion of GDP has not been impressive in Africa. Recent data from the United Nations Industrial Development Organization (UNIDO) suggest that industrial productivity – measured as percentage of manufacturing value added – consistently declined in Africa over the past two decades albeit not monotonically. Industrial value added which stood at 9% in 1990 declined to 7% in 2000 and further down to 4% in 2014. At the same time, the percentage of manufacturing value added in Asia and the Pacific region increased from 37% in 1990 to 54% and 71% in 2000 and 2014 respectively. Africa's manufacturing value added remains very low and accounts for only about 1.6% of world industrial value added. Industrial and manufacturing sector has not improved over time as the proportion of African manufacturing value added in total GDP decreased from 12.8% in 1990 to 10.1% in 2014. The manufacturing structure of the region is made up of more primary and secondary goods with low technological drive and this explains the region's poor industrial productivity. Nonetheless, the manufacturing sector output increased in few countries – notably in Ethiopia, Kenya, Mozambique, and Tanzania – albeit on a low base with slow productivity.

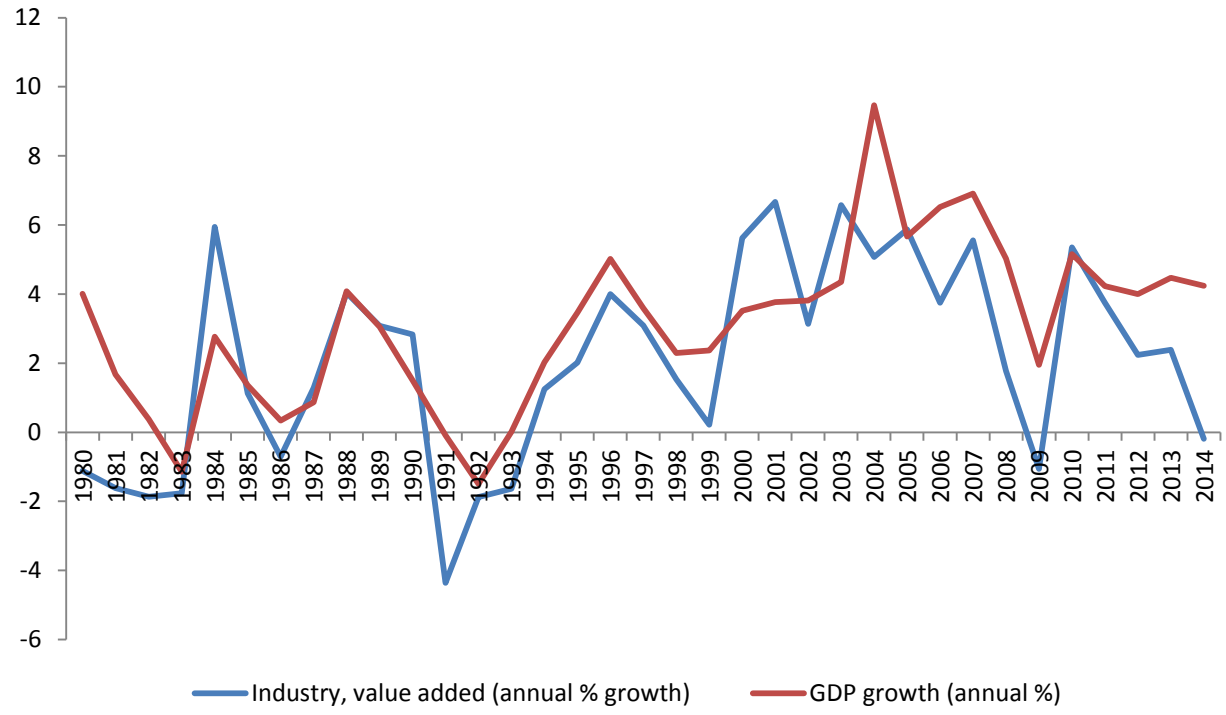


Figure 2.1: GDP growth rate and industrial value added (1980–2014)

Data source: Authors' construct using World Development Indicators.

Although some countries achieved a sustained growth rates, the poor growth performance of the sub–region mirrors the sluggish growth rates of many other countries. For instance, GDP growth slowed markedly in South Africa, inhibited by strikes in the mining sector, electricity shortages, and low investor confidence. This is not different from that of Ghana as GDP growth rate decreased from 14.05% in 2011 to 9.29% in 2012 before reaching 7.33% and 4.18% in 2013 and 2014 respectively. This notwithstanding, growth rate generally picked up moderately in SSA in 2013, to an average of about 4.5% compared with 4.0% in 2012 before nose–diving to 4.23% in 2014 (see Figure 2.1). One could see some palpable link between industrial sector value added and growth rates. Taking this trend together one is left at first blush of a direct relationship between real sector output and economic growth on the back of the financial sector. Also worth mentioning is the region's growing equity markets. Indeed, development of capital markets in SSA has gained much prominence particularly in the

aftermath of the global financial and economic crises as several countries traditionally depended on the banking system. Hitherto, the preponderance and influx of these capital markets by far enriched the nascent financial landscape.

Table 2.1 shows the averages of the financial development indicators together with some selected macroeconomic variables such as growth of GDP, real GDP per capita, broad money supply, inflation rate and some indicators of real sector growth. From Table 2.1, both the real sector indicators have increased from their initial point in 1980–1984 to relatively higher values in 2010–2014. For instance, manufacturing value added increased from 3.49% to 4.36%. Similarly, industrial value added increased around the same period and both indicators registered positive growth rates expect for 1990–1994 where negative growth rates were recorded. This period was also marked with high inflation. Anecdotally, such abysmal real sector performance during the early 1990s culminated in a reduced growth rate and real GDP per capita where both indicators registered their all-time lowest.

Table 2.1: 5–year averages of growth variables, financial development, real sector productivity and inflation

Year	GDP growth rate (%)	Real GDP per capita (in US$)	Domestic credit provided by financial sector (% of GDP)	Private credit to private sector (% of GDP)	Broad money (% of GDP)	Manufacturing, value added (annual % growth)	Industry, value added (annual % growth)	Inflation, consumer prices (annual %)
1980–1984	1.54	933.15	51.00	33.82	35.89	3.49	0.90	12.12
1985–1989	1.91	861.21	57.48	40.16	36.06	2.25	1.54	8.00
1990–1994	0.64	800.48	69.35	54.42	35.35	-2.31	-0.46	12.62
1995–1999	3.24	787.65	72.31	59.42	35.46	2.47	1.68	7.31
2000–2004	4.89	820.78	72.95	55.18	37.39	3.07	4.61	5.17
2005–2009	4.77	943.16	72.91	61.34	43.64	2.84	1.77	7.62
2010–2014	4.41	1,015.47	58.55	46.97	39.17	4.36	3.70	5.34

Source: Authors' computation using World Development Indicators.

Indeed, recent sustained growth rates experienced in the sub–region partly spurs financial deepening with financial sector development playing a significant supporting function in the growth trajectory. While the financial sectors in SSA are underdeveloped, the banking systems dominate financial sector activities. The banking system is largely concentrated because of the narrowness of the market often dominated by foreign banks (Andrianaivo and Yartey, 2009). By leveraging on financial sector reforms introduced in the 1980s and 1990s,[1] the banking sectors have moved to strengthen their capital bases and improve risk management (Mlambo et al., 2012). Financial depth and coverage – respectively measured as broad money to GDP ratio and domestic credit provided by the financial sector (% of GDP) – increased steadily over the past few decades although its base remain a lackluster. For instance, both broad money supply and domestic credit consistently increased over the period 1985–1989 to 2000–2004. Conversely, between 2000–2004 to 2010–2014, broad money ratio declined to 39.17% from the 43.64% over the previous period. Domestic credit also decreased by 14.36% over the past decade recording an average of 58.55%. Private credit has over the sample period non–linearly increased from 33.82% (1980–1984) to 46.97% (2010–2014) as it declined to 55.18% (2000–2004) from 59.42% (1995–1999). Equally important, from Table 2.1 is the picture of palpable relationship between economic growth and financial development measures. However, the perceptibly lower growth rate is suggestive of a plausible occurrence and influence of major sectoral performance. Interestingly, both the financial and real sectors appear related to growth as for example, a decrease in the financial development indicators coincided with a lower real sector performance and a reduced growth rates. These patterns are noticeable over the periods spanning 2005–2009 and 2010–2014. This leaves ample room to investigate the likely effect on overall growth when the speed of

[1] These reforms included the liberalization of interest rates, restructuring and privatization of state-owned banks, abolishing of credit ceilings, introduction of a variety of measures to promote development of financial markets, including money and stock markets, and private banking systems, along with bank supervisory and regulatory schemes. Senbet and Otchere (2006) provide an excellent discussion of the financial sector reforms in Africa.

growth in finance is higher than that of the real sector output. This study is apt on the face of the vacillation observed in the growth in financial sector development.

2.3 Finance–growth nexus: A review

Early theoretical writers (Schumpeter, 1911; Kuznets, 1955; Patrick, 1966) on financial system development show divergent views on the link between financial sector and economic growth. Schumpeter's (1911) pioneering work on finance–growth nexus argues that a well–developed financial system spurs growth in technological innovations by redistributing resources from less productive to more productive sectors. Kuznets (1955) proposes that financial markets only begin to grow as the economy approaches the intermediate stage of the growth process and develop once the economy matures. However, Lewis (1956) finds that financial markets first develop as a consequence of economic growth process and before driving real economic activity. These divergent views can be grouped into the so–called "supply–leading" and "demand–following" hypotheses. As noted by Patrick (1966), the supply–leading view hypothesizes that the development of a robust financial sector contributes to economic growth. Thus institutionalization of functional financial markets ahead of their demand spurs the growth of real or non–financial sector and consequently economic growth. On the other hand, the demand–following hypothesis contends that the growth of real economic activities increases demand for financial services and consequently the development of the financial sector. This view was originally espoused by Robinson (1952: 86) who argued that "where enterprise leads finance follows". Economic growth produces an increased demand for financial services and that the development of the financial sector is an important conduit to drive economic growth.

Bencivenga and Smith (1991) elaborate the liquidity management role of banks. Financial intermediaries reduce low return investment due to premature liquidation and redirect funds into longer term, high–yield projects, leading to faster growth. Levine et al.'s (2000) cross–country study show a positive relationship between financial intermediary development and economic growth while cautioning that such positive link is not only due to growth influencing financial development but also on account of the effect of exogenous component of financial development on growth. Rioja and Valev's (2004a) study of 74 developing and developed countries show that finance has a strong positive influence on productivity growth in more developed economies. In low–income economies, the effect of finance on output growth occurs through capital accumulation.

Hassan et al. (2011) show that gross domestic savings – a proxy for financial deepening – positively affects long run growth in all regions. They argue that a well–developed domestic financial sector significantly spurs growth through its impact on savings and investment. However, by using private credit provided by the banking sector, the authors find a negative relationship between financial development and growth in high income countries. While this finding is particularly inconsistent with Levine et al. (2000), Hassan et al. (2011) argues that private credit is only a suitable proxy for financial development in developing countries and not in developed countries since developing countries are more inclined to building their bank–based financial markets than the capital markets involving stocks and bonds.

More recently, Mishra and Narayan (2015) depart from these traditional parametric approaches to examining financial development–growth nexus for 43 developed and developing countries over the period 1986–2012. Results from their study show that financial development positively (negatively) affects growth as long as a country's level of financial development is above (below) their cross–sectional averages. This evidence is somewhat

consistent with Calderon and Liu (2003), and Masten et al. (2008) who found that financial development contributes more to growth in developing countries than in developed countries. However, by employing a semi–parametric approach in examining the link between financial and economic development, Herwartz and Walle (2014) found that low–income economies obtain the least benefit from financial development while high–income economies enjoy almost three times as much benefit. In particular, the authors find a negative financial development–growth nexus in low and lower–middle income countries with large government sizes. Xu (2000) argues that a high degree of government regulation could be attributed to such a negative relationship in low income countries.

By utilizing data on 71 countries over the period spanning 1960–1995, Levine et al. (2000) examine the effect of financial development on economic growth relying on liquid liabilities to GDP ratio, ratio of assets of deposit money banks to assets of deposit money banks plus Central Bank domestic assets and credit issued to private enterprises to nominal GDP ratio as indicators of financial development. The authors found a positive nexus between financial development and economic growth in the countries investigated. Kargbo and Adamu (2009) examined the relationship between financial development and economic growth in Sierra Leone for the period 1970–2008. Their results corroborate the finance–led growth hypothesis in Sierra Leone with financial development exerting a significant positive growth effect. More importantly the authors show that investment is an important conduit through which financial development affects economic growth.

"Is finance a leading sector in economic development, or does it simply follow growth in real output which is generated elsewhere?" McKinnon (1988: 390). Empirical literature on finance–growth causality remains mixed. Some studies (Ghirmay, 2004; Christopoulos and Tsionas, 2004) find support for the supply–leading hypothesis while Odhiambo (2004) finds

that sustained increase in economic activities spur demand for improved financial services and that economic growth actually causes financial development in uni–directional order – a finding consistent with the "demand–following" hypothesis. Others (Blackburn and Hung, 1998; Luintel and Khan, 1999; Khan, 2001) have found evidence of bi–directional causality of finance and growth. Recent findings from Hassan et al.,'s (2011) panel study of low and middle income countries resolves the conflicting causality in the literature by showing that the direction of causality is region–specific. The authors find a bi–directional causality between finance and growth in all regions except for SSA and East Asia and the Pacific region. Hassan et al., (2011) further found a uni–directional causality running from growth to finance in the two poorest regions in their sample (SSA and South Asia) suggesting that in developing countries, growth leads finance on account of the high demand for financial services. These findings are consistent with Patrick's (1966) stage of development hypothesis. Notwithstanding the foregoing, Atindehou et al. (2005) found no causality in any direction suggesting that financial development and growth are completely independent.

On the (non)linearity nexus between finance and growth, Deidda and Fattouh (2002) employed the threshold regression model to King and Levine's (1993a) data and found evidence of non–linear relationship. Some studies (Cecchetti and Kharroubi, 2012; Shen and Lee, 2006; Law and Singh, 2014) have found an inverted U–shaped relationship implying that financial development is only good up to a point after which it becomes deleterious. However, Samargandi et al. (2015) show that such an inverted U–shaped relationship is only evident in the long run and not in the short run. Even the turning point for the reversed effect is far from being conclusive. For instance, Law and Singh (2014) suggest that financial development is growth–enhancing but not when private credit exceeds 88% of GDP compared to 90% in Cecchetti and Kharroubi's (2012), and 110% in Arcand et al.'s (2012),

study. This notwithstanding, Samargandi et al. (2015) found that the threshold point is generally lower in middle income countries.

Adeniyi et al. (2015) recently investigated the non–linearities in the relationship using Nigeria as a case study by including a square term of financial development in their autoregressive distributed lag growth model. Contrary to Cecchetti and Kharoubi's (2012) findings, Adeniyi et al. (2015) found a U–shaped relationship suggesting that financial development decreases growth up to a certain threshold above which growth increases with increasing financial development. Favara (2003) finds an *S*–shaped relationship between financial deepening and economic growth and concludes that at very low (high) levels of financial development, growth suffers (improves). Aghion et al. (2005) contends that the reason for the non–linearity of the finance–growth relationship might be that financial development helps catch up to the productivity frontier, but has limited or no growth effect for countries that are close or already at the frontier.

2.4 Does the relative speed of growth in finance and real sector matter?

The plethora of theoretical and empirical literature posits that the financial sector provides valuable and essential services to the real sector and economic growth more generally partly on account of its ability to allocate resources more efficiently. We explore the potential deleterious effect on growth when the speed of growth in finance and real sector is disproportionate and posit that such negative growth effect emanate from both investment and inflation channels.

Indeed, during the growth process, improvement in the financial sector benefits real sector activities as this alleviates firms' binding financing constraint thus enhancing their access to

external credit to finance productive investments necessary for stimulating long run growth. The risk is that once firms are no longer financially constrained, further increases in credit become unwarranted as bad projects get funded and some credit may even be channeled to support excessive consumption culminating in higher inflation. Acharya and Naqvi (2012) note that given excess liquidity, financial institutions are more probable to extend credit to bad risks or under–pricing credit risk firms. Thus, beyond the solvent needs of firms, increases in finance is associated with little or no significant increases in real economic activity, deteriorates credit quality and making the financial sector more prone to solvency and systemic instability. To the extent that lending supports consumption, growth in private sector credit can potentially over–stimulate aggregate demand beyond output–consistent level thus causing economic overheating and inflation (IMF, 2014). We infer that financial development can potentially decrease economic growth when the relative speed of growth in finance and real sector is unbalanced and we proceed to formally demonstrate this.

We build on the AK model to capture the dynamic relationship between growth and financial development by introducing a two–sector – financial and real – model economy. Each sector has different factor proportions and combining with capital deepening leads to unbalanced economic growth. Assume the two sectors exhibit constant returns to scale production function and (non)arbitrary preferences over the goods produced in each sector. Both sectors employ a common capital K and labour L. Assume the process of K and L $[K(t), L(t)]_{t=0}^{\infty}$ are taken as given and L is supplied inelastically. We let the final output be represented by Y with the assumption that it is produced as an aggregate of the output of the financial and real sector respectively denoted as Y_F and Y_R. Thus,

$$Y(t) = F(Y_F(t), Y_R(t)) \tag{2.1}$$

With sectoral production functions of the financial and real sectors respectively represented in equations (2.2) and (2.3):

$$Y_F(t) = A_F(t)K_F(t)L_F(t) \tag{2.2}$$

$$Y_R(t) = A_R(t)K_R(t)L_R(t) \tag{2.3}$$

where $L_j(t)$ and $K_j(t)$ are the labour and capital employed in j = financial (F) and real (R) sectors while Harrold–neutral technology terms $A_j(t)$ is asymptotic following Acemoglu (2009). Therefore, the market clearing K and L are:

$$K(t) = K_F(t) + K_R(t) \tag{2.4}$$

$$L(t) = L_F(t) + L_R(t) \tag{2.5}$$

By taking the final good as the numeraire in each period and denoting the prices of Y_F and Y_R by p_F and p_R, wage and interest rate (rental rate of capital) by w and r respectively. Hence, under competitive product and factor markets, prices must satisfy equations (2.6) to (2.8) below:

$$\frac{p_F(t)}{p_R(t)} = \frac{\partial F(Y_F(t), Y_R(t))/\partial Y_F}{\partial F(Y_F(t), Y_R(t))/\partial Y_R} \tag{2.6}$$

$$w(t) = \frac{\partial A_F(t)(K_F(t)L_F(t))}{\partial L_F} = \frac{\partial A_R(t)(K_R(t)L_R(t))}{\partial L_R} \tag{2.7}$$

$$r(t) = \frac{\partial A_F(t)(K_F(t)L_F(t))}{\partial K_F} = \frac{\partial A_R(t)(K_R(t)L_R(t))}{\partial K_R} \tag{2.8}$$

We now respectively denote the capital share of the financial and real sectors as:

$$\sigma_F = \frac{r(t)K_F(t)}{p_F(t)Y_F(t)} \tag{2.9}$$

$$\sigma_R = \frac{r(t)K_R(t)}{p_R(t)Y_R(t)} \tag{2.10}$$

Assume both sectors share a common technology that evolve exogenously according to the differential equations $\frac{\dot{A}_j(t)}{A_j(t)} \forall\, j = F\ and\ R$ with initial $A_j(0) > 0$. Technological progress at time t is balanced if $\frac{\dot{A}_F(t)}{A_F(t)} = \frac{\dot{A}_R(t)}{A_R(t)}$. Similarly, the capital share is balanced if $\sigma_F(t) = \sigma_R(t)$. We again assume that there is capital deepening and the real sector is relatively more capital–intensive, $\sigma_R(t) > \sigma_F(t)$. If K and L are allocated to the two sectors at constant proportions overtime, the real sector will growth disproportionately faster than the financial sector thus increasing demand for financial sector output. In equilibrium, real sector growth would force changes in equilibrium prices and a reduction in relative price of real sector output will drive reallocation of K and L to the financial sector. Indeed, this reallocation may not totally offset the higher increase in Y_R.

We respectively and explicitly specify the production functions for the financial and real sectors as:

$$Y_F(t) = A\theta K(t) \tag{2.11}$$

$$Y_R(t) = A(1-\theta)K(t) \tag{2.12}$$

while final output is a constant elasticity of substitution (CES) aggregator of the outputs of the two sectors:

$$Y(t) = \left[\varrho Y_F(t)^{\frac{\varepsilon-1}{\varepsilon}} + (1-\varrho)Y_R(t)^{\frac{\varepsilon-1}{\varepsilon}}\right]^{\frac{\varepsilon}{\varepsilon-1}} \tag{2.13}$$

where $\varepsilon \in [0, \infty)$ is the elasticity of substitution between these two inputs in the production of the final good while ϱ is the distribution parameter. Thus, equations (2.11) and (2.12) are

the sectoral production functions with the assumption that the two sectors share a common technology and θ is the share of the economy's capital stock (which by assumption we define to broadly include human capital) used in the financial sector while the remaining share $1-\theta$ is used in the real sector.

If $\varepsilon < (>)\ 1$, then the outputs of the financial and real sectors are gross complements (substitutes) in the production of the final good. In the spirit of this study, we assume that $\varepsilon < 1$ since the part of Y_F is also used in the production of Y_R. By taking the logs of equation (2.13) and differentiating with respect to time yields the aggregate growth rate in equation (2.14) below:

$$g(t) = \frac{\theta Y_F(t)^{\frac{\varepsilon-1}{\varepsilon}} g_F(t) + (1-\theta) Y_R(t)^{\frac{\varepsilon-1}{\varepsilon}} g_R(t)}{\theta Y_F(t)^{\frac{\varepsilon-1}{\varepsilon}} + (1-\theta) Y_R(t)^{\frac{\varepsilon-1}{\varepsilon}}} \qquad (2.14)$$

We introduce the growth rates for K and sectoral growth rates as $\frac{\dot{K}_j(t)}{K_j(t)} \equiv z_j(t)$; $\frac{\dot{Y}_j(t)}{Y_j(t)} \equiv g_j(t)$ and $\frac{\dot{Y}(t)}{Y(t)} = g(t)$. For a balanced growth, $g_F(t) = g_R(t)$. We define their corresponding asymptotic growth rates as $g_j^* = \lim_{t\to\infty} g_j(t)$ and in a more explicit form $z_F^* = \lim_{t\to\infty} z_F(t)$ and $z_R^*(t) = \lim_{t\to\infty} z_R(t)$.

The question is whether resource allocation towards the real sector can spur growth in the rest of the economy and whether fast growing financial sector hurts economic growth through its impact on the real economy. The balanced growth path contends that all sectors should grow at constant rate. Lewis (1955: 276) advocates for balanced growth in the sense that "the various sectors of the economy must grow in the right relationship to each other, or they cannot grow at all". Arguably, the process of economic development can become self–

sustaining, self–reinforcing and cumulative only if this process is coordinated, integrated and balanced growth takes place in all the inter–related sectors of the economic system (Bhatt, 1960). Thus, both the financial and the real sector should grow at the same speed in order for the latter to positively impact on economic growth.

Thus, in our model, financial sector development causes economic growth which is consistent with the supply–leading hypothesis and follows directly from Schumpeter's (1911) assertion that credit to the real sector is the primary force driving economic growth and development. If we begin from a rather simplifying assumption that only credit to the real sector leads to economic growth and if financial market supports real sector development, credit to the real sector will spur growth.

Given the constant proportion of each element and for a balanced growth, the ratio of $g_F(t)$ and $g_R(t)$ must be unit. If $g_F(t) > g_R(t)$, the overall growth rate $g(t)$ falls through the effect on productivity of real sector in the aggregate production function stemming from excess finance. However, when $g_F(t) < g_R(t)$, there would be increasing competition for financial resources hence a decrease in inefficient and riskier projects that get funded. The overall effect is that $g(t)$ increases. The conclusion here is that to ensure such positive growth effect, lending must support the real economy so that credit and real GDP grow in tandem, with a non–accelerating share of domestic credit to real sector and to GDP.

To allocate resources efficiently and prevent macroeconomic and financial instability, the real sector should grow sufficiently enough to maintain the demand of financial resources supplied by the fast–growth financial sector. With this, the real sector would be able to finance profitable investment projects and attract and maintain efficient human resources. Thus, in this study, we hypothesize that financial development damages growth if the growth

in finance and real sector output is disproportionate. In other words, the threshold effect of financial development on growth depends on the relative speed of growth in finance and real sector. The next section clearly describes the empirical strategy employed in testing this hypothesis.

2.5 Data and methodology

2.5.1 Data

To test our hypothesis, we construct a panel dataset of 29 SSA countries for the period 1980–2014. The choice of these countries is based entirely on data availability for a sufficiently longer time period and a list of these countries is provided in Appendix 1. Annual data for all the variables were gleaned from the World Development Indicators (WDI) of the World Bank. We used credit provided by financial sector to the private sector as percentage of GDP to proxy the quality of financial development. Relative to the quantity–based measure, the private credit measures the value of credit advanced by banks and other financial intermediaries to the private sector as a share of GDP and disentangles credit to the private sector relative to credit issued to governments, government agencies, and public enterprises. Furthermore, it excludes credit issued by Central Banks. The financial credit on financial deposits as well as bank credit on bank deposits measure how financial institutions effectively transform mobilized deposits into credit. A high ratio of domestic credit to GDP indicates both higher domestic investment and higher development of the financial system.

Indeed, SSA countries have comparative advantage in agriculture emanating from their abundant factor endowments, productivity and costs differences and from dynamic economies of scale (Collier and Venables, 2007; Eifert et al., 2005; Wood and Mayer 2001). It is therefore unsurprising that many agriculture–based countries have high agricultural shares in GDP and employment averaging 34% and 64% respectively (Hayami, 2005). Yet,

agriculture creates special challenges for financial institutions due to its spatial and risk characteristics (Meyer, 2011).

Mhlanga (2010) notes that, the overwhelming failure of financial institutions combined with scant penetration by risk–averse commercial financial institutions have led to a widespread dearth of agricultural credit. Reflected in their efforts to track the progress of economic activities, Central Banks in many countries compile annual statistical bulletins, which contain information on commercial banks' lending to major real sectors of their economies. Relying on data from the Central Banks' bulletin, Mhlanga (2010) shows credit share to the various sectors in some selected SSA countries. With the exception of Malawi, Tanzania and Uganda, commercial banks in SSA lend less than 10% of their total credit to the agricultural sector. The case of Botswana is dire. On average, commercial banks in Botswana invest the least share of their credit into the agricultural sector where credit advance to the sector has never exceeded 1.5% of total credit. However, manufacturing and industrial sectors are seen as a sound destination for bank lending because they are insulated from the inherent challenges faced by the agriculture sector. We therefore limit our attention to the manufacturing sector not only because they receive majority of the banks' credit relative to other sectors, but because they are now the backbone of economies' growth. Following from this, the development of the real sector is therefore proxied by growth in industrial sector value added which comprises value additions in manufacturing, mining, construction, electricity, water and gas where the value added is the output of the sector when all outputs are summed up and intermediate inputs subtracted.

We define excess finance to refer to a situation where certain aspects of the financial system outstrip real sector activity. On hindsight, the idea of excess finance may suggest that SSA has reached its optimal level of finance which may of course be misleading given the

underdeveloped nature of the financial systems. As a caveat, excess finance does not refer to access to finance over and above the optimal level. In line with standard literature, we used real GDP per capita to proxy economic growth. Both GDP per capita and growth rate of real sector output are in real terms based on 2005 US$ constant prices. Our control variables are based on the standard neoclassical growth theory and include inflation, investment rate, government expenditure, labour and trade openness. The inflation variable is the annual percentage change in the consumer price index and used to proxy macroeconomic (in)stability. This is expected to negatively impact on growth. We use gross fixed capital formation as a percentage of GDP to proxy investment rates and this is expected to positively influence economic growth. Government expenditure expressed as a percentage of GDP measures final government consumption expenditure and used to measure government size. Labour is proxied by the percentage of economically active population aged 15 to 64 years. The descriptive statistics of the variables are presented in Table 2.2 below.

Table 2.2: Summary statistics

Variables	Mean	Std. dev	Coefficient of Variation	25th PCT	50th PCT	75th PCT	Skewness	Kurtosis	Correlation Coefficient
Real GDP per capita	1,241.27	1,804.98	1.45	321.79	479.23	973.88	2.36	7.65	–0.54 [0.02]**
Government expenditure	14.88	6.31	0.42	10.64	13.79	17.52	1.57	7.15	–0.07** [0.03]
Inflation	56.23	36.63	0.65	27.56	52.93	84.06	0.30	2.60	–0.31 [0.04]**
Trade openness	71.15	36.48	0.51	44.86	61.09	89.22	1.10	3.83	–0.27*** [0.00]
Labour	52.83	4.65	0.09	50.55	52.04	53.89	–1.24	30.73	0.25*** [0.00]
Capital formation	19.69	9.65	0.49	13.56	18.61	23.64	1.59	8.25	–0.17*** [0.00]
Domestic credit	25.60	29.66	1.16	12.04	19.57	33.52	2.39	13.48	0.91*** [0.00]
Excess finance1	0.23	33.85	147.17	-12.82	–1.06	12.67	0.82	8.70	1.00
Private credit	19.52	21.72	1.11	8.77	14.61	22.72	3.78	19.68	0.59* [0.06]
Excess finance2	0.14	24.49	174.93	-16.93	-6.47	12.58	1.79	11.07	–0.42** [0.00]
Real output growth	25.37	13.83	0.55	15.99	22.03	32.03	0.94	4.29	–0.49*** [0.00]

Notes: *, ** and *** denote significance at 10, 5 and 1% respectively. Excess finance1 is the average difference between growth rate in domestic credit and that of real sector output while excess finance2 is the average difference between growth rate in private credit and that of real sector output. The correlation coefficient of private credit is its correlation with real GDP per capita. Similarly, the correlation coefficient of excess finance2 is its correlation with real GDP per capita. We do not report how excess finance2 and private credit correlate with the remaining variables because of space but they do not significantly differ from that of excess finance1.

All the variables are averaged across the period 1980–2014 and presented in percentages. Average real GDP per capita over the sample is $1,241.27 reiterating the low income levels of the countries under consideration. In the case of income per capita, we interpret the large standard deviation as marked cross–country income differences within the sub–region. Domestic credit to GDP ratio is averaged 25.6% relative to real output which is averaged 25.37% over the sample period. Government expenditure as a proportion of GDP is also averaged 14.88% and does not show substantial differences across the countries. We compute the coefficient of variation (CV) as the ratio of standard deviation to mean in order to

measure the relative dispersion of the variables. Excess finance is the most volatile variable given the high values of CV. Real GDP per capita is also exceedingly volatile and labour is least volatile. However, among the conditioning variables, inflation is the most volatile with an average value of 56.23% which is fairly higher than the median value (52.93%). This evidence reflects that majority of our sampled countries experienced episodes of hyperinflation over the period under consideration.[2] All the variables are skewed to the right except the labour. While our sampled countries are gleaned from the same region, there still exist some variations in the macroeconomic indicators. We therefore present the values for the 25th, 50th and 75th percentiles to allow for cross–country comparisons. The average difference between growth in real sector and that of the financial sector is around 0.23% which is significantly higher than the 50th percentile (–1.06) suggesting that excess finance is highly skewed to the right. This is also collaborated by the sign of the skewness. Thus, for most of the countries, growth in financial sector significantly outstrips that of the real sector of the economy. Among others, the value of the skewness and kurtosis of real GDP per capita, domestic credit and excess credit show non–normality and the distributions are leptokurtic. We present the correlation coefficient between excess finance and each variable in order to provide a cursory look at their relationships. Excess finance is positively correlated with labour and domestic credit. While it is strongly and significantly related to domestic credit, excess finance is negatively and significantly related with economic growth, capital formation and inflation. We present a scatter plot of financial development and economic growth in Figure 2.2 below.

[2] Given the mean inflation rate, 15 countries experienced rates below 56% while the remaining 14 exceeded the average.

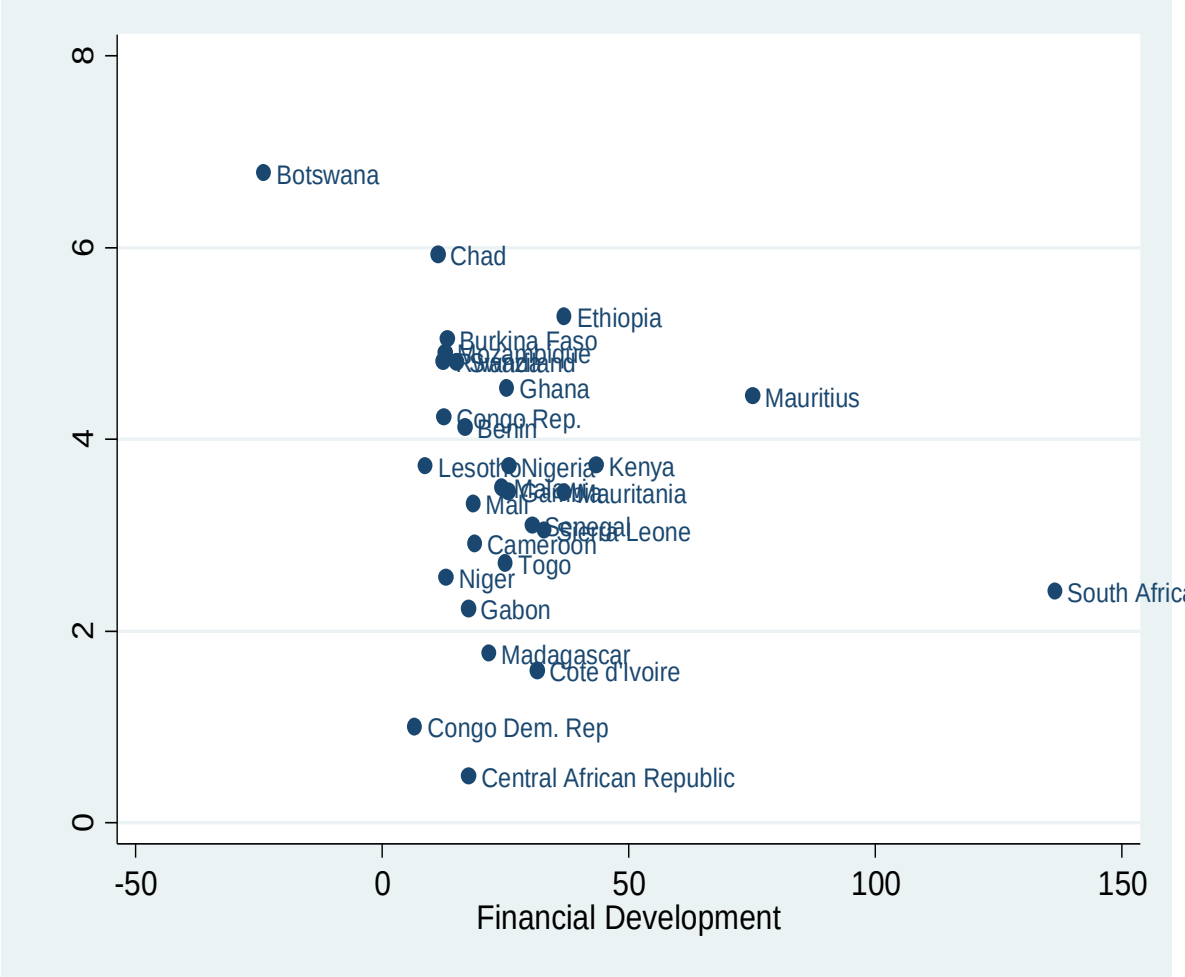


Figure 2.2: Financial development and economic growth (1980–2014)

Source: Authors' construct using WDI.

Figure 2.2 illustrates a plot of economic growth and financial development averaged 1980–2014 with one observation of growth and financial development for each country. While financial development is relatively homogenous for most of the countries, some outliers are noticeable. For instance, Botswana recorded the highest GDP growth rate on the back of a lower financial development. South Africa on the other hand has the highest financial development with a relatively lower growth rate. This notwithstanding, the nexus between financial development and economic growth looks non–linear, largely positive for low and intermediate levels of financial development and negative for high levels. Given this

understanding, it is instructive to note that the rather non–linear relationship and inverted U–shaped in particular may largely be driven by excess finance through the financial sector credit boom which interacts with real sector and economic growth more generally. In order to provide cursory evidence on the interrelationship between financial sector development, real sector and economic growth, we qualitatively identify patterns of credit expansion by the financial sector in order to examine the hypertrophy of finance. And as argued by Barajas et al., (2010), credit booms need to be recognized as definite events separate from the normal increments in the volume of credit.

2.5.2 Identifying episodes of credit boom

SSA's credit expansion has not been unusually buoyant by international comparison. This notwithstanding, most SSA countries have experienced a decade–long rapid increase in private credit. IMF (2015) notes that real credit to the private sector grew fivefold over the period 2003–2014 with an average annual progression of 16% culminating in doubling the region's credit–to–GDP ratio. To some extent, the rising credit growth to GDP ratios is indicative of financial deepening but increases in credit above stylized trends have also been identified as an important early warning indicator of banking crises (Drehmann and Juselius 2013). In this section, we determine episodes of credit boom albeit some caveats. We refer to credit boom to denote unusually faster pace of credit growth to the private sector by the financial system relative to the typical cyclical expansion. Although the region's financial development is low compared to other emerging economies but in relation to its real growth, it is high for SSA's level of development.

Indeed, what constitutes rapid credit growth deviation and how the "normal" growth trend should be determined are both contested and subject to several interpretations (Gourinchas et

al., 2001; Mendoza and Terrones, 2008; Mitra et al., 2011: Claessens et al., 2012). Following Decressin and Terrones (2011), we express the credit growth in logarithmic form and conditions that, a country experiences a credit boom when the deviation in (log) domestic credit from its long run trend exceeds the standard deviation of the cyclical component. We respectively denote the deviation from long run path in country *i* at time *t* and the corresponding standard deviation as d_{it} and $\sigma(d_i)$. We provide a more robust estimate of the credit trend by employing the Hodrick–Prescott (HP) filter – originally introduced by Hodrick and Prescott (1980) – which allows for the identification of credit boom incidence.[3] The filter includes a parameter, λ which determines the smoothness of private credit series and identifies the trend series μ_t that minimizes the sum for a given value of λ specified as:

$$\min_{\{\mu_t\}_{t=0}^{T}} \left[\left(\sum_{t=0}^{T} (y_t - \mu_t)^2 + \lambda \sum_{t=1}^{T-1} ((\mu_{t+1} - \mu_t) - (\mu_t - \mu_{t-1}))^2 \right] \right. \qquad (2.15)$$

Typical of annual time series data, we set the smoothing parameter $\lambda = 100$ in line with Mendoza and Terrones (2012). By applying the boom threshold factor, we further define a credit boom as an episode where the country has at least one contiguous date that satisfies the credit boom condition $d_{it} \geq \Xi\sigma(d_i)$, where Ξ is the boom threshold factor. Following from Mendoza and Terrones (2008; 2012), we set the baseline value of Ξ at 1.65 because Prob $(d_{it}/\Xi\sigma(d_i) \geq 1.65$ satisfies the 5% tail of the standardized normal distribution (Mendoza and Terrones, 2008; 2012).

[3] Indeed, the HP filter provides reasonable and elegant way of detrending a range of commonly encountered economic time series. This notwithstanding, the HP approach has recently come under attack (see Hamilton, 2017).

We identify those countries where credit has grown much faster than the cyclical trend over the last decades. In this study, we identify credit boom as deviations from the domestic credit trend that exceed the typical cyclical expansion by a threshold factor of 1.65. We set the date of the peak of the credit boom (t_d^*) at a point where the value of $d_{it} - \Xi\sigma(d_i)$ is highest among the set of contiguous dates that satisfy the credit boom condition. Some studies (see for instance Gourinchas et. al., 2001) relied on *ad hoc* threshold factor to identify boom episodes. However, apart from its likelihood to potentially exclude a large number of countries, the use of this approach is not instructive because rapid credit growth in financially underdeveloped countries is largely driven by financial deepening. Besides, thresholds for the credit–to–GDP are often hard to determine let alone interpret (Dell'Ariccia et. al., 2012).

By relying on the credit–to–GDP ratio rather than credit itself, our approach relates credit developments to the size of the economy and accounts for the pro–cyclical nature of credit. Thus, our methodology inextricably links the financial and real sectors of the economy. Admittedly, our use of aggregate measure however captures only bank–based credit to the private sector. Indeed, while non–bank financial institutions constitute an appreciable proportion of the financial system thus advancing some amount of credit to the private sector in SSA, rapid credit growth emanating from non–bank financial institutions may be overlooked. We present findings on the credit boom incidence in Figure 2.3 and Table 2.3 below.

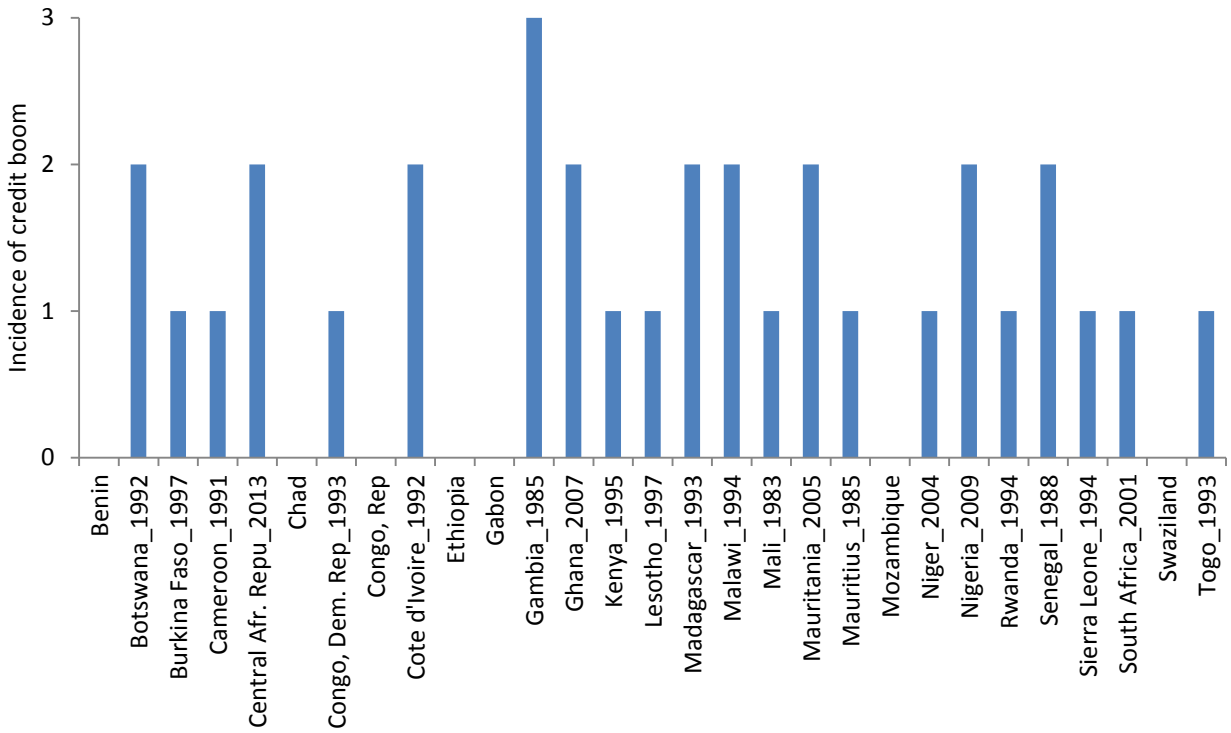


Figure 2.3: Country–by–country credit boom incidence

Source: Author's construct

From the Figure above, it is clear that seven countries do not record a credit boom over the period and such countries are seen to have sound regulatory supervisions. For instance, although the country has seen rapid growth and development of its banking market over the last decade, Mozambique is not episodic largely because the Central Bank oversees an active interbank money market and open market operation. Bank supervision also imposes strict impairment recognition rules and has rules for large credit exposures. Country–by–country analysis reveals that out of the 29 countries, more than two–thirds experienced at least one episode of credit boom.

Gambia alone recorded three episodes of credit boom. At the peak of its boom in 1985, the average expansion in private credit reached 11% above the domestic credit trend.[4] Credit growth rate was on the crescendo against the slow pace of financial sector growth and real sector need. In fact, the 1985 boom peak is unsurprising. Evidence provided by the Central Bank of the Gambia shows that the main aim of Gambia's Economic Recovery Programme (ERP) in August 1985 was to bring discipline and equilibrate the economy's financial sector. Specifically, the ERP was primarily directed at regaining control of liquidity and excessive credit expansion by the banking system.[5] With no minimal capital requirement for entry, Gambia's banking system has been inefficient resulting from the heavy regulatory framework, the oligopolistic market structure and the small banking market (Agu, 2014).

Botswana and Cote d'Ivoire show homogeneity both in terms of incidence and time of peak. For instance, both countries experienced boom in 1992 and 1993 with peak period in 1992. Rwanda and Sierra Leone each experienced 1 boom over the period and both incidences occurred in 1994. Same can be observed for Togo and Democratic Republic of Congo. However, the recent episode in the sub–region occurred in Central African Republic in 2013 and this had a magnitude of 2% above the credit trend.

South Africa has a relatively developed financial sector. In the early 1990s the banking sector volatility created scope for consolidation through the mergers of several banks and the introduction of the Banks Act (94 of 1990) led to an industry growth spurt with a number of new banking licenses being issued paving way for new entrants into the domestic banking system (Matemilola et. al., 2015). Consequently, the banking sector became more

[4] For countries with multiple episodes, we show only the peak incidence (t_d^*) from among the multiple contiguous dates that satisfy the credit boom condition. See Appendix for the rest of the boom periods. We do not report the magnitude of the boom but these ranges from 1 to 11% above the cyclical component of the domestic credit in each episodic country.

[5] See http://www.sesrtcic.org/files/article/30.pdf

competitive. It is therefore unsurprising that the country experienced a boom in 2001. Rapid expansion in unsecured lending is an important development in the South African banking industry and considered to be the second–biggest weakness of the banking industry (PwC, 2013).

IMF (2015) defines credit boom by relying on an *ad hoc* threshold of a 20% point increase in credit–to–GDP ratio in a single year and proceed to identify episodic countries in SSA. It identifies 24 countries that have experienced at least one credit boom episode. Our findings are consistent with IMF (2015) where among others countries like Central African Republic, Democratic Republic of Congo, Ghana, Lesotho, Malawi, Niger, Nigeria, Rwanda, Sierra Leone and Togo are episodic. IMF (2015) further shows that the Democratic Republic of the Congo, Ghana and Lesotho are among the 7 countries where credit expansions have exceeded the region's average. The case of Ghana is interesting. Growth rate in gross loans and advances increased from 17.5% in September 2006 to 45.6% in September 2007. During the same period, real private sector growth and household credit respectively increased from 17.3% to 51.7% and 7.6% to 66.6% (Bank of Ghana, 2015).

Table 2.3: Credit boom incidence

Descriptor	No credit boom	Credit boom episodes				Total
		1980–1989	1990–1999	2000–2009	2010–2014	
Number of incidence	7	6	18	9	1	34
Percentage of incidence	–	18%	53%	26%	3%	100%

Overall, our study results reveal 34 credit boom episodes over the entire period. The frequency of episodes increased from 18% in the 1980s to 53% in the 1990s (see Table 2.3). Majority of the episodes in the 1990s occurred in the early and late 1990s and these periods

also saw reductions in value additions of the real sector and economic growth (see Figure 2.1). Majority of the credit booms tend to be synchronized regionally and centered on the reforms period that saw massive restructuring of the financial sectors in the 1980s and 1990s. This finding is akin to Dell'Ariccia et al., (2012). The authors study reveals that the proportion of countries experiencing a credit boom at any given time has seen a rapid credit growth in response to the financial liberalization and deregulation of the 1980s. In particular, a third of the booms either follows or coincides with financial liberalizations. There is also evidence that financial reforms are predictors of credit boom. Decressin and Terrones (2011) found that financial sector reforms – usually aim to foster financial deepening – are linked to sharp increases in credit growth and has between 59 to 69% likelihood of triggering credit boom.

More booms occur in relatively underdeveloped financial systems as observed in SSA partly reflecting the regions' country composition and historically volatile macroeconomic dynamics (Dell'Ariccia et al., 2012). While credit is essential for investment, innovation and economic growth, the current narrow financial and real sectors have highlighted the risks of lending booms' excessive indebtedness of firms and effect on economic growth in the sub-region. Economists have since recognized that financial sector conditions and dynamics in the private sector could have a compelling effect on real sector and macroeconomic outcomes more generally. Rapid credit growth on the back of weak real sector and poor supervision increases probability of default, and in turn higher costs of external financing (Kiyotaki and Moore, 1997).

Taking Ghana as a case, the recent 2015 Financial Stability Report of the Bank of Ghana reveals that non–performing loans (NPLs) of the banking industry increased from 12.1% in September 2014 to 13.5% in September 2015. Private sector credit contributed 97.4% of the

total banking sector's NPLs as at September 2015 compared with 93.1% in September 2014. In fact, the highly disproportionate level of NPLs associated with the private enterprises was driven mainly by indigenous enterprises. Although these enterprises received about 61% of credit to the private enterprises, they accounted for 79.1% of NPLs as at September 2015.[6] The likely effect is that the rising NPLs on banks' balance sheet can potential trigger bank insolvency. Evidence from Ghana reveals a severe downturn of the financial sector due to the slump of the real sector of the economy which stifled creativity and sustained finance along the entire value chain. And as noted by Bernanke and Gertler (1995), rising corporate leverage could induce severe slow–downs by amplifying and propagating adverse shocks to the real economy. The end result is lower investment, cash flow and overall output. Across the entire region, a significant proportion of the credit boom episodes are associated with an expansion of domestic credit beyond the trend with an attendant knock–on effect on real sector.

There is evidence that leverage at the firm level sharply increases during episodes of credit boom (Mendoza and Terrones, 2008). Overleveraged firms tend to focus on generating adequate cash flow to service their debts rather than pursuing continued productivity growth. Markedly, the episodes of credit boom in the 1980s culminated in a reduction of growth rates from 1.91% in 1985–1989 to 0.64% in 1990–1994. Also, economic growth decreased from 4.89% (2000–2004) to 4.41% in 2010–2014 in the face of credit boom. At the same time, firms and households with excessive debts may also be more susceptible to unexpected adverse demand shocks and are therefore more probable to fall into financial distress following a shock. In South Africa for instance, while household loans account for 44% of bank lending, rapid growth in private sector credit between 2003 and 2006 boosted household

[6] At the same time, indicators of profitability for the banking industry deteriorated in banks' earnings performance for the period ended September 2015. The industry net interest income, returns on assets and equity significantly declined. See Bank of Ghana (2015).

debt to 83% of income in 2008. Subsequently, the African Bank was placed under curatorship after recording losses from unsecured lending (IMF, 2014b).

While a significant proportion of the boom episodes occurred before the 2008 Global Financial Crisis, among the incidence that happened in the 2000s, 60% occurred prior to the crisis thus providing some circumstantial evidence of boom–crisis–growth nexus. This evidence is unsurprising because credit booms are often cited as the culprit of financial crises (Eichengreen and Arteta, 2002). Our evidence suggests that while domestic credit significantly increased in periods prior to the crisis, industrial sector output of the economy slowed from 6.7% in 2003 to 3.7% in 2006 with a concomitant reduction in growth rate (see Figure 2.1). Coricelli et al., (2010) note that while moderate levels of debt permits the financing of new technologies or capacity of real sector with the potential of stimulating economic growth, excessive credit growth and debts adversely affects growth by damaging total factor productivity. This blueprint provides some qualitative evidence on the relationship between financial development, real sector output and economic growth. Anecdotally, this nexus suggests that the reduction in growth rates may be the resultant effect of the unbalanced growth in the financial sector development and that of the real sector. In the next section, we outline the empirical strategy in examining the unbalanced growth effects without explicitly modeling domestic credit boom episodes as these are intrinsic to the financial sector.

2.5.3 Empirical strategy

Empirically, regression models are used to study the relationship between financial development and economic growth. Following this, we specify equation (2.16) below where

economic growth depends on the level of financial development and other conditioning variables.

$$y_{it} = f(FD_{it}, Q_{it}, \varepsilon_{it}) \quad (2.16)$$

where y_{it} is log of income per capita of country *i* at time *t*; FD_{it} is financial development; Q_{it} is a vector of control variables; ε_{it} is the error term while *t* and *i* are time and country indices respectively.

To examine the effect of financial development on growth, we set out a baseline model where economic growth depends on its one period lag to check countries' conditional convergence effect, financial development and the set of controls estimated in equation (2.17) below;

$$y_{it} = \beta_o y_{it-1} + \beta_1 FD_{it} + \alpha_2(g_{FDit} - g_{RSit}) + \beta_2 Q_{it} + \gamma_i + \mu_t + \varepsilon_{it} \quad (2.17)$$

where y_{it-1} is the growth lag representing the initial conditions thus testing for the convergence effect as espoused by the neoclassical growth model; g_{FDit} and g_{RSit} respectively denote the growth rate in finance and real sector output; γ_i is the country–specific fixed effects; μ_t is the time effects while ε_{it} is the idiosyncratic error term. The remaining variables are as previously defined.

In this study, we estimate equation (2.17) above by employing the system generalized methods of moments (GMM) dynamic pooled estimator. Unlike the traditional cointegration and ordinary least squares (OLS) techniques, this approach resolves the econometric problems inspired by endogeneity of the lagged dependent (y_{it-1}) and the unobserved country–specific effects eminent in growth models. Our main parameter of interest is α_2 which measures the effect of excess finance on growth and forms the basis of our hypothesis. We investigate the channels through which excess finance affects economic growth by

including a multiplicative interaction term of the difference between growth in finance and that of real sector output and investment and household consumption. From equation (2.17), we specify our general system GMM framework as:

$$y_{it} = \sum_{k=1} \gamma_k y_{it-k} + \alpha_1 FD_{it} + \alpha_2 (g_{FDit} - g_{FDit}) + \alpha_3 (DIFF_{it} \times CHA_{it}) + Q_{it}\beta + \epsilon_{it} \qquad (2.18)$$

$$t = 1, \dots\dots\dots, T; i = 1, 2, \dots\dots N$$

$$\epsilon_{it} = \gamma_i + \mu_t + \varepsilon_{it}$$

where β is the vector of parameters associated with each explanatory variable; p is the maximum lag in the model; $DIFF_{it}$ is excess finance while CHA_{it} is the vector of transmission channels. The other variables remain as previously defined.

In order for the equation to be estimable, there is a restriction on the serial correlation of the error term which requires it to be uncorrelated with the explanatory variables. This condition has both economic and statistical meaning. Economically, it means that the instrumental variables only affect growth through their effect on the explanatory variables. Statistically, the condition means that our set of explanatory variables are weakly exogenous. In other words, they can be affected by current and past realizations of GDP per capita – our proxy for economic growth – but must be uncorrelated with the future realizations of the error term. Thus, from equation (2.18), we write an arbitrary time period *T* for a random country *i* as:

$$y_i = V_i\psi + \lambda_i\gamma_i + \epsilon_{it} \qquad (2.19)$$

where ψ is a vector of γ_i's, α_k's and β's; V_i is a vector containing the initial conditions and all the explanatory variables (Q's) while λ_i is a $T \times 1$ vectors of unity.

By employing the dynamic pooled panel, we compute the linear GMM estimators of ψ with a general form equation specified in equation (2.20) below:

$$\widehat{\psi} = \left[\left(\sum_i V_i^{*|} X_i\right) M_N \left(\sum_i X V_i^*\right)\right]^{-1} \left(\sum_i V_i^{*|} X_i\right) M_N \left(\sum_i X_i^{|} y_i^*\right) \quad (2.20)$$

$$\text{where } M_N = \left(\sum_i X_i^{|} \Gamma_i X_i\right)^{-1}$$

V_i^* and y_i^* are transformations of V_i and y_i respectively; X_i is a matrix of instrumental variables while Γ_i is the country–specific weighting matrix.

Whereas the traditional cross–sectional estimators follow directly from traditional growth studies, our panel estimator makes use of the pooled cross–country and time series properties while utilizing additional information provided by the variations in the level of economic growth and its intrinsic drivers. Thus, the added information from this property by far provides more precision in the estimations as well as correcting for biases beset with existing studies on the finance–growth nexus. Following from this approach, equation (2.17) can be estimated using the first difference or system GMM and consequently, from equation (2.17), we rewrite the economic growth model as:

$$y_{it} = \theta_1 y_{it-1} + \theta_2 W_{it} + e_{it} \quad (2.21)$$

Since the unobserved country–specific (γ_i) effect contained in e_{it} may be correlated with other explanatory variables, we first difference equation (2.21) to eliminate this effect thus giving equation (2.22) below:

$$\Delta y_{it} = \theta_1(\Delta y_{it}) + \theta_2(\Delta W_{it}) + (\Delta e_{it}) \quad (2.22)$$

By assuming uncorrelated error terms and weak exogeneity property of the explanatory variables, for our GMM dynamic panel estimations, we use the following moment conditions:

$$E[y_{it-s}(\Delta e_{it})] = 0 \quad \text{for } s \geq 2,\ t = 3, \ldots\ldots, T \tag{2.23}$$

$$E[W_{it-s}(\Delta e_{it})] = 0 \quad \text{for } s \geq 2,\ t = 3, \ldots\ldots, T \tag{2.24}$$

However, using the first difference GMM is not without weaknesses. For instance, Blundell and Bond (1998) argue that this form of GMM estimation has very poor finite properties both in terms of bias and precision especially when the explanatory variables are persistent overtime as their lagged values are weak instruments and predictors of endogenous changes. Thus, the appropriate technique capable of yielding consistent and unbiased estimates is the system GMM which rests on the combination of the system regression in differences with the regression in levels (Arellano and Bover, 1995; Blundell and Bond, 1998). Blundell and Bond (1998) further show that the system GMM is superior to the first difference GMM estimator in that the instruments in the levels equation remain good predictions for the endogenous variables even in the presence of highly persistent variables like inflation and output. To permit the workings of the system GMM, Blundell and Bond (1998) propose the use of extra moment conditions that rely on stationarity property of the variables. It is also imperative to note that the additional condition imposed by the system GMM may require deviations from long run averages to be uncorrelated with the fixed effects. This condition particularly holds in this study since all the countries in our sample may not show much variation in economic conditions given their rather low income level and hence are more likely to be in steady state. The additional moment conditions for the regression in levels are therefore given as follows:

$$E[y_{it-s} - y_{it-s-1}(\gamma_i + \varepsilon_{it})] = 0 \quad \text{for } s = 1 \tag{2.25}$$

$$E[W_{it-s} - W_{it-s-1}(\gamma_i + \varepsilon_{it})] = 0 \quad \text{for } s = 1 \tag{2.26}$$

Thus, relying on the moment conditions in equations (2.23), (2.24), (2.25) and (2.26) and invoking the GMM technique yield consistent and efficient estimates which are invariably contingent on the validity of the instruments. We address the validity of the instruments by using two formal tests: serial correlation test and Sargan's test for over–identifying restriction. While the serial correlation test examines the null hypothesis that the error term is serially uncorrelated (whether first, AR(1) or second order, AR(2)), the Sargan's test examines the exogeneity of the instruments with the null hypothesis that over–identifying restrictions are valid.

2.6 Empirical results

We regress economic growth on its initial real GDP per capita and other controls selected in line with the standard growth theory and other indicators of financial development, excess finance and multiplicative interaction terms measuring transmission channels of excess finance effects on economic growth. We include time and country effect dummies to eliminate time–related shocks and country–level heterogeneity in growth trajectory. We estimate five models by sequentially introducing the set of explanatory variables to determine the robustness of the regressors to model specification. Table 2.4 presents findings on the relationship among financial development, real sector and economic growth relying on a balanced panel dataset spanning 1980–2014.

Table 2.4: Finance, real sector growth and economic growth based on GMM

	1	2	3	4	5
Initial GDP per capita	–1.016 (0.421)**	–0.991(0.171)**	–0.984(0.472)**	–1.098(0.482)**	–1.920(0.375)***
Government expenditure	–0.018(0.033)	–0.026(0.027)	–0.014(0.033)	–0.007(0.006)	–0.047(0.036)
Trade openness	0.044(0.014)***	0.039(0.021)*	0.041(0.016)**	0.081(0.030)**	0.088(0.026)**
Labour	0.048(0.023)**	0.013(0.064)	–0.034(0.011)***	–0.068(0.025)**	–0.035(0.020)*
Capital formation	0.048(0.017)**	0.053(0.023)**	0.028(0.013)**	0.035(0.016)**	0.045(0.023)**
Inflation	–0.001(0.005)	–0.003(0.025)	–0.007(0.003)**	–0.006(0.002)**	–0.005(0.002)**
Domestic credit	0.021(0.006)***	0.034(0.011)***	0.051(0.016)**	0.018(0.004)*	0.012(0.006)**
Domestic credit squared	–	–0.058(0.012)***	–	–	–
Excess finance	–	–	–0.009(0.002)***	–0.007(0.002)**	–0.006(0.003)**
Industrial output	–	–	–	0.029(0.018)*	–
Channels:					
Excess finance × Capital formation	–	–	–	–	–0.020(0.010)**
Excess finance × Inflation	–	–	–	–	0.009(0.002)*
Diagnostics:					
Observations	986	986	986	986	986
Country fixed effects	YES	YES	YES	YES	YES
Time effects	YES	YES	YES	YES	YES
Number of countries	29	29	29	29	29
AR(1) z – value [*p*–value]	–2.697 [0.007]	–2.742[0.006]	–2.708[0.007]	–2.756 [0.006]	–2.860 [0.004]
AR(2) z – value [*p*–value]	–1.343 [0.179]	–1.544[0.123]	–1.367[0.172]	–1.508 [0.132]	–1.286 [0.198]
Threshold value		29%			
Sagan chi-square [*p*-value]	27.823[0.241]	26.923[0.261]	26.568[0.275]	25.977[0.228]	24.303[0.202]
Wald chi-square [*p*-value]	0.0000	0.0000	0.000	0.000	0.000

Notes: ***, ** and * denote significance at 1, 5 and 10% level. All variables are in logs. Excess finance here is the difference between growth rate in domestic credit and that of real sector output. The threshold value is the value after which financial development negatively affects economic growth.

Column 1 reports the drivers of economic growth in addition to the unique effect of financial development on long run growth. Lagged real GDP per capita is included as an explanatory variable, as in the standard Barro growth model. Consistent with standard growth models, the coefficient of the initial growth variable is negative and significant suggesting a conditional convergence. The implication is that, each country in the sample is converging to its own steady state income per capita. This is valid irrespective of the model specification. The coefficient of government expenditure – our proxy for government size – is negative in all models suggesting that increase in size does not support economic growth. However, this effect is insignificant. This finding is plausible and may perhaps reflect that quality in government expenditure matters for economic growth relative to size. Trade openness, labour and capital formation positively and significantly affects growth. Consistent with Fischer (1993), inflation negatively affects growth. With regard to effect of financial development, the coefficient of domestic credit is positive reflecting that the development of financial sector propels long run growth. This is largely insensitive to model choice suggesting that the growth–enhancing effect of financial development is robust (Columns 1 to 5). This finding is particularly akin to a large body of literature including Levine et al.'s (2000) and Masten et al. (2008).

We investigate threshold effects in the finance growth–growth nexus in Column 2 by including the square term of domestic credit.[7] The differencing sign of the level of domestic credit and its square term reveals a non–linear relationship between financial development and economic growth. Specifically, the inverted U–shaped nexus suggest that too much fimance is not healthy for growth. This finding is consistent with Cecchetti and Kharroubi (2012), Shen and Lee (2006) and; Law and Singh (2014) but inconsistent with Adeniyi et al.

[7] Using the "nl" function in Stata, we fit an arbitrary non–linear regression function by least squares and this produces 0.556 and 0.035 as the coefficient for the level financial development and standard error respectively. Similarly, the coefficient for the square term is -1.034 with a standard error of 0.074.

(2015). The divergence we attribute to Adeniyi et al.'s (2015) single country–usage which is far from reflecting the entire region on account of their rather small sample.

Given the threshold effect, what is the optimal level of financial development consistent with long run growth? By taking the partial derivative of the growth equation with respect to domestic credit and setting the result to stationary/zero, our finding reveals that the effect of financial development on economic growth becomes negative when domestic credit to GDP ratio exceeds 29%. Countries where this threshold was reached and in some cases exceeded over the period spanning 1980–2014 were Cote d'Ivoire, Ethiopia, Kenya, Mauritania, Mauritius, Senegal, Sierra Leone and South Africa. By controlling for the quadratic term, the coefficient of level domestic credit in Column 2 increased relative to the baseline estimation (Column 1) on account of the addition of highly correlated square term which clearly violates the multicollinearity assumption. All the other variables maintain their signs and significance except for labour which turns insignificant. This study hypothesizes that such non–linear relationship is the resultant effect of the relative speed in finance and real sector growth. To test this hypothesis, we include the relative growth difference of domestic credit and real sector output – excess finance – in the model and result is presented in Column 3. The coefficient of domestic credit remains positive and significant at 5% while that of excess credit is negative and significant at 10%. In particular, a percentage rise in excess finance decreases economic growth by 0.9%. Confirming our hypothesis, this finding suggests that excess finance negatives the positive effect of other growth determinants. Further findings from our study suggest that when domestic credit growth outstrips real sector growth by 0.23%, an increase in credit from the 25th percentile of the distribution to the median

domestic credit, economic growth increases by 3.06%.[8] However, with a balanced sectoral growth, economic growth is expected to increase by 3.19% when domestic credit increases from the 25th percentile value (12.04%) to the median value (19.57%).[9] Our evidence is also akin to Ductor and Grechyna (2013). By defining excess finance as the average difference between financial and real sector output growth under which aggregate output falls, the authors construct a panel data of 33 OECD countries and show that for a sustained economic development, simultaneous growth rates of real and financial sectors is required.

Up to this stage we do not include industrial share as a regressor. We contend that changes in growth emanating from excess finance may be due to some changes in industrial output following exogenous factors not attributable to financial sector dynamics. By controlling for industrial share in Column 4, the coefficients of domestic credit (excess finance) remain positive (negative) and significant at conventional levels although both coefficients are relatively lower than that of the baseline estimation (Column 3). Increases in the size of the industrial sector enhance economic growth given the positive coefficient of the industrial output. This finding is consistent with Manyika et al., (2012). They argue that higher industrial sector permits growth in agriculture and allows other sectors to become more productive, provides materials and tools to build and operate quality infrastructure and creates new products that open new service growth opportunities and continue to drive trade. Healthy real sector by far drives growth momentum of developing countries.

[8] We obtain the expected growth rate first by calculating the percentage increase from the 25th percentile to the median value $\left[\frac{19.57-12.04}{12.04}\right] \times 100$ which is 62.54% and then multiplying the percentage increase by 0.051–0.009(0.23) where 0.23 is the average excess finance.

[9] We obtain the expected growth gains first by calculating the percentage increase from the 25th percentile to the median value and multiplying the result by the coefficient of private credit. That is, $\left[\frac{19.57-12.04}{12.04}\right] \times 0.051 = 0.0319$.

In this specification, when the relative speed of growth in finance and real sector is proportionate, growth is expected to increase by 1.13% when credit growth increases from its 25th percentile value (12.04%) to the median value (19.57%). However, when domestic credit growth exceeds real sector output growth by 0.23%, economic growth is expected to rise by 1.03%. When domestic credit growth outstrips real sector growth by 0.23%, an increase in real sector size from the 25th percentile of the distribution (15.99%) to the median size of real sector (22.03%), economic growth increases by 1.02%.[10] With a balanced sectoral growth, an increase in the size of real sector from the 25th percentile of the distribution (15.99%) to its median distribution (22.03%), economic growth increases by 1.10%.[11]

Our findings are particularly consistent with Ductor and Grechyna (2015) who find that the main channel through which financial development harms growth is unbalanced growth between private credit and real output. In other words, the rapid growth of financial development thwarts the positive impact of financial development on economic growth when the growth in finance is unaccompanied by development of the real sector. Our evidence shows that although financial development promises an unequivocal positive effect on growth, such growth effects is contingent on the relative speed of growth in finance and real sector as an unbalanced sectoral growth does not promote long run economic growth. To the extent that disproportionate growth in finance and real sector negatively affects economic growth, a number of crucial policy insights can be gleaned from these findings. How does excess finance impact on economic growth in SSA? We examine the channels through with excess finance affects growth by including the multiplicative interactive terms of capital

[10] We obtain the expected growth rate first by calculating the percentage increase from the 25th percentile to the median value $\left[\frac{22.03-15.99}{15.99}\right] \times 100$ which is 37.77% and then multiplying the percentage increase by 0.029–0.009(0.23) where 0.23 and 0.029 is respectively the coefficient of size of the real sector and the average excess finance.

[11] We obtain the expected growth gains first by calculating the percentage increase from the 25th percentile to the median value and multiplying the result by the coefficient of real sector size. That is, $\left[\frac{22.03-15.99}{15.99}\right] \times 0.029 = 0.0109$.

formation and inflation. From Column 5, the coefficient of the interaction of excess finance and capital formation is negative and significant at 5%. Consistent with our hypothesis, this evidence suggests that excess finance drags growth by damaging investment rates where a percentage rise in excess finance significantly reduces growth by 2% via capital formation channel. The manifestation is that credit growth over and above the optimal level required by firms permits the financing of unproductive investments and as a consequence shifting resources away from efficient investments thus fueling undesired growth. Indeed, when the credit growth exceeds real sector demand, bad and risky investments get financed on the back of hypertrophic credit. This heightens both returns and growth volatility with the preeminent effect on overall economic growth. Thus, given the direct effect of capital formation, excess finance indirectly negates the growth–enhancing effect of growth owing to the build–up of capital. This finding is consistent with Cecchetti and Kharroubi (2015). The authors note that by disproportionately benefitting low productivity investments, an exogeneous increase in financial sector growth harms total factor productivity. Our evidence also collaborates with Li (2006) who finds investment as an important channel through which financial market development affects economic growth. Beyond damaging capital formation, further results reveal that excess finance increases macroeconomic instability by magnifying inflation. The coefficient term of inflation and excess finance is 0.009 suggesting that a percentage rise in excess finance decreases growth by 0.9% through its effect on inflation. In terms of its manifestation, excess supply of credit permits higher private consumption expenditure (relative to investment) thereby increasing aggregate demand and general price levels. This finding is in synch with Barro (1995). The author finds that economic growth slows down due to a reduced proclivity to invest in response to rising inflation. This notwithstanding, the negative effect of inflation of growth is associated with cash–in–advance models where money is complementary to capital (Stockman, 1981).

Lesotho presents an interesting case worth considering. The country has experienced rapid private sector credit growth in recent years. However, available evidence reveals that Lesotho's economy is characterized by a higher share of credit to the household. In fact, more than half of private sector credits are used to support household consumption relative to investment. Available figures from the Central Bank of Lesotho show that lending to household has been persistently increasing since 2009. Lending for household consumption rose from 52.3% in 2010 to 56.2% in 2011 relative to investment credit of 47.7% and 43.8% in the same period (Central Bank of Lesotho, 2013). The rise in household consumption credit coincided with increased inflation from 3.6% to 5.0%. It is therefore not surprising that annual GDP growth rate declined from 5.7% in 2010 to 4.2% in 2011.

Friedman (1977) has long argued that higher inflation rates reallocate scarce resources to unproductive activities thus reducing output growth. Apart from this, faster inflation spurs inflation uncertainty which distorts economic efficiency thus reducing total employment. However, the growth–damaging effect of excess finance is stronger via capital formation compared to inflation. To the extent that inflation in itself drags growth and further heightened by excess finance, the inverted U–shaped nexus between financial development and economic growth can best be explained by the disproportionate rate of growth in finance and real sector output.

With regard to models adequacy, the *p*–values of the Wald chi square statistic shows that all the models are jointly significant at 1%. Our tests for over–identifying restriction support the validity of the instruments used for all the models given our failure to reject the null hypotheses for the Sagan's tests. The tests for first and second order–correlation reveal the absence of first–order serial correlation. However, given the rather high (low) *p*–values (*z*–

values), we fail to reject the no serial correlation of order two at conventional levels. These findings provide coherent and consistent estimates on the back of valid instruments.

2.6.1 Sensitivity analysis

This section provides sensitivity analysis in determining whether our results are robust to, first, the main financial development proxy and second the estimation approach. In this pursuit, we use private credit to the private sector as the main proxy for financial development. Unlike the private credit which includes all credit to various sectors on a gross basis except credit to the central government, domestic credit provided by the financial sector refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of non–equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. This is a more broad measure of financial development as it includes credit provided by non–bank institutions. With regard to the estimation approach, we use the fixed effect instrumental variable (FEIV) technique to examine the relationship between financial development and economic growth. We estimate the fixed effect model by considering the following baseline model:

$$y_{it} = x_{it}^{|}\vartheta + v_i^{|}\varphi + \varepsilon_{it} \qquad (2.27)$$

where vector x_{it} houses *K* regressors without a constant term while vector v_i contains a constant and a set of time *t* invariant country–specific variables which may either be observable or unobservable. Thus, the underlying heterogeneity is represented by $v_i^{|}\varphi$. If v_i is not observable but correlated with x_{it}, then the least squares estimator of vector ϑ will be biased hence producing inconsistent estimates. Given this, we re–write our baseline model in equation (2.27) as:

$$y_{it} = x_{it}^{|}\vartheta + \mho_i + \varepsilon_{it} \qquad (2.28)$$

where $\mho_i = v_i^{|}\varphi$ and represents all the observable effects. We control for simultaneity in the finance–growth nexus because there is a strong likelihood of financial development being endogenous to economic growth. We therefore use legal origins of the countries as candidates for the instrumental variables. This measure has been extensively used in the finance–growth literature.[12] This approach is based on the presumption that legal origin affects economic growth only through financial development (La Porta et al, 1998a, b; Levine et al., 2000; Aghion et al., 2005). The existence of well–functional legal systems shapes information asymmetry, quality of financial development and overall contracting efficiency which by far explains differences in country's growth trajectory.

Table 2.5 presents the results based the alternative indicator of financial development – private credit – and using the FEIV approach. For brevity, we do not report results on the first stage regression but the findings largely show a positive (negative) relationship between financial development (excess finance) and economic growth.

[12] Our sample countries fall under three (3) legal origins namely the English, French and the Portuguese Common laws. Our reference legal origin is Portuguese. See Appendix 1 for countries' respective legal origin. For some discussion on these legal origins and systems, see Asongu (2011a, b).

Table 2.5: Finance, real sector growth and economic growth based on FEIV

Dependent variable: Real GDP per capita	**1**	**2**	**3**	**4**	**5**
Initial GDP per capita	–2.712 (0.501)*	–2.210(0.493)**	–2.471(0.521)*	–2.730(0.397)*	–2.114(0.281)*
Government expenditure	–0.032(0.029)	–0.041(0.031)	–0.018(0.041)	–0.004(0.006)	–0.060(0.071)
Trade openness	0.039(0.016)**	0.058(0.019)**	0.034(0.019)***	0.050(0.026)***	0.065(0.014)*
Labour	0.035(0.013)**	0.017(0.014)	–0.027(0.012)***	–0.053(0.013)*	–0.022(0.009)**
Capital formation	0.050(0.015)**	0.041(0.013)**	0.019(0.010)**	0.027(0.011)**	0.031(0.010)*
Inflation	–0.006(0.005)	–0.002(0.030)	–0.005(0.002)**	–0.009(0.003)**	–0.007(0.001)*
Private credit	0.015(0.006)***	0.022(0.011)***	0.018(0.009)**	0.011(0.004)*	0.009(0.006)**
Private credit squared	–	–0.074(0.012)***	–	–	–
Excess finance	–	–	–0.011(0.002)***	–0.008(0.002)**	–0.009(0.003)**
Industrial output	–	–	–	0.019(0.010)***	–
Channels:					
Excess finance × Capital formation	–	–	–	–	–0.031(0.008)*
Excess finance × Inflation	–	–	–	–	0.007(0.002)*
Diagnostics:					
Observations	986	986	986	986	986
R–squared	0.512	0.547	0.553	0.571	0.594
Number of countries	29	29	29	29	29
Threshold value		27%			
p-value of *F*–statistics	0.0000	0.0000	0.000	0.000	0.000

Notes: ***, ** and * denote significance at 1, 5 and 10% level. Standard errors are presented in parentheses. All variables are in log. Excess finance here is the difference between growth rate in private credit and that of real sector output. The threshold value is the value after which financial development negatively affects economic growth.

Results from Tables 2.4 and 2.5 above are qualitatively similar both in terms of effects and significance but not in terms of magnitude of effects. From Table 2.5, the coefficients of the lagged dependent variable remain negative and significant. Government size is also negative and insignificant even in the model controlling for transmission channels. Trade openness is also a robust determinant of growth although the coefficients are lower relative to Table 2.4. Capital formation, inflation and labour do not show much variation in terms of direction of effect but not the level of significance. With regard to our main variable of interest, the coefficient of private credit and its quadratic term is respectively positive and highly significant (Column 2) suggesting that increases in private credit boost economic growth which is consistent with Levine et al.'s (2000) and Masten et al. (2008). While this holds, financial development does not always support growth. The coefficient of the quadratic term is negative relative to sign of private credit in levels. The differencing in signs collaborates with our earlier finding and reveals an inverted U–shaped relationship. The threshold value at which further increases in private credit damages growth is 27% which is relatively lower than the earlier finding. This evidence nonetheless confirms studies by Cecchetti and Kharroubi (2012), and Arcand et al., (2012).

By relying on the difference between growth rate in private credit and real sector output to proxy excess finance, we find a robustly negative and significant effect of excess finance on economic growth albeit reduced magnitude relative to domestic credit proxy in Table 2.4. Here, a percentage rise in excess finance reduces growth by 1.1%. The difference in magnitude of effect perhaps reflects the broad definition of domestic credit as opposed to narrow–based private credit. Given the average difference between domestic credit growth and that of the real sector (0.14%), the proportion of growth loss due to excess finance is expected to reduce to about 0.62% when the 25th percentile of the distribution of excess finance (–16.93%) decreases to its median value of –6.47%. However, with a balanced

sectoral growth, economic growth is expected to increase by 1.93% when private credit increases from the 25th percentile value (8.77%) to the median value (14.61%). Controlling for industrial share also reveal growth is maximum when the growth rate in finance and real sector output is proportionate. The key implication drawn here is statistically and economically not different from our earlier evidence which by far confirms our hypothesis: growth in financial development not accompanied with growth in real sector output does not propel economic growth. Controlling for industrial share to account for variations in real sector output not attributable to the financial sector does not significantly alter the results (Column 4). The coefficient of real sector size is positive and statistically significant where a percentage point increases in industrial size increases growth by about 2%. Consistent with our earlier evidence, this finding is expected as growth in real sector size increases the economies' productively capacity thus propelling growth. Manifestation of excess finance on growth impact largely stems from the deleterious effect on capital formation and heightening of macroeconomic instability with their attendant ramifications for economic growth. Consistent with the system GMM estimates, the elasticity of capital formation to excess finance is higher than that of inflation as we reach the same conclusion: excess finance hurts growth by misallocating resources and financing unproductive investments and undesired household consumption.

2.7 Policy implications and recommendations

Based on the findings from our empirical analysis and given the overall objective of this study, we highlight the policy implications of our results to guide policy. As discussed earlier, in an attempt to improve their growth performance through the financial sector, countries in SSA implemented some financial reform measures with view to eliminating financial repression and increasing financial deepening. But financial reforms can also be

associated with credit boom where credit growth deviate from the normal cyclical trend although what constitutes deviation from normal trend and how it is measured still remains inconclusive. Our study revealed 34 credit boom episodes over the entire period with a rising frequency in the 1980s to 1990s.

Majority of the credit boom occurred during the financial reforms period that many SSA countries embarked on. It is not surprising that intrinsically similar economies in the sub–region can experience divergent economic performance for purely endogenous reasons. Indeed, domestic factors as well as differences in Central Bank's monetary policy regimes matter. The differences in boom incidence across our sample suggest that local, structural, institutional and domestic policy paths are crucial. Specifically, much of the booms occur in countries with soft or hard pegs exchange rate regimes involving currency boards,[13] loose monetary policies and lax supervision although the latter is characteristic of many developing countries. For countries like the Central African Republic where they maintain a de facto exchange rate anchor to the U.S. dollar, monetary policy is often directed at maintaining a fixed exchange rate at the expense of effectively responding to rapid credit growth. There is also a transmission channel. In fixed exchange rate regimes, domestic cost of borrowing reduces in response to a lower global interest rate thus prodding domestic credit growth – a consequence of loose monetary policy – beyond the level needed by firms.

The level of financial sector supervision has a bearing on the enforcement of bank regulation and the effectiveness with which supervisory discretion is applied to deal with hypertrophic finance and early symptoms of credit boom. Central Banks are best placed to act as lender of last resort and supplying adequate liquidity to the financial and real sectors of the economy.

[13] Burkina Faso, Cote d'Ivoire, Mali, Niger, Senegal, Togo are in West African Economic and Monetary Union (WAEMU); Cameroon, Central African Republic in Central African Economic and Monetary Community (CEMAC); Congo, Dem. Rep in stabilized arrangement, Botswana in crawling peg; managed arrangement are The Gambia, Nigeria, Rwanda.

The use of open market operations and direct application of the reserve requirement are powerful tools in regulating the credit growth. Practically, the Bank can raise (lower) the reserve requirement when there is too much (little) liquidity and credits in the economy. What is needed here is a good understanding of the optimal level of credit consistent with long run economic growth. A supervisory role of Central Banks can help it obtain crucial information about whether a situation is likely to culminate in excess finance and thus require their intervention. Without this information, the Central Bank may either intervene too aggressively or fail to do so when its intervention is best needed. Central Banks in SSA can therefore strengthen their research department in this regard through prudential banking supervision and conduct of more robust studies. Identifying the healthy credit levels could help a country's susceptibility to credit booms, macroeconomic and financial instability as well as ways of reducing their susceptibility.

The rather low levels of financial development in SSA may not lead to financial and banking sector crises although there is evidence that rapid credit growth may be a pre–curser to crisis (Borio and Lowe, 2002; Laeven and Valencia, 2010; Mendoza and Terrones, 2008; Dell'Ariccia et al., 2012). We argue that, not all booms necessary end up in crises but the remnant of credit boom is an excess supply of financial resources relative to the needs of the real sector. Indeed, we found that financial development spurs economic growth but too much finance is not growth–enhancing. Excess finance negatively affects economic growth. Existence of an undisturbed equilibrated growth of real and financial sectors is a necessary condition for a smooth economic growth. Whether we control for the size of the real sector or not, the elasticity of growth to changes in either the size of the real sector or domestic credit is higher under balanced sectoral growth. Technological advancement in the real sector expands the economy's productive capacities while a balanced growth in the financial sector

permits the efficient use of these new capacities. Traditional theory of informational overshooting suggests that as long as the production capacity is not reached, the economy grows together with its financial system. And to the extent that this limit is unknown, rational agents continuously learn about it with optimistic expectations until the economy eventually reaches the limit (Rob, 1991; Zeira, 1994, 1999). Our evidence in this study however does not find economies in SSA to overshoot because the region may be far from its production frontier largely as a result of untapped resources.

An alternative view of the existence of excess finance may rely on negative externalities resulting from overdeveloped financial sector (Rochet and Woolley, 2009; Philippon, 2010). The 2008 Global Financial Crisis raised some legitimate concerns about financial deepening and financial development, given that the crisis originated in advanced economies, where the financial sector had grown both very large and complex. However, in the case of SSA, we do not see the possibility of the credit boom resulting in financial crisis and the negative externalities of overdeveloped financial systems on account of the narrow and underdeveloped financial markets. Rather, what we observe is fragile economies resulting from risky and sustainable investments coupled with superfluous consumption on the back of rapid and unbridled credit growth far outstripping the solvency needs of firms. Excess finance may reflect both the micro and macroeconomic inefficiencies in credit allocation and size of the real sector. Thus, in the case of SSA, lending booms could be the resultant natural consequence of financial and economic development consolidation. It is therefore crucial for policymakers to identify the point beyond which further increases in financial development become a great cause for concern. There is also the need for policymakers to continuously conduct needs assessment of real sector credit demand and leverage sustainability levels, both

in order to prevent excess finance and to identify those firms or sectors of the economy that need to undergo a deleveraging exercise.

Undoubtedly, the financial sector makes a critical contribution to the quantity and quality of capital formation by directly contributing to productivity growth through its own share of output and indirectly through its contribution to the efficiency of the capital stock. Apart from this, financial markets promote competition in the ownership of quality investments and allow entrepreneurs and firms to effectively manage risk. An equally important function of the financial sector is to improve the efficiency with which saving and investment are allocated in the economy. This in turn determines quality of the capital stock and its contribution to productivity and long run economic growth.

But our study shows that the process of financial development can involve substantial trade–offs, particularly when rapid financial development is not accompanied by real sector growth. The proportionate growth in the real sector balances the supply and demand of financial resources thus improving the allocative efficiency. As such, only growth–enhancing projects get funded. In an upturn, better growth prospects improve creditworthiness of borrowing firms and financial institutions respond with an increased supply of credit. Our findings however suggest that the relatively abundant credit does not necessarily promote investment rates. This is because financial institutions may lower lending standards during episodes of higher credit growth. As a consequence, collateral value decreases and excess finance may be used to finance unproductive investments and personal consumption thus exacerbating growth vagaries through higher inflation and bad investments. Although the coefficients of the transmission channels are generally lower in the sensitivity analyses compared to those obtained from the system GMM estimations, what is vivid from our findings is the consistent higher elasticity of investment to excess finance compared to consumption. Our evidence

reveals that the pass–through excess finance–economic growth effect via investment is much stronger than the growth responsiveness of excess finance to changes in consumption as the elasticity of investment channel is between 2.22 to 4.43 times higher than that of inflation. The increase in consumption associated with rapid credit growth is often more pronounced in the non–tradables sector. Interestingly, excess finance effect on growth via inflation is subdued. This finding particularly has important implication for real sector growth. Not only do those needing credit for higher productive investment get denied but those who actually get financial resources owing to their political influences invest in bad projects where returns are low at best. The resultant effect is a constrained real sector output relative to credit growth with an attendant undesirable economic growth impact.

The rather high rate of inflation in SSA should also be a concern. Higher rates of inflation reduce savers' real rates of return and lower the real rates of interest that borrowers pay. This increases people's appetite for borrowing with fewer savers. And where the financial sector responds by increasing credit, such funds are used to finance private consumption exacerbating inflation. On the other hand, credits may be rationed and perhaps be politically driven and once inflation is exceedingly high, a potential consequence is that the financial system fails to provide the needed investment capital, resulting in a lower capital formation and levels of real sector growth. At the same time, high rate of inflation can potentially trigger an endogenous macroeconomic instability and theory predicts that this instability should as well be transmitted to real activity.

We can also draw crucial lessons from the impact of monetary policy. Financial sector growth is more likely to reflect an inverse relationship between the monetary policy stance and cost of capital: the more accommodative monetary policy is the lower the cost of capital and the faster the growth of the financial sector. If the level of financial development and

financial sector are inversely related such that underdeveloped financial sectors have rapid financial development, then monetary policy may be counter–cyclical especially since it is most accommodative when aggregate growth is low.

There is also some political economy dimension to this: prejudice lending – where credit may be allocated to favoured groups and to those with networks rather than commercial criteria. Fafchamps (1999) empirically examines the effect of network and ethnicity on banks' credit to manufacturing firms in Kenya and Zimbabwe. The author finds a negative relationship between individuals with little or no association with bank staff and bank credit and that what matter most for bank credit is largely a personal interaction with an insider. Those who access credit this way may use it to finance unproductive activities while those who actually need credit may not have access. And firms that are denied credit are probably more fragile and pruned to fail. Given the rather weak institutions in the sub–region, this effect is uncommon and investment–growth effect is dire. Politically motivated credits are also not healthy for the financial performance of those very financial institutions. These classes of borrowers are often not screened properly and their credit documentations are inadequate. Financial distress banks caused by political pressures to lend to some players in the private sector including parastatals and politically influential borrowers and by further politically preventing banks from enforcing repayment (Brownbridge et al., 1998). The end result is a rising NPLs and such firms do not generate high profits to service their debts due to their lack of ingenuity. Consequently, financial markets channel more resources into loan recovery thus increasing endogenous market frictions by way of higher transaction costs. However, Choi et al., (1996) opine that when the severity of an economy's financial market frictions is endogenous, it is possible for the friction to be perceived more or less severe. If the perception of the friction is more (less) severe, financial markets provide less (more) capital for investment. The result is a reduced (enhanced) level of real economic performance. Efforts must therefore be made to

advance credit to innovative firms in dire need. In the case of Lesotho, an increase in credit extension was also supported by Partial Credit Guarantee Fund which was consciously designed by the Government and commercial banks to provide guarantee on Micro, Small and Medium Enterprises that do not have access to credit and ensure that banks recover portion of their money in an event of a default.

To check the overall financial sector's credit growth, first, countries could consider developing a legal framework to guide the extension of credit which among others sets the conditions for sustainable credit advancement to the private sector and at the same time clean the real sectors' excess finance on the back of reckless lending. South Africa is a shining example with the enactment of the National Credit Act 34 of 2005. Second, Central Banks in SSA need to aggressively comply with the Basel III framework which creates the countercyclical capital buffer designed to sanction the macro–financial environment in which banks operate. The Basel III establishes tougher capital standards through more restrictive and stringent capital definitions, higher risk-weighted assets, additional capital buffers and higher requirements for minimum capital ratios. Apart from this, it further creates liquidity standards to limit illiquid asset and restrict unstable sources of funding. A broader macro–prudential goal of sound financial system that supports real sector growth can be achieved when a clear approach that progressively imposes a capital buffer for the financial sector during periods of credit boom reflected in private sector credit exceeding its long term trend. On the other hand, there would be no need to intervene or set the countercyclical capital buffer when real and financial sector growths are proportionate and credit growth aligns with long run trend.

Boosting real sector growth also requires firms to develop a detailed understanding of specific emerging markets opportunities, as well as the needs of their existing clients. They

will also require agile approaches to the development of strategies using critical scenario planning and research. The challenge for the real sector and industry in particular however will be on how to advance their footprints in a more nuanced approach that go beyond rhetoric. For instance, population is undoubtedly a useful labour input in production process and given the abundance of labour in SSA, it is natural for labour–intensive industries to almost always follow the path of low wages labour often with low skills. However, the changing global landscape presents key opportunities for industries in SSA to develop innovative ways of increasing productivity. A key priority of firms should be on skills and capacity of their workers and to develop a granular understanding of their operations, investment in research and development as well as expertise in product design for the complex supply and value chains.

Supporting industries requires a well–grounded policy based on comprehensive understanding of the diverse industry fragments of the economy as well as the intrinsic factors affecting them. For instance, the inadequate supply of energy is a major challenge facing the industrial sectors of several SSA countries including Ghana, South Africa, Gambia and Malawi. Given that energy crisis is an important source of output fluctuations (Alagidede and Ibrahim, 2016), energy policies of Governments need to focus on ways of generating enough capacity that do not only meet the demand of the real sector but provides reserve capacity to support other sectors of the economy. A formidable strand of innovation, information technology, and optimal finance enhances real sector productivity and bringing a renewed dynamism to the sector.

Apart from making conscious efforts to depoliticize operations of the real and financial sectors, Governments can set up business advisory services to provide important business advice to firms and entrepreneurs on sustainable investment opportunities. There is also a role

for the financial institutions to play. Banks can leverage on their expertise to critically support firms with their business plans so as to tailor firms' credit need with the expected rate of return. In all these, a sound coordination is needed to ensure that all sectors grow in proportional reciprocity.

2.8 Conclusion

The significance of financial sector to an economy cannot be overemphasized with rising interest in both growth and financial literature on the relationship between financial development and economic growth. The general consensus is that improved financial sector development promotes growth by efficiently allocating resources. However, little is known on the effects of real sector output growth in the finance–growth literature. The case of SSA is interesting given the region's renewed interest in propelling growth on the back of its nascent financial sector. In this study, we evaluate the economic growth effects when the growth in financial development and that of the real sector is unbalanced relying on data for 29 SSA countries over the period spanning 1980–2014. We find that financial development positively affects growth albeit non–monotonically with inflection points ranging between 27 to 29%. Overall economic growth effect is contingent on the relative speed of growth in finance and that of real sector output. In particular, financial development damages economic growth when the improvement in the financial sector is not accompanied by higher real sector growth. Maximum growth is attained with a balanced sectoral growth. However, excess finance negates the positive effects of financial development by damaging capital formation as bad investments get financed and at the same time exacerbating macroeconomic instability through increased aggregate demand. Financial boom are generally not growth–enhancing likely because it harms what is ought to spur growth while at the same time magnifies the effect of macroeconomic instability. Our findings remain robust to estimation techniques and

largely in synch with theoretical literature suggesting the interdependence of real and financial sectors in growth process. To ensure a sustained growth, we recommend strengthening of the institutions to exercise proper oversight of the financial sector, enactment of laws and adopting the countercyclical capital buffer to guide credit growth and establishment of business advisory centers to encourage real sector ingenuity.

CHAPTER THREE

THRESHOLDS IN FINANCIAL DEVELOPMENT–ECONOMIC GROWTH NEXUS

3.1 Introduction

The importance of financial development to economic growth has been given much credence in the literature. Indeed, early writers on this relationship have used financial systems in the context of endogenous growth theory in investigating such nexus. One of such foremost writers is Schumpeter (1911) who first highlighted the significant role of financial sector development in economic growth through the provision of efficient financial services. This evidence has been supported by other empirical literature (see King and Levine, 1993a, b; Levine et al., 2000; Hassan et al., 2011, Masten et al., 2008). Interestingly, while both theory and the available empirical evidence have almost settled on the importance of financial development in countries' economic growth trajectory, the specific nature of effect is less than clear. Evolving theoretical studies have espoused that there may be potential thresholds in the relationship between finance and growth. Admittedly, studies on the nonlinearities is far from being conclusive (Cecchetti and Kharroubi, 2012; Shen and Lee, 2006; Law and Singh, 2014; Adeniyi et al., 2015; Favara, 2003). What is missing from these studies is the role of mediating variables in refereeing the impact of finance on growth. Theory contends discontinuities in this relationship largely as a result of host of factors that sets the stage at which finance spurs or harms growth (see for instance Saint–Paul, 1992; Berthelemy and Varaudakis, 1996; Acemoglu and Zilibotti, 1997). More specifically, the initial level of income per capita, countries' initial human capital and the initial level of financial development have been proffered as key potential threshold variables mediating how finance affects growth. However, despite the nascent theoretical evidence projecting the crucial role

of these threshold variables, empirical efforts have not been rigorous in examining these effects.

More so, the existing empirical studies on the threshold effects have relied on rudimentary threshold estimation techniques in determining the existence of nonlinearity in finance–growth nexus by imposing exogenous thresholds in *ad hoc* approaches involving the inclusion of quadratic terms of finance in the growth regression. Our aim in this chapter is to fill this literature gap by rigorously examining nonlinearities in the link between financial development and economic growth using sound techniques involving an asymptotic theory for nonlinearity estimations that permits the determination of threshold within a confidence interval. We do this relying on data for 29 sub–Saharan African (SSA) countries over the period 1980–2014. This study contributes significantly to the literature in so many ways. First, we use the sample splitting and threshold estimation developed by Hansen (1996; 2000) which is better than earlier approaches employed in previous studies. Indeed, apart from not assuming *a prior* functional form of the relationship, our approach does not require exogenous specification of the threshold values of the conditions mediating the finance–growth nexus. Second, apart from estimating the threshold values, our approach permits the classification of the observations in relation to whether or not they exceed the threshold values so that the exact effect of finance on growth is determined for both when countries are below and above the threshold. With this we are able to settle the highly contested threshold evidence produced by earlier studies as we show how obscuring initial values of host countries' condition may culminate in incorrect conclusions in the link between finance and economic growth particularly in SSA. By and large, our findings reveal that while financial development significantly affects growth, the values of the threshold variables crucially mediates this effect. Specifically, when the initial levels of per capita income, human capital

and financial development are below the threshold, overall economic growth is largely insensitive to financial sector development suggesting that countries' initial level of income, human capital and financial development are necessary conditions in spurring long run economic growth.

The rest of the chapter is organised as follows. The next section provides an extensive review of the literature on nonlinearities in finance–growth nexus while section 3.3 presents the data and empirical strategy. Section 3.4 outlines the threshold estimation approach while 3.5 discussed the findings on the nonlinearities. Section 3.6 highlights key implications for policy while section 3.7 concludes the study.

3.2 Literature review

A growing body of theoretical literature shows a strong relationship between financial development and economic growth. Evidence abound that a functional financial sector encourages savings, ameliorates information asymmetry and provides opportunity for diversifying risk in addition to efficiently allocating resources (King and Levine, 1993a; Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991). While theoretical studies have settled on the impact of finance on economic growth, empirical studies on the relationship is far from being conclusive although majority of the literature suggest a positive link (Khan, 2008; Khan and Senhadji, 2000; King and Levine, 1993a, b; Levine et al., 2000).

Xu (2000) finds that the low or lower middle income countries in his sample display negative effects of financial development on GDP growth and investment, while the reverse is true for the high income countries. Contrary to Xu (2000), De Gregorio and Guidotti (1995) obtains a similar weak relationship in high income countries which they attribute to the fact that

financial development in such advanced economies occurs beyond the banking system, while their proxy for financial development is bank credit to the private sector as a percentage of GDP.

Huang and Lin (2009) examined a sample of 71 high and low income countries in cross-section instrumental variable threshold estimations and found evidence of positive relationship between finance and economic growth although the nexus is nonlinear. Contrary to Xu (2000) and Rioja and Valev (2004a, b), the effect of finance on growth is more important for low income economies. By relying on panel data spanning 1961 to 1995 for 74 developed and developing countries, Rioja and Valev (2004a, b) find that the effect is positive and significant only in countries with high and intermediate income levels, with no apparent impact in low income countries. However, Rousseau and Wachtel (2011) reveal that the impact of finance on growth is weaker in more recent period spanning 1990–2004 compared to 1960–1989. Their argument is that the rapid growth of credit and widespread liberalization in the 1990s resulted in both inflationary pressures and a deteriorating banking system that eventually caused financial crises, thus taking away the growth–enhancing effect of finance. With regard to the transmission channels through which finance impacts on growth, Rioja and Valev (2004a, b) find that in middle and high income countries, this occurs mainly through the enhancement of productivity, while in the low income economies it happens predominantly through the accumulation of capital.

One important weakness of these studies is their assumption of linear functional form in estimating the link between finance and growth. Recent empirical literature posits that such relationship is far from being monotonic and that the overall effect on growth is conditioned on the attainment of a certain unique threshold. Studies like Cecchetti and Kharroubi (2012), Shen and Lee (2006) and Law and Singh (2014) have found an inverted U–shaped

relationship implying that financial development is only good up to a point after which it becomes deleterious. However, Samargandi et al. (2015) show that such an inverted U–shaped relationship is only evident in the long run and not in the short run. Even the turning point for the reversed effect is still disputed in the literature. For instance, Law and Singh (2014) suggest that financial development promotes growth but not when private credit exceeds 88% of GDP compared to 90% in Cecchetti and Kharroubi (2012) and 110% in Arcand et al.'s (2012) study. These notwithstanding, Samargandi et al. (2015) conclude that the threshold point is generally lower in middle income countries.

More recently, Adeniyi et al. (2015) assess nonlinearities in the relationship by including a square term of financial development in their autoregressive distributed lag (ARDL) growth model. Contrary to Cecchetti and Kharoubi's (2012) findings, Adeniyi et al. (2015) found a U–shaped relationship suggesting that financial development decreases growth up to a certain threshold above which growth increases with increasing financial development. Favara (2003) however finds an interesting *S*–shaped relationship between financial deepening and economic growth and concludes that at very low (very high) levels of financial development, growth suffers (improves). Aghion et al., (2005) contends that the reason for the nonlinearity of the finance–growth relationship might be that financial development facilitates the catch up to productivity frontier, but has limited or no growth effect for countries that are close or already at the frontier.

At the theoretical front, there is a growing consensus that these threshold effects are motivated by the initial levels of per capita income, human capital and financial sector development. One of such theoretical works is Saint–Paul (1992). By relying on the initial level of per capita income, the author analyzes a mechanism which may give rise to multiple

equilibria in financial and economic development where agents can choose between two technologies. The first is flexible and allows productive diversification but at the same time has low productivity. The second technology is rigid, more specialized and productive. The model argues that when financial institutions are less developed, risk diversification is carried out through the selection of less specialized and less productive technologies. With this form of technology, there is less risk exposure and incentives to develop financial markets are limited and can lead to "low equilibrium". In the "high equilibrium", financial markets are well developed with specialized technology. In these economies, agents choose more risky, higher yielding technologies and the impact of finance on growth is higher. However, the transition from the "low equilibrium" to a "high equilibrium" one is mediated by the initial level of income per capita that function as a threshold variable above which financial sector development is healthy for economic growth.

Zilibotti's (1994) model also espouses the initial level of per capita income as a potential threshold variable in finance–growth nexus. The model establishes the idea of "thick" and "thin" markets. There exists positive impact of finance on growth for economies with "thick" markets above the per capita income threshold with low intermediation cost, improved capital allocation and sustained growth. While for economies below the threshold of per capita income, there are "thin" markets with limited capital, the higher cost of financial intermediation prevents investors from using efficiently available capital stock and financial development to have significant impact on economic growth.

Greenwood and Jovanovic (1990) also identify the initial level of per capita income as a mediating factor in the relationship between finance and economic growth. They formally model the dynamic interactions between financial development and growth where a country

passes through a development cycle from a primitive stage to a developed fast growing stage. At early stage, growth is slow and the financial sector only mobilizes savings and diversifies risk. However, as the income levels begin to increase, the financial intermediaries become more sophisticated and perform costly functions of monitoring investment and screening for cost effective innovations. Finally, during the maturity state, the country's financial system fully develops with a relatively stable and higher growth. Moreover, during the early stages of financial development, only a few relatively rich individuals have access to financial markets. However, with aggregate economic growth, higher number of people accesses the formal financial system, with spill-over effects on economic growth. The main thrust of their model reveals that the relationship between financial development and growth varies depending on the level of per capita income.

Apart from per capita income, the work of Azariadis and Drazen (1990) has also shown the initial level of human capital as a crucial threshold variable in growth models. They emphasize that an economy can attain a sustained level of growth only when it has exceeded the minimum threshold level of human capital. Their model predicts that, in the absence of an adequate level of human capital, countries transition into poverty traps. More specifically, if the human capital development is below a certain threshold level, the economy is characterized by a neo-classical growth model with no apparent traces of sustained economic growth. However, where the level of human capital exceeds the threshold, the economy will be characterized by an endogenous growth model where long run economic growth is sustained.

Galor and Zeira (1993) theoretical model indirectly highlights the importance of human capital in finance–investment–growth relationships. Their model proposes the initial level of wealth as a potential threshold variable and emphasizes that only those individuals with

initial wealth greater than the threshold level will invest in their human capital and participate in the financial markets. As such, the initial wealth distribution matters for long run distribution of income, aggregate output, investment as well as the level of income per capita. In the long run, there will be a divergence of wealth between high income skilled labor and the low income unskilled one. The rich/educated will converge to the high income steady state owing from increases in skilled labour wage while the poor/uneducated will converge to the low income steady state. The greater the number of people above the initial wealth/education threshold, the higher will be the country's per capita income. However, there will be no investment increase in human capital in poor countries with unequal income distribution.

Berthelemy and Varaudakis (1996) argue that the initial level of human capital is a crucial threshold variable in finance–growth nexus as far as the human capital accumulation is positively associated with the level of educational development. Their theoretical model exhibits multiple steady state equilibria where economies with low educational development (and human capital) are trapped in low level underdevelopment equilibrium and thus unable to enjoy the benefits of financial sector development. Consequently, these countries have low savings and "quiet" financial sector stemming from weak competition. Conversely, economies with high human capital are characterized by well-developed financial sector development and as such enjoy relatively higher savings and income. By employing the regression tree technique, Berthelemy and Varaudakis (1996) empirically examine whether the initial level of human capital mediates the effect of financial development on economic growth. The authors find that the initial level of human capital proxied by the level of secondary school enrolment is a central threshold variable that influences the unequivocal effect of finance on economic growth.

Beyond the level of human capital acting as a threshold variable influencing finance and growth, Acemoglu and Zilibotti's (1997) study highlight the initial level of financial development as a potential threshold variable mediating the finance and growth nexus. The main thrust of their study is that, projects with relatively higher rates of return require large initial investment. Apart from this, they are frequently indivisible and the financial sector has to maintain a certain minimum size before sufficient funds can be pooled to finance these projects. Acemoglu and Zilibotti (1997) therefore opine that the impact of financial deepening on economic growth may be huge in developed countries with higher income per capita and greater financial development.

Deidda and Fattouh (2002) present simple two–period overlapping generations model with risk–averse agents and costly financial transactions which establishes possible nonlinearity in financial development and economic growth relationship. They test for the threshold effect in relation to countries' initial per capita income. After splitting the sample into low and high income groups and controlling for initial level of human capital, the authors found that initially high income countries grow slower. Further findings also suggest that higher levels of financial development are associated with higher growth rates but only hold for countries with higher incomes. Replicating the results relying on the initial level of financial development shows a non–monotonic relationship between initial financial depth and economic growth in high income countries.

Indeed, the majority of existing studies suggest a nonlinear relationship between finance and economic growth. As a deficiency however, these studies suffer from two important weaknesses. First, they rely on rudimentary threshold estimation techniques to determine the existence of nonlinearity in finance–growth nexus either by imposing exogenous thresholds

in an *ad hoc* techniques or endogenous thresholds that involve specifying specific linear function for identifying the below and above threshold values and effects. Second, beyond establishing the threshold effects, the majority of these earlier studies have failed to rigorously stem–the–tide by empirically investigating whether these thresholds are mediated by the initial levels of per capita income, human capital and financial development. One exception is the work of Berthelemy and Varaudakis (1996) where the regression tree technique was used to empirically examine whether the initial human capital operates as a threshold variable in finance–growth relationship. However, apart from its inability to show statistical significance of the estimates, this technique does not reveal the confidence intervals within which the threshold estimates lie.

In the current study, we avoid these problems by using Hansen's (1996, 2000) sample splitting and threshold estimation technique. This approach controls for the asymptotic theory that permit the estimation of the thresholds, their confidence intervals and the level of statistical significance. We estimate three separate sets of thresholds variables focused on the initial level of per capita income, the levels of human capital and financial development. The thrust of this study is that financial development enhances growth only after exceeding a distinct threshold levels of initial income per capita, initial human capital and initial financial sector development. In other words, we proffer that the differences in the direction of effect stems from countries' heterogeneous income levels, human capital development and financial markets. The next section discusses the data and empirical strategy in pursuing the aim of this chapter.

3.3 Data and methodology

3.3.1 Data

We construct a panel dataset of 29 SSA countries for the period 1980–2014. The choice of these countries is based entirely on data availability for a sufficiently longer time period and a list of these countries is provided in Appendix 1. We use the annual data sourced from the World Development Indicators (WDI) of the World Bank. We use two measures of financial development: private and domestic credits. Unlike the private credit which includes all credit to various sectors on a gross basis except credit to the central government, domestic credit provided by the financial sector refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of non–equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. These indicators thus have clear advantage over measures of monetary aggregates, in that it more accurately represents the actual volume of funds channeled to the private sector. Therefore, the ratios of private and domestic credits to GDP are more directly linked to investment and economic growth.

In line with standard literature, we used real GDP per capita based on 2005 US$ constant prices to proxy economic growth. Our control variables are based on the standard neoclassical growth theory and include inflation, investment rate, government expenditure, labour and trade openness. The inflation variable is the annual percentage change in the consumer price index and used to proxy macroeconomic (in)stability. This is expected to negatively impact on growth. We use gross fixed capital formation as a percentage of GDP to proxy investment rates and this is expected to positively influence economic growth. Government expenditure expressed as a percentage of GDP measures final government consumption expenditure and used to measure government size. Labour is proxied by the

percentage of economically active population aged 15 to 64 years. We also include our threshold variables (initial level of income per capita, initial level of human capital and initial level of financial development) as control variables. The introduction of the threshold variables as slope covariates permits the identification of possible differential effect of finance on growth as such measurement highlights the theoretical arguments that a country has to develop critical threshold of income, human capital and financial sector development before financial development positively and significantly impact on economic growth. Following from standard literature, we proxy human capital by the secondary school enrolment. However, as a robustness test, we also use the primary pupil–teacher ratio in line with Ibrahim et al., (2015). Relative to the enrolment which is a quantity–based measure, this proxy measures the quality of the training pupils' receive stemming from teacher contact hours. The descriptive statistics of the variables are presented in Table 3.1 below.

Table 3.1: Summary statistics

Variables	Mean	Standard deviation	Coefficient of Variation	Skewness	Kurtosis
Real GDP per capita	1,241.27	1,804.98	1.45	2.36	7.65
Government expenditure	14.88	6.31	0.42	1.57	7.15
Inflation	56.23	36.63	0.65	0.30	2.60
Trade openness	71.15	36.48	0.51	1.10	3.83
Labour	52.83	4.65	0.09	–1.24	30.73
Capital formation	19.69	9.65	0.49	1.59	8.25
Secondary school enrolment (% gross)	28.19	11.02	0.39	2.03	7.91
Primary pupil teacher ratio	38.03	19.85	0.52	4.11	11.58
Private credit	19.52	21.72	1.11	3.78	19.68
Domestic credit	25.60	29.66	1.16	2.39	13.48

The variables presented in Table 3.1 are averaged over the sample period (1980–2014) and presented in percentage terms. The average real per capita GDP is $1,241.27 which reveals the low income status of the countries under study. Government size is estimated at about 15% of GDP and do not register much variations across the countries relative to trade openness which has a mean of 71.15%. The average percentage labour force and inflation respectively stands at 52.83 and 56.23% reiterating the evidence that majority of the countries under consideration have experienced episodes of hyperinflation.[14] With regard to secondary school enrolment, our descriptive statistic shows an average of 28.19% relative to 38.03% of the primary pupil teacher ratio suggesting that over the sample period, the mean quality of education at the primary level is exceedingly higher than gross secondary school enrolment. Our financial development indicators show higher mean domestic credit (25.6%) compared to private credit (19.52%). We estimate the relative variations of the variables using the coefficient of variation (CV) computed as the ratio of standard deviation to mean. Our findings reveal that real GDP per capita is the most volatile variable while the composition of labour is least volatile. The primary pupil teacher ratio is not only higher than the secondary school enrolment but also show much variation across the countries. Similar pattern is also observed for both financial development indicators where domestic credit exhibit severe fluctuations relative to private credit. Interestingly, all the variables are skewed to the right except the labour which is negatively skewed. The values of the skewness and kurtosis reveal that the distributions of our variables are far from being normal as they are largely leptokurtic.

[14] Given the mean inflation rate, 15 countries experienced rates below 56% while the remaining 14 exceeded the average.

3.3.2 Empirical strategy: Identifying nonlinearities: A threshold estimation approach

Indeed, the assumption of a linear functional form of finance–growth nexus is a major deficiency of existing studies. More specifically, the earlier studies obscure the possibility of initial per capita income, initial human capital and initial of level of financial development moderating the relationship between finance and growth in a manner that initiates stern discontinuities in the nexus. Our main argument is that financial development may not influence growth below a certain value of the threshold variables and that the overall effect is conditioned on the initial level of per capita income, human capital and financial development. In this section, we set out the procedure in identifying the threshold values and how finance affects growth below and above these values. Specifically, we identify three potential threshold variables namely the initial level of per capita income, initial level of human capital and the initial level of financial development. While our earlier findings in chapter two provide evidence of the growth–enhancing effect of financial development even after controlling for covariates, like other studies (King and Levine, 1993a, b, Xu, 2000), we ignore the likelihood that the overall finance–growth nexus may be mediated by these threshold variables. We therefore specifically model this possibility that the growth effect of finance is refereed by the initial levels of per capita income, human capital and financial development. Second, we depart from presuming a smooth finance–growth relationship by testing for the distinct thresholds. Indeed, several authors (see for instance Arcand et al., 2012; Adeyini et al., 2015; Ductor and Grechyna, 2015) have included quadratic terms in examining nonlinearities in the impact of finance on growth. However, the exact inflection points are usually not known and thus these results are far from being instructive. We therefore control for this by directly altering our linear growth model and testing for definite discontinuities in the relationship using the Hansen's (1996, 2000) threshold model relying on data sorting process. Our choice for Hansen's (1996, 2000) hinges on its usage of the

asymptotic theory in estimating the thresholds hence making it the appropriate tool. The Hansen (1996, 2000) threshold technique relies on the least square estimation of the regression parameters which is superior to the traditional regression tree and quadratic approaches because the form of nonlinearities of our chosen approach is not imposed and the statistical significance of all thresholds identified can empirically be verified.

We begin by specifying a baseline model where economic growth depends on its one period lag, financial development and a set of controls estimated in equation (3.1) below;

$$y_{it} = \beta_o y_{it-1} + \beta_1 FD_{it} + \beta_2 V_{it} + \tau_i + \vartheta_t + \varepsilon_{it} \qquad (3.1)$$

where y_{it} is economic growth of country *i* at time *t*; y_{it-1} is the growth lag representing the initial condition; FD_{it} is financial development; V_{it} is a vector of control variables; τ_i is country–specific fixed effects; ϑ_t is time effects while ε_{it} is idiosyncratic error term.

From equation (3.1), our observed sample is $\{y_i, x_i, v_i\}_{i-1}^{n}$where y_i and v_i is real–valued and x_i is an m–vector. Our threshold variable v_i is taken as a continuous distribution and the parameters from our estimated baseline model vary depending on the value of v_i. We estimate two regime threshold models in a single equation of the form:

$$\begin{aligned} Y_i = {} & (\beta_{11} + \beta_{21} FD_i + \beta_{31} TH_i + \beta_{41} V_i) d_i\{v_i < \gamma\} \\ & + (\beta_{12} + \beta_{22} FD_i + \beta_{32} TH_i + \beta_{42} V_i) d_i\{v_i > \gamma\} + \varepsilon_i \end{aligned} \qquad (3.2)$$

where Y is a vector of economic growth; FD is a set of financial development indicators; TH is the vector of threshold parameters; V is a vector of conditioning variables as previously defined; $d(\cdot)$ is the indicator function of dummy variable that takes the value 1 if the

condition is satisfied and 0 otherwise; v is the threshold variable while γ is the threshold value with subscript i as country index.

In these estimations, our threshold variables are the initial per capita income, initial human capital and initial level of financial development. We compactly write equation (3.2) as:

$$y_i = \beta^{|} x_i + \delta_n^{|} x_i(\gamma) + \varepsilon_i \qquad (3.3)$$

where $\delta_n = \beta_{i2} - \beta_{i1}$ while $\beta = \beta_{i2}$. It is imperative to note that $\delta_n \to 0$ as $n \to \infty$ while β_{i2} is fixed hence $\beta_{i1} \to \beta_{i2}$ as $n \to \infty$. Our equation (3.3) is further specified in matrix notation expressing $n \times 1$ vectors of Y and ε by stacking y_i and ε_i respectively and the $n \times m$ matrices X and X_γ by stacking the vectors $x_i^{|}$ and $x_i(\gamma)^{|}$ respectively. Given these notations, we re–estimate equation (3.4) below:

$$Y = X\beta + X_\gamma \delta_n + \varepsilon \qquad (3.4)$$

The regression parameters β, δ and γ are estimated using least squares where the least squares estimators ($\hat{\beta}, \hat{\delta}$ and $\hat{\gamma}$) minimises the sum of squared errors (SSE) of equation (3.4) defined as:

$$SSE_n(\beta, \delta, \gamma) = \left(Y - X\beta + X_\gamma \delta_n\right)^{|} \left(Y - X\beta + X_\gamma \delta_n\right) \qquad (3.5)$$

On this score, we restrict the threshold value γ to a bounded set $\left[\underline{\gamma}, \overline{\gamma}\right] = \varpi$. The least squares estimators ($\hat{\beta}, \hat{\delta}$ and $\hat{\gamma}$) are estimated using the concentration approach where $\hat{\gamma}$ is the value that minimises $SSE_n(\gamma)$ and can therefore be uniquely estimated as

$$\hat{\gamma} = \underbrace{argmin}_{\gamma \in \varpi} SSE_n(\gamma)$$

where $\varpi_n = \varpi \cap \{v_1, v_2, \ldots\ldots\ldots, v_n\}$ while the slope estimators are therefore estimated as $\hat{\beta} = \hat{\beta}(\hat{\gamma})$ and $\hat{\delta} = \hat{\delta}(\hat{\gamma})$. We test the hypothesis that $H_0: \gamma = \gamma_0$ using the following likelihood ratio (LR) test:[15]

$$LR_n(\gamma) = n\frac{SSE_n(\gamma) - SSE_n(\hat{\gamma})}{SSE_n(\hat{\gamma})}$$

The H_0 is rejected for large values of $LR_n(\gamma_0)$. Indeed, the reliability of γ by far depends on where it lies within the confidence interval which is commonly constructed using the inversion of Wald or *t*–test statistics. However, Hansen (2000) and Dufour (1997) note that, when the asymptotic sampling distribution depends on unknown estimators, the Wald statistic has weak finite sample performance especially when the parameter has a region with failed identification. Given the threshold model, when $\delta_n = 0$, our threshold value γ is not identified. Hansen (2000) newly developed threshold modelling addresses this by constructing an asymptotic confidence level (c) for γ using the $LR_n(\gamma)$ set at $\widehat{\varpi} = \{\gamma: LR_n(\gamma) \leq c\}$.

3.4 Findings on the estimated threshold values and finance–growth nexus

This section discusses the threshold values and how financial development affects economic growth given the threshold variables. In the subsequent Tables, our first row is the estimated threshold value of the respective threshold variable, the 95% confidence interval which shows the level of precision of the estimated threshold value and its associated bootstrap *p*–values. Since our estimations allow one threshold γ, γ is not identified under the null hypothesis of no threshold effect. We therefore bootstrap the *p*–values which are asymptotically correct (Hansen, 1996) in order to examine the relevance of the sample split. The significance of a *p*–value for a value of v_i suggest the need for a sample split based on

[15] Where γ_0 is the true value of γ.

the threshold variable v_i. The *p*–values are computed using the bootstrap approach with 2000 replications and 15% trimming percentage. It is imperative to note that the Hansen (1996; 2000) identifies a single threshold that is significant at 10% or better. In regime 1, we present the results on the effect of finance on growth for countries below the threshold values offered in the second rows, the value of the R^2 and the number of countries trailing behind the threshold values. The regime 2 however shows the relationship between finance and growth when countries exceed the identified threshold values of the threshold variable.

Table 3.2: Results when per capita income is the threshold variable

Threshold variable: Per capita income	**Financial development indicators**	
Dependent variable: Real GDP per capita	**Private credit**	**Domestic credit**
Threshold value	0.62164 ≈ $621.64	0.62164 ≈ $621.64
95% Confidence interval ($\widehat{\boldsymbol{\varpi}}$)	[0.690, 0.870]	[0.690, 0.870]
Bootstrap *p*–value	0.0001	0.0000
Regime 1		
Coefficient of financial development below the threshold	0.312 (0.158)*	0.201 (0.137)
R^2	0.721	0.693
Number of countries below the threshold	11	11
Regime 2		
Coefficient of financial development above the threshold	0.515 (0.125)***	0.211 (0.091)**
R^2	0.753	0.701
Number of countries above the threshold	18	18

Notes: ***, ** and * denote significance at 1, 5 and 10% level. Values in ( ) are the standard errors.

From Table 3.2 above, the threshold of initial per capita income is estimated at 0.62164 ≈ $621.62 and lies within a confidence interval of 0.690 and 0.870 where about 38% of the countries fall below this threshold. In regime 1, we find that private credit is positively

related to growth even below the threshold. Specifically, a percentage increase in private credit spurs economic growth by 0.312% for countries with an initial per capita income below $621.64. However, this effect is slightly significantly at 10%. Interestingly, by using domestic credit as an indicator of finance, our finding reveals a positive coefficient of finance although this effect is flatly insignificant for countries below the threshold. In regime 2 where we estimate the impact of finance on growth, we find that economic growth increases by 0.515% following a 1% rise in private credit for countries above the threshold. Further results also suggest that financial development proxied by domestic credit positively and significantly influences growth for countries with initial per capita income above $621.64. These findings provide further evidence that development of the financial sector has a positive impact of overall growth rates especially for countries that have attained a certain income level to necessary to trigger growth. Our findings are consistent with Berthelemy and Varaudakis's (1996) theoretical work postulating that development of the financial sector largely has no significant impact on growth if a country's per capita income is below a certain threshold level. Interestingly, although financial development spurs growth, the impact of private credit is exceedingly higher than domestic credit and measures about 2.4 times greater in countries above the threshold. While this holds based on our sample evidence, what is apparent is that higher growth is registered for countries above the threshold relative to those below the minimum per capita income level. For instance, for those above the threshold income level, growth–enhancing effect of private credit is at least 1.7 times higher than those below the threshold. The values of the R^2 are also higher in regime 2 suggesting that at least 70% of the variation in economic growth in countries with initial per capita income above $621.64 is explained by our set of independent variables. Greenwood and Jovanovic's (1990) argue that at the early stages of countries' level of development, financial sector intermediaries play an imperfect role of resource allocation, risk pooling and diversification

but as per capita income increases, the financial sector begins to be sophisticated thus performing costly functions with higher returns. And as postulated by theory, average growth rate increases.

Indeed, as argued earlier, apart from the initial income level, theoretical evidence suggests that the impact of finance on growth may be also mediated by the initial level of human capital. Our empirical investigation of this claim is presented in the Table 3.3 below where secondary school enrolment and primary pupil–teacher ratio are used as proxies of human capital.

The mediating variable of initial human capital proxied by secondary school enrolment shows a threshold of 0.11 ≈ 11% that referees the impact of finance on growth. This threshold variable lies within a confidence interval of 0.052 and 0.192 where 9 out of the 29 countries fall below this threshold. In regime 1, we find that for countries below the human capital threshold, financial development has no significant effect on economic growth and in the case of domestic credit, the coefficient is rather negative albeit insignificantly. Our sensitivity check on this relationship using initial primary–pupil teacher as a measure of human capital, we find a threshold of 18% for human capital as the threshold value at the effect of finance on growth may switch signs. Given this threshold, our finding shows that about 66% of the countries are above this threshold. On the finance–growth nexus below the minimum threshold, although the coefficients of private and domestic credits are both positive, none of them is statistically significant revealing that for countries with an initial pupil–teacher ratio below 18%, economic growth is insensitive to changes in financial development.

Table 3.3: Results when human capital is the threshold variable

Dependent variable: Real GDP per capita	Threshold variable: Human capital (proxied by secondary school enrolment)		Threshold variable: Human capital (proxied by primary pupil–teacher ratio	
	Financial development indicators			
	Private credit	Domestic credit	Private credit	Domestic credit
Threshold value	0.11 ≈ 11%	0.11 ≈ 11%	0.1802 ≈ 18.02%	0.1802 ≈ 18.02%
95% Confidence interval ($\widehat{\varpi}$)	[0.052, 0.192]	[0.052, 0.192]	[0.127, 0.301]	[0.127, 0.301]
Bootstrap *p*–value	0.0000	0.0001	0.0000	0.0000
Regime 1				
Coefficients of financial development below the threshold	0.301 (0.178)	–0.222 (0.147)	0.401 (0.264)	0.195 (0.115)
R^2	0.522	0.517	0.613	0.599
Number of countries below the threshold	9	9	10	10
Regime 2				
Coefficients of financial development above the threshold	0.558 (0.231)**	0.211 (0.106)*	0.541 (0.200)**	0.333 (0.118)**
R^2	0.691	0.640	0.634	0.603
Number of countries above the threshold	20	20	19	19

Notes: ***, ** and * denote significance at 1, 5 and 10% level. Values in ( ) are the standard errors.

In regime 2 where we estimate the impact of finance on growth when countries exceed the initial secondary school enrolment threshold, we find that financial development positively and significantly affect growth irrespective of the measure of finance. Specifically, economic growth increases by 0.558% following a percentage rise in private credit. This finding is robust to different indicator of finance as the coefficient of domestic credit is positive and significant for countries with initial secondary school enrolment above 18%. This evidence

does not differ even with the use of initial pupil teacher ratio as a measure of human capital relative to enrolment. For countries with initial pupil–teacher ratio above 18%, both the coefficients of financial development indicators are positive and statistically significant at 5%. In particular, growth increases by 0.541 and 0.333% for a percentage increase in private and domestic credits respectively. These findings further provide unequivocal growth–enhancing effect of finance on growth for countries with quality human capital. While this holds, we find that the impact of private credit is higher than the domestic credit for both measures of human capital. By relying on secondary school enrolment and pupil teacher ratio as measures of human capital, the impact of private credit on economic growth is about 2.6 and 1.6 times higher than domestic credit respectively. The values of the R^2 are comparatively higher in regime 2 suggesting that beyond the threshold values of both human capital indicators, majority of the variations in growth are explained by variations in our set of independent variables. In the next section, we discuss the impact of finance on economic growth given the initial level of financial development. We fix γ at the LR estimate and split the sample into two based on the initial values of private and domestic credit and mechanically invoke the analysis on each sub–sample. Results from threshold effects are presented in Table 3.4 below.

Table 3.4: Results when financial development is the threshold variable

Dependent variable: Real GDP per capita	Threshold variable: Financial development (proxied by private credit)		Threshold variable: Financial development (proxied by domestic credit)	
	Financial development indicators			
	Private credit	Domestic credit	Private credit	Domestic credit
Threshold value	0.081 ≈ 8.10%			0.135 ≈ 13.5%
95% Confidence interval ($\widehat{\varpi}$)	[0.070, 0.196]	–	–	[0.079, 0.191]
Bootstrap *p*–value	0.0001			0.0001
Regime 1				
Coefficients of financial development below the threshold	0.410 (0.256)	0.119 (0.078)	0.391 (0.225)	0.113 (0.057)*
R^2	0.621	0.593	0.671	0.653
Number of countries below the threshold	8	8	12	12
Regime 2				
Coefficients of financial development above the threshold	0.505 (0.126)***	0.211 (0.099)**	0.611 (0.282)**	0.220 (0.103)**
R^2	0.661	0.605	0.679	0.670
Number of countries above the threshold	21	21	17	17

Notes: ***, ** and * denote significance at 1, 5 and 10% level. Values in ( ) are the standard errors.

Starting with private credit, the threshold is estimated at 8.10% and falls within a confidence interval of 0.070 and 0.196 where 8 out of the 29 countries lie below this threshold. In regime 1 which shows the impact of finance on growth when the initial private credit is less than the threshold, our findings shows that although the coefficient of private credit is positive, its effect is flatly insignificant. The same conclusion is reached with domestic credit. Overall, our evidence presented here reveals that financial sector development is ineffective in promoting economic growth when the initial private credit to GDP is lower than the

threshold. Apart from using private credit as a mediating variable in finance–growth nexus, we estimate the threshold effect of domestic credit at which the impact of finance changes sign. Our domestic credit threshold is estimated at 0.135 ≈ 13.5% and lies within a confidence boundary of $\widehat{\varpi}$ = [7.9%, 19.1%] with a bootstrap *p*–value of 0.0001. Given the estimated threshold, we notice that in regime 1, both coefficients of private and domestic credit are positive suggesting that financial development enhances economic growth. However, only the effect of domestic credit is slightly significant at 10%. For the majority of countries above this threshold, we find that financial development is positively and significantly related to growth irrespective of the measure of finance. Specifically in regime 2, we find that for countries with initial private credit to GDP above 8.10%, a percentage increase in private and domestic credit significantly increases growth by 0.505 and 0.211% respectively. Similarly, for countries with initial domestic credit exceeding 13.5%, higher financial development propels economic growth where a 1% increase in private and domestic credit increases economic activity by 0.611 and 0.220% respectively. Given this evidence, what is clear from the relative elasticity of growth to finance is that, although both indicators promote growth, the growth–enhancing effect of private credit is at least 2.78 times higher than the effect of domestic credit when the latter is used as the threshold variable. Similarly, by relying on the domestic credit as the mediating factor in finance–growth relationship, we find that above the threshold, the impact of private credit is about 2.39 times higher than domestic credit. Overall, our evidence suggests that below a minimum finance threshold, financial sector development weakly influences economic growth and as economies develop their finance sector above the threshold, economic activity positively and significantly respond to further increases in finance. Our data is thus akin with the call that financial services fuel growth by increasing the rate of capital accumulation as well as facilitating the efficiency with which countries employ capital.

3.5 Policy implications and recommendations

This section discusses the key policy implications and recommendations based on the findings. Indeed, the importance of the financial sector to economic growth cannot be overlooked. In this study, we find support for the view that development of the financial sector spurs growth partly through its ability to allocate resources efficiently.

The main transmission channels are that financial sector development ameliorates information asymmetry, diversifies risks, efficiently and effectively allocating resources for productive investment thus accelerating overall economic growth. Given this conclusion however, there are theoretical studies positing discontinuities in the relationship between financial development and economic growth. Starting with the level of initial per capita income as a mediating variable in finance–growth nexus, we deduce that although financial development positively affects economic activity in SSA, this effect is only significant for countries with initial per capita income above $621.64. What is also observed is that, even though private and domestic credit improves long run growth, growth elasticity to financial development is higher for private relative to domestic credit. A key implication emanating from this is that for economies in SSA to register the growth–enhancing effect of finance, it is important for countries to first improve their income levels. As long as a country's per capita income is above the threshold, finance drives growth. This is rightly so because as income levels increase, agents begin to demand for more financial services thus improving financial intermediation thereby increasing the impact of finance on growth. This presents a feedback effect where higher per capita income increases finance which in turn spurs overall economic growth. Thus financial development disproportionately benefits countries with higher income with no apparent significant effect on relatively low income economies in the sub–region. It therefore suggests that policies aimed at reducing the rather high rates of poverty in the sub–region potentially improve the finance–growth relationship.

Building the human capital is also crucial in mediating the overall impact of finance on economic growth. Indeed, countries show variations albeit not significantly in the level of their human capital stock proxied by secondary school enrolment and pupil–teacher ratio at the primary schools. By refereeing the finance–growth effect using the stock of human capital, our key finding suggests that although finance positively impacts on growth, the significance of that relationship is only determined by countries' initial human capital. Thus, the impact of finance on economic activity might not be the same in countries with different human capital development. Specifically, our evidence shows that at low human capital, growth is insensitive to the role of finance but after exceeding a threshold level of human capital accumulation, increases in financial development significantly drives growth. One plausible elucidation is that, for countries with low human capital level, innovation and technological advancement is constrained and level of participation in financial sector activities (and inclusion) is minimal thus hindering the development of the financial sector with a concomitant effect on growth. However, as economies' human capital accumulation speeds up, agents' risk taking behaviour may increase thus raising investment and credit demand and an expanded financial system. Ultimately, the greater financial sector development therefore facilitates investment through financial intermediation. Apart from influencing agents' risk–taking attitude, higher human capital permits innovation and technology thus improving financial sector efficiency in financial intermediation which are crucial for accelerating faster economic growth. Following from this finding, it is imperative for countries in SSA to encourage school enrolment while reducing the pupil–teacher ratios. In all these, it is important for education policy makers to improve on the curricular in such a way that inspires ingenuity and teacher motivation.

While financial development promotes growth, the initial level of finance significantly matter in mediating the impact of finance on economic activity. In other words, below a certain threshold, the intrinsic drive of the financial sector insignificantly affects growth. An underdeveloped financial sector may be associated with high transaction cost, rigidities and sub-optimal resource allocation with consequential effect on overall growth. However, as the financial sector continue to develop above a threshold, growth increases suggesting that countries with relatively high financial sector development enjoy higher growth. A key implication is that the link between economic growth and finance is contemporaneous and financial development importantly impact on economic activity. Thus, within this framework, policies that alter the efficiency of financial intermediation invariably provide a first order stimulus on overall level of growth. At the policy level, countries in SSA need to design strategies to enhance credit allocation, competition and regulations in order to make it possible for the financial development to stimulate economic growth as these appear to be necessary condition for long run growth.

3.6 Conclusion

The impact of financial development on economic growth has received much attention in recent literature. The general conclusion is that development of the financial sector is positively related to the level of growth. However, theoretical studies have espoused discontinuities in the relationship. More importantly, the relationship between finance and economic activity is well mediated by the level of initial per capita income, human capital and existing financial development. While this is well documented at the theoretical front, empirical literature is silent on the nonlinearities in finance–growth nexus caused by the threshold variables. Beyond examining the impact of financial development on economic growth for 29 SSA countries over the period 1980–2014, in this study, we further investigate

whether the impact of finance on growth is conditioned on the initial levels of countries' income, human capital and financial sector development. Our overall finding is that, financial development is positively and significantly associated with economic growth. However, the growth–enhancing effect of finance is higher when measured with private relative to domestic credit. We re–examine the threshold effect of finance in the face of the threshold variables. Our evidence suggests that, in almost all cases, financial sector development is positively related to growth albeit insignificantly below the estimated thresholds. In other words, below the threshold level of per capita income, human capital and the level of finance, economic growth is largely insensitive to financial development. The only exception is the impact of private credit on growth below the income threshold where the impact is slightly significant. Similar trend is also noticed when domestic credit mediates the finance–growth nexus. The main conclusion drawn is that higher level of finance is a necessary condition in long run growth and so are the overall level of income and countries' human capital.

Our results are of crucial importance to policymakers with regard to the optimisation of the level of income, human capital and financial development that needs to be vigorously improved to ensure higher potential benefits for the economy through the financial sector. The evidence presented here reveals that predetermined components of countries' structural characteristics are a good predictor of long run economic growth and that the level of countries' income, human capital development and finance shape the ability of financial sector development in ameliorating information asymmetry, diversifying risk and efficiency with which resources are allocated.

CHAPTER FOUR

FINANCIAL DEVELOPMENT, ECONOMIC VOLATILITY AND SHOCKS

4.1 Introduction

According to the IMF's (2016) Regional Economic Outlook for sub-Saharan Africa (SSA), global growth stood at 3.1% in 2015 and is expected to marginally increase to 3.2% in 2016. While global growth largely remains unchanged, composition with SSA performance is bleak and less favourable. Economic activity in SSA has weakened markedly with large country-level variations. Growth for the region as a whole decreased to its all-time lowest in 15 years to 3.5% in 2015, and average growth for the region in 2016 is projected to further fall to 3%. The report highlights that, the most vulnerable SSA countries are the region's oil exporters. For them, the commodity terms of trade index dropped by 20% of GDP in a matter of a few years, after recording steady gains of about 45% during 2000 to 2014. Evidently, the macroeconomic effect is huge. IMF (2016) found that a negative terms of trade shock of this size on average generates a slowdown in annual growth of 3 to 3.5 percentage points for several years after the shock.

With the exception of the region's middle-income countries (such as South Africa), both financial market depth and institutional development of the region remain lower compared to other developing regions. Given this understanding, there still remain substantial avenues for further financial development which could yield as much as 1.5 percentage points of additional economic growth on average for countries in SSA (IMF, 2016). Evidence abound of the positive relationship between financial development and economic growth (King and Levine, 1993a, b; Levine et al., 2000; Khan, 2008; Méon and Weil, 2010; Hassan et al., 2011). While the empirical and theoretical literature has established a positive impact of

financial sector development on economic growth (King and Levine, 1993a, b; Levine and Zervos, 1998; Rousseau and Wachtel, 2011; Beck et. al., 2000), the potential links between financial development and economic growth volatility in developing countries and SSA in particular have been understudied despite the apparent rampant shocks. Specifically, the channels through which financial development potentially affects growth volatility even remain unknown how much more the manifestations of financial development on the relative types of shock. More so, the extent of the growth volatility–financial development nexus is very mute in the literature. Meanwhile growth volatility, regardless of its source, is a natural source of worry in a world of market imperfections. This holds with particular force in developed economies where the financial sectors are relatively well-developed. Some studies (see for instance Caprio and Honohan, 1999) have long revealed greater forms of volatilities in high income countries on account of greater economic concentration. Legitimate as it is, if macroeconomic volatility matters in developed economies, then it must pose an even greater source of concern for developing countries that are still struggling to meet basic needs.

Empirically, what we know so far on the financial development–growth volatility is inconclusive although some studies (Denizer et al., 2000; Easterly et al., 2002; Tiryaki, 2003; Beck et al., 2006; Tharavanij, 2007; Kunieda, 2008) have found some link between financial development and macroeconomic volatility. Apart from the limited studies, the few existing works relied on standard deviation to measure volatility with no apparent distinction among the different volatility components. This thesis argues that this approach is far from being informative as financial sector development and shocks impact on aggregate growth volatility via its business cycle and long run components. Growth volatility declines either a consequence of a change in the nature of shocks or a change in how economies react to shocks. However, majority of the cross-country literature on business cycles has rather

concentrated on documenting "stylized facts" without attempting to interrogate some disaggregated causal nexuses. More importantly, these studies have failed to decompose volatility into its various components thereby obscuring how finance uniquely interacts with each component and leaving out much of the richness of the volatility–finance–shocks relationships as much of the real world interactions can best be explained with disaggregated models of economic fluctuations.[16]

This apparent and significant gap in the literature necessitates further research efforts in this direction as it presents a serious challenge to policy makers in the conduct of monetary and stabilization policies in the face of financial sector development. From academic and policy perspectives, there are two central questions this paper seeks to address. Do economies with higher levels of financial development experience more or less volatility? What are the channels through which financial development affects volatility components?

This chapter can be thought of as a re–examination of the standard paradigm relating finance and macroeconomic stability. It makes two significant contributions to literature. First, this chapter employs the spectral approach in extracting business cycle and long run components of growth volatility. Relative to previous studies,[17] this approach which provides instructive illustration on volatility, to the best of my knowledge has not been used in developing country context. Second, by decomposing volatility and in contrast to earlier studies (see for instance Tharavanij, 2007; Lopez and Spiegel, 2002), we further explore how financial development impacts on volatility component via effect on shocks.

[16] Our focus is not on the length of business cycles but rather on the cross-country volatility. It is imperative to note that financial sector development does not necessarily affect cycle length. In the face of higher uncertainty, investment irreversibility and indivisibility, economic recessions are expected to persist over a long time relative to boom and entrepreneurs will adamantly believe the economy is recovering and begin to take positive investment decisions.

[17] Apart from standard deviations, band-pass filter and GARCH family have recently been used to estimate volatility (see Silva, 2002; Tharavanij, 2007; Hegerty, 2014; Hartwell, 2014).

Findings from the cross-country regressions show that while financial sector development affects business cycle volatility in a non-linear fashion, its effect on long run fluctuation is only imaginary. More specifically, well-developed financial sector dampens volatility at the business cycle. However, in the long run, unbridled financial development may magnify fluctuations. Further findings show that while monetary shocks have large magnifying effect on volatility at the long run business cycle, their effect in the short term is minuscule. The reverse however holds for real shocks. Our main conclusion is that irrespective of the component, volatility caused by monetary shocks is more important and persistent than those caused by real shocks and financial underdevelopment and factors driving fluctuations are largely internal. With regard to channels of manifestation, our evidence reveal that whether in the short or long term, financial development dampens (magnifies) the effect of real shocks (monetary shocks) on the components of volatility with the dampening effects consistently larger only in the short run.

The rest of the chapter is as follows: the next section provides a review the theoretical underpinnings and hypothesis while section 4.3 reviews the empirical literature. Section 4.4 outlines the data and empirical strategy while section 4.5 presents the findings. Section 4.6 highlights the policy implications while section 4.7 concludes the study.

4.2 Contextualizing financial development, shocks and volatility linkages

The high growth volatility that many developing countries experience has reignited the debate on whether and to what extent output variations relate to the development of the financial sector. Kiyotaki and Moore (1997) note that credit market imperfections increase the effect of temporary shocks thus exacerbating their persistence. Theoretically, Bacchetta and Caminal (2000) present a tractable dynamic general equilibrium model with asymmetric

information in the credit markets. The idea is that information asymmetry is reflected in the evolution of agency costs. In their model, asymmetric information only matters whenever the level of internal funds and collateralizable assets is sufficiently low. In equilibrium lenders find it optimal to restrict the amount of credit only to those firms that can self-finance a low proportion of desired investment. They posit two co-existing firms: affluent firms with abundant cash flow and poor firms with little cash flow and the latter suffer from credit rationing. Thus, given decreasing returns to scale in production, credit-constrained firms exhibit higher diminishing marginal productivity. Their theoretical model finds that information asymmetry affects the relative output movements if it impacts on the allocation of funds between the credit-constrained and unconstrained firms culminating in a composition effect.[18] This composition effect exacerbates the impact of a positive shock whenever the level of internal funds available to credit-constrained firms increases relative to the total amount of funds. Thus, whether asymmetric information amplifies or dampens output fluctuations depends on whether there is a redistribution of funds in favour or against credit-constrained firms. Fazzari et al., (1988) show that fixed investment is dependent on firms' liquidity, which would not be the case under perfect capital markets. Acemoglu and Zilibotti (1997) also underscore an important link between financial development and volatility by highlighting the role of diversification risk reduction. They show that when there are indivisible investment projects, in the early stages of development, diversification is impossible. As wealth accumulates overtime, however, diversification becomes possible spurring investment thereby reducing investment risk and volatility. There is also groundswell micro-level evidence on the behaviour of firms that are more likely to be subject to information asymmetries (see for instance Gertler and Gilchrist, 1994).

[18] See Bernanke and Gertler (1989) on how condition of borrowers' balance sheets influences output dynamics

Aghion et al., (1999) develop a theoretical macroeconomic model on the basis of micro-foundations combining financial market imperfections with unequal access to investment opportunities. Their model shows that countries with underdeveloped financial systems tend to be more volatile and experience slower growth. They show that, low levels of financial development and the separation of savers from investors lead to vacillations in the macro-economy with the economy converging to a cycle around its steady-state growth trajectory. Conversely, under well-developed financial sector, economies converge to a stable growth path along which volatilities are only due to exogenous shocks. Aghion et al., (1999) model suggests that supply and demand for credit tend to be cyclical when the financial sector is underdeveloped. Specifically, investors are more probable to be credit constrained when the economy is hit by a bad shock. The reverse holds when the economy sustains a good shock.

Beck et al., (2006) build on Bacchetta and Caminal (2000) model with an endogenous financial intermediation and two conditions for the existence of a bank-lending channel of monetary policy: (i) firms cannot substitute bank lending with alternative finance sources, and (ii) the monetary authority can affect the supply of credit. Beck et al., (2006) consider only unanticipated productivity and monetary shocks and assume that agency costs do not influence output volatility hence providing no role for financial intermediaries influencing these shocks. The relative output effect of a shock that leads to a change in the relative wealth effect ratio of low and high entrepreneurs which is larger under asymmetric information than under perfect capital markets. The underlying intuition is that a well-developed financial sector alleviates the cash flow constraint for low entrepreneurs (or credit constrained firms) thus dampening the impact of shocks on the production function while magnifying the effect on monetary shock. On the impact shock on volatility, their model show that the effect of real (monetary) volatility on output and growth volatility is larger (smaller) under asymmetric

information than under well-developed financial system and increases (decreases) in agency costs.

Aghion et al. (2005) examine how credit constraints affect the cyclical behaviour of productivity-enhancing investment and thereby, volatility and growth. They find that a lower degree of financial development is associated with stronger sensitivity of both the composition of investment and mean growth to exogenous shocks, and a stronger effect of volatility on growth. Aghion et al. (2007) model of long run growth and business cycles reveal that the share of long term investment is counter-cyclical especially under perfect capital market. However, this effect becomes pro-cyclical with an imperfect capital market. Since long term investment promotes more productivity relative to short term investment, it implies that the cyclical dynamic of the composition of investment dampens fluctuations when financial markets are perfect, but amplifies them under tight credit constrained environment.

The theoretical underpinnings above mimic the proposition that if two economies vary in terms of volatility, the spectrum of the country experiencing low fluctuations will disproportionally lie underneath at the business cycle. This is particularly evident if the lower fluctuation largely emanates from a positive spill-over from improved business practices that falters output overtime. And if financial sector development mitigates business cycle volatility, then economies with well-developed financial systems will have their spectrum disproportionally lower at the business cycle component relative to those with underdeveloped financial sector. According to Gertler (1988) and Levine (1997), financial intermediaries decrease the costs of acquiring information and aid in reducing transaction costs. In doing so, the financial sector help to ameliorate information asymmetries, improves

corporate governance and efficiently allocates resource. However, its long run effect is still unclear. In fact Aghion and Banerjee's (2005) model is capable of spawning endogenous fluctuations under credit constraint economy where long run fluctuation is only a possibility for countries with underdeveloped financial systems and low level of financial intermediation. In their model, financial underdevelopment interacts with interest rate (or real exchange rate in open economy) resulting in volatility which can be persistent. Borrowing and investments are higher during boom period increasing the debt burden of firms resulting from higher interest rate thereby thwarting firm's wealth and investment capacity which may well fall below the economy's total savings. The economy eventually goes into recession driving down interest rates. In financially developed economies, firms invest up to the expected capacity of their projects because they face no credit constraints. However, in less developed financial economies, firms entirely depend on retained earnings for investments and do not experience long run fluctuations expected for those economies with intermediate financial systems. Leveraging from the foregoing, we hypothesize that financial sector development only affects volatility at the business cycles while shocks impact on both long run and business cycle volatility components and are dampened or magnified depending on their nature. More specifically, because financial deepening makes available credit for investment and consumption, shocks that only affect the real sector via terms of trade are dampened whereas shocks that directly affect the monetary and financial sector via inflation are magnified.

4.3 Financial development, shocks and volatility: An empirical review of literature

Empirically, literature on financial development–volatility nexus provide only mixed results on whether financial deepening lowers fluctuations. We classify empirical studies into four

distinct groups as follows. The first group focuses on the overall effects of financial development on volatility. Denizer et al., (2000) estimated fixed effects regressions with panel data and found that countries with well-developed financial sectors experience lower fluctuations in output, consumption and investment growth suggesting the proportion of private credit best explains volatility. Similar findings are found by Easterly et al.,'s (2000). Beck et al., (2012) analyze micro and macro data from 32 developed economies and find that increased levels of financial innovation between 1996 and 2006 were associated with both increased levels of economic growth, and increased levels of economic volatility and idiosyncratic bank fragility. Indeed, these studies assume a linear functional relationship between finance and volatility which may be untenable on account of recent evidence. While a burgeoning financial sector can dampen growth volatility, excessive and rapid expansion can also propagate fluctuations. The empirical analysis of Easterly et al., (2002), Arcand et al., (2012) and Dabla-Norris and Srivisal (2013) suggest that financial development acts as a shock absorber against volatility but only up to a point; beyond which further increases in financial systems exacerbate shocks thereby increasing volatility. Rajan (2005) remarked that excessive financial sector development increases its capacity to bear risk, but also increases the actual level of risk taken, raising systemic risk and exposing the entire financial sector to vulnerabilities. Kunieda's (2008) study provides an elaborate insight into the non-linear relationship. The author shows that financial development has a hump-shaped effect on growth volatility. In early stages of financial development, growth is less volatile and as the financial sector develops, the economy gets highly volatile but subsequently becomes less volatile once again as financial sector matures.

The second group provides evidence of varying effect of financial development on volatility at different point in time. For instance, Loayza and Ranciere (2006) found a beneficial long

run relationship between financial intermediation and output growth that co-exists with a mostly adverse short run relationship. Similarly, Lopez and Spiegel (2002) found a negative long run relationship between financial development and volatility. Controlling for factors that may influence fluctuations in economic activity, Tiryaki (2003) study reveals that although the long run volatility of the business cycle component of growth is dampened in countries with more developed financial system the short term response is mixed. Specifically, the author found that investment (consumption) volatility falls (rises) as financial systems develop but its effect on output volatility is insignificant. These findings appear to reconcile the seemingly contradictions in the literature on financial intermediation and growth volatility nexus.

The third group traces the effects of financial development in mitigating adverse shocks. Aghion et al. (2005) examine how credit constraints affect the cyclical behaviour of productivity–enhancing investment and thereby, volatility and growth. They find that a lower degree of financial development is associated with stronger sensitivity of both the composition of investment (long term versus short term investment) and mean growth to exogenous shocks, and a stronger effect of volatility on growth. Beck et al. (2006) use the volatility of the terms of trade and inflation as proxy for real and monetary volatility, respectively. They find evidence that financial development dampen the effects of real shock proxied by terms of trade volatility while amplifying the positive impact of monetary shock on growth volatility in less developed countries. Raheem (2016) extended the work of Beck et al. (2006) by including efficiency of financial sector indicators. The author found that "more finance" strongly dampens effect on output growth volatility, "better finance" (efficiency measures) indicators have weak smoothening impact on output growth volatility. The interaction between financial development indicators and sources of shocks indicate that

the output volatility reduction stemming from shocks is enhanced in the presence of "better or quality finance".

By relying on semi structural vector auto-regressions, Loayza and Raddatz (2006) find that while international trade openness always magnifies the impact of a shock, its magnitude is considerably smaller in countries with high level of financial development. Similarly, the level of financial depth is negatively associated with terms of trade shocks. Caprio and Honohan (2001) however argue that the extent to which financial sector development absorbs or propagates shocks crucially depends on regulatory and supervisory framework.

The fourth group highlights the effect of financial development at the industry level and also explores the channels through which finance impacts on volatility. Raddatz (2003) estimated the effect of financial development on volatility based on sensitivity differences to financial conditions across industries. The results presented reveal that firms with larger cash flow needs are more volatile in financially underdeveloped countries. The main conclusion drawn is that changes in financial development can potentially generate important productivity differences in aggregate volatility. Braun and Larrain (2005) found that industries that are more dependent on external finance are hit harder during recessions. In particular, more dependent industries are more strongly affected in recessions when located in countries with poor financial intermediation. This finding is collaborated by Larrain (2004) whose study reveal that firms experience lower volatility of industrial output in more financially developed countries suggesting that financial development by far relaxes financial constraints by smoothening adverse cash flow shocks.

4.4 Data and methodology

4.4.1 Data

We test our hypothesis by constructing a panel dataset of 23 SSA countries for the period 1980–2014.[19] The choice of these countries is based entirely on data availability for a sufficiently longer time period. Annual data for the variables were gleaned from the World Development Indicators (WDI) of the World Bank and Analyse Africa. We used credit to the private sector as percentage of GDP to proxy the quality of financial development. Credit to the private sector as a proportion of GDP is the widely used measure of financial development (see for instance Arcand et al., 2012; Levine et al., 2000; King and Levine, 1993a) since it accounts for credit advanced to the private sector that propelling the utilization and allocation of funds to more efficient and productive activities. Arguably, monetary aggregates are not good proxies since they only resonates the extent of transaction services offered by the financial sector relative to its ability to relocate funds from depositors to investors (Ang and McKibbin, 2007). The inflation variable is the annual percentage change in the consumer price index while terms of trade is the net barter terms of trade computed as the ratio of export to import price. With regard to the shock variables, monetary and real shocks are respectively proxied by inflation and terms of trade volatilities estimated by means of generalised autoregressive conditional heteroskedasticity (GARCH) developed by Bollerslev (1986). Relative to the traditional approaches, our choice of this approach rests on its ability to harvest past values and behaviour of the series. By restricting the vector of terms of trade and inflation ($\mathrm{VEC_t}$) to depend on the log of its one–period lag, we estimate the GARCH (1, 1) model as follows:

[19] The countries are Benin, Botswana, Burkina Faso, Cameroon, Central Afr. Rep., Chad, Congo, Rep., Cote d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mauritania, Mauritius, Nigeria, Rwanda, Senegal, South Africa and Togo.

$$InVEC_t = \propto_1 + \beta^{|} InVEC_{t-1} + \mu_t \quad (4.1)$$

$$\mu_t|\Omega_t \sim iid\ N(0, h_t)$$

$$h_t = \varphi_0 + \delta\mu_{t-1}^2 + \vartheta h_{t-1} \quad (4.2)$$

where $\gamma_0 > 0$, $\delta \geq 0$ and $\vartheta \geq 0$

Therefore, our conditional variance h_t captures the mean (φ_0), information about the previous volatility, μ_{t-1}^2 (ARCH term) and the past forecast error variance, h_{t-1} (GARCH term). Thus, our GARCH model allows the error term to have a time varying variance conditional on the past behaviour of terms of trade and inflation hence reflecting the real volatilities. Figure 4.1 below plots terms of trade and inflation volatility.

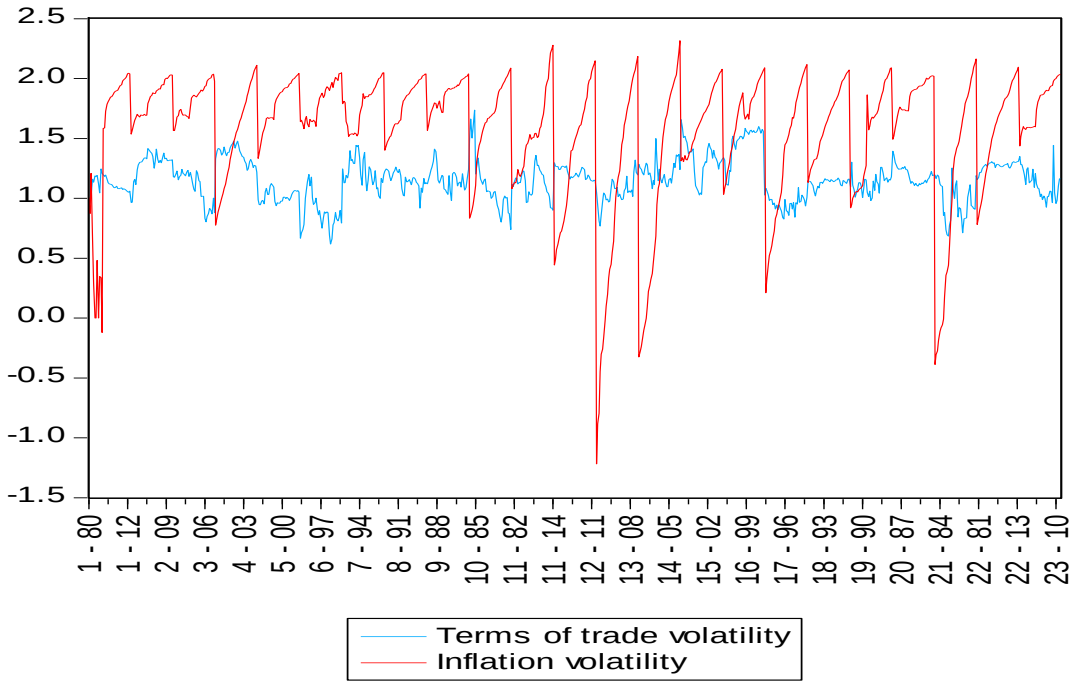


Figure 4.1: Real and monetary shocks

Source: Author's construct using WDI.

Notice that monetary shock is more persistent relative to real shocks. As suggested by Friedman (1977) and Darrat and Lopez (1989), inflation variability is an important determinant of economic volatility. We also include government expenditure and trade openness to assess their contribution to economic fluctuations. While trade openness is taken as the ratio of sum of exports and imports to GDP, government expenditure expressed as a percentage of GDP measures final government consumption expenditure and used to measure government size. Table 4.1 and below presents the summary statistics of the variables.

Table 4.1: Summary statistics

Variables	Mean	Std. dev	Coefficient of Variation	25th PCT	50th PCT	75th PCT	Skewness	Kurtosis
Real GDP per capita	1,405.88	1,964.41	1.40	377.72	546.91	1061.84	2.07	6.11
GDP growth rate	3.65	5.58	1.53	1.45	3.98	6.05	-1.13	20.10
Government expenditure	15.44	6.60	0.43	11.24	14.17	18.13	1.55	6.76
Inflation	55.60	36.13	0.65	27.80	51.01	83.36	0.37	2.74
Inflation volatility	1.97	0.73	0.37	0.41	0.72	1.33	-1.91	6.97
Trade openness	71.91	35.34	0.49	45.81	63.63	92.26	0.94	3.54
Foreign aid	53.25	5.02	0.09	50.80	52.42	54.32	-1.46	28.91
Terms of trade volatility	1.15	0.17	0.15	0.68	1.21	1.98	0.07	3.37
Domestic credit	21.64	23.63	1.09	9.77	15.34	24.88	3.45	16.40
Private credit	18.91	15.53	0.82	9.23	15.03	23.81	2.28	9.52

Note: PCT denotes percentile.

All variables are averaged over the sample period and suggest that real GDP per capita $1,405.88 reaffirming the rather low income levels of the sample countries. Average real GDP growth rate is estimated at 3.65% with a standard deviation of 5.58. Private credit to

GDP ratio is averaged 18.91% relative to domestic credit of 21.64%. The mean government size as a percentage of GDP is also averaged 15.44%, fairly higher than the median (14.17%). To allow for relative comparison of the variables in terms of fluctuations, we estimate the coefficient of variation (CV) as the ratio of standard deviation to mean. GDP growth rate and per capita income are the most volatile variables given their rather high CV although the former is exceedingly higher. Foreign aid is the least volatile with an average of 53.25%. All the variables are skewed to the right except the GDP growth rate, inflation and development assistance. Financial development proxies are also positively skewed and so is real GDP per capita. We report the correlation coefficients which show the level of association between the variables (Table 4.2 below). The correlation coefficient reveals a positive association between financial development proxies and economic growth. However, the correlation between domestic credit and real GDP per capita is not statistically significant at conventional levels. With the exception of government expenditure, inflation and trade openness, terms of trade shock negatively associated with all the variables albeit with some insignificance. Similarly, inflation volatility is negatively associated with economic growth proxies and aid although its relationship with the latter is insignificant. Both the monetary and real shocks have strong positive and statistically significant correlation with business cycle and long run volatilities.

Table 4.2: Correlation coefficients

Variables	Real GDP per capita	GDP growth rate	Government expenditure	Inflation	Trade openness	Domestic credit	Private credit	Foreign aid	Terms of trade	Terms of trade shock	Inflation shock	Business cycle volatility	Long run volatility
Real GDP per capita	1.00												
GDP growth rate	0.88* [0.00]	1.00											
Government expenditure	-0.13 [0.51]	-0.02 [0.65]	1.00										
Inflation	-0.04* [0.02]	-0.11*** [0.07]	0.40 [0.33]	1.00									
Trade openness	0.31* [0.01]	0.10* [0.03]	-0.81 [0.41]	0.22 [0.61]	1.00								
Domestic credit	0.05 [0.31]	0.49* [0.00]	0.16* [0.00]	0.07*** [0.05]	0.04 [0.21]	1.00							
Private credit	0.64*** [0.06]	0.79* [0.00]	0.23 [0.11]	-0.51*** [0.09]	0.31 [0.41]	0.61** [0.04]	1.00						
Foreign aid	-0.41 [0.12]	-0.61 [0.23]	0.55 [0.31]	0.11 [0.40]	0.66* [0.00]	0.31*** [0.09]	0.49** [0.04]	1.00					
Terms of trade	0.81 [0.17]	0.63 [0.40]	0.25 [0.71]	0.71** [0.02]	-0.55* [0.00]	0.62* [0.00]	0.50** [0.03]	0.47*** [0.07]	1.00				
Terms of trade shock	-0.81** [0.00]	-0.63*** [0.05]	0.09 [0.52]	0.71** [0.01]	0.53** [0.04]	-0.72** [0.02]	-0.41*** [0.05]	-0.33 [0.59]	-0.95* [0.00]	1.00			
Inflation shock	-0.62** [0.04]	-0.59** [0.06]	0.34 [0.52]	0.89* [0.00]	0.31 [0.20]	0.56** [0.04]	0.47** [0.01]	-0.12 [0.38]	0.43 [0.27]	0.50** [0.07]	1.00		
Business cycle volatility	-0.67** [0.02]	-0.84* [0.00]	-0.31 [0.20]	0.47*** [0..09]	0.76* [0.00]	-0.68* [0.01]	-0.59** [0.03]	0.47 [0.65]	0.71** [0.04]	0.76* [0.00]	0.55* [0.03]	1.00	
Long run volatility	-0.55 [0.06]	-0.67 [0.80]	0.52** [0.08]	0.31* [0.00]	0.78** [0.04]	-0.52* [0.00]	-0.65** [0.02]	0.10 [0.30]	0.22** [0.03]	0.51* [0.00]	0.47*** [0.08]	0.64 [0.31]	1.00

Notes: *, **, *** denote significance at 1, 5 and 10% respectively. Values in [ ] are the *p*-values.

Figure 2 below presents a scatter plot of economic growth proxied by real income per capita versus financial sector development measure of private credit both averaged over 1980–2014 for the 23 sampled countries. From the Figure, it is clear that majority of the sampled countries have both lower per capita income and financial development measured by private credit reflecting their under–developed financial sectors on the back of lower per capita income.

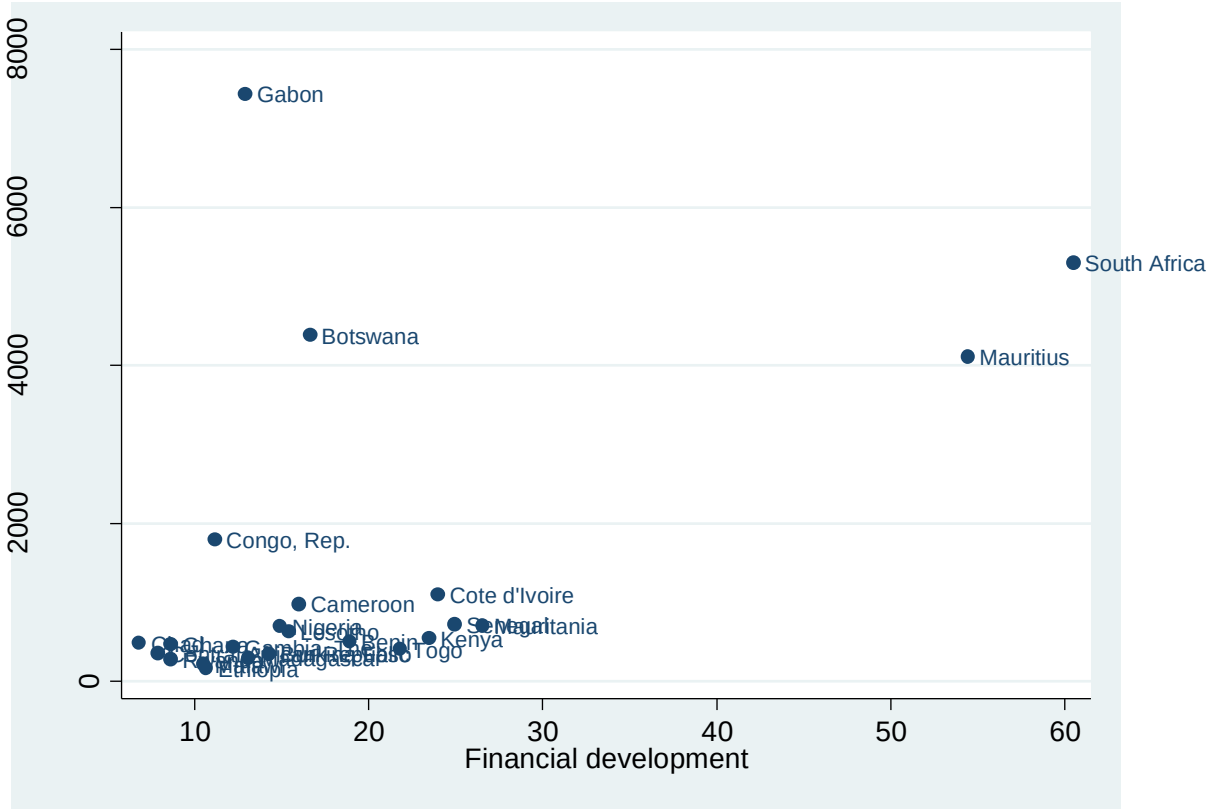


Figure 4.2: Financial development and economic growth

Source: Author's construct using WDI.

4.4.2 Empirical strategy

4.4.2.1 Decomposing growth volatility

As discussed earlier, extant studies have used standard deviation of GDP per capita to proxy volatility. However, the use of standard deviation does not distinguish among the different components of volatility. In other words, relying on the aggregate measure of volatility is far from being informative because financial development and shocks affect aggregate growth volatility via its different components. An improvement over this measure is the band-pass filter by Silva (2002) and Tharavanij (2007) to disaggregate the business cycle volatility component of the series. We decompose growth volatility into different components using the frequency domain approach by first calculating variance and its components relying on spectral method and by taking the square root to estimate volatility. By assuming a covariance stationary growth series, its variance is expressed as the integral of the spectrum of the series, $g(\omega)$, across all frequencies $-\pi \leq \omega \leq \pi$. The implication is that a country with relatively lower growth variance would have a spectrum lying proportionally below the one for the country with relatively higher growth variance. Indeed, the distribution of these two spectra across the difference frequency range conveys crucial information about the relative volatility at the different frequency ranges. Mallick (2009) exploits this property. Two countries have similar structural features when they experience similar magnitude of shocks to volatility. With a varying extent of volatility to shocks, the spectrum of the one with lower volatility of shocks will lie below the other at all frequency levels. We leverage on the Wold's theorem which indicates that the covariance-stationary output growth has an infinite Moving Average process MA(∞). Given that the spectrum of any MA process is proportional to its corresponding innovation variance, the country with a higher volatility of shocks will experience a relatively higher innovation variance than the other although coefficients of the MA stay the same. We decompose volatility into different components

given that a particular component of the variance is the integral of the spectrum over the respective frequency ranges. For instance, our long run volatility is estimated as the integral of the spectrum over the long run frequency range. The business cycle component of the variance will also be estimated in the same fashion. Our spectrum is symmetric around zero such that only frequency range $0 \leq \omega \leq \pi$ is crucial. Thus, any variance component is orthogonal to other components when the covariance between the spectral estimates at the various frequency levels is zero. Given a covariance-stationary, y_t, the periodogram, a sample analog of the spectrum is given as:

$$\hat{g}(\omega) = \frac{1}{2\pi} \sum_{j=-N+1}^{N-1} \hat{\gamma}^j e^{-i\omega j} = \frac{1}{2\pi}\left[\hat{\gamma}^0 + 2\sum_{j=1}^{N-1} \hat{\gamma}^j \cos(\omega j)\right] \tag{4.3}$$

where $\hat{\gamma}^j$ is the j-th order sample autocovariance given by:

$$\hat{\gamma}^j = \frac{1}{N} \sum_{t=j+1}^{N} (y_t - \bar{y})(y_{t-j} - \bar{y}) \tag{4.4}$$

for j = 0, 1, 2, ……., (N – 1) where $\bar{y}$ is the sample mean given as $\frac{1}{N}\sum_{t=1}^{N} y_t$. Since our spectrum is symmetric around zero, $\hat{\gamma}^j = \hat{\gamma}^{-j}$ and the integrated periodogram for the frequency range (ω_1, ω_2) is therefore given as:

$$\hat{G}(\omega_1, \omega_2) = 2\int_{\omega_1}^{\omega_2} \hat{g}(\omega) d\omega = \frac{\omega_2 - \omega_1}{\pi}\hat{\gamma}^0 + \frac{2}{\pi}\sum_{j=1}^{N-1} \hat{\gamma}^j \frac{\sin(\omega_2 j) - \sin(\omega_1 j)}{j} \tag{4.5}$$

It is imperative to note that equation (4.5) denotes the variance of the series y_t, attributed to the frequency range $\omega_1 \leq \omega \leq \omega_2$ where the frequency ω is inversely related to periodicity or cycle length according to $p = \frac{1}{\omega} 2\pi$. Since our interest is on decomposing the volatility components, the frequency ranges of the business cycle and long run are respectively given

as $\omega_1 \leq \omega \leq \omega_2$ and $0 \leq \omega \leq \omega_1$.[20] Given the annual series of our variables, we follow Mallick (2009) in choosing the values of ω_1 and ω_2 to respectively represent 0.79 and 2.09. Indeed, these threshold frequencies are chosen consistent with extant literature on business cycle (see for instance Baxter and King, 1999; Mallick; 2009) with the axiom that the long run comprise cycles of at least 8 years while business cycle correspond to 3 to 8 years (Baxter and King, 1999). Instructively, since our dependent variable variables – volatility and its components – are "generated", measurement error can potentially to influence our estimates as it corrupts estimates at high frequency range. We avoid this by exclusively focusing on business cycle and long run components of the volatility on account of its exclusion of high frequency ranges. We first calculate variance (and its components) using spectral method, and then take the square root to calculate volatility.

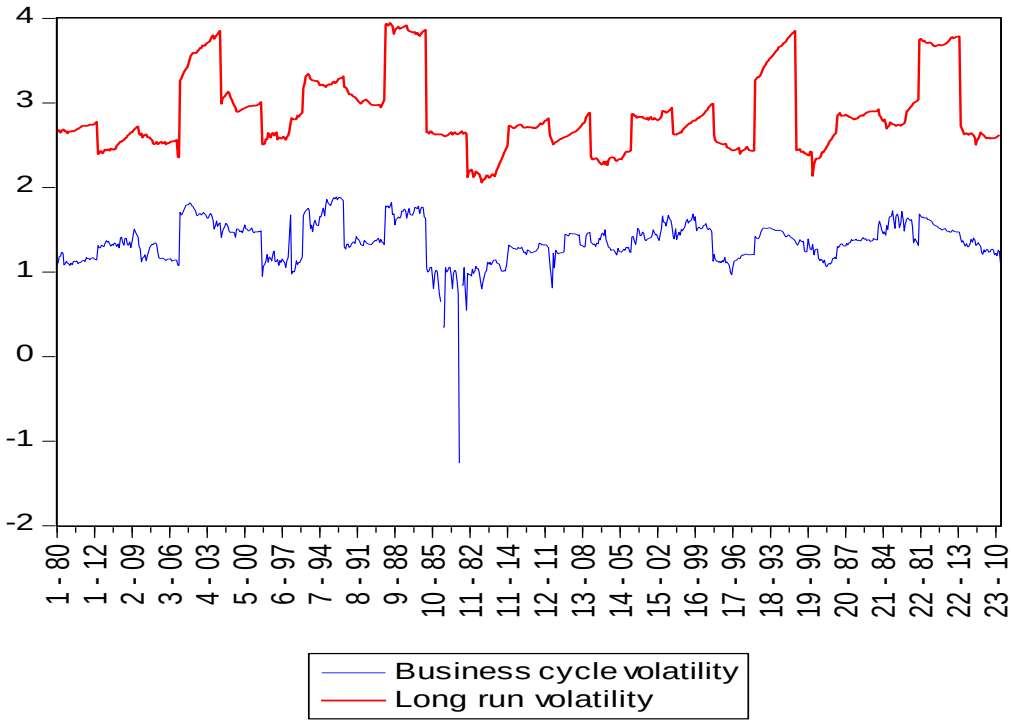


Figure 4.3: Business cycle and long run volatilities

Source: Author's construct based on spectral extraction.

[20] Notice that low frequency is related to long run while high frequency corresponds to short run although periodogram at low frequencies is subject to greater sampling variation (Ahmed et al., 2004).

4.4.2.2 Dynamic panel estimations

The primary aim of this study is to examine the effect of financial development and shocks on growth volatility components and how financial development play out in mitigating or otherwise propagating monetary and real shocks in the growth volatility process using a balanced panel sample of 23 countries (N = 23) over a 34–year period (T = 34). Indeed, studies of this nature involve invoking a panel models. However, standard panel estimations, such as the pooled ordinary least squares (OLS), fixed and random effects models pose fundamental challenges. For instance, the pooled OLS is often a highly restrictive model as it imposes and assumes homogenous intercept and slope parameters for all cross-sections with disregard to their individual heterogeneity thus allowing the error term to correlate with some regressors (Asteriou and Hall, 2011; Gujarati and Porter, 2009). On the other hand, the fixed effects model assumes common slope estimators and variance but country-specific intercepts. Both the cross-sectional and time effects can be observed with the introduction of dummy variables, especially in two-way fixed effects models. However, the fixed effect estimation approach is fraught with serious problem on account of the loss of degrees of freedom. And even for $T = 30$, the fixed effect posses significant bias (Baltagi, 2008) especially when some regressors are endogenous and correlated with the error terms (Campos and Kinoshita, 2008). Relative to the fixed effects model, the severity of the challenges eminent in random effects model is subtle in terms of degrees of freedom as it assumes common intercepts. This notwithstanding, the random effects models are time invariant suggesting that the error term at any period exhibits strict exogeneity and does not correlate with the past, present and future series (Arellano, 2003). This stringent and restrictive assumption is largely inapplicable in real life. Moreover, static panel estimators do not make use of the panel dimension of series by distinguishing between the short and long run relationships (Loayza and Ranciere, 2006). Additionally, conventional panel data models assume common

coefficients of the lagged dependent variable (Holly and Raissi, 2009) and this may potentially bias the estimators especially when the series are heterogeneous.

These problems have been addressed by Pesaran et al., (1999). The authors note that while it is implausible that the dynamic model specification is homogeneous to all countries, it is at least conceivable that the long run estimators may be common. They therefore propose estimating the dynamic model by either averaging the individual country estimates – Mean Group (MG) – or by pooling the long run parameters – Pooled Mean Group (PMG). We adopt the PMG approach as it combines the efficiency of pooled estimation and at the same time avoids the inconsistency problem stemming from pooling heterogeneous dynamic relationships. This procedure fits an error correction model in an autoregressive distributed lag (ARDL) (*p, q*) technique of which we specify as:

$$\Delta(Vy_i)_t = \delta_i\left[(Vy_i)_{t-1} - \left\{\theta_{0,i} + \theta_{1,i}(Z_i)_{t-1}\right\}\right] + \sum_{j=1}^{p-1} \alpha_{i,j}\Delta(Vy_i)_{t-j} + \sum_{j=0}^{q-1} \gamma_{i,j}\Delta(Z_i)_{t-j} + \varepsilon_{i,t} \quad (4.6)$$

$$i = 1, 2, \ldots\ldots\ldots, 23; \; t = 1, 2, \ldots\ldots\ldots, 34.$$

where Vy is a vector of growth volatility components; Z is a vector of regressors including financial development, shocks and other controls; α and γ are the short run coefficients related to growth volatility and its drivers; θ are long run coefficients; δ is the speed of adjustment to long run equilibrium while ε represents the time-varying disturbance with i and t denoting country and time indices respectively.

Notice that the square bracket terms in equation (4.6) contains the long run growth volatility regression and serves as a forcing equilibrium condition:

$$(Vy_i)_t = \theta_{0,i} + \theta_{1,i}(Z_i)_t + \mu_{i,t} \text{ where } \mu_{i,t} \sim I(0)$$

The PMG estimator is particularly useful when the long run is given by conditions expected to be homogeneous ($\theta = \theta_0 \; \forall \; i$) across countries while the short run adjustment depends on country characteristics such as vulnerability to real and monetary shocks, volatile growth rates, financial and capital market imperfections. There are two key empirical estimations issues here: first is the need to separate and estimate short and long run effects and the need to directly decompose growth volatility components into business cycles and long run volatility. The second issue is the potentiality of the model parameters in the relationship between financial development, shocks and growth volatility to vary across the countries. To the extent that countries in SSA are affected by rapid credit growth and credit boom (see chapter one; IMF, 2015) make country–level heterogeneity particularly apt in the short run and may show some homogeneity in the long run due to convergence effect.

Admittedly, Pesaran et al., (1999) contend that omitted group-specific drivers can potentially bias the estimates. Indeed, it is not uncommon in empirical estimations of this kind to reveal "poolability" failure due to group parameter restrictions (see for instance, Baltagi and Griffin, 1997). Pesaran et al., (1999) therefore propose a Hausman test to examine the poolability assumption of the PMG and based on the result that an estimate of the long run parameters in the model derived from the average (mean group) of the country regressions. This test given in equation (4.7) below is consistent even under heterogeneity and more efficient in homogeneous parameter setting.

$$H = \hat{q}'[var(\hat{q})]^{-1}\hat{q} \sim \chi_k^2 \qquad (4.7)$$

where $\hat{q}$ is $(k \times 1)$ vector of the difference between the MG and PMG estimates while $var(\hat{q})$ is the corresponding covariance matrix. This test is based on the null hypothesis that the two estimators are consistent but only one is efficient and if the poolability assumption is

invalid, then the PMG estimates will no longer be consistent and Hausman test fails (Asteriou and Hall, 2011).

The PMG has several advantages over the dynamic panel estimations. Apart from restricting long run slope coefficients to homogeneity across countries while allowing short run parameters (including the error correction term) and the intercept to be country-specific, the PMG approach generates consistent estimates of the mean of short run coefficients across countries by taking the simple average of individual country coefficients. Moreover, Pesaran et al., (1999) show that this approach produces consistent and efficient estimates in a long run relationship between the integrated and stationary variables. Thus, our approach can as well be used whether the series are $I(0)$ or $I(1)$ downplaying the need for unit root testing. What is needed is a long run relationship among the series and a dynamic specification model sufficiently augmented allowing strictly exogenous regressors and uncorrelated residuals. Since we are dealing with macroeconomic variables for a number of countries over a relatively longer period, we test the stationarity properties of the series and long run relationships among the variables using panel unit roots and panel cointegration techniques respectively.

4.4.2.3 Panel unit roots

Analyzing the stationarity properties of the series is the first step in determining their cointegration level which requires analyzing the stationarity properties of the series using panel unit root tests. These are grouped into first generation tests which are the assumption of cross-sectional independence (Maddala and Wu, 1999; Choi, 2001, Levin et al. 2002; Im et al. 2003) and second generation tests which allow for some cross-sectional dependence (Pesaran, 2007). Consider an autoregressive (AR) process for panel data of the form:

$$y_{it} = \propto_i y_{it-1} + \vartheta W_{it} + \mu_{it} \quad (4.8)$$

where $\propto_i$ is the coefficient of the AR process; W_{it} includes individual deterministic effects, such as constants (fixed effects) and linear time trends, which capture cross-sectional heterogeneity.

Levine et al., (2002, LLC hereafter) extend the Dickey-Fuller test and propose a model that allows for two-way fixed effects of the form:

$$\Delta y_{it} = \alpha_i + \theta_t + \delta_i t + \rho_i y_{it-1} + \sum_{k=1}^{n} \gamma_j \Delta y_{t-j} + u_{it} \quad (4.9)$$

i = 1, 2, ……, 28; t = 1, 2, ……, 34.

Indeed, LLC's model is general since it allows for separate deterministic trends in each series through $\delta_i t$ and for both country (α_i) and time–specific (θ_t) effects with the latter (α_i) allowing for heterogeneity since the coefficient of the lag dependent (ρ_i) is typically restricted to homogeneity for all the series. The null hypothesis therefore assumes non-stationary cross-sectional series ($H_0 : \rho = 0$) against the alternative hypothesis ($H_1 : \rho < 0$). Breitung and Pesaran (2008: 2) suggest that the appropriate conclusion when the null hypothesis is rejected is that "a significant proportion of the cross-section units is stationary or cointegrated".

The major weakness of the LLC test is that, it restricts ρ to assume homogeneity for all i (Asteriou and Hall, 2007) although there is no theory postulating that all the series have the same AR dynamics (Brooks, 2014). To overcome such weakness, Im et al., (2003, IPS hereafter) propose an alternative approach where, given equation (4.9) above, the null and alternative hypotheses are now respectively stated as $H_0 : \rho_i = 0 \; \forall \; i$ and $H_1 : \rho_i < 0$ at least

for one i. IPS computes their test statistic ($\bar{t}$) as the average of the individual augmented Dickey–Fuller (ADF) *t*–test statistic for testing $\rho_i = 0 \; \forall \; i$ as:

$$\bar{t} = \frac{1}{N}\sum_{i=1}^{N} t_{\rho_i}$$

IPS showed that, under specific assumptions, t_{ρ_i} converges to a statistic denoted as t_{iT} assumed to be independently and identically distributed. Under this assumption, IPS constructs a standardize statistic for testing panel unit roots given as:

$$t_{IPS} = \frac{\sqrt{N}(\bar{t} - \frac{1}{N}\sum_{i=1}^{N} E[t_{iT}|\rho_i = 0])}{\sqrt{Var[t_{iT}|\rho_i = 0]}}$$

Baltagi (2008) however argues that both the LLC and IPS tests require *N* to be small enough relative to *T* and at the same time requires a strongly balanced panel for the LLC test.

Breitung (2000) develops a modified version of the IPS and LLC test which does not include the deterministic trend but standardises the residuals from the auxiliary regression using the Monte Carlo experiments. Breitung's (2000) test statistic assumes a common unit root process and is also shown to be asymptotically distributed as a standard normal.

Based on Fisher's (1932) non-parametric test, Maddala and Wu (1999) and Choi (2001) developed tests where unit root tests are separately conducted on each series in the panel and combined *p*-values associated with the test statistics instead of averaging the test statistics and this is given as:

$$\tau = -2\sum_{i=1}^{N} \ln(\tau_i) \sim \chi^{N}_{2N}$$

For a given $N, T \to \infty$ thus requiring a relatively large T to be able to perform this test. Like IPS, the Maddala and Wu (1999) and Choi (2001) do not entail the same parameter, ρ, to apply to all the series because the ADF test is separately performed on each series in the panel (Brooks, 2014). However, the drawback of these Fisher–type tests entails deriving *p*–values which takes time to bootstrap in cross-sectional dependence (Martins, 2011).

Hadri (2000) proposes a residual-based Lagrange multiplier (LM) test, which is a panel generalisation of the KPSS test (Baltagi, 2008). Apart from assuming cross–section independence, the IPS and LLC tests are highly sensitive to the number of lag lengths in the ADF regression (Maddala and Wu, 1999). What is probable is the likelihood of obtaining misleading results particularly when these assumptions do not hold especially in empirical work. Hadri test therefore relies on the residuals from individual ordinary least squares (OLS) regressions of y_{it} on deterministic components (constant and trend) to estimate the *LM* statistic given by:

$$LM = \frac{{}^{1}/_{N} \sum_{i=1}^{N} {}^{1}/_{T} \sum_{t=1}^{T} s_{it}^{2}}{\hat{\sigma}_{\varepsilon}^{2}}$$

In terms of stationarity test, Hadri *LM* test differs from the previous tests in that its null hypothesis assumes no unit root in any of the series (all panels stationary), against the alternative of non-stationarity for, at least, some cross-sections. Importantly, Hadri's *LM* test controls for a general form of dependence over time and allows a heteroskedastic disturbance across i.

4.4.2.4 Panel cointegration tests

The order of integration of the variables can be assessed by the panel unit root tests proposed above. Consequently, if the main variables are found to be integrated of order one, then we

should use panel cointegration tests to determine whether a long run equilibrium relationship exists among the non–stationary variables in level form.

Pedroni (1999, 2004) provides cointegration tests for heterogeneous panels based on the two-step cointegration approach of Engle and Granger (1987). Though the test allows for heterogeneity, there are different versions of the test and the within-group test assumes homogeneity. We use the between group test to allow for heterogeneity across the series. The test is done based on the following regression:

$$y_{it} = x_{it} \propto_i + \vartheta_i + \theta_i t + \varepsilon_{it} \qquad (4.10)$$

where $\varepsilon_{it} = \rho\varepsilon_{it-1} + \varphi_{it}$

With this, Pedroni (1999, 2004) uses the residuals from the long run (static) regression and constructs seven panel cointegration test statistics of which four are based on pooling (within-dimension or 'panel statistics test'). The "poolability" assumes homogeneity of the AR term. The remaining three are less stringent and restrictive and based on between-dimension or group statistics test' and allows for the AR term to vary. The assumption has important implications on the specification of the alternative hypothesis where the v-statistic is comparable to the long run variance ratio statistic for typical time series while the rho-statistic is analogous to the semi-parametric 'rho' statistic put forward by Phillips and Perron (1988). The other two tests – panel extensions of the non-parametric Phillips-Perron and the parametric ADF *t*-statistics – allow the slope coefficients to vary but contain the fixed effects and individual-specific deterministic trend. They are however valid only for *I*(1) series.

Closely linked to Pedroni (1999, 2004) is Kao (1999) residual-based DF and ADF tests which specifies the initial regression with fixed effects (individual intercepts) and homogeneous

coefficients. However, this approach does not include deterministic trend and the testing is based on the following procedure:

$$y_{it} = x_{it} \propto_i + \varphi_i + \varepsilon_{it} \quad (4.11)$$

where $\varepsilon_{it} = \rho\varepsilon_{it-1} + \tau_{it}$

Baltagi (2008) notes that, Kao's tests converge to a standard normal distribution by sequential limit theory.

Relying on multivariate framework of Johansen (1988), Maddala and Wu (1999) propose a Fisher cointegration test which combines the *p*–values of individual (system–based) cointegration tests in order to estimate a panel test statistic. A likelihood ratio statistic that averages individual rank trace statistics requires large number of temporal observations (Larsson et al, 2001). Importantly, these tests allow for a multiple cointegrating vectors in each cross-section.

This study relies on the tests developed by Westerlund (2007) which are based on structural rather than residual dynamics and allow for a large degree of heterogeneity (for example, individual specific short run dynamics, intercepts, linear trends and slope parameters). All variables are assumed to be *I*(1). Suppose we have a data generating process of the form:

$$\Delta y_{it} = \delta^{|} d_t + \alpha_i\left(y_{it-1} - \beta^{|} x_{it-1}\right) + \sum_{j=1}^{p_i} \alpha_{ij}\Delta y_{it-j} + \sum_{j=0}^{p_i} \gamma_{it}\Delta x_{it-j} + \epsilon_{it} \quad (4.12)$$

where $t = 1, 2, \ldots\ldots\ldots, T$; $i = 1, 2, \ldots\ldots\ldots\ldots, N$ and denote the time-series and cross-sectional units indices respectively. While d_t contains the deterministic components involving three possible cases. First, $d_t = 0$, so that equation (4.12) does not have a

deterministic term. Second, $d_t = 1$ so that Δy_{it} is generated with a constant case while the third case, $d_t = (1, t)^{|}$ so that Δy_{it} is generated series with both constant and a trend.

For easier exposition, we model the K-dimensional vector x_t as a pure random walk series such that Δx_t and ϵ_{it} are completely independent. We will deal with any dependence across the cross-sectional units i by means of bootstrapping – which provides robust critical values in cases of cross-section dependence – and assume that there is no dependence of ϵ_{it} across both the time series (t) and cross-sectional units (i).

The parameter α_i in equation (4.12) measures the speed of adjustment and reveal the speed at which system fully revert to long run equilibrium following a shock. We require the parameter $\alpha_i < 0$ to have a cointegration relationship among the series. If $\alpha_i = 0$ then there is no cointegration hence no long run relationship. The Westerlund tests for cointegration using the null hypothesis of no cointegration while the alternative hypothesis depends on the assumption about the homogeneity of α_i. The Westerlund's test does not impose any common parameter constraint where the alternative hypothesis distinguishes between group-mean tests and panel tests respectively computed as:

$$G_T = \frac{1}{N}\sum_{i=1}^{N}\frac{\widehat{\propto}_i}{SE(\widehat{\propto}_i)} = \frac{1}{N}\sum_{i=1}^{N}\frac{T\ \widehat{\propto}_i}{\widehat{\propto}_i}$$

and

$$P_T = \frac{\widehat{\propto}}{SE(\widehat{\propto})} = P_{\propto} = T\ \widehat{\propto}$$

These tests assess the null hypothesis that the error correction term in a conditional error correction model is zero suggesting no cointegrating relationships among the series (Baltagi, 2008).

4.5 Empirical results

We start with our empirical analysis by providing findings on the panel unit root tests in order to establish the stationarity properties of the variables. Our findings on the stationarity properties are based on five different panel unit root tests: Levin-Lin-Chu's (LLC) *t**, Breitung's *t*, Hadri's Z, Im-Pesaran-Shin's W-t-bar, and Maddala and Wu's χ^2 statistics. While we include deterministic time trend in all the tests, our choice for these tests is based on the fundamental construction of each test where the weakness of one test is potentially compensated for by the strength of the other. For instance, the LLC, Breitung and Hadri's tests are estimated on the assumption of common unit root process with identical autocorrelation coefficients of the tested series. Conversely, the IPS and ADF–Fisher χ^2 tests are based on individual unit root process on the assumption that the autocorrelation coefficients vary across cross-sections. The Hadri and Breitung tests allow for cross-sectional dependence. To minimise problems associated with cross-sectional dependence,[21] we subtract the cross-sectional means in LLC, IPS and ADF–Fisher tests.

We determine the country-specific lag length for the ADF tests based on the Schwarz-Bayesian information criterion (BIC) where a maximum lag of 3 is selected for the LLC and IPS tests. We further employ the Bartlett kernel approach in estimating the long run variance in the LLC test with an automatic maximum lag length determined by the Newey–West bandwidth selection algorithm. Table 4.3 below presents results on the panel unit root tests.

[21] For problems associated with cross-sectional dependence, see Pesaran (2004) and; Chudik and Pesaran (2015).

Table 4.3: Panel unit root tests

Series	Tests assuming a common unit root process			Tests assuming individual unit root process	
	LLC t^*-stat: H_0: Unit root	**Breitung t-stat: H_0: Unit root**	**Hadri Z-stat: H_0: No unit root**	**IPS W-t-bar stat: H_0: Unit root**	**ADF-Fisher χ^2: H_0: Unit root**
Trade openness	5.132 [0.391]	2.111** [0.031]	21.317* [0.000]	1.811** [0.041]	0.882 [0.710]
Government expenditure	3.910 [0.211]	1.992*** [0.057]	17.937* [0.000]	–1.021 [0.521]	0.618 [0.412]
Foreign aid	2.118 [0.377]	1.149 [0.722]	25.424* [0.000]	0.912 [0.701]	0.725 [0.188]
Financial development	0.923 [0.192]	0.321*** [0.071]	31.514* [0.000]	1.214 [0.612]	1.903** [0.041]
Monetary shock	0.163 [0.221]	0.044 [0.801]	19.642* [0.000]	–1.731** [0.033]	0.935 [0.712]
Real shock	0.953 [0.527]	0.531 [0.630]	15.213* [0.000]	0.189 [0.422]	2.013** [0.031]
Business cycle volatility	2.021 [0.179]	1.291 [0.981]	10.775** [0.012]	–5.352 [0.501]	2.403*** [0.092]
Long run volatility	4.114 [1.000]	8.776 [0.540]	13.366*** [0.071]	3.991 [0.120]	6.667 [0.321]

Notes: *, **, *** denote significance at 1, 5 and 10% respectively. Values in [ ] are the *p*-values.

Results from the LLC test provide strong evidence that none of the series is stationary as we fail to reject the null hypotheses of unit root given the high *p*-values. The IPS, ADF tests which assume individual unit root process and the Breitung test show mixed results although the Breitung and IPS test both reveal that trade openness is non-stationary. Apart from financial development, trade openness and government expenditure, the Breitung test indicates that all the variables are non-stationary. In the case of IPS test, trade openness and monetary shock are stationary while business cycle and long run volatilities are non-stationary. However, relying on the Hadri test where the null hypotheses of no unit root are postulated presents strong evidence that all the series have unit root as the null hypotheses of no unit roots are flatly rejected for all the variables. Thus, our findings on the unit root

properties of the variables largely present evidence of non-stationary series. Economically, the non-stationarity of the series implies that shocks to the variables exhibit permanent impact with no possibility to return to their means. Thus, except in special cases where the variables are cointegrated with strict exogenous regressors, estimating OLS relying on nonstationary panel produces spurious results. Our choice of the ARDL framework is therefore apt as it does not impose strict exogeneity assumption and allows estimations whether the series is $I(1)$ and $I(0)$ process.

Although the above unit roots tests present evidence of non-stationary panel, we further attempt to avoid the problem of spurious regression by conducting cointegration test in order to establish stable long run equilibrium relationships among the series. Table 4.4 below present results on three distinct panel cointegration tests: the Pedroni and Kao test automatically selects appropriate lag lengths for the estimations using the Bayesian information criterion. Specifically, a maximum lag length of 8 was selected. Our spectral estimations are conducted relying on the Bartlett kernel where the bandwidth is selected by Newey–West algorithm. Westerlund test as the third cointegration approach examines the significance or otherwise of the adjustment coefficient in the error correction model framework while Pedroni and Kao tests are both based on the residuals of the long run static regression. All tests are however conducted under the null hypothesis of no cointegration. We included deterministic time trends in all the specifications.

Table 4.4: Panel cointegration tests results

Approach	Panel Cointegration tests	Dependent variable of cointegration regression	
		Business cycle volatility	**Long run volatility**
Pedroni: Common AR coefficients (within dimension)	Panel–v	1.032 [0.727]	3.811** [0.043]
	Panel–rho	0.721 [0.263]	1.320 [0.962]
	Panel–PP	–2.782 [0.399]	3.091 [0.891]
	Panel–ADF	3.367 [1.000]	5.229 [0.510]
Pedroni: Individual AR coefficients (between dimension)	Group–rho	–2.737 [1.000]	–6.503 [0.557]
	Group–PP	3.011 [0.735]	2.992 [0.992]
	Group –ADF	5.903** [0.035]	–2.421*** [0.064]
Kao	T	3.092 [1.000]	–4.955 [0.998]
Westerlund	G_T	–4.332 [0.710]	–9.210** [0.036]
	G_α	–7.122*** [0.061]	3.111 [1.000]

Notes: *, ** and *** denote significance at 1, 5 and 10% respectively. Pedroni's Panel statistics and that of Westerlund's are weighted. We do not bootstrap the critical values of the Westerlund.

Results from Pedroni tests do not show any sign of cointegration between business cycle volatility and the regressors when we assume common autoregressive coefficients. However, the Panel-v test shows some level of cointegration among the variables and long run volatility. When individual autoregressive coefficients are assumed, only the Group–ADF test shows evidence of cointegration among volatility components and the variables. The Kao test on the other hand does not reveal any long run relationships given the high *p*-values.

With regard to the Westerlund tests and with business cycle volatility as the dependent variable, while the G_T statistic show no evidence of cointegration between the dependent variable and its covariates, the G_α rejects the null hypothesis of no cointegration at 10% significance level. Turning to long run volatility as distinct dependent variable, while G_α

statistic do not show evidence of cointegration, G_T statistic strongly suggests that, long run volatility share common stochastic trend among the associated covariates as null hypotheses of no cointegration are both rejected. Thus, our results generally show evidence of cointegration among each volatility component and its associated covariates.

4.5.1 Estimation and interpretation of the long and short run relationships

We estimate the short and long run relationships between the volatility components and the regressors having established cointegration among the series considered. This is done relying on the PMG and MG with the latter being an alternative. While the PMG estimator relies on the panel extension of the single equation in ARDL framework, the MG allows heterogeneity among the long run parameters. As an advantage, the ARDL highlights information about the contemporaneous effects and the speed of adjustment towards long run equilibrium following a shock. While the short run coefficients are assumed to be heterogeneous and country-specific, the long run parameters are taken as homogenous and identical across the panel. Table 4.5 presents results on the estimations of the PMG and MG.

Table 4.5: Financial development, shocks and volatility

Variables	Dependent variables: Components of volatility			
	Business cycle volatility		Long run volatility	
	PMG	MG	PMG	MG
Long run coefficients:				
Trade openness	0.178*	0.194*	0.163*	0.219*
	(2.910)	(2.611)	(3.171)	(3.541)
Government expenditure	0.114	0.215	0.098***	0.137
	(1.310)	(1.516)	(1.993)	(1.621)
Foreign aid	0.811	0.733	–0.219	0.315
	(1.412)	(1.555)	(–1.496)	(1.501)
Financial development	–0.217*	–0.138*	–0.331	–0.271
	(–5.374)	(–7.013)	(–1.401)	(–1.501)
Financial development square	0.443**	0.392**	0.213	0.246
	(2.202)	(2.381)	(1.474)	(1.011)
Shocks:				
Monetary shock	0.721**	0.815*	0.610*	0.774*
	(2.531)	(4.341)	(4.521)	(3.912)
Real shock	0.221**	0.278**	0.437**	0.491*
	(2.170)	(3.013)	(2.884)	(3.714)
Error correction term	–0.745*	–0.621*	–0.687*	–0.572*
	(–4.118)	(–3.914)	(–3.701)	(–3.821)
Short run coefficients:				
Δ Trade openness	0.221***	0.277**	0.307	0.301
	(1.987)	(2.310)	(1.501)	(1.614)
Δ Government expenditure	0.247	0.312	0.418	0.501
	(1.441)	(1.517)	(1.681)	(1.433)
Δ Foreign aid	0.723	0.644	0.864	0.701
	(1.019)	(1.152)	(1.277)	(1.318)
Δ Financial development	–0.112	–0.107	–0.212	–0.197
	(–1.371)	(–1.533)	(–1.349)	(–1.276)
Δ Financial development square	0.981	0.997	0.662	0.721
	(1.171)	(1.038)	(1.559)	(1.619)
Shocks:				
Δ Monetary shock	0.317**	0.384***	0.412	0.474
	(2.151)	(1.981)	(1.531)	(1.607)
Δ Real shock	0.313***	0.372**	0.218**	0.287**
	(1.991)	(2.011)	(2.717)	(2.510)
Intercept	–1.233	–1.772	–1.547	–1.827
	(–3.781)	(–3.922)	(–3.792)	(–4.018)
Diagnostics:				
Hausman test (χ^2)		2.113[0.945]		0.974[0.982]
Number of countries	23	23	23	23
Number of observations	806	806	806	806

Notes: *, **, *** denote significance at 1, 5 and 10% respectively. Values in ( ) are the test statistic. All regressions include the full set of controls including country and time effects. Estimations are done using stata command xtpmg. The lag structure is ARDL (1, 1, 1, 1, 1, 1).

We interpret the coefficients as elasticities since all the variables are in their natural logarithms. Starting with the long run effects of the regressors, results from Table 4.5 show that both the PMG and MG have robustly positive impact of trade openness on all the volatility components. Specifically, an increase in trade openness heightens volatility around its business cycle and so is the long run volatility although coefficients produced by MG are consistently higher. For instance, in the long run, findings from the PMG reveal that a percentage increase in trade openness significantly propagates business cycle volatility by 0.178% compared to 0.194% from the MG. Long run volatilities are also consistent and generally reveal that, in SSA further increases in trade openness increases volatility. The implication is that reduction in barriers to trade perhaps increases countries' susceptibility to external shocks thus exacerbating growth vagaries. This finding is expected and consistent with Tharavanij (2007) whose finding shows a positive effect of openness on business cycle volatility in the pooled estimations. However, after controlling for country fixed effects, Tharavanij (2007) finds that increase in trade openness is associated with lower business cycle volatility. The results from the long run volatility also confirm Rodrik (1998) and Easterly et al. (2000) argument that, more open economies experience larger income shocks. Theory suggests that greater openness to trade might in principle provide a mechanism for smoothing consumption and production in the face of shocks, but at the same time could expose a country to greater volatility as exogenous shifts in trade disrupt economic activity. What is noted from our finding is that greater openness exposes economies to severe volatilities at all levels. To the extent that SSA countries have imperfect financial markets it also exposes the economies to external shocks and greater output volatility.

Turning to the effect of shocks on volatility components, our results suggest that both monetary and real shocks are important sources of volatility both at the business cycle and long run component of macroeconomic volatility. These findings are robust to estimation

approach although the MG provides higher estimates. Specifically and following from the PMG, our findings reveal that a percentage rise in inflation fluctuations heightens business cycle and long run volatilities by 0.72 and 0.61% respectively. While monetary shock magnifies growth vagaries, its effect on business cycle volatility component is consistently higher than the long run component. Our finding is in synch with the monetarist view of destabilizing intervention: volatile monetary shock is associated with more pronounced business cycle. Theory postulates that whether output fluctuation is enhanced or dampened by inflation volatility depends on the source of shock to the economy: inflation volatility is expected to stem the tide of macroeconomic volatility when shock emanates from wage-setting but not when originating in aggregate demand (see De Long and Summers, 1986; Driskill and Sheffrin, 1986). To the extent that monetary shock proxied by inflation variability destabilises volatility components highlights aggregate demand as an important source of volatility in SSA. Indeed, rising aggregate demand can be associated with higher inflation especially when demand is not proportionally accompanied by higher output and productivity. Our finding is consistent with Karras and Song (1996) and Beck et al., (2006). The authors find that increase in inflation volatility is associated with higher macroeconomic volatility.

The effect of real shocks is not different from the monetary shocks in term of direction. Its coefficients are robustly positive suggesting that increases in real shocks magnify volatilities. Indeed, variations in commodity prices are an important source of external shocks. As far as the PMG estimator is concerned, at the business cycle, a percentage increase in real shock significantly increases fluctuation by 0.221% compared to 0.278% of the MG estimates although monetary shocks appear to be an important source of growth fluctuations than external shocks given their relative elasticities. This notwithstanding, the contribution to real

shocks to both business cycle and long run volatilities cannot be taken for granted. Changes in the terms of trade affect the economy via relative price movements of imported input and exported output. As such, shocks to terms of trade should directly affect the tradable sector of an economy with and indirectly impacts on the non–tradable sector. Hence, economies with large non-tradable sector will be relatively less pruned to fluctuations in the terms of trade. What is perceptible from our finding is a significant effect of external shock on volatility with much higher impact on persistence. To the extent that majority of the countries under consideration are dependent on primary commodities, our finding on real shock–volatility nexus is expected and consistent with Kose and Riezman (2001) and Raddatz (2007).

Government expenditure does not significantly affect business cycle volatility although its coefficient is positive. Our finding is inconsistent the notion that government plays as stabilizing role in the macroeconomy with its spending as espoused by Keynessian economics. While output volatility may decrease with government size in developed economies (see for instance Karras and Song, 1996), what is apparent from our results is that, in the case of SSA, government spending does not have any significant impact on business cycle volatility and even if government expenditure matter in volatility, its role is rather a destabilizing one particularly at the long run growth volatility component. This is noticeable given the positive and significant (at 10%) coefficient when estimated with the PMG. This evidence reveals that in the long run, effect of government's fiscal policy is benign at the business cycle but not the long run component as pro-cyclical fiscal policies and unbridled spending tend to magnify volatility persistence. The differences in direction of effect may largely emanate from the quality of spending rather than size. There is evidence that government expenditure in SSA is often on bad investments and boondoggles with potential

deleterious effect on growth. More importantly, discretionary fiscal policy when subject to long time lags may well end up magnifying fluctuations.

The coefficients of foreign aid are positive except the PMG estimator in the long run volatility component. However, none of these effects are significant suggesting that foreign aid does not explain any component of growth volatility whether we assume homogeneous coefficients or we allow them to vary. Consistent with our hypothesis, while the coefficients of financial development are negative in all the estimations, only its impact on business cycle volatility is significant. The implication is that higher financial development is only associated with lower volatility at the business cycle component. Well-functioning financial markets should facilitate a closer match between savers and investors and help absorb exogenous shocks in the real sector, promote diversification and potentially reducing risks and cyclical fluctuations. Given that volatility changes respond to the propagation mechanism via financial development, economies with relatively higher level of financial sector development will have disproportionately lower volatility around their business cycle component relative to those with underdeveloped financial market. Thus, volatility at only the business cycle component will by far be dampened by financial development. Silva (2002) and Denizer et al., (2002) have shown that financial development lowers the volatility of the fluctuations in output during business cycles. Our findings are akin to Beck et al., (2014) who find that financial intermediation stabilizes developing economies. In financially underdeveloped economies like those in SSA, firms may rely entirely on retained earnings for investment due to credit constraints exacerbating volatility. As private credit increases in response to growth in the financial sector, funds available to entrepreneurs increase thus dampening business cycle volatility. More specifically, firms with higher liquidity needs experience higher volatility at the business cycle. Our finding therefore opines that the development of financial system reduces volatility as it provides distress firms with cash flow

for increase investment. This finding is particularly consistent with Raddatz (2003) who examines how financial development interacts with volatility on the basis of firms' differences in sensitivity to financial conditions. Does financial development always mitigate volatility? We include a quadratic term of financial development to capture threshold effects and our evidence reveals that while deeper financial system is significantly associated with less volatility at the business cycle, such relationship appears to be intrinsically nonlinear. The squared term of financial development is positive and statistically significant at 5%. Consistent with Dabla-Norris and Srivisal (2013), this finding implies that, while developed financial systems provide opportunities for stabilizing business cycle volatility, they may also imply higher leverage of firms and thus more risk and less stability. As the financial system continues to grow relative to GDP, the increase in risk becomes more crucial and acts to reduce stability. The coefficient estimates indicate that this threshold is 24.49% of GDP for PMG and 17.60% for MG estimators. Countries where financial development exceeded these thresholds included Mauritius, Mauritania, Senegal and South Africa. Above these levels, business cycle volatility increases with the level of financial development. This is perhaps evident when economies like those in SSA experience rapid credit growth relative to real sector needs. In fact, our previous chapter one presents evidence that unbalanced growth in finance and real sector destroys investment rates potentially magnifying macroeconomic volatility.

With regard to short run dynamics, all the coefficients maintain their signs except the level of significance. Our findings show that only international trade openness and shocks are significant. And even so, trade openness is significant at only the business cycle component of growth volatility. Consistent with the long run finding, deregulating trade restrictions magnify business cycle fluctuation. What is clear from the result is the higher short run elasticities relative to long run. For instance, estimations from the PMG reveal that in the

short term, a percentage increase in trade openness significantly increases business cycle volatility by 0.221% compared to the long run coefficient of 0.178%. Indeed, economies' vulnerability is largely driven by either their structure or their level of economic development. Developing countries like those in SSA by their nature are more exposed to shocks and they do not always have the necessary and sufficient mechanisms and/or internal conditions to enable them to absorb the shocks. This perhaps explains why the impact of trade openness at the business cycle component is more pronounced in the short run as its long run effect appears to fade perhaps as economies begin to adjust and develop some mitigating force.

Government expenditure and foreign aid do not influence short term fluctuations in growth components although their coefficients are positive and consistent with long run finding. While the coefficient of financial development is negative at all components, none of the effects is significant suggesting that, in the short run development of financial sector does not dampen macroeconomic volatility.

In the long run, while monetary shock aggravates business cycle and long run volatilities, in the short run, its effect on long run volatility is only imaginary given the insignificant coefficients. Importantly, the magnitudes of effect suggest that short run monetary shock has a less magnifying impact on economic volatility compared to its long term effect. More specifically, variations in business cycle volatility increases between 0.317 to 0.384% for every 1% rise in monetary shock. Further results reveal that while monetary shock only affects business cycle, in the short run real shock affects both business cycle and volatility persistence. Specifically, the coefficients of monetary shock are robustly positive and significant consistent with the long run finding: increases in terms of trade shock magnify macroeconomic volatility. However, the elasticity of business cycle volatility to short run

fluctuations in external shock is greater than its long run effects reflecting the importance of terms of trade shock in fuelling short term fluctuations at the business cycle. The reverse is true for the long run volatility. The error correction term which measures the speed of adjustment to long run equilibrium is correctly signed and robustly significant at 1% under the two estimators. The significance of the error correction terms indicate that the models instantaneously return to their equilibrium levels following a shock to the system resulting from deviation of the long run path from its steady state.

So far our evidence presented above suggests that well-developed financial sector significantly dampens macroeconomic volatility via various components but silent on the transmission channels. In this next section, we empirically examine the channels through which financial development mitigates the effects of volatility. We hypothesize that the development of efficient financial system impacts on volatility through its effect on shocks. We examine this by including interaction terms of private credit, monetary and real shocks in the volatility equation while controlling for covariates and findings are shown in Table 4.6 below.

Table 4.6: Transmission channels, shocks and growth volatility

Variables	Dependent variables: Components of volatility			
	Business cycle volatility		Long run volatility	
	PMG	MG	PMG	MG
Long run coefficients:				
Trade openness	0.112**	0.142***	0.329**	0.391**
	(2.018)	(1.998)	(2.318)	(2.720)
Government expenditure	0.210	0.414	0.253	0.119
	(1.009)	(1.256)	(1.811)	(1.721)
Foreign aid	0.552	0.420	0.192	0.217
	(1.669)	(1.821)	(1.591)	(1.681)
Financial development	–0.196**	–0.119**	–0.215	–0.171
	(–2.036)	(–2.112)	(–1.700)	(–1.605)
Financial development square	0.312*	0.163*	0.271	0.222
	(3.502)	(3.409)	(1.515)	(1.049)
Shocks:				
Monetary shock	0.551**	0.793***	0.561**	0.772**
	(2.190)	(1.985)	(2.810)	(2.601)
Real shock	0.208**	0.211**	0.314**	0.403*
	(2.099)	(2.633)	(2.191)	(3.182)
Transmission channels:				
FD × Monetary shock	0.191**	0.214**	0.256**	0.428**
	(2.823)	(2.511)	(2.501)	(2.577)
FD × Real shock	–0.199**	–0.201**	–0.291***	–0.312**
	(–2.513)	(–2.790)	(–1.968)	(–2.701)
Error correction term	–0.612**	–0.559**	–0.591**	–0.495*
	(–2.914)	(–2.700)	(–2.930)	(–3.161)
Short run coefficients:				
Δ Trade openness	0.201***	0.213**	0.371***	0.309
	(1.974)	(2.001)	(1.981)	(1.801)
Δ Government expenditure	0.523	0.412	–0.701	0.611
	(1.023)	(1.554)	(1.765)	(1.621)
Δ Foreign aid	0.332	0.341	0.500	0.552
	(1.221)	(1.033)	(1.473)	(1.691)
Δ Financial development	–0.852***	–0.741	–0.633	–0.602
	(–1.981)	(–1.715)	(–1.577)	(–1.617)
Δ Financial development square	0.331	0.282	0.292	0.310
	(1.503)	(1.299)	(1.777)	(1.672)
Shocks:				
Δ Monetary shock	0.299**	0.332**	0.360	0.299
	(2.033)	(2.501)	(1.771)	(1.632)
Δ Real shock	0.341*	0.339**	0.312**	0.290***
	(3.910)	(2.881)	(2.766)	(1.920)
Transmission channels:				
Δ FD × Monetary shock	0.319*	0.401*	0.399**	0.290**
	(4.011)	(3.061)	(2.810)	(2.511)
Δ FD × Real shock	–0.381**	–0.396**	–0.419**	–0.398***
	(–2.610)	(–2.901)	(–2.111)	(–1.998)

Intercept	–1.251** (–2.803)	–1.411** (–2.912)	–1.802*** (–1.970)	–1.771** (–2.004)
Diagnostics:				
Hausman test (χ^2)		1.952[0.791]		1.821[0.822]
Number of countries	23	23	23	23
Number of observations	806	806	806	806

Notes: *, **, *** denote significance at 1, 5 and 10% respectively. Values in ( ) are the test statistic. All variables are in logs.

As regards to the controls, in the long run the effect of trade openness in exacerbating both business cycle and long run volatilities is robust confirming earlier finding that de-restriction of trade barriers can be associated with severe volatility albeit varying magnitude owing to the estimation technique. While this holds, the long run impact of increase in trade openness on volatility persistence is enormous in both estimations with effect on long run volatility measuring three times higher than that of business cycle volatility.

Fiscal policy measured by government expenditure is positive in all the models suggesting some magnifying effect in the long term. However, none of the coefficients is significant at conventional levels consistent with majority of the baseline findings that government's use of fiscal policy as a tool to tame long run economic fluctuations may not be effective based on our sample evidence.

Both real and monetary shocks amplify fluctuations given their positive coefficients with estimates under the MG for the business cycle being slightly significant. While the effect of monetary shock appears critical, these findings confirm that terms of trade shock and persistent inflation fluctuation are both unhealthy for internal stability. As regards to relative strength in the propagating effect, our findings reveal that the long run effect of inflation shock on business cycle volatility is at least twice as the real shock and the relative effect produced by the MG is exceedingly higher.

Consistent with our earlier finding, the coefficient of financial development is negative and only significant at the business cycle volatility indicating that even when channels of manifestation are controlled for, well-developed financial system is associated with reduced volatility. The coefficient of the square term is however negative and significant at 1%. The difference signs reveal the existence of long run U-shaped nexus in finance-volatility affirming the need to include quadratic term of private credit to reflect the threshold effect that too much finance has painful consequence for internal stability. Sahay et al.,'s (2015) study in SSA also documents that financial development impacts on growth volatility in a non-linear fashion. In terms of manifestation, our evidence reveal that financial development magnify the effect of monetary shock on both business cycle and long run volatilities. However, its magnifying effect on the latter is higher. More specifically, an increase in private credit from its 25th percentile (9.23%) to the median (15.03%) exacerbates business cycle and long run volatilities by 0.21 and 0.16 percentage-points respectively.[22] By investigating whether financial system dampens or exacerbates monetary shocks to the economy relying on cross-sectional data on 88 countries, Lensink and Scholtens (2004) find that financial development smoothes the negative impact of inflation uncertainty on macroeconomic volatility thus contrasting our findings. Perhaps the relationship between inflation shock and volatility as highlighted in their study is largely driven by the low (high) inflation (financial development) experienced by the developed countries contained in their sample.

Consistent with our hypothesis, the coefficient of the interaction term of private credit and terms of trade shock enters with a negative sign suggesting a dampening effect on macroeconomic volatility. Specifically, we find that in the long term while trade openness

[22] This is estimated first by calculating the percentage increase from the 25th percentile to the median value and multiplying the result by the coefficient of the interaction term at the respective volatility component.

increases macroeconomic fluctuations, developed financial sector reduces the impact of terms of trade shocks on both business cycle and volatility persistence in more open economies. Given the coefficient of the interaction terms and relying on the PMG estimates, increase in financial development from its 25th percentile (9.23%) to the median (15.03%) dampens business cycle and long run volatilities by 0.125 and 0.183 percentage-points respectively. All these results taken together imply that financial development helps mitigate macroeconomic volatility even after controlling for monetary and real shocks, thus providing support for the role of financial sector in fostering risk diversification and providing liquidity within an economy. These finding are akin to Beck et al., (2006) and Mallick (2009).

The short run coefficients are consistent with the earlier findings. Business cycle volatility and volatility persistence are responsive to trade openness given the positive elasticities although estimates under the PMG are slightly significant at 10%. Government expenditure and foreign aid do not matter in macroeconomic fluctuations in both the short and long run. While short run coefficient of private credit is negative in all the models, interestingly, it is only significant at the business cycle volatility under the PMG estimation. Darrat et al., (2005) find that short run effects on growth volatility from financial development are statistically insignificant. Further findings from our study reveal no short run threshold effect on finance-volatility nexus when we control for shocks. Thus, in the short term excessive development of the financial sector does not have attendant magnifying effect on volatility. A possible conjectural explanation for this is that in the short term, firms may be below their (optimal) solvency level and further increase in credit does not come at a cost to stability.

Consistent with long run finding, both shocks to inflation and terms of trade have amplifying business cycle volatility in the short run. While real shock also significantly increases long

run volatility, the effect of monetary shock on short term volatility persistence is insignificant at conventional levels suggesting in the short run, shocks to inflation do not matter in volatility persistence. As regards to their respective elasticities, while both shocks propagate short run business cycle volatility, the coefficients of real shocks are larger. There is evidence that volatility driven by external factors and terms of trade in particular, generates internal volatility, especially in developing countries (see for instance Aguiar and Gopinath, 2007; Loayza et al, 2007).

Juxtaposing with the long run evidence proposes that, while monetary shocks have large magnifying effect on volatility at the long run business cycle their effect in the short run is minuscule. More specifically, the impact of inflation fluctuation on the long run business cycle volatility is almost twice as the short run gleaning from the PMG estimation. The reverse however holds for real shocks. In other words, external shocks have higher propagating effect on short run volatility at the business cycle relative to the long run where the latter effect is 1.6 times greater than the former.

Findings on the effect of financial development on volatility remain robust to model specification. We turn to the channels through which financial sector impact on volatility. Consistent with earlier evidence, our findings reveal that even in the short term, financial development dampens (magnifies) the effect of real shocks (monetary shocks) on the components of volatility. Relative to the MG where the effect is almost 1:1, the PMG estimation shows that the dampening effects of financial sector are consistently higher than its propagation effect in the short run. Overall, the findings reveal that improvement (deterioration) in terms of trade allays (amplifies) both volatility components.

As expected, the error correction terms are negative and significant in the estimation approaches suggesting convergence. More specifically, the coefficients reveal that, the system instantaneously reverts to its long run equilibrium following a shock that diverts its path away from steady state. The validity of the long run homogeneity restriction across countries, and hence the efficiency of the PMG estimator over the MG, is assessed by the Hausman test. While the MG allows the long run coefficients to vary across countries, the PMG estimator on the other hand equates the long run elasticities by assuming homogenous effects across the countries under consideration. Indeed, the "pooling" as espoused by the PMG across countries produces efficient and consistent estimates only when the restrictions are true and the PMG estimators are relied on. And if the true model is however heterogeneous, estimates under the PMG are inefficient and inconsistent and the MG estimators are used. Our Hausman tests of model difference accept the null hypotheses of the homogeneity restriction on the regressors in the long run given the low (high) chi-square (*p*-values) test statistics. This evidence projects the PMG as a more efficient and consistent estimator relative to the MG.

4.5.2 Sensitivity analysis

In this section, we determine the robustness of the results using (i) different measure of financial development and (ii) estimation approach. Specifically, we proxy financial development using domestic credit to the private sector which refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of non–equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. Relative to private credit, domestic credit to the private credit is a broader measure of financial development and extend to capture credit provided by non–bank institutions. With regard to the estimation approach, we use the system generalised methods

of methods (GMM) to examine the relationships among financial development, shocks and growth volatility components by estimating the following general model:

$$V_{it} = \varpi_0 V_{it-1} + \varpi_1 FD_{it} + \varpi_2 CON_{it} + \varpi_3 SHO_{it} + \varpi_4 TRA_{it} + \gamma_i + \mu_t + \varepsilon_{it} \qquad (4.13)$$

where V_{it} and V_{it-1} is the vector of volatility components and their one-period lag respectively; FD_{it} is financial development; CON_{it} is a vector of control while SHO_{it} represents the shock variables (real and monetary shocks); TRA_{it} denotes the transmission channels derived by interacting FD_{it} and SHO_{it}. We also include the square term of FD_{it} to capture the threshold effects. γ_i is country–specific fixed effects; μ_t is time effects while ε_{it} is the idiosyncratic error term. *i* and *t* respectively denote country and time indices.

We estimate equation (4.13) above by employing the system GMM dynamic pooled estimator as it resolves the econometric problems inspired by endogeneity of the lagged dependent and the unobserved γ_i eminent in growth models. From equation (4.13), we specify our general system GMM framework as:

$$V_{it} = \sum_{k=1}^{p} \varpi_k V_{it-k} + \Upsilon_1 FD_{it} + \Upsilon_2 CON_{it} + \Upsilon_3 SHO_{it} + \Upsilon_4 TRA_{it} + \epsilon_{it} \qquad (4.14)$$

$$t = p + 1, \ldots\ldots\ldots, T; i = 1, 2, \ldots\ldots, N$$

$$\epsilon_{it} = \gamma_i + \mu_t + \varepsilon_{it}$$

where Υ_1 through to Υ_4 are the parameters associated with each explanatory variable while p is the maximum lag in the model.

Estimating equation (4.14) above requires the error term to be uncorrelated with the explanatory variables and can be written by allowing an arbitrary time period *T* for a random country *i* as:

$$y_i = W_i\xi + \lambda_i\gamma_i + \epsilon_{it} \qquad (4.15)$$

where ξ is a vector of ϖ_i's and Υ_k's; W_i is a vector containing the lagged volatility components and all the explanatory variables while λ_i is a $T \times 1$ vectors of unity.

We exploit the pooled cross–country and time series properties and estimating equation (4.15) above using the system GMM since the first difference GMM has poor finite sample properties inspired by persistent explanatory variables rendering their lagged values weak as instruments necessitating the use of extra moment conditions that rely on stationarity property of the variables (Blundell and Bond (1998). Efficiency of the GMM estimates is contingent on the validity of the instruments which we examine using serial correlation and Sargan's tests for over–identifying restriction. Table 4.7 presents findings on the relationships among financial development, shocks and volatility components relying on a panel dataset spanning 1980–2014.

Table 4.7: Financial development, shocks, volatility and transmission channels

Variables	Levels		Transmission channels	
	Business cycle volatility [Column 1]	**Long run volatility [Column 2]**	**Business cycle volatility [Column 3]**	**Long run volatility [Column 4]**
Lagged dependent	–1.501**	–1.984*	–3.673**	–3.807*
	(2.111)	(0.005)	(0.039)	(0.002)
Trade openness	0.092**	0.077*	0.064**	0.059***
	(2.149)	(3.104)	(2.301)	(1.910)
Government expenditure	0.051	0.025	0.040***	0.037
	(1.422)	(1.333)	(1.921)	(1.600)
Foreign aid	0.094	0.101	0.077	0.071
	(1.115)	(1.410)	(1.094)	(1.251)
Financial development	–0.056**	–0.043**	–0.045**	–0.017*
	(2.017)	(2.281)	(2.173)	(3.744)
Financial development square	0.084*	0.061*	0.059**	0.021**
	(3.901)	(3.102)	(2.321)	(2.001)
Shocks:				
Monetary shock	0.066***	0.056**	0.049**	0.029**
	(1.968)	(2.110)	(2.091)	(2.311)
Real shock	0.041*	0.031**	0.046**	0.027***
	(3.620)	(2.362)	(2.210)	(1.980)
Transmission channels:				
FD × Monetary shock	–	–	0.093**	0.063*
			(2.227)	(3.340)
FD × Real shock	–	–	–0.023*	–0.019*
			(3.901)	(3.411)
Diagnostics:				
Observations	806	806	806	806
Country fixed effects	YES	YES	YES	YES
Time effects	YES	YES	YES	YES
Number of countries	23	23	23	23
AR(1) *z*–value [*p*–value]	–3.584 [0.000]	–2.952 [0.001]	–3.266 [0.000]	–2.113 [0.000]
AR(2) *z*–value [*p*–value]	–1.793 [0.410]	–1.012 [0.318]	–1.827 [0.251]	–1.146[0.409]
Threshold value	33.33%	35.25%	38.14%	40.48%
Sagan chi-square [*p*-value]	16.321[0.280]	21.544[0.271]	17.901[0.209]	22.535[0.233]
Wald chi-square [*p*-value]	0.001	0.000	0.000	0.000

Notes: *, **, *** denote significance at 1, 5 and 10% respectively. Values in ( ) are the test statistic. All variables are in logs. The threshold value is the value after which financial development exacerbates volatility.

Results from the Table above show that the respective lagged dependent volatility component is included as an explanatory variable and coefficients of the initial volatilities are negative and significant suggesting that the countries eventually converge over time towards a common level volatility.

Our findings are qualitatively similar to those from the PMG and MG estimations in terms of direction of effect but not the level of magnitude and significance. For instance, trade openness positively and significantly influence both business cycle and long run volatilities although the former effect is larger. This finding is consistent with our earlier evidence and suggest that a percentage-point increase in international openness magnifies volatility at the business cycle and long run component by 9.2 and 7.7% respectively (Columns 1 and 2). These findings remain robust to controlling for transmissions as trade openness amplifies volatilities albeit reduced magnitudes and impact on long run volatility is slightly significant at 10%. This is consistent with the finding of Easterly and Kraay (1999) that small economies are more volatile when they are more open. Government expenditure does not influence volatility (Columns 1 and 2). However, its effect on business cycle volatility is positive and slightly significant in the model containing the transmission channels (Column 3) suggesting that impact of fiscal policy on macroeconomic fluctuations is not robust and model-specific. Foreign aid does not appear to matter in volatility. Consistent with our earlier findings, the coefficient of financial development – proxied by domestic credit to GDP ratio – is robustly negative and significant revealing that higher development of the financial sector is associated with reduced volatilities at both the business cycle and long run components whether or not we control for pass-through effect of finance to volatility. Easterly et al., (2000) find that the amount of domestic credit available is necessary prerequisite for reduction in economic fluctuations. Our further findings suggest such effect is intrinsically non-linear. For instance, the quadratic term of financial development is also robust and positive confirming threshold effect in finance–volatility nexus. These thresholds are estimated to range between 33.33 to 40.48% and are relatively higher compared to the PMG and MG estimations. The conclusion drawn from this finding is that financial development

dampens business cycle fluctuations up to a point where domestic credit to GDP ratio ranges between 33.33 to 38.14% and begins to magnify volatility at the business cycle when domestic credit exceeds these thresholds. The inflection point at which further increases in financial development exacerbates volatility persistence is relatively higher and estimated at 35.25 to 40.48%. Countries where these thresholds were exceeded over the sample period 1980–2014 were South Africa and Mauritius.

The effect of monetary and real shocks in volatility process is positive and robust albeit reduced coefficients at the long run components. Specifically, a percentage rise in shock to inflation magnifies business cycle and long run volatilities by 6.6 and 5.6% respectively. These effects remain significant when transmission channels are controlled for although coefficients produced here are relatively smaller. The results reported are similarly to real shock–volatility nexus where shock to terms of trade amplifies both volatility components. However, elasticity of volatility components to changes in shock is higher when the economy is hit by monetary shock relative to real shock. Even under real shock, effects are subdued when we include transmissions. These findings collaborate with our earlier findings and imply a magnifying impact of real and monetary shocks thus revealing the importance of inflation and terms of trade fluctuations in the volatility process. Controlling for channels does not alter the results. Specifically, we found that financial development even when proxied by domestic credit reduces both volatility at the business cycle and persistence by dampening the positive effect of terms of trade shock while heightening the pass-through effect of monetary shock to growth fluctuations (Column 3 and 4). More specifically, an improvement in financial development from its 25th percentile (9.77%) to the median value (15.34%) exacerbates business cycle and long run fluctuations by 0.053 and 0.036 percentage-points respectively through its effect on inflation shock. Conversely, when domestic credit to GDP ratio increases from the 25th percentile to the median, volatilities at

the business cycle and long run decreases by 0.013 and 0.011 percentage-points respectively via terms of trade.

4.6 Policy implications and recommendations

The results herein are of crucial importance to policy makers in terms of highlighting the optimal level of financial development to ensure that minimal growth fluctuations are maintained through the financial sector. We discuss key policy implications arising from the findings. We have found that while financial development dampens business cycle volatility, its effect on the long run volatility is insignificant.

International trade policies are also often linked to the economic fluctuations although it is generally difficult to assess the overall contribution of an economy's openness to its business cycle and long run volatilities. On one hand, by lowering barriers to trade, economies become more susceptible to shocks. However, trade with other countries can also potentially decrease the effect of domestic shocks by "exporting" some of their destabilizing effects to the economy's trading partners. Our findings however document the latter effect as output fluctuations rise following de-restrictions on trade. In fact, the magnifying role of trade openness is more pronounced in the short run business cycle component. Perhaps in the long run, economies are better able to develop strong mitigating effects.

The standard Keynesian view highlights government's consumption expenditure as critical antidote to fluctuations. We however do not find the role of fiscal policy in smoothening volatility in the case of SSA as effects of government size are largely insignificant suggesting that using fiscal policy to stabilize the economy will be ineffective. Our evidence highlights the role of financial sector in economic fluctuations given the negative relationship between

financial development and business cycle volatility. The implication is that, developed financial systems are more capable of screening potential borrowers, which should reduce the likelihood that projects with greater probability of failure are financed. Thus, smoother business cycle is associated with financial systems characterized by reduced credit markets imperfections. From a theoretical perspective, the "balance sheet view" postulates that developed financial sectors improves the ability of financial institutions to gather, process and screen information about debtors thus reducing agency costs and minimizing credit market imperfections. Because external shocks to economic activity are magnified by asymmetric information, lowering the level of market imperfections is therefore expected to reduce volatility at the business cycle (see Hubbard, 1997; and Bernanke et al., 1998).

In other words, financial development indicators may reveal the level and effects of financial imperfections arising from information asymmetries and/or other structural bottlenecks. Thus, an adverse relationship between volatility and financial development is generally consistent with the hypothesized impact of asymmetric information in amplifying business cycles. Indeed, the idea is that factors motivating the growth–enhancing effects of financial development should also lead to smoother fluctuations. As financial systems become more capable of cream-skimming, the likelihood of financing bad projects is reduced thus taming economic activity fluctuations. The overall result emerging from the cross-country regressions is that economic fluctuations are less volatile with developed financial sector. However, unbridled financial development associated with over developed financial sector is not healthy for growth as financial development–volatility nexus is nonlinear. Specifically, financial development decreases business cycle volatility up to a point beyond which further increases in financial sector size magnifies volatility. While developed financial systems tend to be more efficient in identifying those firms that wrongly overstate the extent of their liquidity, over developed financial sector is often associated with excessive credit growth to

the private sector thus permitting the financing of unsustainable projects magnifying business cycle volatility. Thus, knowledge of firms' solvency needs and proper supervision is therefore needed to ensure that credit advanced is consistent with the solvency needs of firms because in the end, the behaviour of those firms are constrained by the financial sectors' unwillingness to lend. Business cycles will therefore be smoother following financial institutions' effective use of available information about potential borrowers and cash flow needs. Encouraging financial development for its own sake may be counter-productive. Policy makers should rather seek to strengthen the appropriate size and quality of finance rather than expanding the financial sector.

Our cross–country evidence suggests that large fluctuations in commodity prices have non-trivial quantitative effects that warrant some attention. However, the general notion is that although real shocks have magnifying effect on real activity via business cycle of developing economies, they account for only a small proportion of the volatility of these countries that emanate from monetary shock. Put differently, volatility caused by monetary shocks is more important and persistent than that caused by real shocks and financial underdevelopment of SSA. If domestic output fluctuations were primarily driven by external shocks, then our evidence would have supported the real business cycle view that economic fluctuations are largely influenced by world productivity disturbances. Rather, our findings show that factors driving fluctuations are largely internal. More importantly, the rather high inflationary pressures as experienced in majority of the countries under consideration exacerbates macroeconomic instability and volatility. Thus, the belief that stabilizing exogenous shocks would significantly dampen SSA's long run macroeconomic volatility is not borne out by current data.

With regard to transmission channels, higher levels of financial development magnify the impact of monetary shocks proxied by shock to inflation. Rising inflation reduces consumers' spending as this erodes purchasing power thus lowering firms' revenues, net worth and creditworthiness. These increases the agency costs and the external financing premium magnifies shocks to economic activity by amplifying spending, borrowing and investment vagaries. The magnifying effect of financial sector is however higher at the short run business cycle relative to the long run. This notwithstanding, financial development dampens the positive effect of real shocks on volatility components. Apart from relaxing credit constraints for firms, deepening the financial sector may also help mitigate real shock to economic activity as it promotes diversification thereby lowering risk.

The large role played by internal factors signifies that exogenous contingencies may not have substantial power to smooth macroeconomic volatilities. Even without controlling for the pass-through effects of finance to volatility, the relatively sizable external shocks raise some critical issues regarding the best response to shocks. Thus, irrespective of the nature of shock, structural changes may be an important prerequisite for taming volatility as these ensure strong domestic institutions necessary for maintaining macroeconomic stability and sound position in the international economy.

At the policy front, strengthening supervision, including cross-border oversight is crucial in examining the right levels of finance necessary to falter economic fluctuations. Because enforcement of prudential standards remains lax, providing supervisors with more enforcement power and strengthening the capacity of Central Banks should be the core in financial sector development process. Moreover, leveraging on the importance of monetary shocks in propagating volatility, it is important for Central Banks like those in SSA to adopt

inflation targeting approach as it sets institutional commitment to price stability as the primary long run goal of monetary policy. A major perceived challenge will be on managing Central Bank and government's relationship. While granting Central Banks' autonomy and depersonalizing the conduct of monetary policy, setting inflation targets with direct involvement of government coupled with a more active and transparent role of the Central Bank in communicating targets to government and the public is crucial in managing relationships. Our evidence suggest that, monetary policy that targets inflation is likely to produce better outcomes for both output and inflation volatilities. Cecchetti and Ehrmann (2000) provide evidence that Central Banks' aversion to inflation shocks is stronger with the adoption of inflation targeting. However, increased uncertainty in developing economies particularly makes it tedious to predict inflation movement as required by the forward-looking nature of inflation targeting. Improving transparency by regularly communicating inflation targets and policy commitments to the public reduces speculations fuelling inflation.[23] And given the obvious likelihood that countries in SSA are frequently hit by shocks that could distort inflation from its long run path, missing the inflation targets may be untenable. What is needed by policy makers is to focus on short to medium term to ensure that deviations are brought on track and inflation converges to a trajectory consistent with price stability and financial sector development.

4.7 Conclusion

The aim of this study has been to examine the role of financial sector development in volatility as well as channels through which finance impacts on volatility relying on annual data for 23 countries in SSA spanning 1980–2014. Earlier studies attempting to assess finance-growth volatility nexus have not been informative as they fail to decompose the

[23] There is evidence that South Africa adopted the inflation targeting approach in February, 2000 but does not publish inflation forecasts limiting the transparency and accountability of the Central Bank (see Mishkin, 2007).

various components of volatility understanding that financial development affects volatility through its different components. This paper quantified the relative importance of a monetary and real shocks and the how finance affects business cycle and long run volatilities through its interaction with broad set of shocks. Our overall finding supports the salutary effect of finance reducing business cycle volatility in SSA albeit not monotonically. The implication is that while well-developed financial sector dampens volatility at the business cycle, unbridled financial development may also magnify fluctuations. However, effect of financial development on long run fluctuation is only imaginary. Further findings show that while monetary shocks have large magnifying effect on volatility at the long run business cycle, their effect in the short run is minuscule. The reverse however holds for real shocks. Our main conclusion is that irrespective of the component, volatility caused by monetary shocks is more persistent than those caused by real shocks and financial underdevelopment. This notwithstanding, our evidence reveals that irrespective of the time horizon, financial development dampens (magnifies) the effect of real shocks (monetary shocks) on the components of volatility although the dampening effects are huge in the short run. These findings are robust to financial development proxy and estimation approach and reaffirm our evidence on finance–volatility nexus. To smooth volatility, the study recommends Central Banks to strengthen their supervision role in aligning financial development towards a path consistent with long run growth while adopting an inflation targeting approach to falter monetary shocks.

CHAPTER FIVE

FINANCIAL DEVELOPMENT, VOLATILITY AND INFORMATION ASYMMETRY: DOES LAW MATTER?

5.1 Introduction

A growing body of literature highlights financial development as a key factor in promoting economic growth (Levine, 1997; Beck et al., 2000; Hassan et al., 2011) and reducing economic volatility (Denizer et al., 2000; Ibrahim and Alagidede, 2017). Recent studies identify legal origin as important factor influencing cross–country differences in financial development and growth (Beck et al., 2003; La Porta et al., 1998a; Levine, 1998). More importantly, the law–finance theory suggests that common law countries have better prospects for financial development than civil law countries. The reasons are that common laws are more likely to protect the private property rights relative to the State, and they tend to be dynamic to changing country landscape (La Porta et al., 1998a; Beck and Levine, 2003).

There is literature proffering that limited access to finance has been on account of higher information asymmetry (Triki and Gajiko, 2014; Asongu et al., 2015). Consequently, the desire to increase financial access and financial development has led to the establishment of information sharing offices notably the Private Credit Bureaus (PCB) across sub–Saharan Africa (SSA) countries with the intent of reducing information asymmetry between borrowers and lenders in the financial markets. Indeed, some authors (Batuo and Kupukile, 2010; Allen et al., 2011) have argued that the establishment of information sharing offices is based on the premise that, the limited access to finance (and financial development more

generally) by prospective borrowers is constrained by such factors (namely eligibility of bank lending, physical access and affordability) that can be explained by information asymmetry.

Theoretically, information sharing offices are expected to serve as agents of financial intermediation by narrowing information gap between borrowers and lenders. According to Jappelli and Pagano (2012), by reducing information asymmetry, these information sharing bureaus are able to increase competition and reduce bottlenecks in access to finance thus aiding in efficient capital allocation. However, recent literature on information asymmetry (see Asongu et al., 2015) has doubted the ability of these information sharing offices to inspire competition in the financial sector for increased financial access.

For most part, studies on information asymmetry and financial development (Ivashina, 2009; Houston et al., 2010; Tanjung et al., 2010) have failed to (i) engage the crucial role of law in financial development in the light of evolving legal systems in SSA, (ii) incorporate the concept of finance given the role of banking institutions in transforming mobilised deposits into credit for productive investment. On the other hand, the law–finance theory literature in Africa (see for instance Asongu, 2011) has been situated around its implications for economic growth and welfare without examining how legal origin explains cross–country differences in economic volatility. More tellingly, how effective law shapes and/or limits information sharing in growth volatility remains an unexplored area of research in SSA.

The current literature has therefore left much space for engagement in at least three areas: (i) re–positioning the debate where the issue of financial development and banking system efficiency is lower (ii) examining the role of legal origin in influencing information sharing for both financial system activity and the fundamental role of financial institutions to

transform mobilised deposits into credit for economic agents and (iii) examining the moderation role of legal origin in information asymmetry–economic volatility nexus. Given the evolving legal systems in the sub–region on the back of narrow financial markets, shocks and volatility, we engage the literature by re–examining the law–finance theory and the fundamental role of information sharing in financial development measured in terms of financial activity and efficiency. We also examine how legal origin interacts with information asymmetry in explaining cross–country differences in economic volatility in SSA. This study therefore presents a case for the imperative of introducing the previously missing links into the law–finance literature.

Our evidence suggests that legal origin significantly explains cross–country differences in financial development and economic volatility. More importantly, English common law countries have higher financial sector development both in terms of activity and efficiency accompanied by low growth volatility. Not only is the relationship between the interaction term of legal origin and private credit bureau (PCB) on volatility negative and statistically significant, it is economically large for the English legal legacy countries. Specifically, volatility–reducing effect of the English common law is greater than Portuguese legal origin while countries with the French civil law origins are within the two. Although the effect of PCB is negative and significant, juxtaposing the impact of PCB on volatility on one hand and that of transmission channel on the other suggests that, the establishment of information sharing offices per se may be insufficient in taming growth vagaries. We argue that it is the effectiveness of law that is exceedingly relevant in faltering economic volatility. Thus, relative to countries with lax legal systems, those that enforce contracts effectively, protects private property and lender rights have better information sharing and reduced information asymmetry which are essential in smoothening fluctuations.

The rest of the chapter is as follows: the next section draws the linkages among legal origin, financial sector development and information asymmetry. Section 5.3 reviews a body of empirical literature on these nexuses. Section 5.4 outlines the data and empirical strategy while section 5.5 presents the findings. We highlight the policy implications and recommendations in section 5.6 and section 5.7 concludes the study.

5.2 Legal origin, finance and information asymmetry: Drawing the linkages

According to Beck and Levine (2003), legal origins have been argued to influence financial development through (i) the political and (ii) adaptability channels. The former is built on two tenets: first, legal legacy vary regarding its emphasis on protecting the rights of private investors compared with that of the State. Second, private property rights protection forms the bedrock of financial development. Thus, primitively, differences in legal traditions may predicate prior variations in the level of financial development (La Porta et al., 1998a). Hence, the extent to which legal origin enhances or hampers the financial sector depends on whether it supports the right of private property rights relative to the State or vice versa. Where the prevailing legal framework supports the State, then private property rights tend to suffer and the reverse also holds. Arguably, relative to the common laws, the political mechanism contends that civil laws are more inclined to protecting the rights of the State as opposed to property rights which has consequential dire implications for financial development (Beck and Levine, 2003). La Porta et al., (2003) note that States are more likely to intervene in the judicial system by hesitating judges' permission, offering courts' jurisdiction over cases involving the government or allowing judicial review of the laws governing the country which may lower its powers. La Porta et al., (1999) therefore likens civil legal origin to the intent of building institutions to further confer powers to the State. In this case, a more powerful State is progressively inclined to misappropriate society's

resources to its favour which is detrimental to competitive financial market systems. Moreover, a relatively powerful State is more likely to interfere in the operations of the financial sector by directing the flow of financial resources to cronies and ultimately increasing non–performing loans of the financial institutions. The law and finance theory therefore suggests that civil law countries have feeble private property rights protection and a lower financial sector development relative to other legal legacies.

Conversely, the common law has historically been projected to uphold the rights of private property owners against the State. In fact, Rajan and Zingales (2003) argue that compared to civil law countries, governments in common law countries were ineffective in expanding the role of the government at the expense of financial sector development during the interwar period 1919–1939 largely on account of the stronger role of the judiciary. Thus, the law and finance theory contends that the English common law supports financial sector development to a larger extent compared to civil law systems where powers of the State are weakly checked.

Similarly, the second channel – adaptability mechanism – linking legal origin with financial development is also constructed around two areas: First, legal systems vary in their ability to adjust to changing landscapes. Second, if a country's legal system sluggishly adapts to changing circumstances, then large gaps will exist between the economy's financial needs and the ability of the legal system to support those needs (Beck and Levine, 2003).

Posner (1973) has long argued that legal systems that support case law and judicial discretion are more responsive to different financial conditions than legal systems that rigidly embrace formalistic procedures relying more strictly on judgments based on shallow statutory laws. Indeed, there is possibility of challenging inefficient and rigid laws in courts to improve

efficiency to allow for flexibility of the laws. In this course however, statutory laws appear exceptional. For instance, Bailey and Rubin (1994) note that statutory laws are slow and costly to amend, so that the absence of jurisprudence negatively impacts on the efficiency with which laws instantaneously change to different market conditions including the financial markets.

The adaptability channel therefore predicts that English common law countries have higher proclivity of instituting well developed and functional financial sector than civil law countries. More importantly, the adaptability mechanism affirms that common laws are intrinsically dynamic and responds to the changing needs of countries thus constantly narrowing agents' demands and provisions of the law.

Djankov et al., (2003) note that differences in legal formalism also influences the adaptability of the law. The authors find that common law countries have relatively lesser legal formalism regarding the regulation, collection and presentation of evidence, while requiring extensive procedures throughout the judicial processes. However, in the case of the French law countries, the Napoleonic doctrine's wariness in judges promoted the reliance on judicial formalism thus inhibiting the flexibility of the legal system with dire implications on financial development.

Asongu (2011) provide a brief historical note arguing that, the partitioning of SSA into French and British colonies in the 19th century led to the implementation of two distinct colonial policies: while the French imposed a highly centralized bureaucratic system that clearly elevated empire–building, the British on the other hand pursued pragmatic decentralized and flexible policies, economic and business aspirations subsequently dominated the British colonial activities who sought to turn–around their colonies into

commercially viable trading economies through the indirect-rule. The French on their part pursued imperial ambitions through the policy of assimilation.

Indeed, the balkanization and subsequent colonisation of Africa by the Europeans resulted in the transplant of their legal doctrines into the host countries. Beyond classifying countries into various colonies (such as the British, French, Portuguese or Belgian), Berkowitz et al., (2002) stress that the transplant process also established legal systems in colonised countries consistent with the colonial legacy. Thus, when the common and civil laws were transplanted in the sub-region, both the rules and legal ideologies were also transplanted. In fact, Zweigert and Kötz (1998: 72) note that, "the style of a legal system maybe marked by an ideology, that is, a religious or political conception of how economic and social life should be organized".

On the macroeconomic management, Mundell (1972) notes that the French monetary tradition, which emphasizes on the automaticity within a fixed exchange rate framework achieved stability at the expense of institutional development while the British opted for monetary discretion, sacrificing stability for experience and relatively more developed financial sector institutions. Mundell (1972) therefore conjectures that Anglophone countries in SSA inspired by British common law would naturally register higher levels of financial development than their Francophone counterparts whose legal frameworks are inclined to the French civil law.

Beyond the political and adaptability channels, legal frameworks must also be capable of propelling agents to disclose full information on their qualities for the usage of other interested parties. In other words, well–functional legal systems ought to be able to ensure

"perfect information" in the financial sector by propelling the disclosure of all relevant information to information sharing offices to allow for efficient financial intermediation.

Tchamyou and Asongu (2016: 3) define these information sharing offices also known as 'credit reference agencies' "as institutions that collect information on an individual or commercial borrowers' obligations from multiple sources, namely: retails lenders, credit card companies and banks (for individuals) and supplies, direct investigation and public sources (for businesses)". Information gathered is used to write a report on credit history and used by prospective lenders. Reports generated details both positive (consisting of details on all closed and opened credit amounts, closed credit accounts, repayment behaviour and plan) and negative (information on default and bad investment history for most part) outlook of agents.

Mylenko (2008) notes that, the rising demand for information by financial institutions to improve on risk management practices culminated in the establishment of credit bureaus in Africa. Apart from South Africa, only few countries in the sub–region had well–functional credit reporting offices prior to 2008. Important legal adjustments were made to enable private credit bureaus operate in a number of countries including Ghana, Nigeria, Uganda, Tanzania and Zambia.

Indeed, the rising establishment of private credit bureaus is unsurprising given their key role in financial development as they remove information bottlenecks restricting lenders from investigating and accessing risk registry of borrowers. With this, they play a very critical role in addressing adverse selection from the part of lenders and alleviate moral hazard by addressing the unappealing financial behaviour of borrowers. Ultimately, the financial sector is able to shape and monitor investment choices of agents both in terms of the nature of projects that get funded and their overall contribution to economic growth. Following from

the political and adaptability routes, we can presuppose that the extent to which agents disclose information to information sharing bureaus crucially depends on the form of legal origin and this should be higher among British common law countries relative to the French civil law.

In the next section, we review a body of empirical literature on legal origins and their association with finance, growth and information asymmetry.

5.3 Literature review

Diamond and Dybvig's (1983) theoretical work posits that *ex ante* information asymmetry arises when lenders are unable to categorize borrowers according to their credit risks culminating in adverse selection. On the other hand, *ex post* information asymmetry occurs when only borrowers are able to observe actual returns from a funded investment. Potentially, this may lead to moral hazard if borrowers resort to constraining compliance of their financial obligation with the lenders. The impulse of Diamond and Dybvig's (1983) model is based on the premise that, the key intent of financial intermediaries is to decrease cost of transaction and information owing to information asymmetry between borrowers and lenders. Other studies have highlighted the importance of reducing information asymmetry for increased financial intermediation largely through diversification with financial intermediaries (Diamond, 1984) and communication by banks to investors on potential borrowers (Leland and Pyle, 1977). Thus, the establishment of private credit bureau is a genuine channel of increasing (decreasing) information sharing (information asymmetry) to boost (dampen) financial development (growth volatility).

Some studies have argued that effective legal institutions permits knowledgeable market participants in the design and review of contractual agreements aimed at reducing complex agency problems (Coase, 1960; Stigler, 1964; Easterbrook and Fischel, 1991) caused by asymmetric information. The substantial empirical literature on information asymmetry–finance nexus have been on assessing how reduced information asymmetry propels financial access (Triki and Gajigo, 2014; Brown et al., 2009); reduces default rates (Jappelli and Pagano, 2002); mitigates cost of credit (Brown et al., 2009); influences syndicated bank loans (Ivashina, 2009) and affects corruption in lending (Barth et al., 2009). Using firm-level data, Love and Mylenko (2000) examine linkages between enhanced financial sharing by perception managers and banks, public credit registry and private credit bureau and financing credit constraints. Findings from their study reveal that, while public credit registry do not significantly influence financing constraints, private credit bureau are associated with higher banks financing and lower constraints in credit financing. Similarly, Triki and Gajigo's (2014) study on the impact of information sharing on access to finance have established that, access to finance is higher in countries with private credit bureau relative to those with only public credit registry or no information sharing office. More recently, Asongu et al., (2015) have examined the information sharing threshold for financial development in Africa. Evidence from their study shows that, while private credit bureau negatively affects banking system efficiency, the impact of public credit registry is insignificant. On the information sharing–private credit nexus, the authors have established that both public credit registry and private credit bureau are associated with reduced financial activity with the private credit bureau having a huge magnitude.

The broad spectrum of the literature suggests that political (Pagano and Volpin, 2001; Haber et al., 2003; Rajan and Zingales, 2003; Haber, 2004), cultural (Guiso et al., 2004), religion

(Stulz and Williamson, 2003) and even geographical (Engerman and Sokoloff, 2002), Acemoglu et al., 2001; Beck et al., 2003a; Easterly and Levine, 2003) factors influence the financial system and that much more work is required to better understand the role of law in the financial development process of countries. La Porta et al.'s (1998b, 1999) study find that countries that adopts the French civil law have the lowest levels of financial development. Specifically, French civil law countries have narrow stock markets, less active initial public offering markets, and relatively lower levels of bank credit. Levine (1998, 1999) and Levine et al. (2000) empirically examine the legal origin–financial development–economic growth nexus and find that legal origin importantly explains cross–country differences in the development of bank and stock markets and that the level of finance accounts for the international differences in long run growth.[24]

Beyond explaining the overall levels of financial development, legal institutions also influence the ability of firms to raise capital thus determining the extent to which domestic firms operate at financially constrained levels. Beck et al., (2002) find that countries with legal institutions that effectively protect property rights tend to have larger firms as firms are less constrained by retained earnings thus operating at more efficient levels. This finding is consistent with Kumar et al., (2001). Closely linked to this is the impact of well–functioning legal institutions in shaping the efficiency with which financial systems re–allocate capital across firms and industries (see Wurgler, 2000; Beck and Levine, 2002).

On the relationship between legal institutions and the efficiency of equity markets, Morck et al., (2000) investigate the interaction among law, availability and precision of information on firms and the efficiency of the stock prices. They find that the extent to which legal

[24] However, countervailing evidence challenges the law and finance theory (Pagano and Volpin, 2001; Rajan and Zingales, 2003). Some studies (see for instance Acemoglu and Johnson, 2005; Klerman et al., 2008) suggest that legal origin cannot explain economic growth performance.

frameworks protect private property rights and that of minority shareholders help explain the cross-country variations in stock market synchronicity.

Beck et al., (2003b) empirically examine the political and adaptability channels – respectively proxied by Supreme Court power and case law – in accounting for international differences in stock market, financial intermediary and private property rights development. As espoused by the political channel, it is expected that less State control of the judiciary will result in higher financial development thus hypothesizing a positive coefficient of the political channel proxy. However, the authors find support for the adaptability channel but not the political channel as the case law is positively associated with stronger private property rights protection, higher stock market and bank development. Similarly, Acemoglu and Johnson (2003) assess the impact of legal formalism on financial sector development. They find that, while legal formalism is not linked with banking sector development, greater legal formalism lowers stock market development, which is akin to the adaptability mechanism.

Beyond the effect of legal origin on finance, Agbor (2011) examines how colonial origin affects economic growth performance in SSA. Findings from the study suggest that the indirect influence of colonial educational policies matter more for post-colonial growth rather than the direct effect of colonisation. More importantly, Agbor's (2011) evidence shows that former British SSA colonies have grown marginally faster relative to former French colonies largely attributable to the favourable contribution of the indirect influence of the legacy of British colonization on education.

Arguably, none of these studies have examined the connection between legal institutions, availability and precision of information on borrower, the efficiency of banks, quality of financial development and growth volatility. Given the role of financial intermediaries, when

information on borrower quality is symmetric, default rate is minimized as financial intermediaries effectively monitor resources provided to the financial sector hence dampening growth volatility. Indeed, lenders are most often left with issues of adverse selection on account of their lack of information on borrower quality particularly on risks associated with investment needing the borrower to mobilize financial resources. This concern is even more pronounced when lenders are intrinsically unable to control the direction of borrowers in post–credit grant. Given this understanding, a borrower may conceal returns from an underlying investment in order to reduce the possibility of default or amount of repayment at agreed times. This behaviour of borrower is paramount and evident in countries with weak information sharing and legal systems leading to sub-optimal resource allocation, financing of unproductive projects thus exacerbating growth volatility. Levine (1997) argues that financial development affects long run growth by reducing information and transaction costs which in turn influences savings and investment choices and technological innovations. However, its long run volatility effect is unclear. Cross–country evidence on the financial depth and macroeconomic stability suggests that well–developed financial sectors do protect countries against certain types of shocks (Easterly et. al., 2002; Beck et. al., 2006; Ibrahim and Alagidede, 2017). Caprio and Honohan (2001) argue that regulatory and supervisory framework have an impact on the extent to which financial intermediaries absorbs or propagates exogenous shocks.

Conceivably, countries in SSA are prone to economic volatility due to their nature and financial underdevelopment (Ibrahim and Alagidede, 2017). For this reason, financial sector development, premised on effective legal systems, is viewed as essential factor influencing both the level of finance and volatility. Indeed, our focus on the market–supporting institutions including law, information sharing office and financial systems, in explaining

long run economic volatility has by far come to the fore as important factors for SSA, a clear niche for the sub–region that has become a major puzzle necessitating further research efforts to shed light on both its growth vagaries and legal trajectory; and uncover any potential lessons for other developing economies.

Admittedly, very scanty literature pertains to SSA and those existing ones does not particularly show how the evolving legal origins in the sub–region play out in information asymmetry–volatility nexus apart from their interaction with finance. We address this gap in the literature by first discussing our methodology in the next section.

5.4 Data and methodology

5.4.1 Data

Annual data for the study is gleaned from 33 SSA countries comprising 13 English common law origins. The civil law countries consist of 14 French, 4 Portuguese and 2 Belgian. Our sample covers the period 2004–2011. Details of the countries are in Appendix 2. The choice of these countries is exclusively based on data availability. For instance, data on information sharing bureaus is only available from 2004 to 2011. The fundamental object of increasing information sharing and/or reducing information asymmetry is to improve financial intermediation efficiency, lower default rate which has the potential of improving returns on investment and growth. Following Triki and Gajigo (2014), we measure information sharing/asymmetry with the private credit bureaus. Our choice for this proxy is guided around five indicators: access, data sources, ownership, coverage and purpose. Access to private credit bureaus is opened to all lenders and not restricted to only information providers. Data on private credit bureaus is extensive and largely obtained from the public credit registry, courts and tax authorities. On the ownership, beyond Central Banks and government,

ownership of private credit bureaus encapsulates lenders, independent third parties and lender group. In terms of coverage, apart from the large corporations, private credit bureaus also focus on small and medium scale entrepreneurs often with richer data set. Finally, in terms of purpose, the private credit bureaus are established on account of the increasing demand for and need of information on borrowers in the financial sector. Therefore data on the private credit bureaus provide crucial information of borrower quality and is therefore used to proxy the level of information sharing or asymmetry in the domestic financial markets. We used credit to the private sector as percentage of GDP to proxy the quality of financial development. This measure, which accounts for credit advanced to the private sector thus propelling the utilization and allocation of funds to more efficient and productive activities has been extensively researched in the finance literature (Arcand et al., 2012; Levine et al., 2000; King and Levine, 1993a). While this proxy's financial access, as robustness checks, we used the banking system credit' on 'banking system deposits' to measure the efficiency of the banking system in financial development. The legal origin variables are the English common law, French, Portuguese and Belgian civil laws. Our main dependent variable is growth volatility where data on GDP growth rates are used to construct the fluctuations using the generalised autoregressive conditional heteroskedasticity (GARCH) developed by Bollerslev (1986). Real and monetary shocks proxied by terms of trade and inflation shocks respectively are similarly constructed using the GARCH (1, 1) process. The inflation variable is the annual percentage change in the consumer price index while terms of trade is the net barter terms of trade computed as the ratio of export to import price. Trade openness is taken as the ratio of sum of exports and imports to GDP. While data on the legal origin is taken from La Porta et al. (2008) and Asongu (2011), data on private credit bureau is sourced from African Development Bank. Data on all the remaining variables are gleaned from the World

Development Indicators (WDI) of the World Bank. Table 5.1 below presents the summary statistics of the variables.

Table 5.1: Summary statistics

Variables	Mean	Standard Dev	CV	Min.	Max.	Skewness	Kurtosis	Observations
Growth volatility	13.75	10.88	0.79	7.96	26.01	1.20	1.83	256
English	0.40	0.50	1.22	0.00	1.00	0.48	–1.73	256
French	0.42	0.49	1.04	0.00	1.00	0.32	–1.81	256
Portuguese	0.12	0.33	2.75	0.00	1.00	1.67	2.00	256
Belgian	0.06	0.21	3.50	0.00	1.00	0.42	1.07	256
Private credit	22.02	18.35	0.83	0.41	128.43	1.95	7.01	251
Bank credit	43.49	25.11	0.58	15.30	98.21	2.33	9.75	244
PCB	3.98	12.87	3.23	0	64.80	1.02	4.77	256
Terms of trade shock	1.93	0.22	0.11	0.31	3.01	–0.42	10.32	256
Inflation shock	3.96	0.95	0.24	1.33	6.70	–1.21	118.13	242
Trade openness	74.11	72.63	0.98	14.55	255.00	0.98	3.12	251

Notes: PCB, CV, Min. and Max. respectively denote public credit bureau, coefficient of variation, minimum and maximum.

Preliminary findings reveal that out of the sampled 33 countries, majority (42%) align with the French civil law relative to 40% of the English common law. While 12% are of the Portuguese legal origin where legal issues are adjudicated leveraging from the Portuguese civil laws, only 6% are Belgian legal origin which is aligned to the civil law. All variables are averaged over the sample period and suggest that private credit to GDP is 22% relative to the bank credit of 43.49%. To allow for inter-series comparison of variability, we compute the coefficient of variation (CV) as the ratio of standard deviation to mean. Values from the CV show a higher volatility of private credit proportional to bank credit. These taken together

may imply higher banking system efficiency relative to the financial system activity. The mean trade openness is 74.11% and has a reasonably large variability. Interestingly, all the series are positively skewed except the shock variables (inflation and terms of trade) which are skewed to the left. We report the correlation coefficients which reveal the level of association between the variables (see Table 5.2 below).

Table 5.2: Correlation coefficients

Variables	Economic volatility	Legal origins				Financial development		Info. sharing	Controls		
	Volatility (GARCH)	English	French	Portuguese	Belgian	Private credit	Bank credit	Public credit bureau	Terms of trade shock	Inflation shock	Trade openness
Volatility GARCH	1.00										
English	–0.242* (0.082)	1.00									
French	0.181 (0.200)	–0.831* (0.075)	1.00								
Portuguese	–0.133 (0.101)	–0.140** (0.046)	–0.512* (0.070)	1.00							
Belgian	–0.142 (0.111)	–0.201* (–0.081)	–0.132* (0.092)	–0.240** (0.041)	1.00						
Private credit	–0.164*** (0.001)	0.231** (0.017)	–0.564* (0.069)	0.631** (0.033)	0.431* (0.060)	1.00					
Bank credit	–0.210** (0.041)	0.363*** (0.002)	0.721** (0.040)	0.694* (0.060)	0.333* (0.051)	0.873*** (0.003)	1.00				
Private credit bureau	0.188 (0.217)	0.118 (0.102)	0.320 (0.447)	0.450 (0.200)	0.400 (0.142)	0.531** (0.034)	0.621* (0.086)	1.00			
Terms of trade shock	0.473** (0.026)	–0.555 (0.121)	–0.409* (0.084)	–0.592** (0.041)	–0.671** (0.037)	–0.502* (0.070)	–0.651** (0.027)	–0.211 (0.111)	1.00		
Inflation shock	0.221 (0.132)	0.692 (0.103)	0.723 (0.146)	0.620 (0.229)	0.542 (0.194)	0.522 (0.140)	0.631 (0.228)	–0.532* (0.060)	0.578* (0.051)	1.00	
Trade openness	–0.530*** (0.004)	0.761* (0.082)	0.663** (0.030)	–0.751* (0.059)	–0.667** (0.030)	0.771** (0.041)	0.231* (0.062)	–0.422* (0.055)	–0.612** (0.043)	0.612 (0.173)	1.00

Notes: *, ** and *** denote significance at 10, 5 and 1% respectively. Values in ( ) are the *p*–values.

The correlation coefficient reveals a positive and significant association between private credit, English, Belgian and Portuguese legal origins while negatively and significantly related with the French legal origin. However, bank credit is positively and significantly correlated with all the legal origins although its relationship with the French civil law countries is higher and lowest among the English common law. While bank credit and private credit have a very high correlation, their relationships with economic volatility are significantly negative. Interestingly, private credit bureau is positively correlated with all the variables although its relationship is only significant with the financial development proxies. While inflation shock is positively correlated with terms of trade shock, the relationship with private credit bureau is negative and slightly significant at 10%.

5.4.2 Empirical strategy

The objective of this chapter is to examine whether legal origins explain cross–country differences in financial development and volatility and how legal legacy interact with information sharing in economic fluctuations in SSA. Indeed, estimating such relationships using OLS pose endogeneity problems rendering the estimates biased and inconsistent. For instance, existence of robust legal environment shapes information sharing thus determining the quality of financial development and its impact on growth volatility. This is in synch with the law and finance literature.

It is imperative to note that, two main problems may occur in assessing the impact of financial development on growth volatility: endogeneity bias and reverse causality. Thus a more general antidote to the endogeneity is the use of instrumental variables where the current chapter adopts the two-stage least squares (2SLS) with heteroskedasticity–consistent standard errors. This approach which is also used by Beck et al., (2003b) relies on the

identification of structural system of equations with instruments that are weakly correlated with the endogenous regressor.

We consider a structural equation of the form:

$$Y_K = \gamma_0 + \gamma_1 X_1 + \gamma_2 X_2 + \ \ldots\ldots\ldots\ldots + \gamma_K X_K + \varepsilon_K \qquad (5.1)$$

where $E(\varepsilon) = 0$; $\quad COV(X_K,\ \varepsilon) = 0 \quad$ $j = 1, 2, 3, \ldots\ldots\ldots, K-1$

While the explanatory variables $X_1,\ X_2\ ,\ \ldots\ldots,\ X_{K-1}$ are exogenous, X_K is potentially endogenous in the structural equation (5.1) above necessitating the use of instrumental variables (IV). With X_K endogenous, we select an observable variable q_1 that satisfies two conditions: first q_1 must not be correlated with ε such that $COV(q_1,\ \varepsilon) = 0$. The second condition requires the linear projection of X_K onto all the exogenous variables. Thus, the linear relationship between the instrumented variable and the IVs is given in its reduced form in equation (5.2) below:

$$X_K = \lambda_0 + \lambda_1 X_1 + \lambda_2 X_2\ \ldots\ldots + \lambda_{K-1} X_{K-1} + \theta_1 q_1 + \theta_2 q_2 + \ \ldots\ldots\ldots\ldots + \theta_3 q_L + \epsilon_K \qquad (5.2)$$

where θ are the parameters of the IVs; ϵ_K which is the error term with $E(\epsilon_K) = 0$, is uncorrelated with each of the variables on the right hand side of the equation where $\theta \neq 0$. The implication is that q_L is partially correlated with X_K once the other exogenous variables $X_1, X_2, \ldots\ldots\ldots, X_{K-1}$ have been netted out (Wooldridge, 2002).

From the structural equation (5.1) and the reduced form for X_K, we derive a reduced form for Y by putting equation (5.2) into equation (5.1) and rearranging produces equation (5.3) below:

$$Y = \rho_0 + \rho_1 X_1 + \rho_2 X_2 + \ \ldots\ldots\ldots\ldots + \rho_{K-1} X_{K-1} + \ \theta_1 q_1 + \theta_2 q_2 + \ \ldots\ldots\ldots\ldots + \theta_L q_L + v \quad (5.3)$$

where $v = \varepsilon + \gamma_K \epsilon_K$ is the reduced form error; $\rho_j = \gamma_j + \gamma_K \lambda_j$ and $\theta_L = \gamma_K q_L$. We show that the assumptions made on the IV q solve the identification problem for γ_j in equation (5.4) by specifying a matrix form equation to be estimated as:

$$Y_i = \gamma^{|} X_i + \varepsilon_i \quad (5.4)$$

With *i*th row where X is an $n \times k$ matrix with n denoting the number of observations; ε is the error term which is independently and identically distributed with zero mean and variance–covariance $\sigma^2 I$ represented by $n \times n$ matrix Ω. The intercept is subsumed in X such that $X = (1,\ X_2, \ldots\ldots, X_K)$. In this form, the 2SLS selects a matrix of exogenous variables denoted by $q \equiv (1,\ X_2, \ldots\ldots, X_{K-1},\ q_1, q_2, \ldots\ldots\ldots,\ q_L)$ which is an $1\times K$ matrix.

From equation (5.4), the explanatory variables X are not correlated with the error term ε and we select the IV $q_1,\ q_2, \ldots\ldots\ldots,\ q_L$ which are exogenous and uncorrelated with ε_i, $COV[q_j,\ \varepsilon_i] = 0\ \in j = 1, 2, \ldots\ldots\ldots, L$. Indeed, these assumptions imply the K population orthogonality conditions $E(q^{|},\ \varepsilon) = 0$. By multiplying equation (5.4) through by $q^{|}$ and taking expectations together with the orthogonality condition produces:

$$[E(q^{|}X)]\gamma = E(q^{|}Y) \quad (5.5)$$

where $E(q^{|}X)$ is $K \times K$ and $E(q^{|}Y)$ is $K \times 1$.

Equation (5.5) is a system of K linear equations in the γ unknowns $\gamma_1, \gamma_2, \ldots\ldots, \gamma_K$. In the presence of full rank, equation (5.5) yields a unique solution as:

$$\gamma = \left[E\left(q^{|}X\right)\right]^{-1} E\left(q^{|}Y\right) \tag{5.6}$$

where expectations $\left[E\left(q^{|}X\right)\right]$ and $E\left(q^{|}Y\right)$ can be consistently estimated relying on a random sample on ($X,\ Y,\ q$). With a random sample $\{(X_i,\ \ Y_i,\ \ q_i): i = j = 1, 2, \ldots\ldots\ldots\ldots, N\}$ from the population, the IV estimator of γ is therefore estimated as:

$$\hat{\gamma} = \left(N^{-1}\sum_{i=1}^{N} q_i^{|}x_i\right)^{-1}\left(N^{-1}\sum_{i=1}^{N} q_i^{|}y_i\right) = \left(Q^{|}X\right)^{-1}Q^{|}Y \tag{5.7}$$

where Q and X are $N \times K$ matrices and Y is the $N \times 1$ vector on the Y_i.

When the order condition of the above equation (5.7) is met, the IV estimator $\hat{\gamma}$ can be found under the condition that there are as many instruments as the endogenous variables. There is exact identification if the number of instruments is equal to the number of endogenous regressors. However, where these are unequal, there is under-identification when the number of instruments is less than that of the exogenous regressors otherwise our equation is over-identified.

The lose IV estimation is under the presumption that the error matrix is homoskedastic $COV\left(\varepsilon\varepsilon^{|}\right) = \sigma^2 I$. However, what is evident in empirics is heteroskedasticity with $COV\left(\varepsilon\varepsilon^{|}\right) = \Omega = \sigma_i^2 I$.

Although the IV estimations are consistent notwithstanding, the estimation of the standard errors are inconsistent, which leads to diagnostic tests for endogeneity and over–identifying restrictions. We therefore use the heteroskedasticity-consistent standard errors in the estimation.

Given the overarching aim of this study, we address the issues of whether the exogenous legal origins explain financial development and the propensity of the exogenous components of finance to account to cross–country differences in growth volatility besides the financial development. We examine this by specifying our first stage regression as:

$$Finance_{it} = \gamma_1[English_i] + \gamma_2[French_i] + \gamma_3[Portuguese_i] + \gamma_4[Blocs_i] + \delta X_{it} + v_{it} \quad (5.8)$$

In the second stage, we estimate the following regression:

$$Volatility_{it} = \gamma_1 Finance_{it} + \varphi[Inter_{it}] + \delta X_{it} + u_{it} \quad (5.9)$$

In both regressions, $Blocs$ is a set of the regional blocs while X denotes a vector of the exogenous variables that are included in the second stage regression. We include an interaction term, $Inter$, of legal origin and private credit bureau to account for the indirect influence of law on volatility through information sharing. The error terms in the first and second stage regressions are v and u, respectively.

Following Levine at al. (2000) and Beck et al., (2003b), we use a set of dummy variables representing differences in legal systems and origins as instruments for financial development. Our instruments are legal origin dummies comprising English (= 1 for British legal origin and = 0 otherwise), French (= 1 for French legal origin and = 0 otherwise) and Portuguese (= 1 for Portuguese legal origin and = 0 otherwise) and Belgian (= 1 for Belgian legal origin and = 0 otherwise). Of course, only three of the legal origin dummies (English, French and Portuguese) enter the regression while the Belgian legal origin serves as reference.

Once determined, legal origins stay the same by their nature and may be uncorrelated with growth volatility beyond their relationship with financial development and information sharing. La Porta et al., (1998a) show that legal origin crucially shapes national approaches to laws concerning borrowers and lenders and the efficiency with which those laws are broadly applied. Indeed, beyond effective enforcement, since finance is based on contracts, legal origins that produce laws that protect the rights of external investors and lenders will perform a correspondingly better job at increasing (reducing) information sharing (asymmetry). By recognizing that concealing vital information with regard to borrower traits and credit worthiness is punishable by law, borrowers reveal their "true" qualities to lenders. With this, legal origin promotes financial development. By considering legal origins as not affected by the growth volatility, it satisfies only one of the two requirements for a set of instruments to be regarded as valid. The second requirement is the correlation between the set of instruments and the endogenous regressor. We empirically assess whether our choice of instruments satisfies the exogeneity requirement by conducting the over–identifying restrictions (OIR) test.[25] Relative to the number of the endogenous explaining variables and an attempt to mitigate the constraints of the Sargan's OIR test, we include three additional dummies principally used as instruments. Our additional instruments are the regional blocs comprising Western Africa (= 1 for Western African country and = 0 otherwise), Southern African (= 1 for Southern African country and = 0 otherwise) and Eastern Africa (= 1 for Eastern African country and = 0 otherwise) and Central Africa (= 1 for Central Africa and = 0 otherwise). Similarly, only three of the blocs dummies (Western, Southern and Eastern) enter the regression while the Central Africa bloc is used as the base group.

[25] It is imperative to note that the Sargan OIR test for instrument validity is feasible only in case of over–identification (where the instruments must be higher than the endogenous explaining variables by at least one degree of freedom).

5.5 Findings and discussions

We examine the importance of legal origin in explaining cross-country differences in growth volatility. In other words, we assess the ability of legal origins to explain the cross-country variations in information sharing and financial development, and the propensity of the exogenous components of finance and information sharing channels to account for the differences in country's growth volatility. In Table 5.3, we regress financial development both in terms of financial activity and banking efficiency on English, French and Portuguese legal origin dummies. This is done first at two levels: without (Columns 1 and 3) and with control variables (Columns 2 and 4). Our joint significance test with the Fisher test reveals that legal origins jointly and significantly influence growth volatility suggesting that disaggregating countries by their legal origin reveals the cross-country differences in growth volatility.

In the proceeding section, we examine by OLS the importance of legal origin in explaining cross-country differences in financial development. In other words, we assess the ability of legal origins to explain the variations in financial system activity as well as the banking system efficiency. We regress the former (private credit) and the latter (bank credit on bank deposit) on the legal traditions both with and without controls. Imperatively, the regression of financial development on the instruments is a crucial precondition in the estimation of the 2SLS. Indeed, these first stage regressions provided in Table 5.3 below provide opportunity for testing the strength of the instruments. Our results provide ample evidence that the set of instruments significantly determine the endogenous regressors of both financial system activity (private credit–to–GDP) and banking system efficiency (bank credit on bank deposits). The values of the *F*–statistics suggest that legal origins importantly explain the differences in financial development among countries in SSA.

Table 5.3: Legal origins, financial development and information asymmetry

Variables	First stage regressions			
	Financial system activity (Private credit–to–GDP)		Banking system efficiency (Bank credit on bank deposits)	
	1	2	3	4
Legal origin:				
English	0.371**	0.402***	0.391**	0.442**
	(2.902)	(3.101)	(2.757)	(2.751)
French	0.194***	0.200***	0.291***	0.296***
	(3.812)	(2.915)	(3.713)	(3.812)
Portuguese	0.228**	0.293***	0.301***	0.321**
	(2.011)	(3.152)	(3.910)	(2.750)
Regional blocs:				
Western Africa	0.201**	0.228***	0.232***	0.259**
	(2.370)	(3.072)	(4.094)	(2.610)
Southern Africa	0.337***	0.3500**	0.341***	0.372**
	(4.901)	(2.011)	(3.523)	(2.341)
Eastern Africa	0.177*	0.195**	0.180**	0.197**
	(1.955)	(2.315)	(2.097)	(2.160)
Controls:				
Private credit bureau		0.271**		0.114***
		(2.111)		(1.982)
Term of trade shock		0.159**		0.311***
		(2.730)		(3.015)
Inflation shock		–0.221***		–0.301
		(–4.012)		(–2.731)
Trade openness		0.092***		0.271***
		(5.011)		(3.301)
Diagnostics:				
F–test (instruments)	24.11	16.01	25.24	18.90
Adjusted R^2	0.35	0.47	0.33	0.42
No. of observations	184	184	173	173

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

More specifically, with regard to Column 1 and 3, our evidence shows that, British common law countries have significantly higher levels of financial system activity and banking system efficiency than the French civil law countries which have relatively lower private credit. Countries that have adopted the Portuguese civil law have significantly higher financial system activity and lies in between the English and French civil law countries. Further finding reveals higher banking system efficiency in all the legal origin dummies relative to

the financial system activity. We include the control variables in Columns 2 and 4 and our findings on legal origin–financial development nexuses are robustly positive and significant. Consistently with the earlier finding, English common law countries dominate in the banking efficiency followed by the Portuguese civil laws which has higher bank credit on bank deposits relative to the French civil laws.

With regard to the regional blocs, relative to Central Africa, our findings reveal higher financial activity and efficiency among Southern African countries compared to Western and Eastern Africa. Eastern African countries have the lowest financial development while Western African is between the two blocs. For both financial development indicators, coefficients of the regional dummies are higher when we include the controls although banking system efficiency is consistently higher relative to the financial sector activity. To the extent that about 62% of the Southern African countries fall under the English legal origin confirms our earlier evidence that financial development is higher among countries that adopts the English legal doctrines. Moreover, based on our sample, 50% of the Western African countries follow the French legal legacy which is relatively lower compared to the English common law countries in relation to the levels of financial sector development. Our sample evidence by far confirms Mundell's (1972) conjecture that financial development is higher among Anglophone countries relative to the Francophone countries.

Turning to the controls, terms of trade shock is associated with higher financial activity given the sign of the coefficient. As economies are hit by real external shocks, agents in the large tradable sector recalibrate their investment and consumption choices resulting in higher demand for financial resources. However, an increase in monetary shock reduces the amount of private credit available. Our evidence suggests that economies with higher inflation variability are likely to have less active financial activity and less efficient banking systems.

A standard elucidation is that higher inflation volatility is associated with greater uncertainty. In the face of information asymmetry, the problem is particularly exacerbated when collateral is required for the efficient functioning of borrowing and lending markets. With low returns on capital during inflationary episodes, the disincentive to save due to high monetary shock inhibits the accumulation of collateral and thereby militating against financial intermediation (Altig, 2003). The negative relationship between monetary shock and financial sector development may also be an indication of financial repression (see Rousseau and Wachtel, 2001; McKinnon, 1973; Shaw, 1973). Moreover, a percentage increase in trade openness significantly improves financial system activity by 0.092 percentage points. With more openness, there is demand for both external and internal finance hence higher financial activity and efficiency. Indeed, de–restricting international trade allows the entry of efficient financial sector institutions from abroad with a positive spill–over into the domestic financial system which increases both in terms of size and quality. Undoubtedly, openness may potentially be associated with greater risks, including exposure to external real shocks and foreign competition consequently encouraging the development of financial markets largely through the rising demand for finance that can be used to diversify such risks and allow firms to surmount short term liquidity constraints or adverse shocks. Thus, openness enhances financial sector development through the demand side (Svaleryd and Vlachos, 2002).

As regards to the impact of the covariates on the banking system efficiency, our evidence reveals that only the effects of private credit bureau, terms of trade shock and openness are significant. The coefficients of private credit bureau are positive suggesting that higher information sharing is associated with higher financial development. More specifically, a percentage increase in information sharing significantly spurs financial system activity – private credit to GDP – by 0.271 percentage–points. In the case of efficiency of the banking

system, higher private credit bureau increases bank credit on bank deposits by 0.114 percentage points clearly highlighting the importance of reducing information asymmetry in the financial sector. Information sharing bureaus are primarily designed to reduce information gap between lenders and borrowers thus increasing financial access in the formal financial sector. Specifically, it does this by mitigating moral hazard on the part of borrowers and adverse selection on the part of lenders. This finding is particularly consistent with Tchamyou and Asongu (2016).

What is also noticeable is that, while terms of trade shock improves financial development, its impact is higher in the banking system efficiency than the financial system activity. In the same view, the impact of openness on efficiency is almost three times higher compared to the financial system activity. Relative to the private credit, inflation shock does not have any influence on bank credit on deposits although it enters with a negative sign.

In the next section, we assess whether the exogenous components of financial development explain volatility and whether legal framework explains economic volatility through some other sources apart from finance. We do this using the 2SLS with heteroskedasticity and autocorrelation consistent standard errors. This is done first at two levels: first without and second with control variables. We flatly reject the null hypothesis of the Hausman tests in all the models suggesting the presence of endogeneity/simultaneity bias thus justifying our use of the 2SLS approach.

Table 5.4: Legal origins, growth volatility and information asymmetry

Variables	Second stage regressions					
	Economic Volatility (GARCH)			Economic Volatility (Standard deviation)		
	1	2	3	4	5	6
Legal origin:						
English	–3.781*** (–5.022)	–3.979*** (–5.771)	–3.981*** (–4.310)	–5.021*** (–3.781)	–5.754*** (–4.731)	–4.012*** (–3.117)
French	–2.803*** (–3.755)	–1.934** (–2.017)	–2.111** (–2.312)	–2.016** (–2.751)	–4.481** (–2.750)	–3.230** (–2.021)
Portuguese	–2.019*** (–4.663)	–1.681** (–2.925)	–1.995* (–1.961)	–1.992*** (–3.217)	–0.981** (–2.045)	–0.182** (–2.399)
Regional blocs:						
Western Africa	–3.012** (–2.042)	–3.191*** (–3.401)	–3.211** (–2.630)	–3.312*** (–3.753)	–3.379** (–2.601)	–3.441*** (–3.991)
Southern Africa	–4.022** (–2.310)	–4.190** (–2.281)	–4.201*** (–4.049)	–4.311** (–2.710)	–4.471*** (–3.231)	–4.801*** (–4.113)
Eastern Africa	–1.878** (–2.511)	–1.993** (–2.403)	–2.151** (–2.620)	–1.902** (–2.351)	–2.120*** (–3.710)	–2.190** (–2.117)
Controls*:*						
PCB		–0.301** (–2.104)	–		–0.198** (–2.156)	–
Private credit to GDP		–0.721** (–2.055)	–0.588** (–2.731)		–0.201*** (–3.040)	–0.141** (–2.903)
Bank credit on bank deposits		–0.511** (–2.034)	–0.500** (–2.722)		–0.432*** (–3.281)	–0.250*** (–3.099)
Terms of trade shock		0.055*** (2.214)	–		0.041* (1.971)	–
Inflation shock		0.097** (2.751)	–		0.028*** (3.771)	–
Transmission:						
English and PCB			–0.921*** (–4.925)			–0.840** (–2.351)
French and PCB			–0.601** (–2.891)			–0.520*** (–3.053)
Portuguese and PCB			–0.442* (–1.901)			–0.372** (–2.055)
Diagnostics:						
Hausman test	25.78	32.01	41.87	21.88	38.92	46.35
OIR (Sargan) test [*p*–value]	9.21 [0.002]	11.55 [0.000]	12.58 [0.000]	8.37 [0.003]	9.61 [0.001]	10.69 [0.000]
Cragg–Donald Wald *F*–test	22.45	19.01	17.34	25.87	21.98	19.51
Number of obs.	162	162	162	155	155	155

Notes: *, ** and *** respectively denote significance at 10, 5 and 1%. Values in the parentheses ( ) are the robust *t*–statistic. PCB refers to private credit bureau.

Overall, our findings show that legal origins dampen growth volatility. More specifically, growth volatility reduction is higher (lower) among countries with the English (Portuguese) while French legal origin lies between the English and Portuguese civil laws (Column 1). The implication is that countries with the English common laws are faster in faltering growth vagaries while those with Portuguese legal origin are slower. In Column 2, we estimate legal origin–volatility by including our controls. Our findings show robust and overwhelming evidence that legal origin matter in growth fluctuations. More specifically, the rate at which economic volatility is dampened is faster in English common law countries than those with the French civil laws. Countries with the Portuguese legal origin are however between the English and French legal origins. By including our covariates, what is apparent from the finding is that, while the coefficient of English common law decreased suggesting a further dampening of vagaries, inclusion of the controls marginally exacerbates volatility among the French and Portuguese legal origins although the direction of effect is negative.

With regard to the regional blocs, relative to Central Africa, our findings reveal negative relationship between the regional blocs and growth volatility among Southern African countries compared to Western and Eastern Africa. The coefficients of Southern Africa are more negative hence experience lowest economic volatility. Moreover, the coefficients of Eastern Africa denote higher volatility since the coefficients are relatively less negative. Relative to Central Africa, countries in Western Africa have relatively lower volatility and effects fall within the Southern and Eastern African countries. Interestingly, for all the blocs, volatility is lower when measured with the GARCH compared to the standard deviation measure (Columns 4 and 6). This notwithstanding, whether measured with conditional or unconditional volatility, the dampening effect is higher when controls and transmission channels are successively introduced given the more negative coefficients.

Turning to the impact of the controls on growth volatility, the coefficients of private credit bureau are negative suggesting that higher (lower) information sharing (asymmetry) dampens growth volatility albeit insignificantly. The implication is that the mere existence of private credit bureau does not translate into reduced volatility.

On the effects of the control variables on growth volatility, the coefficients of private credit bureau are negative suggesting that higher (lower) information sharing (asymmetry) dampens growth volatility and significantly. The implication is that existence of private credit bureau appears useful for reducing volatility. Our evidence suggests that financial sector development is associated with reduced economic fluctuations although the elasticity effect of financial system activity is huge relative to the banking system efficiency. Specifically, the elasticity effect of private credit to GDP is at least 1.4 times larger than the banking system efficiency (Column 2). Thus, although efficiency in the banking sector dampens growth, the drive to do this is subdued in the face of financial sector activity. The implication is that higher financial development is associated with lower volatility. More importantly, improved financial systems should facilitate a closer match between savers and investors, promotes diversification and potentially reducing risks and fluctuations. Thus, financially underdeveloped economies are expected to experience higher economic volatility thus projecting the beneficial effect of financial activity and banking system efficiency in smoothing growth volatility in countries with well–developed financial sector.

The coefficients of terms of trade shock are robustly positive suggesting that increases in terms of trade shocks heighten volatilities. Terms of trade shock however magnifies growth volatility by 0.055% following a 1% real external shock. Arguably, variations in the terms of trade affect the economy through relative price fluctuations of imported input and exported

output. As such, shock to terms of trade is expected to directly affect the tradable sector and indirectly impacts on the non-tradable sector. It therefore presupposes that, economies with huge non-tradable sector will be relatively immune to real shocks. Our finding therefore highlights the dependency nature on primary commodities of our sampled countries hence the relationship between the terms of trade shock and economic fluctuation is unsurprising.

Growth volatility is also positively associated with monetary shock proxied by inflation shock. Our finding shows that, a percentage rise in monetary shock heightens fluctuations by 0.097 percentage–points. Monetary shock amplifies economic volatility. In fact, theory suggests that whether economic fluctuation is magnified or dampened by inflation volatility well depends on the source of the shock. Monetary shock is expected to stem the tide of macroeconomic volatility when shock originates from wage-setting but not when emanating from aggregate demand (see De Long and Summers, 1986; Driskill and Sheffrin, 1986). To the extent that monetary shock proxied by inflation fluctuation amplifies volatility underlines the key contribution of aggregate demand in the region's economic volatility. And as argued by Ibrahim and Alagidede (2017), higher aggregate demand can be associated with higher inflation especially when the growing demand does not follow a higher productivity and output.

Consistent with the instrumental variable estimation techniques, we test for the OIR using the Sargan's test. The null hypothesis of the test shows that our set of instruments does not suffer from endogeneity as the exogenous components are uncorrelated with the error terms in the second stage regressions. These findings therefore suggest legal origins explain economic volatility via other transmission channels beyond financial system activity and banking efficiency.

From a theoretical point of view legal origin may negatively affect growth volatility in several ways. Direct negative effects could come through improvement in institutional framework, improved regulation, corporate governance and efficiency in doing business due to the protection of investor and/or shareholder rights. Apart from the direct dampening effect of legal origin on volatility, existence of efficient legal systems may improve the allocation of capital. Moreover, the legal tradition indirectly falters growth volatility through its effect on information sharing. Without information sharing, lenders are unable to monitor and advice on the investment decision of borrowers. In this case, borrowers may end up using the borrowed funds to finance unproductive investments thereby increase economic volatility. However, with the existence of efficient laws and with the fear of being prosecuted for concealing information on their credit worthiness and investment choices, borrowers are compelled to disclose these information leading to less volatility. We examine this indirect channel by introducing interaction terms of the legal origins and private credit bureau, our proxy for information asymmetry. In Column 3, our findings are consistent with our hypothesis and show that apart from the direct effect, legal origin dampens growth volatility by reducing information asymmetry. The coefficients of the interaction terms are negative and statistically significant at conventional levels.[26] The indirect effect of the legal traditions is higher in English common law countries followed by the French civil law tradition. The impact of the Portuguese civil law regimes on volatility through the private credit bureau is lower and slightly significant at 10%. The lower intrinsic characteristic of the Portuguese civil law to exert large dampening effect on volatility can be attributed to its weak deterrent nature in compelling borrowers to succumb to full disclosure. The marginal effect of English, French and Portuguese legal origins on private credit bureau for growth volatility is –0.921, –0.601 and –0.442 respectively with a corresponding net effect of –0.679, –0.583 and –

[26] Here, we do not include the real and monetary shocks as exogenous variables as their inclusion will make the Sargan's OIR impossible due to over–identification. Specifically, the number of exogenous variables will exceed that of the instruments.

0.354.[27] These findings are far reaching implying that, information about corporations and borrowers is critical for exerting corporate governance and identifying the best investments. Not only is the relationship between the interaction term of legal origin and private credit bureau and volatility negative and statistically significant, it is economically large for the English legal legacy. Thus, countries that enforce contracts effectively, protects shareholder and lender rights have better information sharing and reduced information asymmetry than countries with lax legal system. Invariably, what is apparent from the finding is that, higher information sharing interacted with legal origin by far falters volatility.

Apart from OIR test, we test for the strength or otherwise the weakness of instruments using Cragg–Donald Wald *F*–test. For each regression, Wald *F*–test statistic exceeded the critical values at 5% significance level implying a rejection of the weak instruments. Thus, our instruments are not only valid but are sufficiently strong. Indeed, our results are robust even after including the transmission channels. The coefficients of the legal origins remain negative and statistically significant and so are the financial development indicators. However, the ability of both financial system activity (private credit–to–GDP) and banking system efficiency (bank credit on bank deposit) to tame volatility following their individual rise is lower relative to the model without the interaction term (Column 2). The effects of legal origin and regional blocs are robustly negative and statistically even after controlling for the transmission channels (Column 3). Here, both indicators of financial sector development are also negative and significant at 5% although the volatility–dampening effect of private credit is higher. With regard to the transmission channels, the coefficients of the interaction terms are negative and statistically significant. The implication is that legal origin significantly dampens growth volatility through information sharing proxied by the private

[27] This is computed as [(Mean value of the respective legal origin) × coefficient of transmission channel) + coefficient of private credit bureau].

credit bureau. Given this, we note the volatility elasticity is higher in English common law countries and lower in Portuguese civil law countries. Specifically, the volatility–reducing effect of the English common law is greater and averages at least 2.1 times higher than Portuguese legal origin while countries with the French civil law origins are within the English and Portuguese legal tradition effects (Column 3).

In Columns 4 through to 6, we provide a sensitivity checks by regressing economic volatility using standard deviation of growth rates on the exogenous variables. In Column 4, the coefficients of legal traditions are negative and statistically significant at conventional levels with huge impact registered in the English common law countries relative to the Portuguese civil law. Countries with the French civil law doctrines fall between the English and French legal origins. The value of the *F*–test statistic is consistent with the earlier finding suggesting that grouping countries by their legal procedure provides an important conduit for explaining the variations in growth volatility in SSA. Even after including covariates, volatility is negatively associated with legal origins. Interestingly, while the dampening volatility effect of the English common laws and French civil laws increased, there is reduced volatility elasticity effect of the Portuguese legal origin.

Although both real and monetary shocks heighten volatility, what is clear from the finding is that, relative to real shocks, monetary shocks appear to be an important driver of economic fluctuations. In the last Column, we include the interaction term of legal origins and information asymmetry to examine how it affects volatility proxied by the standard deviation of growth rates. Consistent with the earlier finding, the coefficients of the interaction terms are negative and statistically significant albeit varying magnitudes. For instance, volatility–reducing effect of the English common law is greater and averages at least 2.3 times higher than Portuguese legal origin while countries with the French civil law origins are within the

English and Portuguese legal tradition effects. Although the effect of private credit bureau is negative and significant, juxtaposing the impact of private credit bureau on volatility on one hand (Columns 2 and 5) and that of transmission channel on the other (Columns 3 and 6) suggests that, the establishment of information sharing office per se may be insufficient but the effectiveness of the law is relevant in faltering economic volatility. In other words, our findings reaffirm the hypothesis that effectiveness of the legal origin reduces information asymmetry between borrowers and lenders culminating in smoother growth volatility. In this model, the coefficients of legal origin are still robustly negative evidencing their dampening volatility effects. Indeed, effectiveness of the prevailing legal system propels economic agents to disclose key borrower information to information sharing bureaus which are subsequently accessed by financial institutions in pursuing their intermediation roles. Thus, improvement of the informational efficiency permitted by effective legal regime by far improves the production of *ex ante* and *ex post* information about possible investment and delegated monitoring thereby taming volatility.

5.6 Policy implications and recommendations

We discuss key policy implications arising from the study. We have found that legal origins matter in explaining cross–country differences in financial development. More importantly, countries with English common laws experience higher levels of financial activity and banking system efficiency since their legal legacy largely champion private property rights on the back of its responsiveness to changing country's economic and social environment. Indeed, the financial needs of the economy continue to change so that more flexible legal frameworks are better placed at advancing financial development relative to more rigid systems. Undoubtedly, these conditions are fertile grounds for financial sector development.

One important finding documented is the finance–enhancing role of private credit bureau. Theory suggests that information sharing bureaus are expected to facilitate efficient resource allocation in financial intermediation by reducing information asymmetry between borrowers and lenders. Difficulty in accessing corporate records compels financial institutions to rely on local market and community knowledge. While this may appear a norm, it inhibits the financial sector's role in intermediation that supports efficient resource allocation for increased economic growth. Admittedly, fuzzy information investor creditworthiness does not ensure reliable underwriting thus exposing banks to fraud. Apart from their vulnerability to fraud, financial institutions are unable to monitor projects that get funded paving the way for investors to invest in projects with no or low returns thus exacerbating economic volatility. Thus, the establishment of information sharing office may therefore aid in smoothening fluctuations. While this holds, our finding further shows that the efficiency of the information sharing office and the volatility–reducing effect of private credit bureaus by far depends on how effective the transplanted legal system is in forcing economic agents (such as borrowers and investors) to disclose accurate information in promoting effective capital allocation consistent with long run growth. Thus, countries that grant excessive power to State, and those laws that sluggishly respond to the changing financial needs will experience lower financial sector development and higher volatility. Conclusively, apart from the direct effect of the legal origin, the ineffective prevailing legal systems may be unable to commit agents to fully disclose key information on their credit risk and investment choice. Consequently, bad projects get funded exacerbating growth volatility owing to moral hazards on the part of borrowers.

At the policy level, the relatively sizable effect of private credit bureau highlights some critical issues as regards the best approaches to improve on information sharing. Structural changes in the economy may be an important requirement for arresting volatility as these

ensures stronger domestic institutions necessary for maintaining macroeconomic stability. On the back of this is the need for the judicial system to maintain more agile and effective legal systems that are responsive to changing financial landscape while forcing economic agents to full information disclosure. Developing information sharing bureaus in SSA may present vital space for facilitating the efficient resource allocation role of the financial sector. Once established, information sharing offices should affect the operations of lenders and every economically active individual or firm within country borders. Irrespective of the legal origin, financial institutions may be restricted to ensuring confidentiality in terms of disclosing customer information to third parties. Following from the need to reduce (promote) information asymmetry (sharing) aimed at efficient capital allocations and hence stable macro-economy, it is important for legal frameworks to confer rights on financial institutions to share key information with credit bureaus under their credit contractual agreements. This has imperative implications for credit culture and changing the overall economic behaviour of agents. However, improving information infrastructure for efficient resource allocation is conditioned on the existence of well–functional legal and regulatory systems.

5.7 Conclusion

Previous studies on law–finance literature have failed to (i) engage the crucial role of law in financial development in the light of evolving legal systems in SSA as well as (ii) examine how legal origin explain cross–country differences in economic volatility. In addition, how effectiveness of law shape or limit information sharing in growth volatility is not thoroughly explored. The aim of this study has therefore been to (i) examine whether cross-country differences in financial development and economic volatility can be explained by differences in legal origins in SSA and (ii) how legal origin interact with information sharing in influencing growth volatility.

Our evidence suggests that legal origin significantly explains cross–country differences in financial development and economic volatility. More importantly, English common law countries and those in Southern Africa have higher financial sector development both in terms of activity and efficiency on the back of lower volatility. Specifically, volatility–reducing effect of the English common law is higher than Portuguese legal origin while countries with the French civil law origins are within the two. While private credit bureau positively (negatively) impact on financial sector development (economic volatility), the latter effect is conditioned on the form of legal origin suggesting that, the establishment of information sharing offices per se may be insufficient in taming growth vagaries but the effectiveness of law is exceedingly relevant. At the policy front, maintaining more agile and effective legal systems that are responsive to changing financial landscape while forcing economic agents to improve informational infrastructure is healthy for both financial sector development and macroeconomic stability.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1 Introduction

This final chapter is divided into four sections. This section introduces the chapter while the next section summarizes and concludes the study. Key policy recommendations are proffered in section 3 with the last section providing areas necessitating further research efforts.

6.2 Summary and conclusions

This study re–examined the linkages between financial sector development and economic growth in sub–Saharan Africa (SSA) with regard to some critical themes previously missing in the literature. Specifically, the study took a new dimension through its examination of the economic growth effect of relative speed of growth in financial and real sectors. The study also examined whether the finance–growth nexus is mediated by important threshold variables. Beyond these, the current study also investigated the channels through which financial development affects growth volatility and how legal origin interacts with information asymmetry in growth volatility. This thesis thus focused on salient areas in finance–growth nexus that have not seen much attention in the literature. Specifically, the study provided answers to the following research questions:

1. Is the effect of financial development on economic growth contingent on the relative speed of growth in finance and real sector?
2. To what extent is the overall impact of finance on growth threshold specific?
3. What is the nature and channels through which financial development affects growth volatility?

4. How do the legal system and information asymmetry play out in financial development and volatility?

6.2.1 Finance–economic growth relationship under unbalanced sectoral growth

By employing the generalized methods of moments (GMM), the study examined the effect on economic growth when financial sector growth outstrips the solvency needs of the real sector. Our overall findings reveal that while financial development supports economic growth, the extent to which finance helps growth depends crucially on the simultaneous growth of real and financial sectors as excess finance hurts growth. The elasticity of growth to changes in either size of the real sector or financial sector is higher under balanced sectoral growth. We also show that rapid and unbridled credit growth comes at a huge cost to economic growth with consequences stemming from financing of risky and unsustainable investments coupled with superfluous consumption fuelling inflation. However, the pass–through excess finance–economic growth effect via the investment channel is stronger.

6.2.2 Thresholds in financial development and economic growth nexus

Investigating whether the impact of finance on growth is conditioned on the mediating variables namely initial levels of countries' income per capita, human capital and financial development, findings from the sample splitting and threshold estimations showed that while financial development is positively and significantly associated with economic growth, our evidence suggests that, in almost all the threshold variables, below a certain estimated threshold, financial sector development is positively and insignificantly related to growth. In other words, below the threshold level of per capita income, human capital and the level of finance, economic growth is largely insensitive to financial development while significantly influencing economic activity for countries above the thresholds. The main conclusion drawn

is that higher level of finance is a necessary condition in long run growth and so are the overall level of income and human capital.

6.2.3 Effect and channels through which finance affects economic volatility

We disaggregated volatility into its various components relying on the spectral approach in studying the effect of financial development on volatility as well as channels through which finance affects these volatility components by invoking dynamic panel estimation techniques. The study found that while financial sector development affects business cycle volatility in a non–linear fashion, its impact on long run fluctuation is imaginary. More specifically, well–developed financial sectors dampen volatility. The findings also revealed that while monetary shocks have large magnifying effect on volatility, their effect in the short run is minuscule. The reverse, however, holds for real shocks. The channels of manifestation shows that financial development dampens (magnifies) the effect of real shocks (monetary shocks) on the components of volatility with the dampening effects consistently larger only in the short run.

6.2.4 Finance–legal origin–volatility linkages and the role of information sharing

The study re–interrogated the role of law in financial development in the light of evolving legal systems in SSA as well as how legal origin explain cross–country differences in economic volatility through its effect on information asymmetry relying on two–stage–least–squares (2SLS). Our evidence suggests that legal origin significantly explains cross–country differences in financial development and economic volatility. More importantly, relative to civil law, English common law countries and those in Southern Africa have higher financial sector development both in terms of financial activity and banking efficiency on the back of lower volatility. While private credit bureau positively (negatively) affects financial

development (economic volatility) with economically large impact for English legal legacy countries, the latter effect is contingent on the form of legal origin suggesting that, the establishment of information sharing offices per se may be insufficient in taming growth vagaries. The effectiveness of law is exceedingly relevant.

6.3 Policy implications and recommendations

In an attempt to improve their growth performance through the financial sector, countries in SSA implemented some financial reform measures with view to eliminating financial repression and increasing financial deepening. Majority of the credit boom occurred during the financial reforms period that many SSA countries embarked on. The differences in boom incidence across our sample suggest that local structural, institutional and domestic policy paths are crucial.

The level of financial sector supervision has a bearing on the enforcement of bank regulation and the effectiveness with which supervisory discretion is applied to deal with hypertrophic finance and early symptoms of credit boom. Central Banks are best placed to act as lender of last resort and supplying adequate liquidity to the financial and real sectors of the economy through the use of the open market operations and direct application of the reserve requirement. What is needed here is a good understanding of the optimal level of credit consistent with long run economic growth. There is the need for policy makers to continuously conduct needs assessment of real sector credit demand and leverage sustainability levels, both in order to prevent excess finance and to identify those firms or sectors of the economy that need to undergo a deleveraging exercise.

Apart from developing a legal framework to guide the extension of credit, Central Banks in SSA need to aggressively comply with the Basel III framework which establishes tougher capital standards through more restrictive and stringent capital definitions, higher risk-weighted assets, additional capital buffers and higher requirements for minimum capital ratios. A broader macro–prudential goal of sound financial system that supports real sector growth can be achieved when a clear approach that progressively imposes a capital buffer for the financial sector during periods of credit boom reflected in private sector credit exceeding its long term trend is identified.

Given the threshold effects mediated by the initial conditions, it is important for countries to first improve their income levels as a way of increasing growth through the financial sector. As long as a country's per capita income is above the threshold, finance drives growth. This is rightly so because as income levels increase, agents begin to demand for more financial services thus improving financial intermediation thereby increasing the impact of finance on growth. It therefore suggests that policies aimed at reducing the rather high rates of poverty in the sub–region potentially improve the finance–growth linkage. Building the human capital is also crucial in mediating the overall impact of finance on economic growth. Our evidence follows that, as human capital accumulation increase, agents' risk taking behaviour increases which enhances investment and credit demand and may eventually expands the financial system. More so, higher human capital permits innovation and use of technology thus improving financial sector efficiency which is crucial for accelerating faster economic growth. Following from this finding, it is imperative for countries in SSA to encourage school enrolment while reducing the pupil teacher ratios. In all these, it is important for education policy makers to improve on the curricular in such a way that guarantee teacher motivation and inspires ingenuity.

To the extent that economic fluctuations are less volatile with developed financial sector, uncontrolled financial development associated with over developed financial sector is not healthy given the nonlinear relationship between financial development and volatility. While developed financial systems tend to be more efficient in identifying those firms that wrongly overstate the extent of their liquidity, over developed financial sector is often associated with excessive credit growth to the private sector thus permitting the financing of unsustainable projects magnifying business cycle volatility. Thus, knowledge of firms' solvency needs and proper supervision is therefore needed to ensure that credit advanced is consistent with the needs of firms because in the end, the behaviour of those firms are inhibited by the financial sectors' unwillingness to lend. It is expected that, business cycles will smoother following financial institutions' effective use of available information about potential borrowers and cash flow needs. Encouraging financial development for its own sake may be counter-productive. Policy makers should rather seek to strengthen the appropriate size and quality of finance rather than expanding the financial sector.

Another crucial finding is that volatility caused by monetary shocks is more imperative and persistent than that caused by real shocks and financial underdevelopment of SSA. To the extent that factors influencing fluctuations are largely internal suggests that stabilizing exogenous shocks to control the sub–regions long run macroeconomic volatility may be ineffective. Thus, irrespective of the nature of shock, domestic structural changes may be an important prerequisite for reducing volatility.

We therefore recommend that, strengthening supervision, including cross-border oversight is important in examining the right levels of finance necessary to falter economic fluctuations. Because enforcement of prudential standards remains lax, providing supervisors with more enforcement power and strengthening the capacity of Central Banks should be the core in

financial sector development process. Moreover, leveraging on the importance of monetary shocks in propagating volatility, it is important for Central Banks like those in SSA to adopt inflation targeting approach as it sets institutional commitment to price stability as the primary long run goal of monetary policy. And given the obvious possibility that countries in SSA are frequently hit by shocks that could distort inflation from its long run path, missing the inflation targets may be untenable. What is needed by policy makers is to focus on short to medium term to ensure that deviations are brought on track and inflation converges to a trajectory consistent with price stability and financial sector development.

One important finding documented is the finance–enhancing role of private credit bureau. Admittedly, fuzzy information investor creditworthiness does not ensure reliable underwriting thus exposing banks to fraud. Apart from their vulnerability to fraud, financial institutions are unable to monitor projects that get funded paving the way for investors to invest in projects with no or low returns thus exacerbating economic volatility. Thus, the establishment of information sharing office may therefore aid in smoothening fluctuations. However, the efficiency of the information sharing office and the volatility–reducing effect of private credit bureaus by far depend on the effectiveness of the transplanted legal system.

At the policy level, the relatively sizable effect of private credit bureau highlights some critical issues as regards the best approaches to improve on information sharing. Structural changes in the economy may be an important requirement for arresting volatility as these ensures stronger domestic institutions necessary for maintaining macroeconomic stability. On the back of this is the need for the judicial systems to maintain more agile and effective legal systems that are responsive to changing financial landscape while forcing economic agents to full information disclosure. Developing information sharing bureaus in SSA may present vital

space for facilitating the efficient resource allocation role of the financial sector. Once established, information sharing offices should affect the operations of lenders and every economically active individual or firm within country borders. Irrespective of the legal origin, financial institutions may be restricted to ensuring confidentiality in terms of disclosing customer information to third parties. Following from the need to reduce (promote) information asymmetry (sharing) aimed at efficient capital allocations and hence stable macro-economy, it is important for legal frameworks to confer rights on financial institutions to share key information with credit bureaus under their credit contractual agreements. This has imperative implications for credit culture and changing the overall economic behaviour of agents. However, improving information infrastructure for efficient resource allocation is conditioned on the existence of well–functional legal and regulatory systems.

6.4 Areas necessitating further research efforts

Our evidence based on the findings of this study leads us to call for further research efforts in re–examining the finance–growth linkages in contemporary economic systems. The present study presents important implications for conducting macro–prudential policy and uncovers clear avenues for future research in five key areas. First, it would be interesting to explicitly model credit boom in examining real and financial sector interdependence in finance–growth nexus. Second, it would also be laudable to study how the real and financial sectors interact in the growth process disaggregating the data into pre– and post–Global Financial Crisis.

Third, while our sample splitting and threshold technique estimates the various thresholds below or above which finance–growth relationship changes signs or significance, this approach does not control for endogeneity emanating from a possible *lead–lag*/feedback effects well documented in the empirical literature. It is important for future studies to

employ sound threshold methodologies capable of addressing potential endogeneity in finance–growth relationship and at the same time examining the impact of finance on economic activity in the presence of mediating variables. It will be interesting to validate our findings controlling for endogeneity using valid instruments.

Fourth, our legal indicators are relatively time–invariant and therefore empirical evidence are weakly able to explain dynamic influences of effectiveness of law on both financial sector development and growth volatility. Constructing a new legal index capable of monitoring the adaptability mechanism and their implications for macroeconomic stability is particularly apt given the evolving legal systems and narrow financial sector in SSA.

Fifth, it will also be interesting to examine the linkages of law and information sharing throughout the conditional distribution of financial sector development and growth volatility components. Perhaps the role of law and information sharing on finance may well depend on the level of financial sector development and type of volatility.

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Appendices

Appendix 1: List of countries, legal origin and credit boom

List of Countries	Legal origin	Number of credit boom incidence	Year(s) of Incidence	Peak of credit boom from multiple incidence
1. Benin	French	0	No credit boom	
2. Botswana	English	2	1992, 1993	1992
3. Burkina Faso	French	1	1997	
4. Cameroon	French	1	1991	
5. Central Afr. Rep.	French	2	1991, 2013	2013
6. Chad	French	0	No credit boom	
7. Congo, Dem. Rep.	French	1	1993	
8. Congo, Rep	French	0	No credit boom	
9. Cote d'Ivoire	French	2	1992, 1993	1992
10. Ethiopia	French	0	No credit boom	
11. Gabon	English	0	No credit boom	
12. Gambia	English	3	1984, 1985, 2003	1985
13. Ghana	English	2	1987, 2000	2000
14. Kenya	English	1	1995	
15. Lesotho	English	1	1997	
16. Madagascar	English	2	1993, 2003	1993
17. Malawi	English	2	1992, 1994	1994
18. Mali	French	1	1983	
19. Mauritania	French	2	2005, 2009	2005
20. Mauritius	English	1	1985	
21. Mozambique	Portuguese	0	No credit boom	
22. Niger	French	1	2004	
23. Nigeria	English	2	1994, 2009	2009
24. Rwanda	French	1	1994	
25. Senegal	French	2	1988, 1993	1988
26. Sierra Leone	English	1	1994	
27. South Africa	English	1	2001	
28. Swaziland	English	0	No credit boom	
29. Togo	French	1	1993	

Appendix 2: List of countries and legal origin

Legal origin	Countries	Number
English	Ghana, Kenya, Lesotho, Malawi, Mauritius, Nigeria, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania and Zambia.	13
French	Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo Republic, Cote d' Ivoire, Gabon, Madagascar, Mali, Niger, Rwanda, Senegal and Togo.	14
Portuguese	Angola, Cape Verde, Guinea–Bissau and Mozambique.	4
Belgian	Burundi and Democratic Republic of Congo (formerly Zaire)	2
Total		**33**
Western Africa	Benin, Burkina Faso, Cape Verde, Cote d' Ivoire, Ghana, Guinea–Bissau, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.	12
Southern Africa	Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Seychelles, South Africa, Swaziland, Tanzania and Zambia.	10
Central Africa	Angola, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Congo Republic and Gabon.	7
Eastern Africa	Burundi, Kenya, Rwanda and Sudan.	4
Total		**33**