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SCHOOL OF ACCOUNTING, ECONOMICS AND FINANCE

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THE NEXUS BETWEEN MOBILE PHONES DIFFUSION, FINANCIAL INCLUSION AND ECONOMIC GROWTH: EVIDENCE ON AFRICAN COUNTRIES

BY

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Dedication

To my dear wife, Tariro, I thank you for the support you gave me during the period of this study.

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Abstract

The following thesis comprises three discrete empirical essays on the interplay among mobile phones diffusion, financial inclusion and economic growth in Africa. The first essay examines the condition of financial inclusion and its determinants in Africa. Using the World Development Indicators and the Principal Component Analysis to compute the financial inclusion index for 49 African countries over the period 2004 to 2016, the study finds low levels of financial inclusion in Africa compared to other regions. The region is also characterised by large financial inclusion gaps as shown by the minimum and maximum financial inclusion levels of 0 percent and 82 percent respectively. Since policymakers have over the past decade embraced both financial inclusion and economic growth as key policy initiatives, the second essay examines the interplay between financial inclusion and economic growth in terms of the transmission effect and nature of causality. To the best of the researcher's knowledge, this is the first study to explore the transmission effect between financial inclusion and economic growth using a unique and robust Cointegrated Panel Structural Vector Autoregressive model. The study finds the existence of a cointegrating relationship between financial inclusion and economic growth. It also provides evidence that the relationship between financial inclusion and economic growth in Africa is growth-led supporting the demand following hypothesis. The increased internet-enabled phones adoption in Africa has also caused much optimism and speculation regarding its effects on financial inclusion. Policymakers, various studies and the media have all vaunted the potentials of mobile phones for financial inclusion. Therefore, this study examines the interplay between mobile phones and financial inclusion in Africa for the 2004-2016 period using pairwise Granger causality test and found that mobile phones Granger cause financial inclusion. The literature on financial inclusion has identified high-quality institutions and governance as the determinants of financial inclusion. Lack of deeper understanding of these issues results in ill-informed policy designs. Despite the cascading literature on issues impacting financial inclusion, the empirical literature on the impact of institutional quality and governance on financial inclusion are rare. Therefore, the third essay evaluates the impacts of institutional quality and governance on financial inclusion in Africa. Applying the two-step system generalised method of moments

model, the study finds a positive relationship between institutional quality, governance and financial inclusion, indicating that good governance and economic freedom can lead to increases in financial inclusion. The study concluded that African countries have low levels of financial inclusion with a strong relationship between financial inclusion and other variables such as mobile phones diffusion, bank competition, financial stability, institutional quality and governance. The study recommended institutions to make the most out of the high concentration of the rural population to rollout high-volume transactions, rather than clustering in areas with the high-value transaction and to craft policies that remove restrictions to entrance in the banking sector thereby enhancing bank competition. Policymakers should also not just focus on enhancing financial inclusion, without corresponding improvements in institutional quality, governance, financial sector size, financial stability and financial sector development as they positively contribute to financial inclusion. The study also recommended the implementation of pro-growth policies and a review of existing banking sector policies to eradicate unnecessary barriers to financial inclusion.

Keywords: Financial Inclusion, Economic growth, Cointegration, Structural VAR, Principal Component Analysis, Institutional Quality, Governance, Generalised Method of Moments, Africa.

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List of Abbreviations

ADB	African Development Bank
ADF	Augmented-Dickey-Fuller
AFI	Alliance for Financial Inclusion
AIC	Akaike Information Criterion
ARDL	Autoregressive Distribution Lag
ASCRAS	Accumulated Savings and Credit Associations
ATMs	Automated Teller Machines
CGAP	Consultative Group to Assist the Poor
DEA	Data Envelopment Analysis
DEABA	Data Envelopment Analysis Bootstrapping Approach
DMUs	Decision Making Units
ECA	Economic Commission for Africa
ECM	Error Correction Method
FMOLS	Fully Modified Ordinary Least Squares
GDP	Gross Domestic Product
GDPPCGR	Gross Domestic Product Per Capita Growth
GMM	Generalised Method of Moment
HDI	Human Development Index
ICT	Information and Communication Technology
FII	Financial Inclusion Index
IMF	International Monetary Fund

IPS	Im, Pesaran and Shin
IRF	Impulse Response Fund
ITU	International Telecommunication Union
KPSS	Kwiatkowski-Phillips-Schmidt-Shin
LDCs	Less Developed Countries
LLC	Levin, Lin and Chu
Ln	Natural Logarithm
Log	Logarithm
MENA	Middle East and North Africa
NEIO	New Empirical Industrial Organisation
NS	National Strategy
OAU	Organisation for African Union
OECD	Organisation for Economic Development
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
P-P	Phillips-Perron
ROA	Return on Assets
ROSCAS	Rotating Savings and Credit Association
SADC	Southern African Development Community
SBC	Schwartz Bayesian Information Criteria
SEM	Structural Equation Modelling
SMEs	Small to Medium Enterprises

SSA	Sub-Sahara Africa
S-VAR	Structural Vector Auto regression
UNDP	United Nations Development Programme
VAR	Vector Auto regression
VDC	Variance Decomposition
VECM	Vector Error Correction Model
WAEMU	West African Economic Monetary Union
WB	World Bank

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Financial services are the lifeblood of an economy. They enable businesses and households to invest, save, and protect themselves against risk. The majority of businesses and households in many developing and emerging economies today, lack access to these financial services, which impedes economic growth and prolongs poverty. This chapter provides a comprehensive acumen into the nucleus and the outline of the study. In particular, it discusses the background of the study, the research questions and objectives, the scope and significance of the study, as well as the structure of the thesis.

1.2 Background to the Study

The concept of financial inclusion has become the catchphrase for researchers, market practitioners, regulators, policymakers, and other stakeholders. Given its implications for poverty reduction and boosting shared prosperity, it has particularly been highlighted and gained impetus in the topical global policy discussions (IMF, 2014; World Bank, 2014). Financial inclusion refers to the process of ensuring availability, accessibility and use of affordable financial services and products (transactions, credit, savings, payments, and insurance) that meets the requirement of individuals and businesses in a viable and responsible way. Given the important role financial inclusion plays in development and the state of economic development in Africa, a number of development agencies have taken key steps to promote financial inclusion in Africa. However, financial inclusion gaps remain severe in several countries in Africa. About 66 percent of the adult population in Africa did not have a bank account in 2014 (Dermique Kunt *et al*., 2015). The benefits of financial inclusion could particularly be pronounced in Africa where savings and

investments are low, growth is volatile and modest, inequality and poverty remain high, and informality is rampant (Dabla-Norris *et al*., 2015). In Africa, where 36 percent of the population is illiterate, and more than 33 percent live in extreme poverty, a large number of people find it hard to open a bank account because of bank account maintenance costs and document requirements which they cannot afford (World Bank, 2017). Nevertheless, Africa has of late experienced an upward trend in mobile broadband networks, which enhances the ability to boost access to wide-ranging financial services thus improving the lives of many across the continent. Largade (2011) posited that innovative solutions to foster financial inclusion could spur the much-needed growth in Africa.

Mobile phones diffusion refers to the global spread or penetration of mobile phones. Academics and policy makers (Andrianaivo and Kpodar, 2012; Friedline, 2017; Kim et al., 2018; Lenka and Barik, 2018) have perceived mobile phones as a solution that can circumvent geographical isolation and poor banking infrastructure using the network of mobile phones. The high penetration rates and growth of mobile phones that are changing cell phones into pocket-banks is providing prospects for African countries to proliferate cost effective and affordable way of retaining a large number of adult population that previously has been financially excluded for decades. The increased embracing of mobile phones that are linked to internet on the African continent has triggered optimism and speculation regarding the possible effects they have on financial inclusion. Policymakers, academics and media have all vaunted the ability of mobile phones to boost financial inclusion (The Economist, 2008; Friedline, 2017; and Lenka and Barik, 2018). Paul Kagame, the President of Rwanda, introducing the manifesto at the 2007 Connect Africa Summit, said: “What was once a source of pride and object of luxury, the mobile phone has come to be a basic necessity in Africa, in ten short years” (Aker and Mbiti, 2010; 2). Therefore, the question is “Do such mantras and sentiments echo the reality of the effects of mobile phones for financial inclusion, particularly in Africa?” Although mobile phones form the key internet-based devices used in Africa, the application’s robustness and involvedness are so far not as superb as in the developed economies. The inability for regulators to strike a balance between effecting regulations and supporting innovations also poses another challenge.

The empirical literature on the interplay between mobile phones penetration and financial inclusion, particularly in Africa is scarce. Ngugi (2015) investigated the interplay between mobile banking and financial inclusion in Kenya. Using multiple regression analysis on secondary data for the period 2006 to 2014, the study revealed that mobile money banking initiated through mobile phones has positive effect on financial inclusion. Also Sekantsi and Motelle (2016) employed a time series techniques to unpack the proliferation of mobile phones and its effect on financial inclusion in Lesotho for the period of 2013 to 2015 using monthly data. The findings revealed steady state relationship between financial inclusion and mobile phones in the long run and that mobile phones Granger causes financial inclusion both in the short and long run in Lesotho. The greater part of the studies linked to the two variables micro-based and conceptual, with petite empirical consideration to the interplay between the two variables. This scarcity of empirical studies with rigour has been ascribed as the major factor that has engendered scant policy guidance in boosting financial inclusion (Roycroft and Anantho, 2003), regardless of the levels of saturation in developed countries. The current study, therefore, bridges the gap by assessing the causality and transmission effect of mobile phones penetration on financial inclusion for 49 countries in Africa from 2004 to 2016.

The nexus between financial inclusion and economic growth has drawn substantial consideration in the economic growth literature. There lacks consent on the interplay between financial inclusion and economic growth. Some studies argue that financial inclusion contributes positively to economic growth (Andrianaivo and Kpodar, 2012; Hariharan and Marktanner, 2012; Oruo, 2013; Wang'oo, 2013; Babajide and Oyedayo, 2014; Adegboye and Omankhanlen, 2015; Onaolapo, 2015; Nkwede, 2015; Sharma, 2016; Gretta, 2017; Lenka and Sharma, 2017; Okoyo *et al*., 2017; Saidi and Emara, 2017; Iqbal and Sami, 2017; Evans, 2017; Uchenna and Anyanwaokoro, 2017; Mwaitete and George, 2018). Others maintain that economic growth significantly impacts positively on financial inclusion and not otherwise (Evans, 2015). The interdependent approach or secondary views suggests a dual relationship between financial inclusion and economic growth (Evans and Lawanson, 2017; Kim, Yu and Hassan, 2018), others view the relationship as unimportant or absent (Witjas, 2016; Simpasa *et al*., 2017; Ezenwakwelu, 2018). Evidence of the interplay between financial inclusion and economic

growth has been limited and mixed, warranting further investigation. Empirical literature that applied the panel structural vector autoregression (P-SVAR) to explore the transmission effect between economic growth and financial inclusion in Africa has been lacking. This study addresses this gap. It examines the interplay between financial inclusion and economic growth in the African context for the period 2004 to 2016 using the P-SVAR model. A thorough understanding of the link between the two is vital, given the generally held view that financial inclusion catalyses economic growth in the region.

Despite the recent rapid global drive for financial inclusion, several economies are increasingly concerned with financial inclusion. These concerns have steered countries in excess of 50 to prescribe universal financial access as its 2020 formal target and several countries assigning their supervisory and regulatory agencies with promoting financial inclusion (Sahay *et al.*, 2015). The African region has progressed well from these efforts, but whether the efforts have been transformed into the awaited financially inclusive environment leaves a lot to be desired. Among the developing and emerging economies, financial inclusion is lowest in Africa (Mehrotra and Yetman, 2015). According to Dermiguc Kunt *et al.*, (2015), 23 percent of the population above 18 years of age in Africa owns a bank account. A wide heterogeneity also characterises the region in account ownership across countries. While 82 percent, 75 percent and 70 percent of the adults in countries like Mauritius, Kenya and South Africa respectively are banked, only 7 percent have a formal bank account in Burundi, Guinea and Niger (Demirgüç-Kunt *et al*., 2015). The situation in Africa poses a unique economic challenge, not only because the region ranks among the lowest in terms of financial inclusion compared to other regions, but also because of the heterogeneity that exists within the region and the seeming anomaly between the growth of an economy and the extent of financial inclusion. Given the general view that financial inclusion promotes economic growth in the region, a number of questions with insightful policy implications have to be asked. How conversant is this assertion? Do low financial inclusion levels truly characterise the African region? Will exertions to boost financial inclusion result in viable economic growth? Which mechanism relates financial inclusion to economic growth? Is it financial inclusion that enhances economic growth or the expected future economic growth that

enhances financial inclusion? In other words, what sort of link exists between financial inclusion and economic growth in the African context? This study attempts to answer these questions.

Extant literature shows that no research has been published on the transmission mechanism between financial inclusion and economic growth in Africa. Empirical literature on this kind of a relationship is deficient for less developed countries (LDCs). This calls for research amongst countries, given the benefits that countries would get from these findings. Africa is a working example, and this study is one of the pioneering studies in this area. This study applies a co-integrated P-SVAR model to explore the possible linkages between financial inclusion and economic growth in Africa for the period 2004 to 2016. The use of this model is hinged on the advantages of using Shan, Morris and Sun (2001) autoregressive framework. Shan, Morris and Sun (2001) stressed three reasons why the P-SVAR is the best model to apply in any multivariate relation analysis. Firstly, the Wald statistic used in testing of causality does not affect the order of integration between variables since it is in time-series model. Secondly, the model does not require any functional form. Finally, it reduces the possibility of simultaneous bias that can occur in time-series single-equation models. Furthermore, the power of the co-integrated P-SVAR to determine the dynamic response of the variables of interest to several disturbances within the system justifies its adoption in this study.

Literature emphasises that institutional quality and governance are important elements in enhancing financial inclusion. For example, a study by Zulkhibri and Ghazal (2016) on institutions, governance and financial inclusion in developing economies found that governance and institutions have positively influenced people wanting to make savings and open a formal bank account. A recent UNECA (2016:4) report that focused on the importance of putting in practice the implemented principles of good governance highlights how “institutions and effective economic governance are essential for inclusive development in Africa”. Tenets of the conventional wisdom on good governance and institutions imply effective checks and balances, strong enforcement mechanisms and adequate regulatory/legal frameworks as critical to ensuring economic growth and efficient resources allocation according to the mainstream policy thinking.

However, these assumptions have been largely reconsidered in the last two decades with authors such as Stiglitz (2014) and Evans (2015), arguing that for financial inclusion to succeed, it is vital for reforms to be implemented in the right sequence and at the right speed. From the foregoing discussion, it is probable that economic growth has links with institutional quality and governance. Examining the role of institutions and governance in Africa is therefore fundamental since sustainable financial inclusion aiming at promoting economic growth requires their efficient and robust presence.

1.3 Statement of the Problem

Financial inclusion plays a pivotal role in enhancing economic growth (Gretta, 2017; Iqbal and Sami, 2017; Lenka and Sharma, 2017; Okoyo *et al*., 2017; Saidi and Emara, 2017, Mwaitete and George, 2018). Among the developing and emerging economies, financial inclusion is lowest in Africa (Mehrotra and Yetman, 2015). A wide heterogeneity also characterises the region in account ownership across countries. The situation in Africa poses a unique policy making challenge, not only because the region ranks among the lowest in terms of financial inclusion compared to other regions, but also because of the heterogeneity that exists within the region and the seeming anomaly between economic growth and the extent of financial inclusion in the region necessitating empirical investigation. Literature emphasises that internet-enabled mobile phones, institutional quality and governance are important elements in enhancing financial inclusion (UNECA, 2016; Zulkhibri and Ghazal, 2016; Lenka and Barik, 2018). It is also fundamental to examine the role of institutions and governance in Africa since sustainable financial inclusion aiming at promoting economic growth requires their efficient and robust presence. This study, therefore, aims at investigating the interplay among mobile phones diffusion, financial inclusion and economic growth in Africa exploring ways of boosting financial inclusion in the region to support economic growth without experiencing the curses of excessive bank competition, financial instability, lack of governance and poor institutional quality.

1.4 Aim of the study

Given the background above, this study aims to evaluate financial inclusion in Africa and its interplay with mobile phones diffusion and economic growth. This study, therefore, encompasses three inter-related papers corresponding to the four specific objectives specified below.

1.4.1 Specific Objectives

The specific objectives of this study are to;

1. Measure the degree of financial inclusion of the countries on the African continent.
2. Investigate the interplay among mobile phones diffusion, financial inclusion and economic growth in Africa.
3. Examine the impact of institutional quality and governance on financial inclusion in Africa.
4. Identify the factors influencing financial inclusion in Africa.

1.5 Research Questions

This study attempts to provide answers to the following key questions to achieve the objectives of this study;

1. How financially inclusive are African countries?
2. What nature of relationship exists among mobile phones diffusion, financial inclusion and economic growth in Africa?
3. What is the impact of institutional quality and governance on financial inclusion in Africa?

4. Which factors influence financial inclusion in Africa?

1.6 Delimitation of the study

This study focused on the interplay among mobile phones diffusion, financial inclusion and economic growth on the African continent. The period of study spans for 13 years from 2004 to 2016, the choice being influenced largely by the availability of financial inclusion data on the World Development Indicators database formulated by the World Bank. The study only focused on 49 out of 54 countries in Africa which had available data within the period under study.

1.7 Research Contributions

The nexus between financial inclusion and economic growth has gained popularity in the economic growth literature. There is no consensus on the interplay between the growth of economies and financial inclusion. Some scholars contend that financial inclusion contributes positively to economic growth (Andrianaivo and Kpodar, 2011; Hariharan and Marktanner, 2012; Oruo, 2013; Wang'oo, 2013; Babajide and Oyedayo, 2014; Adegboye and Omankhanlen, 2015; Onaolapo, 2015; Nkwede, 2015; Sharma, 2016; Gretta, 2017; Lenka and Sharma, 2017; Okoyo *et al*., 2017; Saidi and Emara, 2017, Gretta, 2017; Iqbal and Sami, 2017; Evans, 2017; Uchenna and Anyanwaokoro, 2017; Mwaitete and George, 2018). Others maintain that economic growth significantly impacts positively on financial inclusion and not otherwise (Evans, 2015). The interdependent approach or secondary views advocate that the link between financial inclusion and economic growth may be twofold (Evans and Lawanson, 2017; Kim, Yu and Hassan, 2017), unimportant or absent (Witjas, 2016; Simpasa *et al*., 2017). Evidence of the interplay between financial inclusion and the growth of economies in Africa has been limited and mixed, warranting further investigation.

The current study's contribution is thus twofold. Firstly, it offers a unique wide-ranging analysis of the interplay between financial inclusion and economic growth in Africa using P-SVAR.

Previous studies have employed panel data analysis like regression, Granger causality tests, GMM and VAR models which have been criticised the VAR for failing to cater for the needs of researchers interested in shocks other than monetary policy shocks. These shortcomings gave birth to Structural VAR (S-VAR) which is superior to the prior models as it accounts for economic information that lays unembellished the rationale for the restrictions that helps identify other shocks. In addition, S-VARs allow the recovery of interesting patterns in the VARs using the minimum amount of theory which is essential in fields with little or no theoretical consensus (Graeve and Karas, 2010), as in the case with this study. Furthermore, SVARs affords the flexibility and dynamic cross-section and slope heterogeneity (Cannova and Ciccarelli, 2014). To the best of the researcher's knowledge, this is the first study to use P- SVAR to explore the transmission effect between financial inclusion and the growth of economies in Africa. Secondly, financial inclusion literature lacks a comprehensive indicator that can use a statistically sound weighting methodology to bring together information on financial inclusion by taking into account both demand (usage) and supply-side information. Several studies have used different types of single proxy variables (like the number of deposit and credit account per 1 000 adults, number of ATMs and bank branches per 100 000 adults and bank deposits as a percentage of GDP) to proxy financial inclusion (Gupte *et al*., 2012; Chakravarty and Pal, 2013; Sarma, 2015; Lenka and Sharma, 2017). The financial inclusion concept is multidimensional and thus cannot be completely measured by a single proxy variable. Thus, several researchers have used the PCA method to compute a single composite index of financial inclusion based on various financial proxies such as bank branches in proportion to 1 000 adults, saving and credit bank accounts in proportion to 1 000 adults, bank employees as a ratio of bank branches, deposits and credits as a percentage of GDP (Arora, 2010; Chakravarty and Pal, 2013; Sharma, 2016; Sarma, 2015; Lenka and Sharma, 2017). This study constructed a unique financial inclusion index for 49 African economies by combining the weights which were normalised from the PCA of Camara and Tuesta (2014) with Sarma's (2008) multidimensional approach to address the weaknesses of each methodology.

1.8 Structure of the Thesis

The study examines the extent and nature of financial inclusion in Africa. This study is composed of six chapters with the contents as presented in Figure 1.1. The first chapter entitled, "***Introduction"*** presents an overview of the whole thesis and includes background to the study, objectives, motivation, and the outline of the whole study. Chapter Two is an ***"Overview of the financial systems, mobile phones diffusion and economic growth in Africa***." The chapter gives an outline of the African economy in terms of key facets of the financial system in Africa including financial inclusion, market structure, competition, mobile phones penetration, financial stability, and economic growth. Chapter Three, "***Financial Inclusion Condition in Africa"***, assesses the condition of financial inclusion in Africa and the determinants of financial inclusion to answer the first and fourth research question with regard to the study's first and fourth objective. Financial inclusion is regarded as a prerequisite for the economies to positively impact economic growth, which is the ultimate aim of any economic policy. Chapter Four, titled, "***Financial Inclusion and Economic Growth in Africa"*** answers the second research question by analysing the directional relationship between financial inclusion and economic growth in Africa. It sets out different hypotheses on the interplay between financial inclusion and economic growth. An empirical analysis of this relationship, which is important for policymakers, is also provided in this chapter. The chapter concludes with an overview of the empirical findings regarding the study's second objective. Chapter Five investigates ***"The impact of institutions and governance on financial inclusion in Africa"***. This chapter achieves the study's third objective and answers the third research question. Chapter Six consists of the ***"Summary of Findings, Conclusions, and Recommendations".*** The chapter gives a summary of the overall study findings and concludes with policy implications and recommendations to improve on financial inclusion. The concluding chapter also presents the inherent limitations of the thesis and suggests tentative areas for future research.

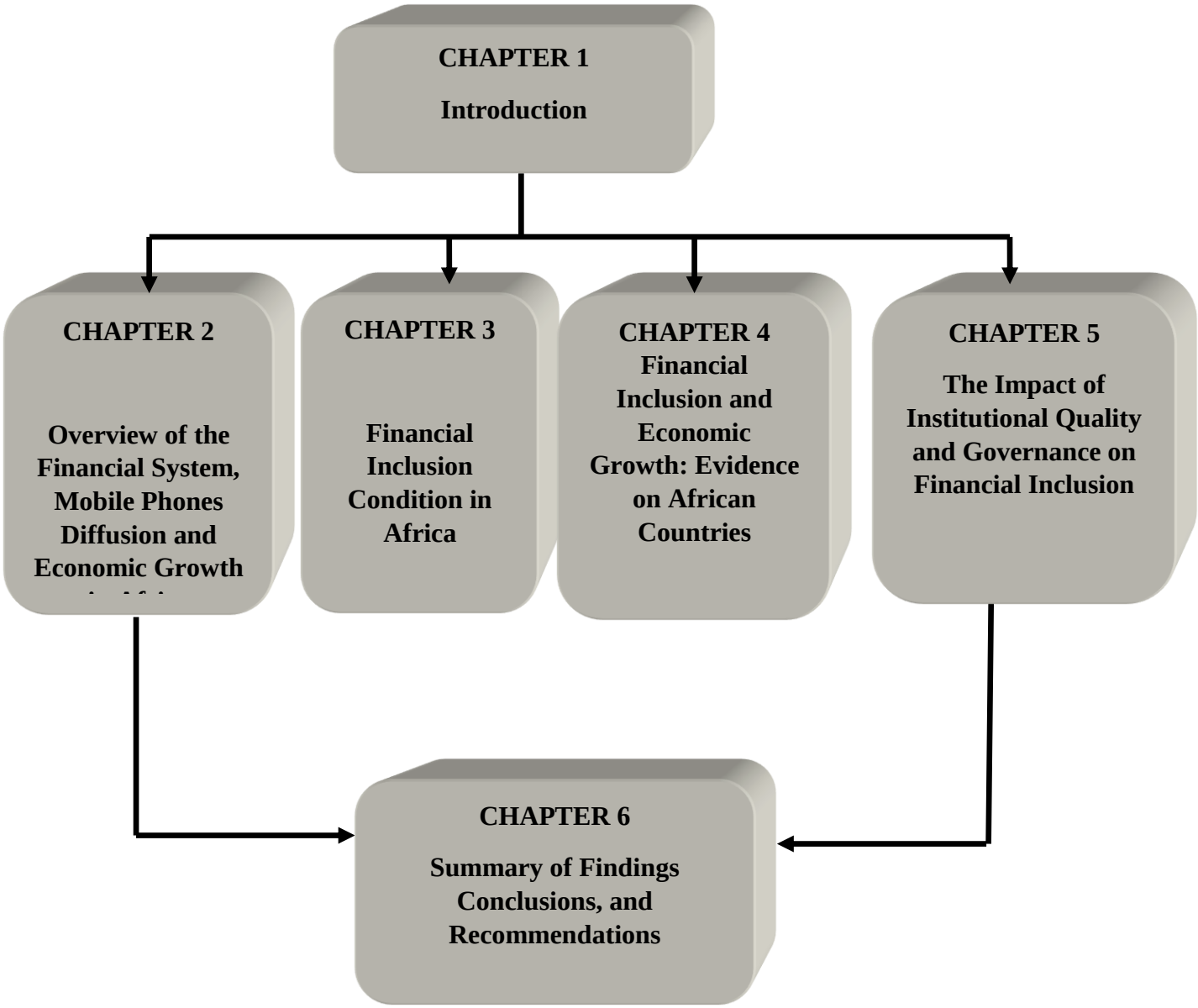

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Figure 1. 1: Structure of the Thesis

CHAPTER TWO

OVERVIEW OF THE FINANCIAL SYSTEMS, MOBILE PHONES DIFFUSION AND ECONOMIC GROWTH IN AFRICA

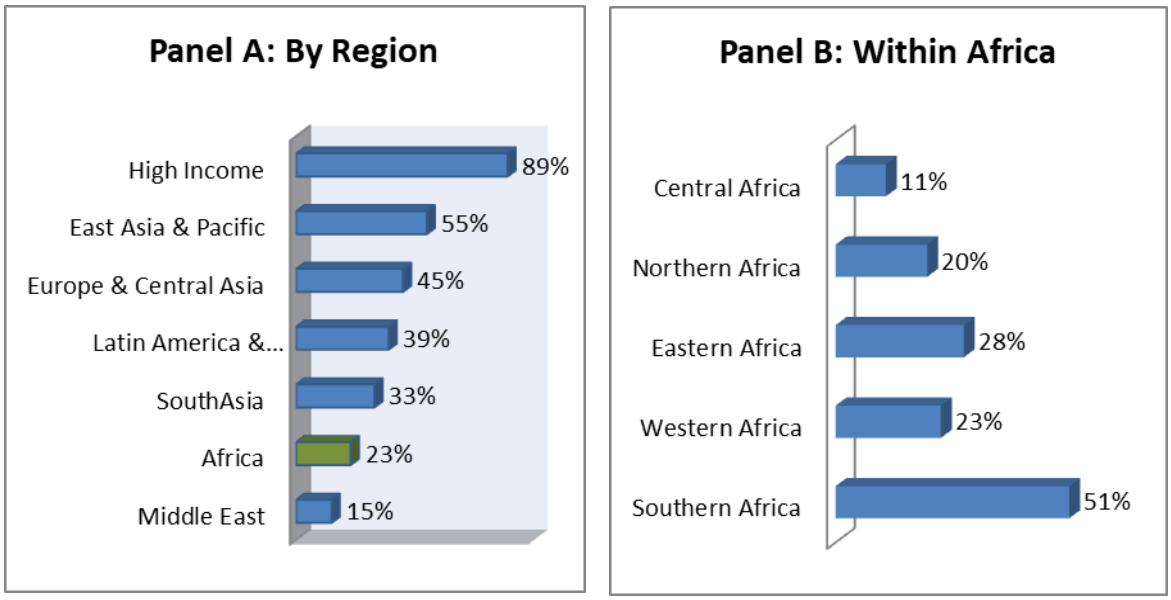
2.1 Introduction

The previous chapter highlighted that there is no consensus in the literature on the interplay between financial inclusion and economic growth. While empirical studies have reported mixed results, none has explicitly focused on panel SVAR approach to determine the transmission mechanism from financial inclusion to the growth of the African economy. This study began with an overview of the financial system in Africa. This chapter, therefore, provides a general idea of critical aspects of the financial system in Africa. It also discusses several important themes, namely; financial inclusion, market structure, competition, mobile phones penetration and financial stability in Africa, barriers to financial inclusion and features used to measure financial inclusion.

2.2 Financial Inclusion in Africa

Despite the progress that has been made by African countries in terms of financial inclusion, the uptake and outcome on the African continent still vary widely by income level and country. The proportion of unbanked adults in emerging and developing economies can be as high as 90 percent, of which financial inclusion is lowest in Africa (Mehrotra and Yetman, 2015). For example, 88 percent of the population in Botswana and 41 percent in Mozambique were financially excluded in 2009 (FinMark, 2009). Bank penetration was lower than 10 percent in some regions of Africa within the same year. A study by Demirgüc-Kunt, Klapper and Singer

(2012) reveals that less than 23 percent of adults in Africa had a formal bank account in 2011. The study witnessed a large disparity in account penetration in Africa, ranging from 51 percent in Southern Africa to 11 percent in Central Africa. Mauritius and South Africa had the highest number of banked adult population at 80 percent and 54 percent respectively, followed by Mozambique, Zimbabwe, Kenya, Morocco, and Angola, (all around 40 percent). Kenya had an efficacious financial inclusion story to tell due to its mobile banking which leads the way. Moreover, 14 countries in Africa had not more than 10 percent of the adult population being formally banked (i.e. Egypt, Niger, Guinea, and Congo). More than 95 percent of the adult population in Democratic Republic of Congo, Chad, and the Central African Republic did not have a formal bank account. In North Africa, an average 20 percent of adults were banked stretching from 10 percent in Egypt in 2011 to 39 percent in Morocco. The situation was even worse in Niger where 98 percent of the adult population had no bank account (Demirgüç-Kunt and Klapper, 2012). The Africa Economic Outlook report (AFDB, 2015) showed that only about 2 percent of the Burundian population have a bank account. This poses a major problem of financial access and economic growth.



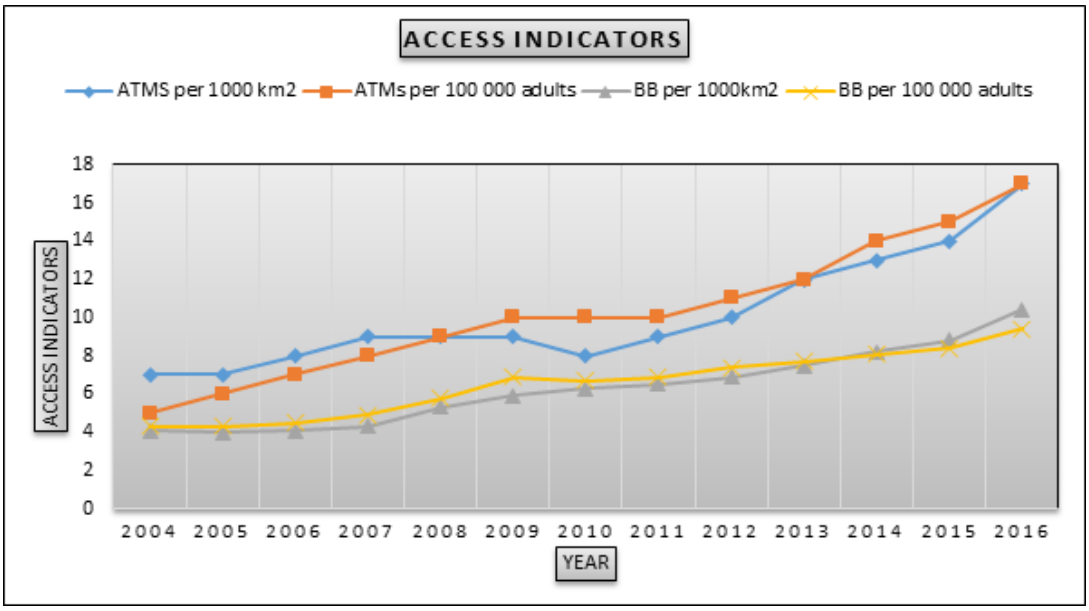
Source: World Bank, 2014

Figure 2. 1: Account Penetration (% Adults)

Figure 2.1 shows that account penetration is second lowest in Africa compared to other regions where only 23 percent of the adult population were banked compared to an average of 50 percent global, and 89 percent in the high-income countries. This proportion varies widely with averages stretching from 11 percent in central Africa to 51 percent in southern Africa, where countries like the Central African Republic, Chad and the Democratic Republic of Congo had adult banking rates of less than 5 percent.

The vastness of Africa (over 24 million km²) combined with poor infrastructure makes it difficult to expand banking networks (Guièze, 2014). On average, there are not more than 10 bank branches per 100 000 adults in Africa ranging from 12 branches per 100 000 inhabitants in Angola and South Africa, to less than 2 branches per 100 000 in the Chad, Central Africa Republic, and the Democratic Republic of Congo (World Bank, 2017). The same observation can be made with reference to the number of automatic teller machines (ATM) in 2015. With the exception of South Africa, which has 70 ATMs per 100 000 adults, there are on average fewer than 19 ATMs per 100 000 adults in Africa, with the highest of 70 ATMs per 100 000 persons in Botswana and the lowest of less than 2 ATMs per 100 000 persons in Chad, the Central Republic of Africa, Guinea, Niger, South Sudan, Sierra Leone, Burundi, and the Democratic Republic of Congo (total of more than 200 million adults). Although the African region ranks lowest in most of the financial inclusion indicators, there has been a steady increase over the years, in basically all the indicators as shown below.

2.2.1 Access Indicators



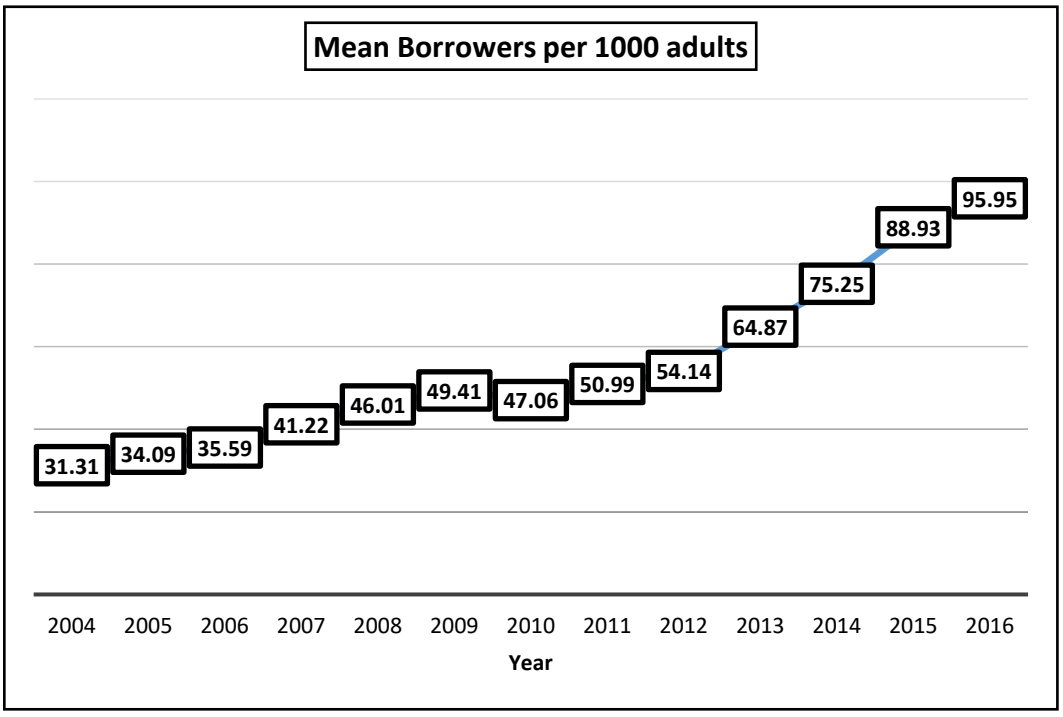
Source: World Development Indicators Database, World Bank (2017)

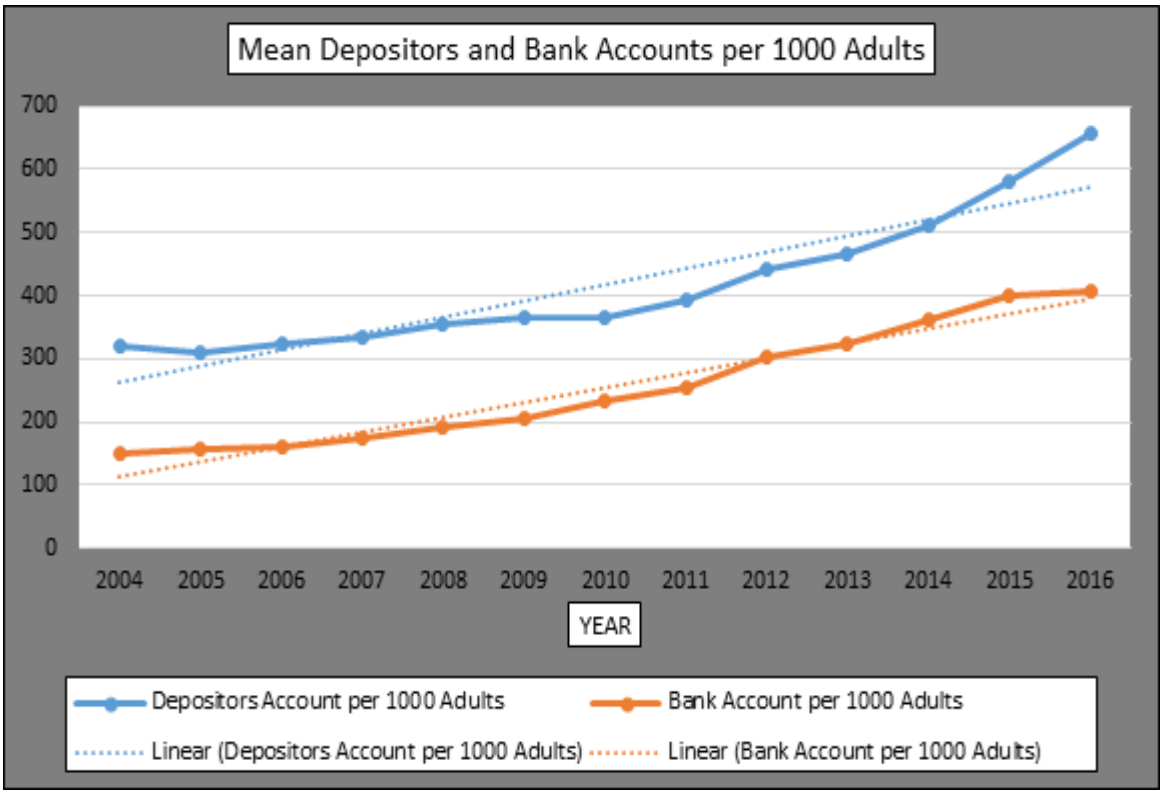
Figure 2. 2: Trend in Access to Finance Indicators

Sarma (2008), cited access to banking services as the first aspect of financial inclusion. All the indicators, that is, ATMs per 100 000 adults, ATMs per 1 000km^2, bank branches per 100 000 adults, branches of commercial banks per 1 000km^2 have shown an increase as highlighted in Figure 2.2. There were 7 ATMs per 1 000km^2 in 2004; no increase from 2004 to 2005; increased from 7 to 9 in 2009 then to 12 in 2013 before increasing by slightly less than 50 percent to 17 in 2016. There has been a tremendous improvement in increase of ATMs per 100 000 as they increased by 100 percent from 2004 to 2009; no increase from 2009 to 2011 and increased by 70 percent from 2011 to 2016. Despite an increase in percentages; the number of ATMs per population and per area is still very low reaching 17 in 2016 thereby justifying why financial inclusion is low in Africa. Access to financial services measured by bank branches per 1 000km^2 increased by approximately 150 percent from 4.1 in 2004 to 10.4 in 2016. Bank branches per

100 000 adults improved from 4.3 in 2004 to 9.41 in 2016 an increase of slightly more than 100 percent. The number of commercial bank branches abruptly increased between 2007 and 2008, which is the same period the World Bank published the first global financial inclusion report which gave emphasis to financial inclusion and this could have stirred the need for increased financial inclusion for countries in Africa, as suggested by the data. Generally, all the dimensions show that financial inclusion has been improving from 2004 to 2016. Despite the increase in access indicators, Africa has a long way to go with respect to financial inclusion indicating that access alone is not enough but should be coupled with usage and quality of services. Bhattacharya and Wolde (2010), established that low access to finance is one of the leading factors that has contributed to lower economic growth in the Middle East and North Africa (MENA) compared to other regions.

2.2.2 Penetration Indicators





Source: World Development Indicators Database, World Bank (2017)

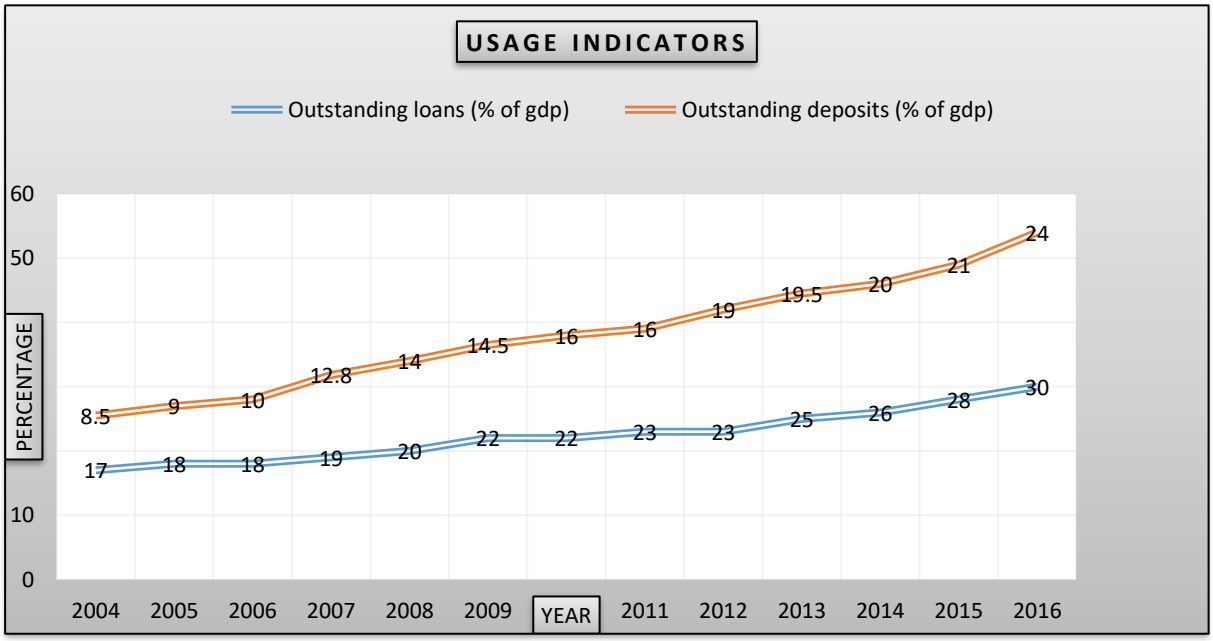
Figure 2. 3: Trend in Penetration Indicators

As much as penetration is concerned, it is seen that generally the number of deposit accounts with commercial banks have increased by more than 100 percent from 2004 to 2016. From 2004 to 2005, the number of accounts decreased from 322 to 309 but gradually increased between 2005 and 2016. This might have been caused by the closure of inactive bank accounts due to requests by central banks regulators. The loan accounts per 1 000 adults which is another indicator of penetration shows an increase of more than 200 percent from 2004 to 2016. Loan accounts only decreased in 2010 possibly due to the global financial crisis and continued to increase until 2016. Unlike Ndlovu (2017) and Yorulmaz (2016), the study included bank

accounts per 1000 adults which is another indicator of penetration. Generally, the number of bank accounts has increased by more than 250 percent from 151 in 2004 to 407 in 2016.

2.2.3 Usage Indicators

Figure 2.4 shows the usage of financial services. It is a significant dimension of financial inclusion as it compares outstanding loans and deposits with GDP. In line with Sharma (2016), the indicators reflect an important contribution of commercial banks in Africa to the economic growth as both outstanding loans and deposits with commercial banks have increased from 2004 to 2016.



Source: World Development Indicators Database, World Bank (2017)

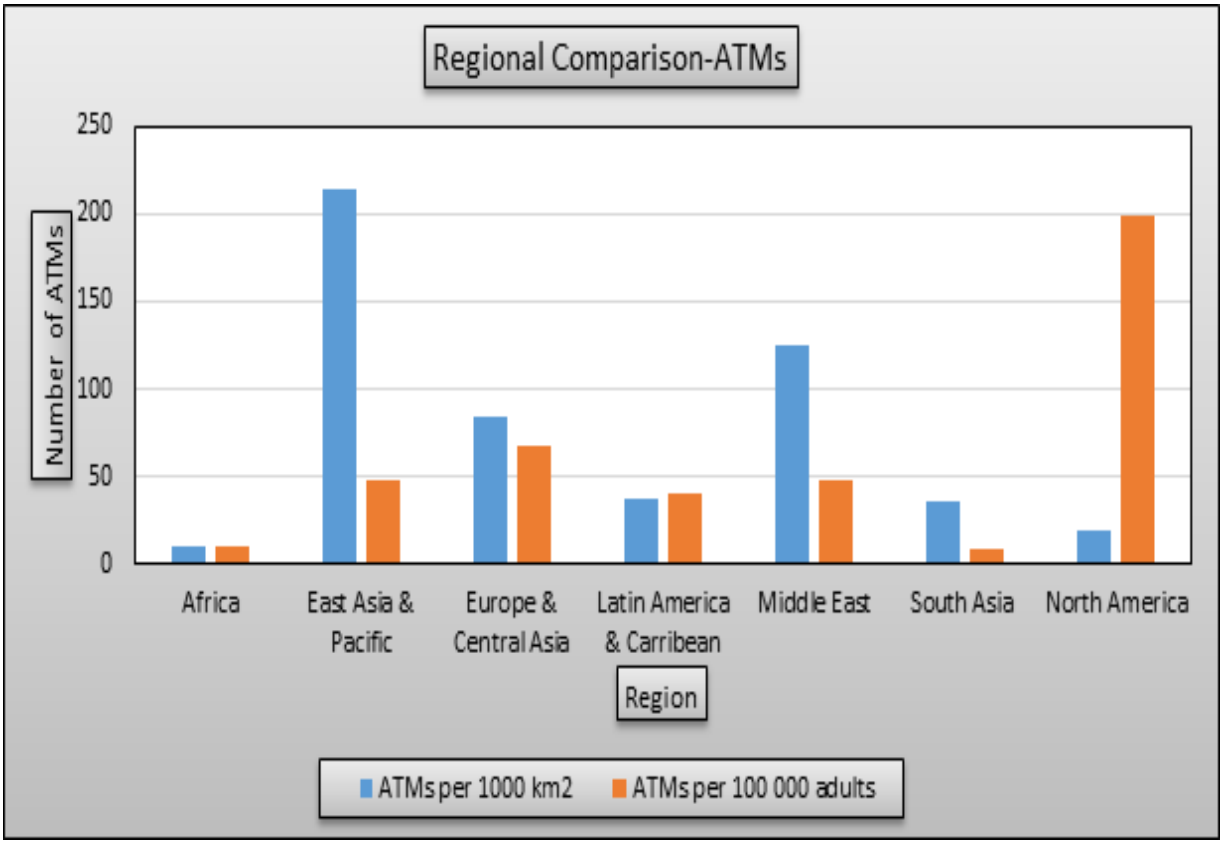
Figure 2. 4: Trend in Usage Indicators

The period 2010 and 2011 saw the number of borrowers largely unchanged compared to a striking element within the same period where a sharp increase in loan accounts was witnessed.

This action increases the number of loan accounts without growing the number of borrowers. This may also signal customers' credit kite flying where a single customer opens multiple loan accounts. However, the number of loan accounts evens out between 2011 and 2012 as they remain fairly stable, while there was a notable increase in the number of borrowers in the same period, hence reversing the anomaly thus validating the inclusion of both usage and access indicators in capturing financial inclusion. Generally, the usage trend is increasing.

2.2.4 Regional Comparison-Access Indicators

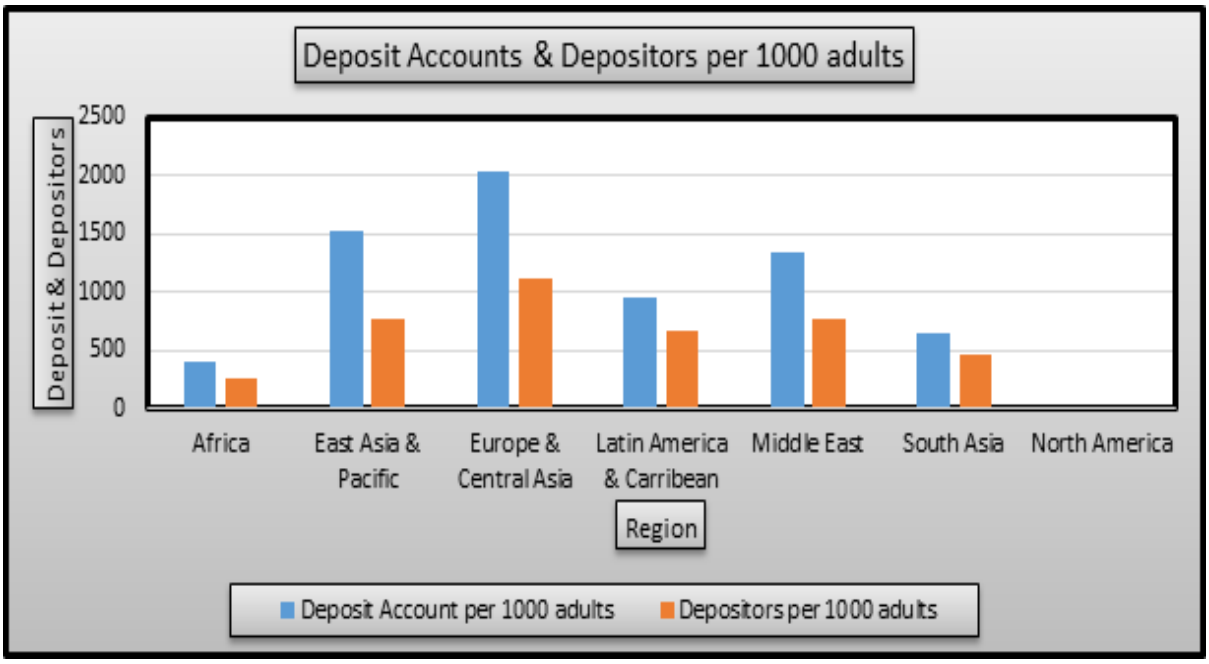
African countries should come up with strategies to overcome the barriers that hinder people from accessing formal financial services. The region has the lowest number of ATMs per area and per capita, with 9.83 ATMs per area and 10.29 ATMs per capita compared to other regions such as East Asia and Pacific with 214 ATMs per area and North America with 199 ATMs per capita (World Bank, 2017).

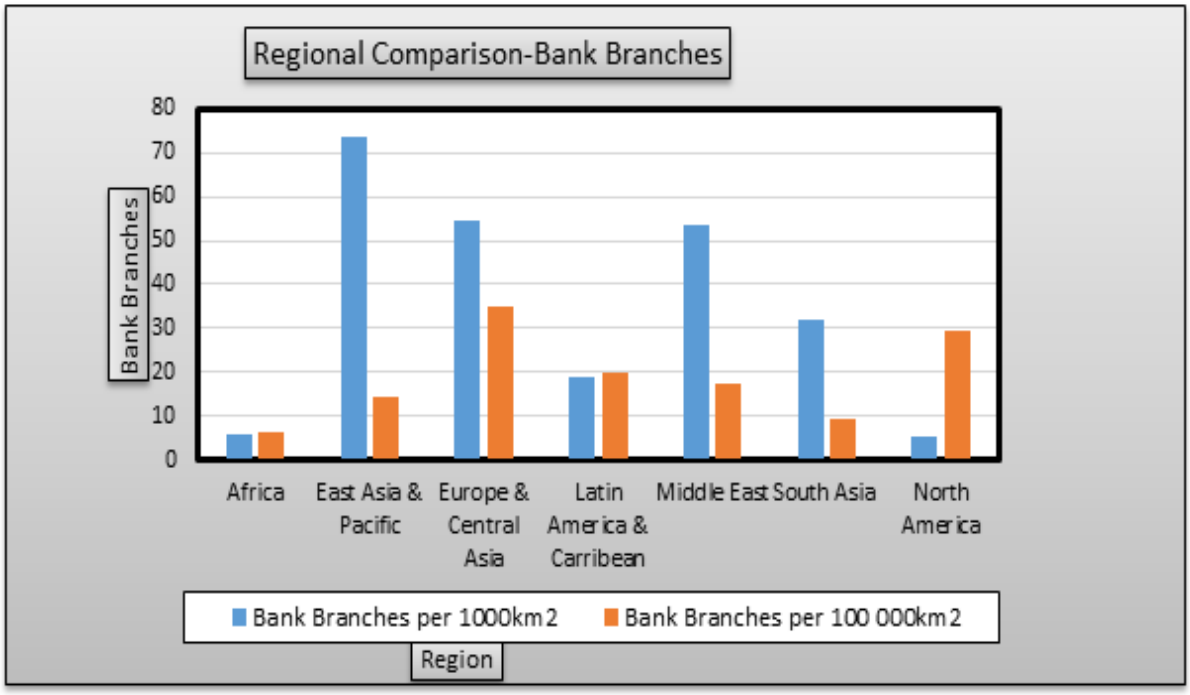


Source: World Development Indicators Database, World Bank (2017)

Figure 2. 5: Trend in Access Indicators (Regional)

2.2.5 Regional Comparison-Penetration Indicators





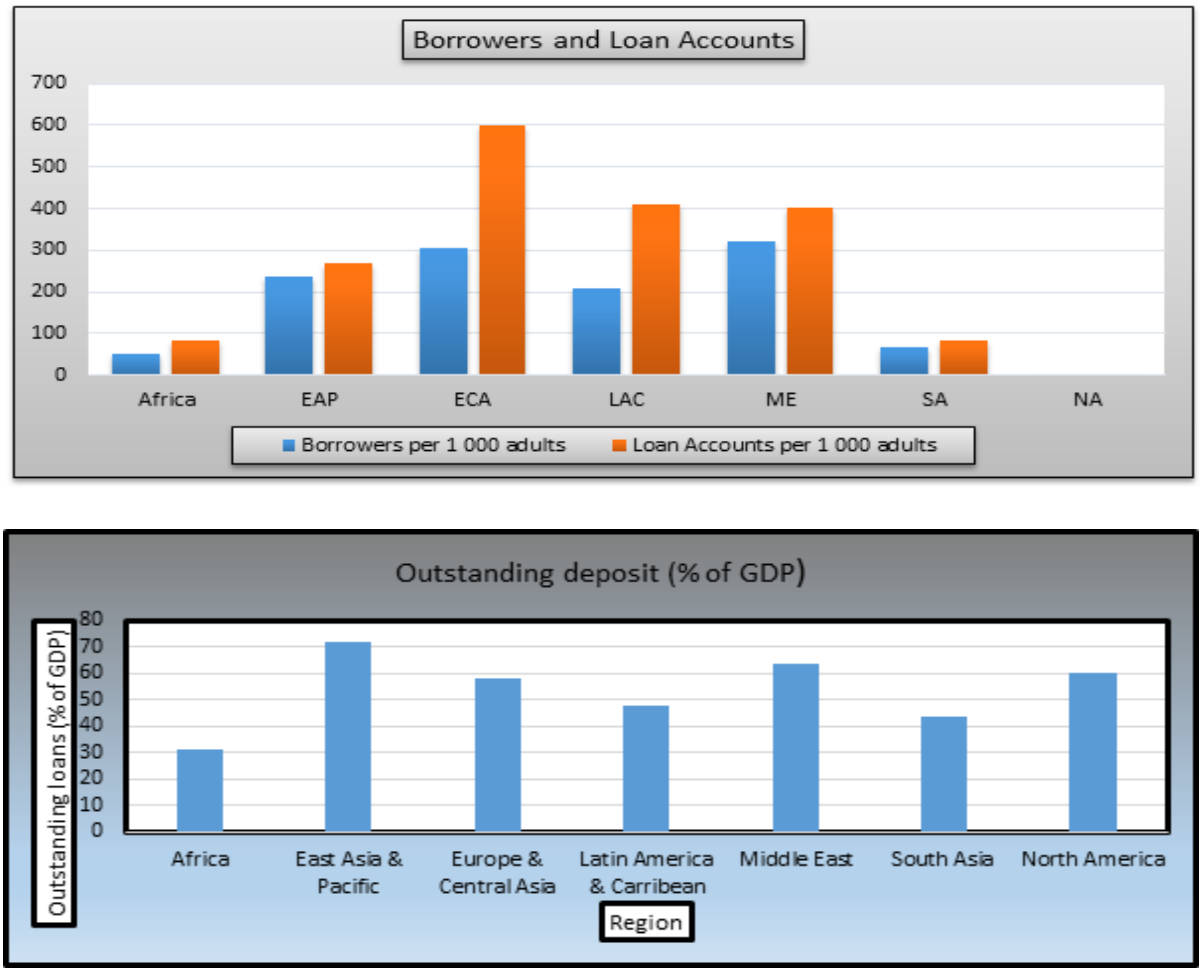
Source: World Development Indicators Database, World Bank (2017)

Figure 2. 6: Trend in Penetration Indicators (Regional)

This graph shows a low penetration rate in Africa as compared to other regions. The region had 6 bank branches per area and per capita compared to East Asia and Pacific with 74 branches per

area and North America with 30 branches per capita. Presumably, the low bank branch penetration in Africa could be due to difficulties in achieving minimum viable scale in low-income areas and sparsely populated areas, through technological innovations are rising to meet that challenge (Beck and Cull, 2013). The trend is also the same for depositors' accounts and deposits per 1000 adults.

2.2.6 Regional Comparison-Usage Indicators



Source: The World Bank-Global Financial Development Database June 2017

Figure 2. 7: Trend in Usage Indicators (Regional)

As shown above, the region lags behind all global regions, in all dimensions of financial inclusion.

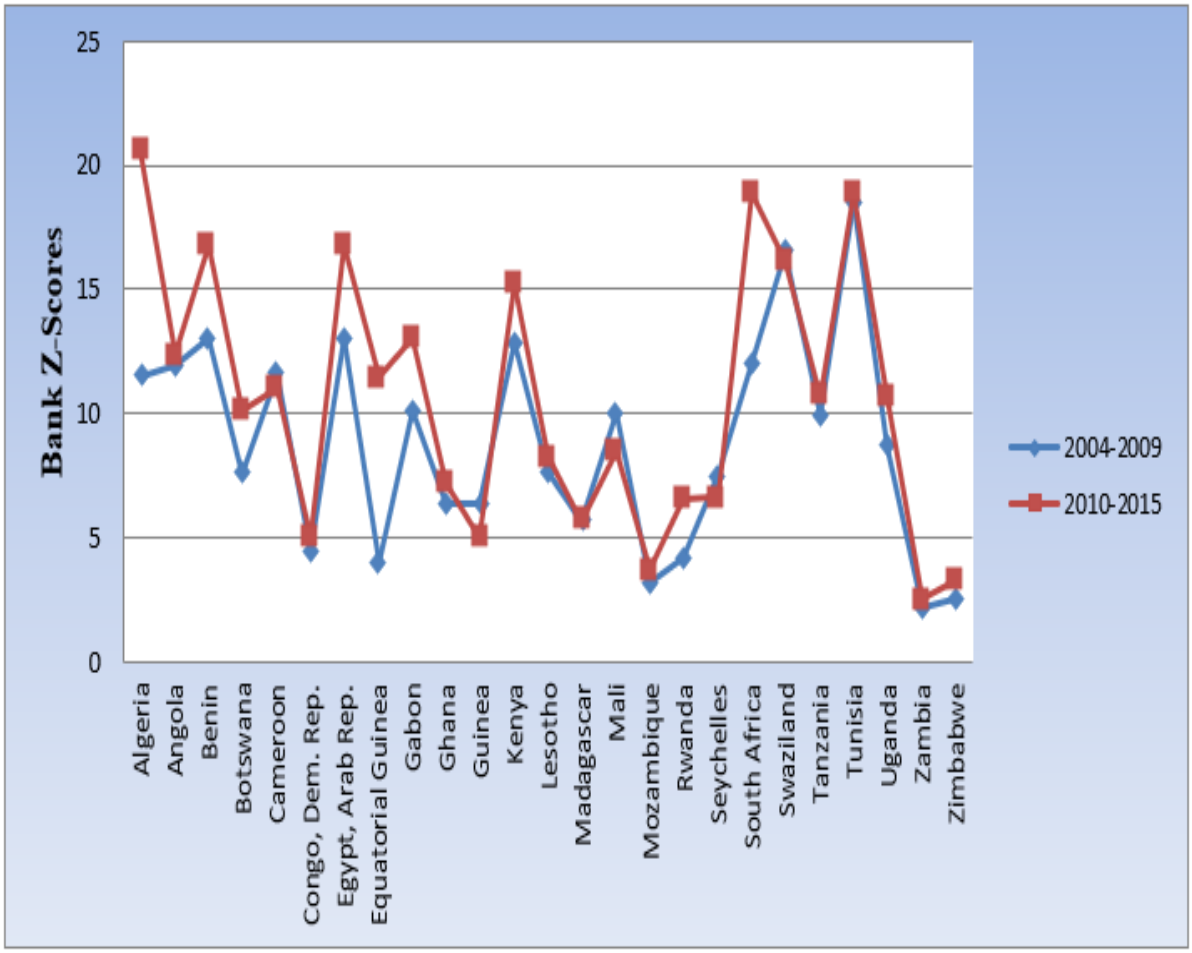
2.3 Bank Stability in Africa

Beck *et al.* (2008), defined bank stability as the distance of a particular bank from failure and insolvency. The Basel Accord considers asset quality, capital adequacy, management quality, liquidity, earnings and profitability and sensitivity to market risk (CAMELS) as core indicators of bank stability. Several other factors such as NPLs, Bank Z-Score are also used as indicators of bank stability. Borrowing from Akande and Kwenda (2017), this study used bank Z-scores as a proxy for bank stability and the position in Africa is explained below. The Z-Score is one of the widely used measures in the accounting literature for approximating the overall bank solvency since it combines leverage (equity to asset), performance (ROA indicator), and risk which is the standard deviation of ROA. The standard approach to estimate the Z-score for an individual bank is calculated as follows:

$$Z = \frac{-EA-\mu\,(ROA)}{\sigma\,(ROA)} \quad \text{..... (2.1)}$$

Where μ represents the expected value and σ represents the standard deviation of the ROA. In literature, it is usual to revert sign to obtain a positive Z-score that is (μ (ROA) + EA/σ(ROA). A higher Z-Score entails a higher notch of solvency and bank stability. Figure 2.3 indicates that from 2004-2009 the Z-score was lowest in Zambia at 2.15 percent and highest in Tunisia at 18.53 percent. Zambia and Zimbabwe had the lowest level of financial stability at 2.52 and 3.31 percent between 2006 and 2010 indicating less stability within the two countries since financial institutions are associated with limited chances of paying one's debt. The highest financial stability was noted in Tunisia and South Africa at 18.87 and 18.85 percent, respectively. Cameroon, Guinea, Madagascar, Mali, Seychelles and Swaziland incurred some drop in financial

stability between the 2000-2005 and 2006-2010 periods as mirrored by a decline of the Z-score at 4.57, 21.75, 0.35, 15.22, 11.82 and 2.3 percent, respectively. Financial stability improved significantly in Equatorial Guinea and Algeria as the Z-score grew by 184.62 and 79.15 percent, respectively.



Source: World Bank Global Financial Development Database

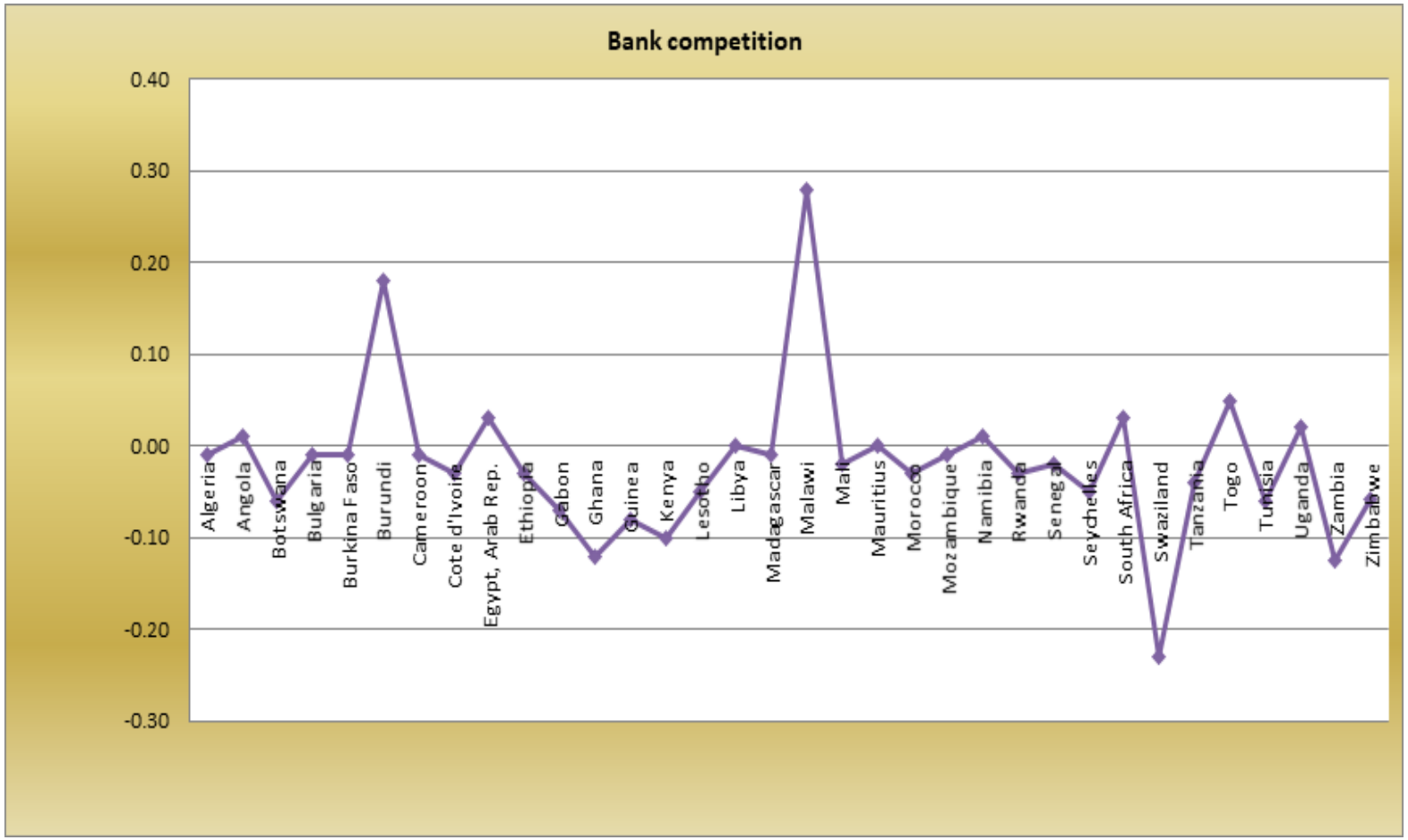
Figure 2. 8: Probability of Default Score (Z-score)

2.4 Bank Competition

The financial system in Africa is highly concentrated as reflected by the bank Boone indicator which ranges between -0.32 to 0.18. A more negative Boone indicator shows higher levels of competition. As shown in Figure 2.4 below, less competition exists in the African banking system. Swaziland, Ghana, Zambia and Kenya had higher levels of competition as shown by an indicator of -0.23, -0.12, -0.12, and -0.10 for the period 2015, respectively. Zambia has about 20 banks some of which are foreign, domestic private or state-owned banks (Mowatt, 2001) thereby justifying the outcome of Figure 2.5. The rest of the members indicated a low level of competition. South Africa has 88 banking intermediaries consisting of 15 controlling companies, 19 banks, 13 foreign banks branches, and 41 offices of representatives from foreign banks (South Africa Reserve Bank, 2010). Zambia has only 10 licensed banks. The South African market is subjugated by 4 big banks that control more than 80 per cent of the banking sector's total assets implying low level of competition (South African Reserve Bank, 2010). Namibia and Swaziland had only 5 banks (Bank of Namibia, 2011). Only 4 banks serve the public in Lesotho. The high levels of concentration in Africa may indicate very low bank competition levels with serious financial exclusion consequences. This scenario even applies to countries with endorsed competition laws to stimulate fair competition. Most of the competition authorities are still young except for those of South Africa, Malawi, Zimbabwe and Zambia which were established in the 1990s (Motelle and Biekpe, 2014).

Figure 2. 9: Bank competition in Africa (The Boone Indicator)

Source: Global Financial Development Database[1]

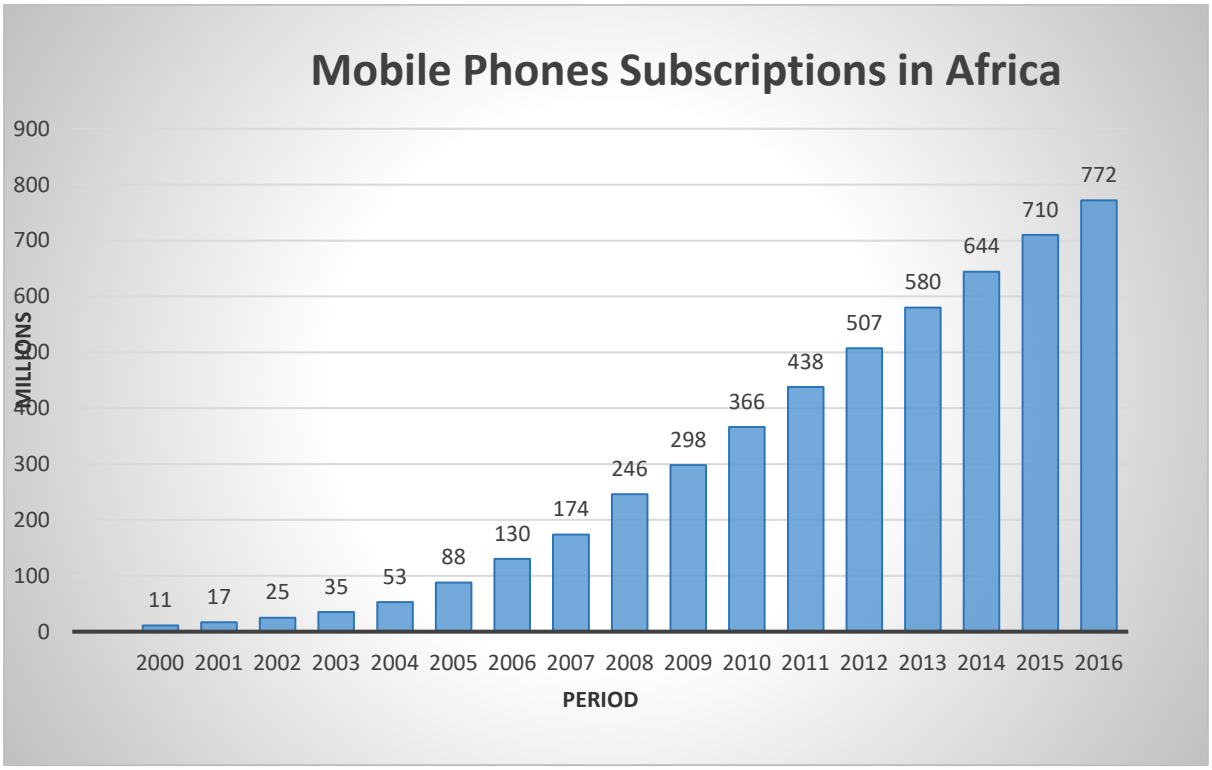


[1] This excluded countries whose data was unavailable.

2.5 Mobile Phones Diffusion in Africa

Basic conventional telecommunications were pioneered in Africa during the pre-independence epoch by trading firms in Eastern and Western Africa. In Eastern Africa, a postal and telecommunication entity was legally created in 1893. The first official mobile phone was launched in 1946 (Kumar and Thomas, 2006). Major development activities on mobile phones, though, started in Africa in the 1960s. Changes in telecommunication infrastructure could not have been realised without financial and technical assistance from regional and international organisations such as International Telecommunication Union (ITU), Economic Commission for Africa, African Development Bank, United Nations Development Program, Organisation of African Unity, and the World Bank (Aloo, 1988). Although Africa was once labelled a black hole of informational capitalism (Castells, 1998), it has experienced a rapid transformation in its telecommunication sector which was witnessed by its mobile phone penetration rate which is the fastest growing globally. This was due to economic reforms, technological revolution and the growth of wireless mobile telecommunication as from the early 1990s. The past decade has witnessed the staggering growth rate of mobile phone coverage in Africa. According to the International Telecommunication Union (ITU), 52 percent (that is 28) of the African countries did not have a mobile phone network in 1995 (ITU, 2008). Only 11 percent of the population in Africa had access to mobile phone coverage, mainly in Northern Africa (Tunisia, Morocco, Libya, Egypt and Algeria) and Southern Africa (Kenya and South Africa). There have been massive discrepancies in the geographical rollout of this coverage stimulating alarms over an intra-African digital divide (ITU, 2008). Only South Africa, Senegal, Morocco and Egypt had coverage rates in excess of 40 percent whilst most African countries lacked mobile phone coverage in 1999. In 2001, the number of mobile subscribers in Africa surpassed the number of land-lines (Gray, 2006). Over 13 million people newly subscribed for mobile phones in Africa in 2003 alone, a figure corresponding to the total number of telephone (mobile and fixed) subscribers in 1995. Within that same year, the total number of mobile subscribers was 6.2 per 100 inhabitants, twice the fixed rate (ITU, 2004). The rate of mobile subscribers in the African region increased by 46.2 percent from 2001 to 2005 (ITU, 2007). Africa had 280 million total subscribers by 2007, of which more than 85 percent were mobile telephone subscribers making Africa the leading continent in terms of the total mobile telephone subscription in the world. Overall, the mobile phone coverage expansion has been the lowest

in Somalia, Ethiopia, and the inland countries of West and Central Africa (Aker and Mbiti, 2010). About 67 percent of Africa's population (644 million) had subscribed to a mobile phone network in 2011, and Sub-Sahara African countries such as Namibia, Botswana, Seychelles, Gabon and South Africa had more mobile subscribers than inhabitants by the end of that year. With 640 million mobile phone subscribers in 2012, Africa ranked second highest worldwide in terms of mobile subscription count, right after the Asian Pacific region (Triki and Faye, 2013). Mobile telephone subscriptions in Africa have risen to 772 million in 2016 thereby becoming the second most connected region in the world with regard to mobile subscription count, after the Asian Pacific region (ITU, 2016). Figure 2.5 indicates how the mobile telephones subscriptions in Africa have spread like veld fire from the period 2000-2016. However, it is common that mobile phones are shared in Africa, and therefore more people may be using mobile phones than indicated by these penetration rates (James and Verseeg, 2007).



Source: World Telecommunication/ ITC Indicators Database (2016)

Figure 2. 10: Mobile Telephone Subscription in Africa (2000-2016)

2.6 Economic Growth in Africa

Ayres and Benjamin (2006), define economic growth as an increase in the total output produced by a country. It occurs whenever people take resources and reposition them in ways that are more valuable. It can also be either positive or negative. Negative growth occurs when the economy is shrinking and is associated with economic recession and depression. Table 2.4 shows the comparison of the trend in economic growth for Africa compared to other regions and the world. The trend indicates an overall economic growth of 2.34, thereby becoming the third performing region after South Asia, Pacific and East Asia. Amongst the key contributors to this growth were economic reforms, technological revolution and the development of wireless mobile telecommunication (Wainaina, 2012).

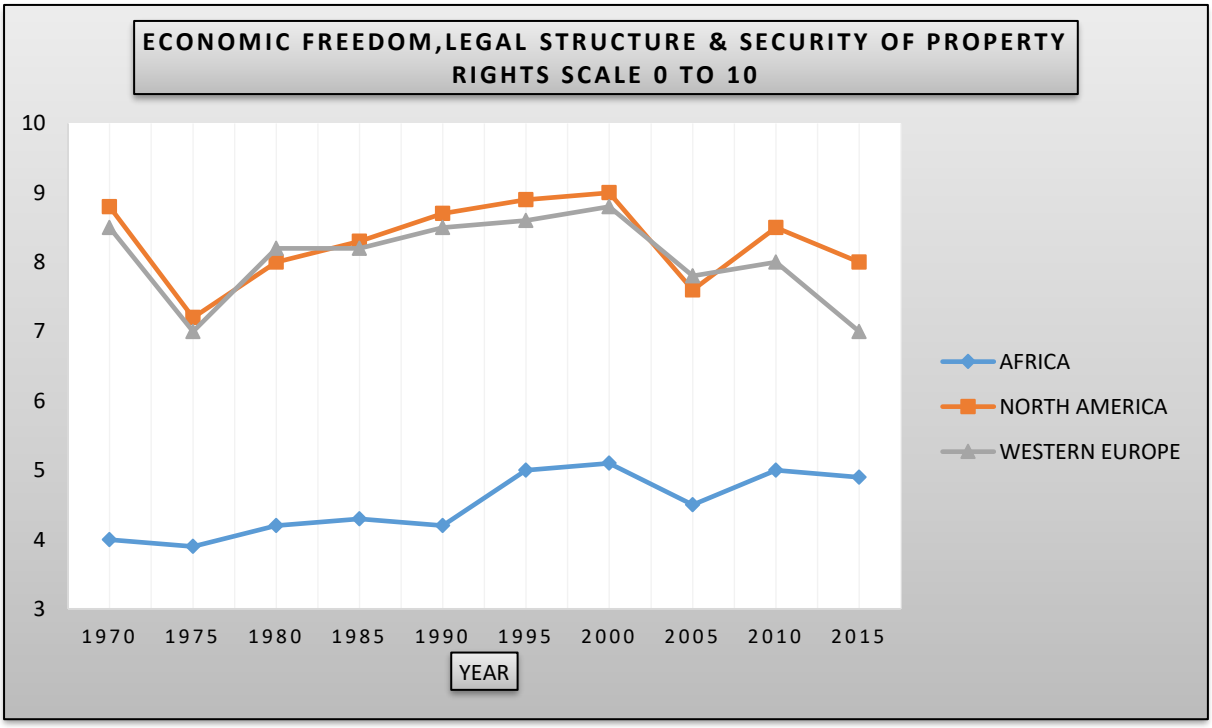
Table 2. 1: Economic Growth in Africa

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Mean
EAP	4.36	4.27	4.78	5.76	2.77	0.66	6.35	3.91	3.95	4.04	3.42	3.45	3.38	3.93
ECA	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	1.30
SA	5.72	5.72	5.72	5.72	5.72	5.72	5.72	5.72	5.72	5.72	5.72	5.72	5.72	5.67
LAC	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	1.87
MENA	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	2.10
NA	2.75	2.38	1.70	0.84	-1.12	-3.67	1.70	0.97	1.37	1.00	1.80	1.92	0.73	0.95
OECD	2.46	2.00	2.20	1.76	-0.59	-4.22	2.20	1.28	0.62	0.77	1.39	1.75	1.05	0.97
Africa	8.75	2.74	4.21	4.27	2.56	0.11	2.56	1.54	0.97	2.02	1.83	0.29	-1.44	2.34
World	3.16	2.56	3.03	2.98	0.57	-2.93	3.06	1.97	1.23	1.41	1.65	1.63	1.29	1.66

Source: World Development Indicators Database, World Bank (2017)

2.7 Economic Freedom and Governance in Africa

For decades, market participants have been actively discouraged from investing in a hostile business environment imposed by many African governments. While trade, profit, and entrepreneurship vary in all African economies, anti-business policies strangle the capacity of many to take part in the formal economy (Okediran, 2013). Despite there being considerable progress in Africa, regulatory requirements continue to smother growth (World Bank, 2016). The report on the global Economic Freedom ranks Africa at the bottom (Gwartney, Lawson and Hall, 2016). Also, the recent World Bank's report on the Ease of Doing Business reckoned Africa as the most challenging region for starting a business in the world. An African entrepreneur will on average take approximately 27 days to register a new business in some African countries and requires more of the annual income (World Bank, 2017).



Source: Own computation using data from Fraser Institute (2017)

Figure 2. 11: Economic Freedom and Governance in Africa

2.8 Summary

This chapter presented an overview of financial systems, mobile phones diffusion and economic growth in Africa. The overview covered bank stability, competition, profitability, financial inclusion, economic growth, mobile phones diffusion, economic freedom and governance structures in Africa. Data were mostly compiled from the World Development Indicators Database, the Fraser Institute of Economic Freedom and Governance database. Despite the proliferation of mobile phones in Africa, the continent is characterised by varied and high financial exclusion levels and oscillatory growth. Financial inclusion gaps remain severe in several countries in Africa. The low financial inclusion and economic growth levels in relation to the proliferation of mobile phones in Africa, therefore, raise the interest to investigate the interplay between mobile phones diffusion, economic growth and financial inclusion. More so, Africa is also characterised by poor governance and economic freedom.

CHAPTER THREE

FINANCIAL INCLUSION CONDITION OF AFRICAN COUNTRIES

3.1 Introduction

The last decade has witnessed the international development community and policymakers making renewed efforts towards enhancing financial inclusion. An additional savings of approximately $157 billion could be generated worldwide if the unbanked channel their savings (informal) into the formal financial system (Allan, Massu and Svarer, 2013). This has motivated other institutions and governments worldwide to develop programs to enhance financial inclusion. To boost financial inclusion, the World Bank has proclaimed a goal of achieving universal access to finance by 2020 (World Bank, 2013).

There is a scarcity of information on the share of the financially included people across the globe. Triki and Faye (2013) assert that this limits the financial service providers and policymakers' ability to locate where opportunities lie, what is working and what is not working, thereby hindering policy. Musau, Muathe and Mwangi (2018), have contended that the aspirations for development in Africa will be unpacked once issues of financial inclusion are addressed. Then the question is, how financial inclusive are African economies? Several studies have used recently constructed global Findex database which comprises the broad dataset on how adults borrow, save, make payments and manage risk endeavouring to understand the determinants of financial inclusion around the globe (Allen, Demirguc-Kunt, Klapper, and Martinez Peria, 2016; Cámara and Tuesta, 2015; Demirgüç-Kunt, Klapper, and Singer, 2013; Efobi, Beecroft, and Osabuohien, 2014; Fungáčová and Weill, 2015; Mohammed, Mensah, and Gyeke-Dako, 2017; Tuesta, Sorensen, Haring, and Camara, 2015). Despite the increase in the number of programs to enhance financial inclusion, empirical work that documents financial inclusion trends to enable policymakers to identify areas with need has been scarce. This study adds to the emerging financial inclusion literature by centring on African countries where financial inclusion is predominantly low. This study

mainly contributes to literature in three-fold. First, the study documents topical financial inclusion trends for 49 African countries by showing the progress from 2004 to 2016. This study diverges from previous studies on financial inclusion as it covers almost the entire continent. Second, the study focused on comprehensive indicators of financial inclusion making the study unique. Thirdly, unlike most existing studies, this study considered both macro and micro-level factors of financial inclusion. This allows the understanding of their importance as contributing factors of financial inclusion. This chapter encompasses the survey of literature on financial inclusion along with factors associated with financial inclusion. It comprises discussions on the determinants and measurement of financial inclusion as well as the chapter summary.

3.2 Literature Review

3.2.1 Definition of financial inclusion

There is no consensus over the definition of financial inclusion as differences emanate from the context wherein the term is used, the state of economic development and geographical location of the area. Chakravarty (2010), defines financial inclusion as the process of making certain easy access to suitable financial services and products desired by various segments of the society at large, in a transparent manner and at a reasonable cost by regulated banks. Concurring with Chakravarty (2010), Khan (2011) defines it as the timely access to adequate credit and banking services needed by vulnerable groups at a reasonable cost. Financial inclusion largely signifies access to affordable credit and bank account supported by deposit insurance and payment system. Financial inclusion has been defined by Hannig and Jansen (2010), as the absence of obstacles in the usage of formal financial services. They allude further that it targets at enhancing financial access, which brings about an improvement in the availability of banking services to all at a reasonable price. They maintain firmly in their argument that the sole aim of financial inclusion is an improvement in access to financial services that basically involve improving availability of financial services to all at a fair price. Amidžić, Massara and Mialou (2014), concur with Hannig and Jansen (2010), whose definition incorporates the absence of barriers in the use of financial services by defining financial inclusion as a condition in which firms and individuals have full access to formal financial services. The G20 recognised financial inclusion as one of the four pillars in its

agenda of global development reforms and gave it equal standing with financial consumer protection, financial stability and financial integrity. The G20 views the "newly banked," as having not necessarily been underprivileged of all financial services. Although they may have negative experience with unofficial exchange houses and informal moneylenders, financial inclusion offers them the opportunity of dealing with regulated institutions which are often cheaper to use, more transparent in their pricing and who are less likely to cheat their customers than the informal service providers. These definitions emphasize the issue of affordability in terms of cost.

Although no consensus exists amongst scholars, some key international bodies have provided some definitions and indicators for financial inclusion (AFI 2011; GPFI and CGAP 2011; Garcia *et al*., 2013). Financial inclusion has been defined by the World Bank as the process of making certain access to or use of affordable financial services and products (transactions, credit, savings, payments, and insurance) that meets the necessities of businesses and individuals, conveyed in a responsible and viable manner[2] (World Bank, 2017). Access to financial products and services denotes the likelihood of consuming financial products and services, while usage means the actual consumption of the products and services. Naceur *et al*., (2015), posit that the definition by the World Bank is the most useful because it is measurable and can be easily incorporated into theoretical and empirical work. The United Nations defines it as the sustainable provision of affordable financial services that convey the poor into the formal economy (World Bank, 2017). Clámara and Tuesta, (2014), suggested a more detailed definition of financial inclusion in which they define financial inclusion as the process of maximising access to and usage of formal financial services while minimising unintended perceived barriers, by those unbanked individuals. Although different definitions of financial inclusion have been put forward, they all seem to concur that: financial inclusion ensures easy access to and usage of formal financial services.

Financial deepening is at times used as a synonym for financial inclusion; nevertheless, it is essential to note that these two are not the same. Financial deepening is the increased provision of financial services by means of a wider choice of services to all levels of society.

[2] Definition obtained from http:// www.worldbank.org/en/topic/financialinclusion/overview

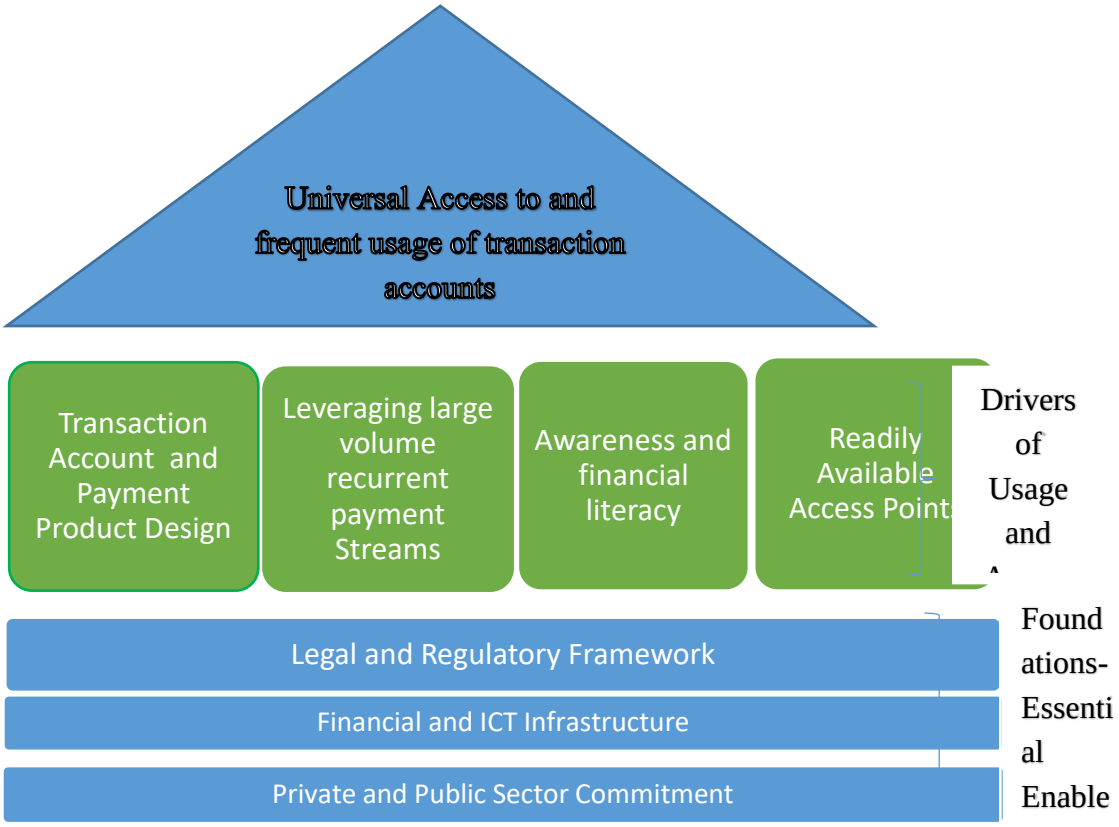
Generally, financial deepening is the increased proportion of money supply to GDP or some price index. It also denotes liquid money. The opportunities for continued growth in an economy increase with more liquid money. It can also play a vital role in reducing vulnerability and risk for disadvantaged groups and increasing the capacity of households and individuals to access basic services like education and health. Deepening can occur without financial inclusion if volumes of financial flows increase while only a portion of the population participates. It is essentially the process of increasing financial intermediation within the financial system (Ardic and Damar, 2006). For example, domestic credit to the private sector to GDP is a commonly used indicator of financial depth. This measure is high in Vietnam (125 percent), but only 21 percent of adults have formal accounts. In contrast, financial inclusion in the Czech Republic is high (81 percent of adults have formal accounts), whilst depth is only moderate at 56 percent of GDP (Demirgüc-Kunt et al., 2012).

This study follows the above-mentioned definition of the World Bank (2017). Unlike other definitions, the advantage of the World Bank's (2017) definition is that it based the financial inclusion concept on numerous dimensions, comprising availability, accessibility, and usage, which can be discussed separately. Financial inclusion does not only mean opening of saving accounts but also includes providing insurance (Bagli, 2012; Padma and Gopisetti, 2013, Garg, 2014 and Lundqvist and Erlandsson, 2014), credit services (Bagli, 2012; Padma and Gopisetti, 2013 and Garg, 2014) and financial advice (Garg, 2014). Financial inclusion is not only about mobile payments or "banking the unbanked" but it involves savings, access to credit, and insurance products that suit the needs of the vulnerable lower-income populations. Lundqvist and Erlandsson (2014), supported the above sentiment when he alluded that only 7 percent out of those with access, use their bank accounts actively.

3.2.2 Determinants of Financial Inclusion

It is desirable to examine the determinants of financial inclusion in order to embark on suitable policy measures for stimulating a more inclusive society. The World Bank (2012) has categorised three essential foundations for financial inclusion, namely a conducive regulatory and legal and framework, public and private sector commitment, and sufficient

financial information and communications technology (ICT) infrastructure. As noted in Figure 3.1, these essential foundations form a base for critical drivers of financial inclusion, that is, access points, financial services and products, awareness, leveraging large-volume recurrent payment streams and financial literacy.



Source: CGAP/World Bank Financial Inclusion (2012)

Figure 3. 1: Determinants of Financial Inclusion

Figure 3.1 demonstrates that to achieve universal access, ICT and financial infrastructure is essential in promoting financial inclusion. Geographical distance to ATMs and banks and spatial population affects the magnitude of the concept (Blanco, 2014). Financial institutions struggle with the establishing costs of branches in areas with low population, yet unavailability of bank branches is a possible barrier to financial inclusion (Demirgüç-Kunt *et al*., 2014). Sparsely populated countries will have barriers to financial inclusion as there will be limited number of ATMs and branches against the population. Emerging economies are mainly concerned with infrastructure related barriers. To compound the situation, literature

has stressed that the absence of a convenient transport network to ATMs and bank branches as well as reliable mobile telephone communication, is hindering financial inclusion. It is difficult to achieve financial inclusion if there is no access to reliable and secure payment and settlement systems. It can, therefore, be construed that lack of convenient transport hinders financial access (Miethe and Pothier, 2016).

Infrastructure also determines the level of financial inclusion since it makes it cheaper for financial institutions to provide their services (Zins and Weill, 2016). This may sequentially have a positive impact on business activities as a result of reduced transactional costs, thus increasing the total demand for financial services. In addition, the outreach of bank branches also determines financial inclusion since distances and costs form the main barriers to financial inclusion (Kendall *et al*., 2010).

Hariharan and Marktanner (2012), argued that besides income levels, factors like democracy, economic capacity, natural resource rents, income inequality, and productive economic capacity are important determinants of financial inclusion. Total natural resource rent determines financial inclusion, the argument being that economies that heavily depend on the extraction of natural resources that are based on authoritarian bargains lead to unequal economic development and monopolised markets. Hence, it projects a negative effect on financial inclusion. Naceur and Zhang (2016), find an inverse association between income inequality and financial access for 143 countries.

Allen *et al*. (2016), found that political situations, laws, and legal names significantly influence financial inclusion. Broader financial inclusion is expected in countries with a strong contract enforcement, more efficient legal system, and political stability. Regulation is another barrier to financial inclusion. State intervention and excessive government regulation result in financial systems which are underdeveloped, which reduces financial inclusion (De Koker and Jentzsch, 2013). In some countries, banks face costly regulatory procedures which contribute to low availability and access to banking services and products. It is therefore important to have an understanding of these determinants as they affect financial inclusion, which is one of the sub-objectives of this study.

3.2.3 Barriers to Financial Inclusion

In order to fully understand financial inclusion, it is essential to understand the reasons why people are unbanked since addressing these reasons will promote financial inclusion (Bhanot, Bapat and Bera, 2012). Besides helping researchers understand reasons for being unbanked, identifying barriers that prevent households and firms in developing countries from using financial services also provides hints to policies which could be helpful in eliminating these barriers and broadening access to financial services. Several barriers hinder vulnerable sections of society from accessing formal financial services or banking products. Illiteracy, lack of awareness, social exclusion and low income are some of the demand side barriers. Distance from bank branches (physical access), cumbersome banking procedures and documentation required in opening bank accounts, high transaction costs, unsuitable banking schemes or products, attitudes of bank officials and branch timings are some of the supply side barriers (Salathia and Andotra, 2014). Below is a discussion of the reasons why some members of the population are unbanked:

3.2.3.1 Geographical barriers

Geographical distance plays a major role in denial of or access to financial services (Naceur and Zhang, 2016). A conveniently located financial institution is vital for availing financial services while remote location may be a deterrent for aspirant clients. This particularly holds for female population since their mobility is hampered due to lack of infrastructure and social taboos in free movement in certain parts of Africa. The aged population also falls in the same category since they are reluctant to undertake long journeys to access financial services. The World Bank Report highlighted geography, or physical access as one of the major constraints to financial inclusion (World Bank, 2008).

Although some financial institutions permit clients to access services via the internet or over the phone, some require clients to use an automated teller machine or visit a branch. While an ideal measure would indicate the average distance from household to ATM or branch, the density of branches per capita or square kilometre, provides an initial, albeit crude, indicator.

For example, Spain had 8 branches per 10 000 people and 59 branches per 1 000 square kilometres, while Zambia had 1 branch per 10 000 people and Zimbabwe had 1 branch per 1 000 square kilometres in 2013 (World Bank, 2014). Demirgüç-Kunt and Klapper, (2013), conducted a study on a snap short of financial inclusion in Africa and found that adults with primary education or less, cited cost and distance as a common barrier to financial access. Bringing financial services to rural clientele is a major challenge on the financial inclusion agenda. Long distances rural residents must travel to reach a bank branch have often been cited as the main barrier to financial inclusion in rural areas. This lack of infrastructure as a result of poor road networks may explain why Africa has been leading in terms of mobile financial services which is considered a bright spot in improving financial inclusion. Bhanot *et al*., (2012), found that chances of inclusion decrease with increasing distance from bank branch in North-East India.

3.2.3.2 High cost/ Affordability

Costs are negatively correlated with banking penetration (Beck *et al.,* 2008). Service providers and service utilisers incur costs when providing and utilising financial services respectively. It is not beneficial for service providers to set up branches in rural areas due to high cost and low business. A study by Mujeri (2015), on improving access of the poor to financial services in Bangladesh found that service utilisers (the poor) living in rural areas are reluctant to utilise these services due to high costs such as minimum balance requirements in savings accounts, loan processing charges, fixed charges in credit and debit cards. Many institutions require a minimum account balance or fees that many potential users cannot afford. For example, usually, banks require a person opening a bank account to deposit a minimum amount equivalent to 50 percent of that countries per capita GDP (Bhanot, Bapat and Bera, 2012). Dupas *et al*. (2012), suggested prohibitively expensive withdrawal fees as one of the main reasons why the poor people did not use bank accounts. While barriers to access differ significantly across countries, lower barriers tend to be associated with banking systems which are more open and competitive.

3.2.3.3 Non-price barriers /Lack of Proper Documentation

Certain demographic groups have cited lack of proper documentation as another barrier to financial inclusion (World Bank, 2008). For identification purposes, financial institutions usually require some for verification which most of the people especially the unemployed and the poor do not have. Most of the poor people lack collateral thus they cannot borrow against their future income and also creditors cannot track them as they tend not to have steady jobs. Lack of legal identities such as identity cards and birth certificates also hinders some minorities from accessing financial services. Women who do not possess property and assets generally find it difficult to access credit facilities. They need male guarantors to provide guarantees for them to access credit from any financial institution (Iqbal and Sami, (2017). Demirgüç-Kunt and Klapper (2012), cited documentation as the second most cited barrier to financial inclusion in East and West Africa, with 36 percent of adults citing it as a reason for them not having a formal bank account. Younger adults in Africa have cited insufficient documentation as an important barrier for opening an account while adults in rural areas have cited remote bank location as a common barrier for adults living in rural areas. Allen *et al*. (2012), found that banking costs, proximity to branches and documentation requirements to open an account hinder financial inclusion in 123 countries thereby concurring with the above three barriers.

3.2.3.4 Financial Education/Literacy

Financial literacy is defined as the process where financial consumers develop their knowledge of financial products, risks and concepts. This could be through objective advice, instruction, or information to grow the confidence and skills to become alert to opportunities and financial risks, to take other effective actions and make informed choices to develop their financial welfare. A study by Atkinson and Messy (2013), shows a positive link between low financial inclusion levels and lower levels of financial literacy. It is therefore imperative for financial services providers to offer necessary education required by consumers to understand financial products available to them. Financial illiteracy is a major problem in the developing world. Kefela (2010), emphasises that enhancing financial literacy could bring on board those financially excluded due to illiteracy, which sequentially supports livelihoods and economic

growth. For example, a study conducted in 2016 by the World Bank Group Financial Capability Surveys (FCS) in Morocco and Mozambique indicated that the majority of the people cited lack of financial knowledge as a barrier to attaining appropriate financial products. It also conducted studies in France and Italy on remittance services among migrants and found that a lack of awareness averts people from using suitable financial products and services. The following are benefits of direct and indirect financial education for the unbanked noted by OECD in 2005;

- Improved understanding of typical financial services, and encouragement to avoid non-standard services.
- Reduced cost of information-search for the unbanked.
- Deeper understanding of the benefits and risks of financial services such as credit helps consumers to make informed decisions while applying for credit.
- Protection against unfair, discriminatory practices, such as predatory lending.
- Higher household savings levels.
- Reduced cost of money transfers.

Lack of understanding as a result of financial isolation of the rural people often makes the rural populace to be aliens to the products offered by formal financial institutions. Despite the fact that banks have some financial products that are fit for the poor people, financial illiteracy makes them not to understand the products and hence opposed to using them (Kaddu, 2014). According to Shankar (2013), financial literacy is one of the demand side factors which are a prerequisite for users who would want to access financial services for the first time. A successfully delivered financial literacy creates a demand for financial services from formal financial institutions, which leads to financial inclusion (Khalid and Khalid, 2012).

3.2.3.5 Behavioural aspects

According to the Industrial Development Bank of India (IDBI) Gilts Report (2007), research in behavioural economics has shown that many people are uncomfortable using formal

financial services due to difficulty in understanding the language, reading the document and various hidden terms and conditions. Poor people also think that financial services and products are meant only for the upper strata of society. Behaviour is also based on trust in banks which is significantly associated with higher chances of being formally banked.

3.2.3.6 Technological hindrances

Customers at times hesitate to conduct their banking activities through technological advancements due to fear, lack of familiarity with technologies such as ATMs/ cash machine, internet and mobile banking; and poor language skills, leaving them isolated from an array of services, including those offered by formal financial service providers. Some of those groups affected by restricted mobility may also be susceptible to technological exclusion. Discrimination in some countries has also been identified as a barrier to financial inclusion for certain groups (Atkinson and Mesy, 2013).

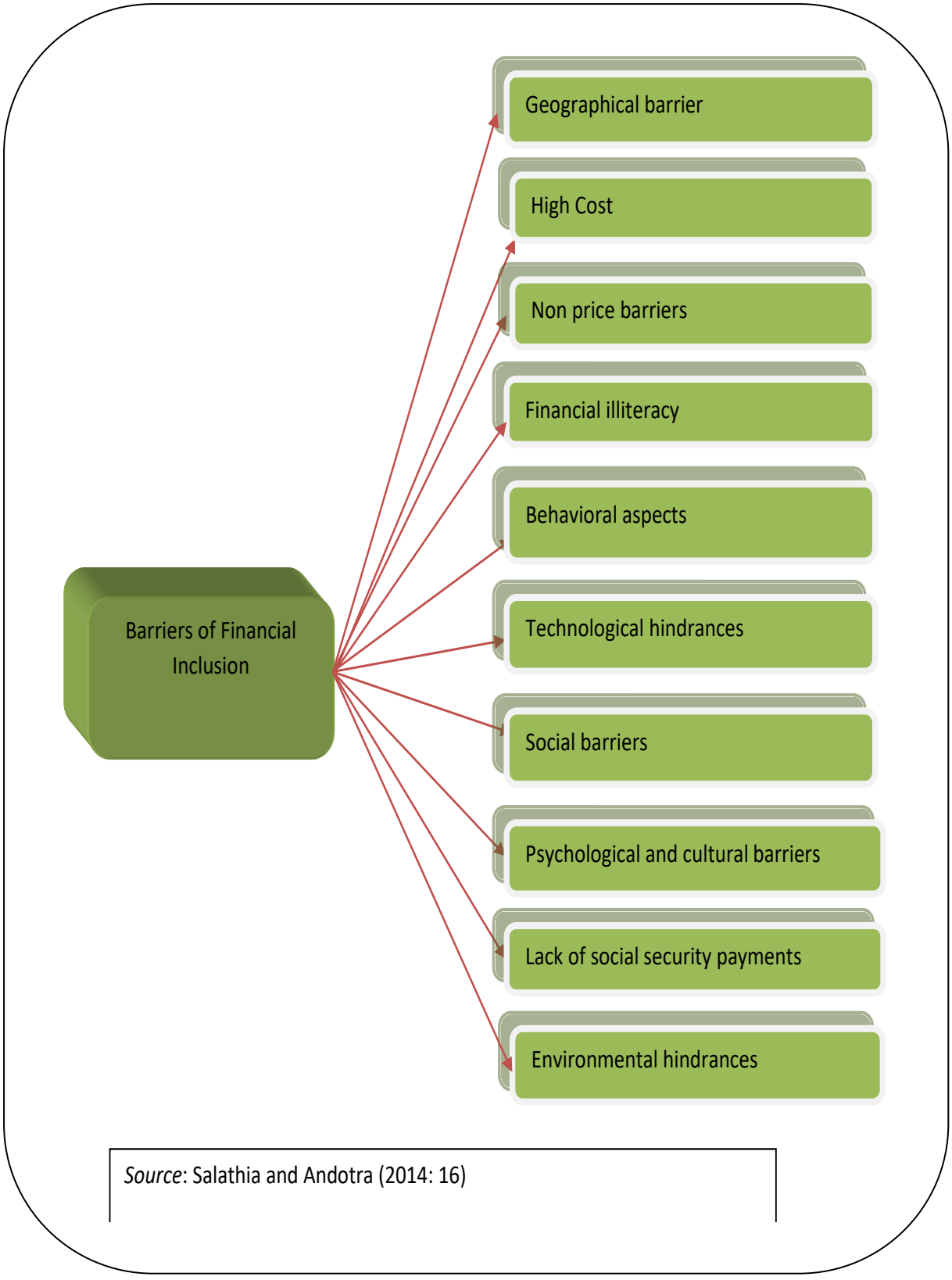


Figure 3. 2: Barriers of financial inclusion

3.2.3.7 Social barriers

Social barriers consist of two major factors, that is, gender and age. In terms of gender, often women have limited access to credit since most of them do not have titles to assets as they must seek male guarantors to guarantee them to borrow. When it comes to age, financial institutions usually target the population which is economically active, often overlooking the design of suitable products for younger or older potential customers (Tuesta *et al*., 2015).

3.2.3.8 Environmental and market factors

Environmental and market factors include demographic and socio-economic patterns such as changing political trends like transfer of risk and responsibilities from state and employer to individuals and market structure (Tuesta *et al.*, 2015).

3.2.3.9 Psychological and cultural barriers

Many of the low-income groups usually willingly exclude themselves from enjoying formal financial products due to psychological barriers such as a feeling of self-discrimination. However, cultural and religious barriers to banking have been observed too among the majority of Muslim nations (Varun Kesavan, 2015).

3.2.3.10 Lack of social security payments

High figures of financial exclusion have been observed in countries where the payment system is isolated from the banking system (Salathia and Andotra, 2014). Surviving research concludes that barriers to financial inclusion are key drivers of financial exclusion (Beck *et al*., 2005; Dermiguc-Kunt *et al*., 2012; World Bank 2008; 2014a).

A theory proposed by Naceur et al., (2015) however argued that financial inclusion is a function of both policy and structural factors. This study identifies the barriers to build an empirical relation between barriers and financial inclusion.

3.2.4 Measurement of Financial Inclusion

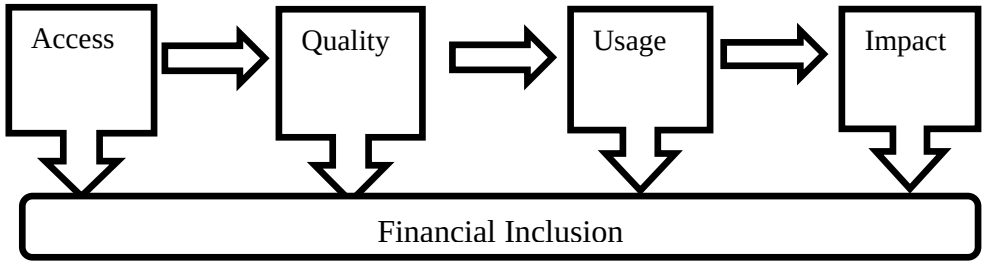
For policymakers to understand the concept of financial inclusion and be able to design policies to improve financial inclusion, they require reliable information on the state of financial inclusion prevailing currently. The information can be used for monitoring and also to deepen understanding around factors of financial inclusion and successively, the effect of policies (Porteous, 2009). There appears to be no standard method of measuring financial inclusion (Young and Mercado, 2015). The difficulties in differentiating between voluntary and non-voluntary financial exclusion bring about challenges in measuring financial inclusion (World Bank, 2008). Voluntary financial exclusion denotes the population that can access financial services but does not do so voluntarily. This population segment needs to be excluded from financial exclusion estimations, posing measurement challenges. This section discusses approaches to measuring the concept of financial inclusion and the instruments used to measure it. Particular attention was however given to their reliability and validity in measuring the concept.

3.2.4.1 Approaches to measuring financial inclusion

Financial inclusion is a multidimensional concept that requires careful selection of variables for its measurement. Numerous studies have commonly used the number of bank accounts (per 1000 adult persons) as the indicator to measure usage (Sarma, 2012; Arun and Kamath, 2015). However, this measure has limitations, since firms or individuals may have multiple and dormant accounts.

Hannig and Jansen (2010), posit that there exist four lenses through which financial inclusion can be measured. These are access, quality, usage, and impact as shown in Figure 3.3 below. Access is the capability to use available products and financial services from formal

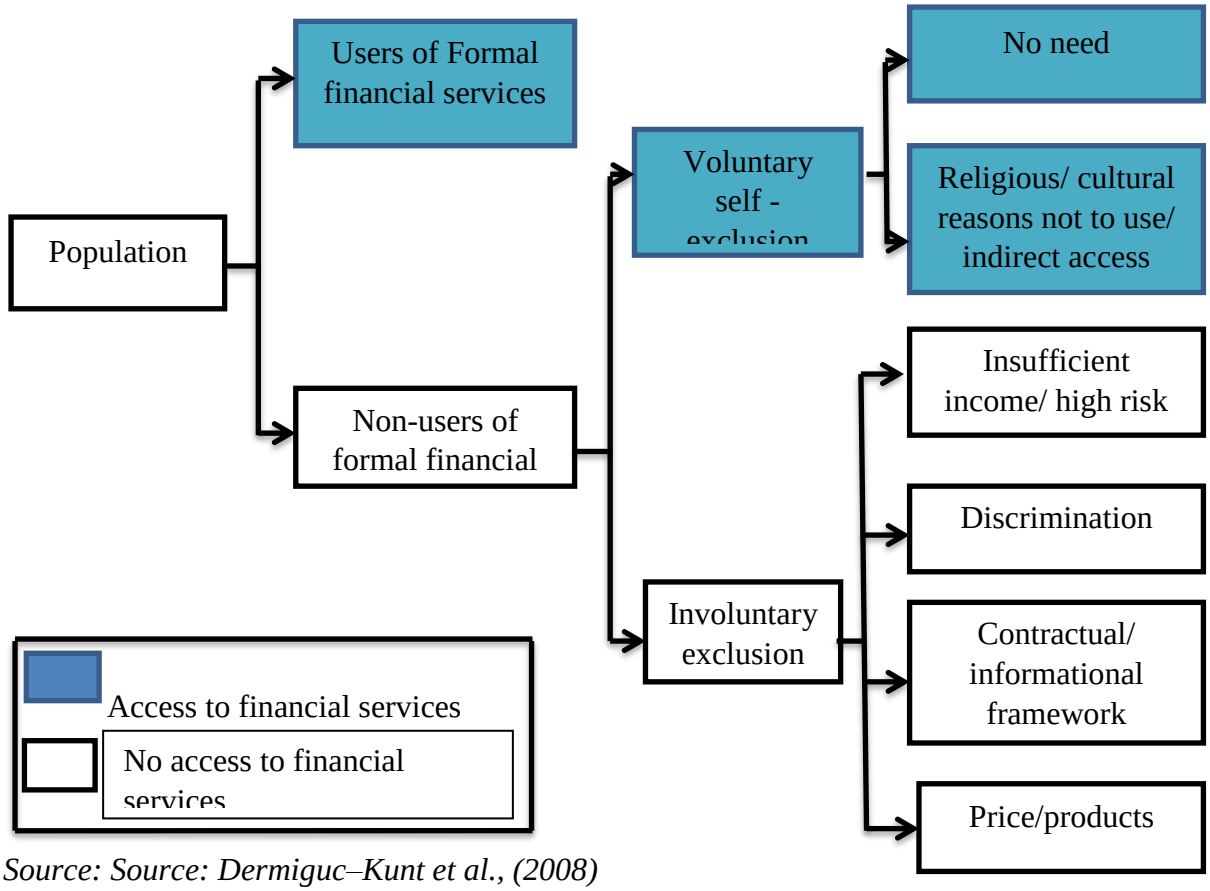
institutions while usage emphasises more on the longevity and depth of financial product and service use. Quality refers to the relevance of the product or financial service to consumer's standard of living. The above factors can be categorised as either demand side or supply side, or a combination of both.



Source: Hannig and Jansen (2010)

Figure 3. 3: Measures of Financial Inclusion

Although financial access and usage may be vital for output, the financial sector may not provide the much-needed financing because of the high cost of credit assessment, credit monitoring and the lack of acceptable collateral. Figure 3.4 shows the difference between financial access and financial usage. Users comprise those who can access the financial system or decide not to use it for some reason. The non-users consist of those populations who are too risky or who do not have enough income, those discriminated on social, religious, or ethnic grounds and those who are costly to reach. Sahay *et al*., (2015), contends that access to finance can expedite the poorest of the population in developing countries to improve their economic situation. However, access to financial services does not guarantee that individuals will use these services. Individuals might decide not to use financial services they have access to, because of high opportunity costs, a lack of trust or socio-cultural concerns. Sahrawat (2010), even went further and stressed that simple ownership of financial products does not lead to financial inclusion; instead, it is the usage of the product which eventually leads to financial inclusion. For instance, if an individual opens a bank account, it is often treated as a proxy for financial inclusion.



Source: Source: Dermiguc–Kunt et al., (2008)

Figure 3. 4: Distinctions between the Access to and Use of Financial Services

The intensity of usage of a bank account by that individual would be a better indicator of financial inclusion. Even though financial access and usage are acknowledged as measures of financial inclusion, financial usage is a better measure (Evans and Evans, 2017). Therefore, this study uses both access and usage as part of the indicators of the financial inclusion index. Moreover, in spite of large evolving literature on financial inclusion, studies that compute a comprehensive index of financial inclusion across countries does not exist.

The existing literature on factors hindering financial inclusion mainly focused mainly on the savings and credit services offered by banks. This gave rise to several studies using banking indicators to discuss the measurement of financial inclusion (for example, Sarma, 2008; Honohan, 2008; Chakravarty and Pal, 2010; Gupte, Venkataramani, and Gupta, 2012). Some studies also attempted to develop an index using various dimensions of financial access.

However, the researchers are restricted to credits and savings data, while ignoring other vital services like insurance. In addition, empirical studies that used a comprehensive index of financial inclusion as the dependent variable are scanty. The financial inclusion measurement involves the indicators and dimensions of financial inclusion which are discussed below.

3.2.4.2 Indicators and Dimensions of financial inclusion

Some studies recommended the use of many dimensions to proxy and measure financial inclusion. Besides that, the comprehensiveness of the financial inclusion index could be improved by taking into consideration the four crucial financial services as specified by the World Bank, that is, credit, saving, banking transaction, and insurance. The first attempt to measure financial sector outreach was done by Beck et al., (2007), measuring the outreach of the banking sector and its determinants for the year 2003-2004. They constructed an index of financial inclusion using eight individual indicators to measure the finance outreach among them: the number of ATMs, bank branches, deposit and loan accounts per square kilometre and per capita. Although the indicators appear to be complete, they yield the correct information if aggregated. A single indicator can sometimes be incorrect and does not mean anything. For example, Sarma (2008), notes that despite having a high number of bank accounts per capita, Russia had few bank branches. Thus, financial inclusion cannot be measured with individual indicators as it is multidimensional. Scholars have divided the financial inclusion indicators into 'availability, accessibility and usage' in an endeavour to compute a multi-dimensional index to measure such inclusion (Sarma, 2008). Other studies have followed the footsteps of Beck *et al*. (2007), in examining barriers to financial inclusion (Beck, Demirguc-Kunt and Martinez Peria, 2008) and other factors of banking outreach (Ghosh, 2012).

Since there may be other financial services providers besides banks, some studies (Christen, Jayadeva and Rosenberg, 2004; Peachey and Roe, 2006) used information on access to substitute financial institutions. Examples are postal savings banks, microfinance institutions, and credit unions to ascertain the extent of access to financial services from these sources in selected countries. Honohan (2008), constructed estimates of the proportional formally

banked households and subsequently compared them to inequality and poverty. Honohan (2008), used average deposit size, household access and GDP per capita, to calculate the estimates for more than 160 countries. The study found that Latin America and the Caribbean had the highest mean percentages, but countries in Africa and Eastern Europe and Central Asia had the lowest mean percentages. Each of the indicators mentioned above provides useful and important information on financial system outreach of an economy. While used individually, they, however, fail to offer a comprehensive measure of the inclusiveness of the banking system. The use of singular indicators may correspondingly lead to wrong interpretation of the results on financial inclusion in an economy. A country may be well positioned in one dimension, but not in the other. For instance, in 2015, Zimbabwe had 14.38 branches per 100 000 adults whereas Angola had 11.75 branches per 100 000 adults. On the other hand, Zimbabwe had 81 depositors per 1000 adults while Angola had 592 depositors per 1000 adults. Using bank branches per 100 adults Angola ranks lower than Zimbabwe but looking at the other dimension; Zimbabwe ranks lower than Angola within the same year.

Studies have used several indicators known as the index of financial inclusion (FII) to evaluate the level of financial inclusion. While they are individually used, they, however, provide part information on the level of financial inclusion in an economy (Chattopadhyay, 2011). Chattopadhyay (2011), opines that the index should be simple, easy to calculate, and comparable across countries. It should also integrate information on several dimensions of financial inclusion. Hannig and Jansen (2010), further opined that financial inclusion measurement serves to measure and monitor financial inclusion levels and to make deeper understanding of factors of financial inclusion and, consequently, impact on policies. Sahrawat (2010), stressed that it is the product usage which eventually drives financial inclusion rather than mere ownership of a financial product. Thus, these views should be taken into account when measuring financial inclusion.

Sarma (2008), attempted to fill the above gap by applying an econometric approach to create a financial inclusion measure. He proposed a multidimensional financial inclusion index on the banking sector outreach using macroeconomic data to combine meaningfully several indicators, such as availability, accessibility and usage of banking services. Sarma (2008),

adopted the Human Development Index (HDI) concept and used one usage variable and three variables to compute a comprehensive financial inclusion index. The index is also easy to compute and is comparable across countries or provinces at a particular point in time. The measure also enforces non-varying weights for each dimension. The measure can also be used to monitor financial inclusion initiatives policy progress in countries over time. Borrowing from Sarma (2008), who adopted the UNDP HDI to compute a FII, a number of researchers have also calculated the financial inclusion index for specific countries and states and examined how it relates to other social factors such as inequality, urbanisation, income, or even literacy (Sarma and Pais, 2008; Kumar and Mishra, 2009; Mehrotra *et al*., 2009; Arora, 2010; Gupte *et al*., 2012; Sarma, 2010; 2012; Kumar, 2016 and Tan, 2017). Pal and Chakravarty (2010), improved upon Sarma's method by employing the axiomatic measurement approach to establish how various factors contribute towards inclusion. Cáamara and Tuesta (2014), measured financial inclusion levels at country level using the supply-and-demand information for eighty-two countries. They used a two-stage PCA to compute a composite index of financial inclusion. In addition, the global Findex database which was initiated by the World Bank makes available indicators of financial inclusion based on a primary survey conducted 148 countries on 150 000 adults during 2011 (Dermiguc-Kunt and Klapper 2012). Amidžić, Massara, and Mialou (2014), computed a financial inclusion index as a compound indicator of variables in relation to outreach (demographic and geographic penetration), usage (lending and deposit), and quality (cost of usage, disclosure requirement, and dispute resolution).

There has been a rapid global drive for financial inclusion in the last decade. However, financial inclusion continues to bring increasing concerns for several economies. The concerns have steered more than 50 countries to set formal targets of attaining universal financial access by 2020 and many more countries tasking their supervisory and regulatory agencies with encouraging financial inclusion (Sahay *et al*., 2015). The African region has progressed well from these efforts, but whether the progress has translated into the much awaited financially inclusive environment still leaves a lot to be desired. According to Dermiguc Kunt *et al.*, (2015), more than 75 per cent of the adult population in Africa have no bank accounts. The region is also characterised by a wide heterogeneity in account ownership across countries. While 82 percent, 75 percent and 70 percent of the adult population in

countries like Mauritius, Kenya and South Africa are respectively banked, only 7 percent have a formal bank account in Burundi, Guinea and Niger (Demirgüç-Kunt *et al*., 2015). As highlighted before, a wide-ranging body of empirical and theoretical studies has conveyed the substantial role of financial inclusion in ensuring economic growth. How conversant is this assertion? Do low financial inclusion levels truly characterise the African region?

Some studies such as Iqbal and Sami (2017), Sharma (2016), Ghosh (2011) and Pradhan (2010), used a single indicator to establish linkages between financial inclusion and the growth of economies. However, Sarma (2008), criticised the use of a single indicator for assessing the level of financial inclusion as it can give a distorted result. So, it is essential to compute a comprehensive financial inclusion measure to avoid such problems. Following the argument made by Sarma (2008) and Gupte *et al*. (2012), this study constructed a multidimensional index of financial inclusion to measure the level of financial inclusion between countries. The study used several dimensions and current time trend which were omitted in previous studies and tested whether adding more indicators and dimensions to the index makes it more holistic and comprehensive. The index is built across many years (2004–2016) and several countries (49), a time-series estimation, which, to the best of the researcher's knowledge has not been done before. This study also contributed to literature by constructing a unique financial inclusion index combining Camara and Tuesta's (2014) principal component analysis with Sarma's (2008) multidimensional approach to address the weaknesses of each approach.

Several reasons account for the low levels of financial inclusion in Africa. These reasons range from structural and policy-related factors (Love and Martínez Pería, 2012) to some non-policy characteristics of the country such as inflows of international remittances (Aga and Martinez Pería, 2014). The productive efficiency benefits of financial inclusion apply in the region despite the existence of these limitations. Various relevant supporting theories and empirical literature on financial inclusion in the region were also reviewed in this section. This study revealed the existence of adamant financial exclusion within the African region with an average FII at 0.14 thereby confirming the argument that most African countries need immediate intervention. The other parts of this study are structured as follows. Section 3.2

reviews theories of financial inclusion and previous empirical literature. The methodology of the study is considered in Section 3.3, then the results and its analysis in Section 3.4 and finally Section 3.5 comprises the summary and conclusion of the study.

3.3. Methodology

An inclusive (financial) environment drives economic growth, competition and stability (Claessens and Laeven, 2005; Hannings and Jansen, 2010; Wang'oo, 2013; Babajide and Oyedayo, 2014; Mehrotra and Yetman, 2014; Mostak, 2015; Lenka and Sharma, 2017; Okoyo *et al*., 2017; Saidi and Emara, 2017, Gretta, 2017; Evans, 2017; Mwaitete and George, 2018). The goal of financial inclusion is to improve resource distribution (Odeniran and Udeaja, 2010), providing reliable low-cost payment means to all (Levine, 2005) and risk management (Bencivenga and Smith, 1991). These suggest that for Africa to harness its prospects for growth, its economies must be able to mobilise access to credit, savings and investments. It has been contended that the developmental aspiration for Africa will be unlocked the moment issues of financial inclusion are addressed (Musau, Muathe and Mwangi, 2018). Then the question is, how financial inclusive are African economies?

3.3.1 Model Specification

To answer the question in section 3.3, this study computed a new index of financial inclusion by combining the Sarma (2008) and Camara and Tuesta (2014) approaches to overcome the weaknesses of each methodology. Like Sarma (2008), the study used usage, access, and availability as dimensions of the financial inclusion index[3]. The study computed the indicator for each dimension as:

$$\wp_{i,d} = \frac{\varkappa_{i-m_i}}{M_{i-m_i}} \quad \text{(3.1)}$$

[3] The study classifies the banked adults (%) as access and not usage, in line with existing studies on financial inclusion (Honohan, 2007, 2008; Beck, Demirgüç-Kunt, and Honohan 2009; Sarma 2008, 2015 and Park and Mercado 2016, 2018).

Where $\varkappa_i$ is the value of indicator i, m_i is the minimum (lowest) value of indicator i, M_i is the maximum (highest) value of dimension i[4]. $\wp_{i,d}$ is the standardised value of indicator i with d being the dimension. The study followed the footsteps of Camara and Tuesta (2014), in using PCA in aggregating each indicator to a dimension index. The study denotes λ_k (k = 1… p) as the k^{th} eigenvalue, subscript k is the number of principal components that also matches with the number of standardised indicators p. The study assumed that $\lambda_1 > \lambda_2 > \cdots \lambda_p$ and denote P_l (k = 1… p) as the l^{th} principal component. The study derived each dimension index in line with the weighted averages:

$$\mathfrak{H}_d = \frac{\sum_{k,l=1}^{p} \lambda_k P_l}{\sum_{l=1}^{p} \lambda_k} \quad (3.2)$$

Where $\mathfrak{H}_d$ is dimension d index and $P_l = \mathfrak{R}\lambda_k$. λ_k signifies the variance of the principal component (weights) and $\mathfrak{R}$ is the indicators matrix. Following Camara and Tuesta (2014), the study also takes into account 100 percent of the total variation in the indices of dimensions to avoid dumping information that could precisely estimate the overall financial inclusion index of a country. Having established the dimension indices, another principal component analysis is run as in Equation 3.3 below to compute the dimension weights for the overall financial inclusion.

$$FII_i = \frac{\sum_{k,l=1}^{p} \lambda_k P_{li}}{\sum_{l=1}^{p} \lambda_k} \quad (3.3)$$

Where FII_i is the aggregate financial inclusion index for country i. $P_l = \mathfrak{R}\lambda_k$. λ_k is the variance of the k^{th} principal component (weights) and $\mathfrak{R}$ is the dimensions matrix. Decreasing weights were assigned to each component and the study also accounts for 100 percent of the total variation in the FII. The above equation can also be represented as:

[4] Following Sarma (2015), the study set zero as the minimum value for each indicator.

$$FII_i = \omega_1 \mathfrak{H}_{1k} + \omega_2 \mathfrak{H}_{2k} + \omega_3 \mathfrak{H}_{3k} \ldots\ldots (3.4)$$

Where ω represents the weights obtained from PCA and $\mathfrak{H}_i$ are the dimensions. Equation 3.4 above shows that the financial inclusion index for the sampled size is a weighted average of individual dimensions.

The study provided summary statistics and correlation analysis to critically examine the strength, magnitude and nature of co-movements between and amongst the indicators of financial inclusion. The study then followed the footsteps of the OECD's handbook in constructing composite indicators of financial inclusion. The study began with data selection followed by identification and treatment of missing data; multivariate analysis; normalisation; aggregation and weighting before linking the index to other variables respectively. The study performed a PCA for both access and usage indices to examine the statistical balance and importance of the indicators used for the index. Given that the indicators are not expressed using the same scales, the study used the Min-Max method to normalise the data thereby making the indicators comparable. The Factor Analysis was latterly used to allocate the weights for the singular indicators of the indices before aggregating the indices. Finally, the study related the index to other specific factors, to ascertain linkages through regressions (see Section 3.4.5).

3.3.2 Determinants of Financial Inclusion

For the purpose of the determinants of financial inclusion in the African region, this study followed (Claessens and Laeven, 2005; Hannings and Jansen, 2010; Mehrotra and Yetman, 2014; Lenka and Sharma, 2017; Okoyo *et al.*, 2017; Saidi and Emara, 2017, Mwaitete and George, 2018) who selected country-specific variables of bank competition, stability, economic growth, economic freedom, governance and size as potential determinants of financial inclusion. Using macro and micro-econometrics methodologies, Sahay *et al.*, (2015), examined the interplay between financial inclusion and the growth of economies and found a positive effect between the variables. They recommended the incorporation of

financial development in future studies. This study, therefore, includes financial development as a determinant of economic growth and financial inclusion.

3.3.3 Panel data analysis techniques

There are various types of panel data analytic models. These includes pooled regression, random effects, fixed effects models and the generalised method of moments.The merits and demerits of each model is explained below;

3.3.3.1 Pooled Regression Model

This is a type of panel model where constant coefficients relate to both intercepts and slopes. Some studies including Ezenwakwelu (2018), Mwaitete and George (2018) and Otiwu et al., (2018) assumed non-unobservable individual effects and used a pooled regression model. The method is inefficient given that μ is indirectly observable and correlates with other explanatory variables (Antoniou et al., 2008). The model works well for homogenous countries making it unsuitable in this case where there is high heterogeneity across countries.

3.3.3.2 The Fixed Effects Model

Sethy (2018) has used the fixed effect model to investigate the interplay between financial inclusion and economic growth for developed and developing countries. One big advantage of the fixed effects model is that the error terms may be correlated with the individual effects. This model however cannot control for problems of endogeneity which can be controlled using the instrumental variable (IV) technique. Nevertheless the technique might not be efficient since it fails to use all the available moments conditions. According to Munos (2013), the endogeneity problem arises from omissions, possible measurement errors, possible bidirectional causation between financial inclusion and economic growth or other variables and the chances that Tobin Q can be endogenous.

3.3.3.3 Random Effect Model

The random effects model is a regression with a random constant term (Greene, 2003). The model assumes the intercept as a random outcome to handle the error. The random outcome is a function of random error and a mean value.The random effects model has the clear-cut advantage of permitting time-invariant variables to be included among the regressors. When there are repeated observations per individual this is both a problem and an advantage in that the observations are not independent. The repetition can be used to get better parameter estimates. In this case the use of pooled OLS would cause biased estimates. Fitting the fixed-effect or random-effect models which take account of the repetition help controlling for fixed or random individual differences. The model fails to take into account issues of endogeneity.

3.3.3.4 Generalised Method of Moments

The application of the regression of the link between financial inclusion and other determinants in Africa banks is done using the GMM regression. The conventional estimators of dynamic panel data like; pooled OLS, first difference, and generalised least squares are inept in handling dynamic panel bias, thus the proposed use of instrumental variables to alleviate endogeneity issues in the lagged endogenous variables. The GMM is free from normality and has greater assumptions of data generating process and adaptability in the presence of lagged variables. The estimation model is based on the system GMM estimator by Blundell and Bond (1998) and Arellano and Bover (1995) who identified the weaknesses in the Arellano and Bond -PDP estimator by Arellano and Bond (1991).The lagged levels are often-times rather poor instruments for first differenced variables, particularly if the variables are more or less a random walk. Their modification of the estimator reckon lagged levels as well as lagged differences. The original estimator is often called difference GMM, whilst the expanded estimator is usually termed System GMM. This allows the application of the economies specific variables that drive financial inclusion while controlling for various macroeconomic variables. Therefore, this study combined time series data of the sampled cross-sectional countries in Africa using the generalised method of moments (GMM). The benefits offered by the technique to the study justify the choice of panel data analysis. Panel analysis allows for the analysis and creation of complicated behavioural models. The

technique also accommodates more degrees of freedom. Moreover, the technique provides more explanatory analysis and is efficient when compared to cross-sectional and time series data. Generally, panel analysis meant fewer collinearity, more variability, and controlled heterogeneity in individual data (Baltagi, 2008).

Financial institutions normally expand their service provision if there exists a significant market for their product. This study used population size as a proxy for market size in line with Beck and Feyen (2013). Larger population size is expected to enhance financial inclusion as a result of scale effects, which potentially give rise to efficient service provision in bigger economies than smaller ones, whose population may be less urbanised and more highly dispersed (De la Torre *et al*., 2013). The variable is expressed in logarithm form in the model estimation.

Financial inclusion is expected to increase with an increase in population density and size. Financial institutions can easily accumulate savings when potential depositors have easy access to them. As population size increases there exists greater chances of individuals and businesses making savings, deposits and insurance to cushion against risk. This study also used population size and density as determinants of financial inclusion consistent with Beck and Feyen (2013).

The relationship between inflation and financial inclusion could be either direct or indirect. Access to bank accounts by the poor can cause them to invest the money and not use it leading to curve inflation. Inflation can also affect money supply within an economy thereby reducing financial inclusion. The level of income is also expected to positively contribute to financial inclusion. Higher income levels may encourage individuals and firms to save and insure their assets against risk thus increasing financial inclusion levels.

Below is an expression of the estimable form of the model;

$$FII_{it} = \delta_{it} + \lambda\ FII_{it-1} + \Psi_{it}\ \sum \chi_{i\,t} + \varrho_{i\,t} \sum \aleph_{i\,t} + \upsilon_{i,t} \ldots\ldots\ldots\ldots\ldots\ldots \quad (3.5)$$

Where, the subscripts *it* represents country and year respectively. *FII* measures the one period lagged financial inclusion, δ is the intercept, whilst λ, Ψ and ϱ are coefficients. $\sum \chi$ represent the country specific variables that drives financial inclusion, these are; population density (POPDENS), population size (POP), broad money (BROAD), and financial development (FDI). The macroeconomic variables considered are the level of income measured by GDP per capita (GDPPC), inflation rate (INF) represented by $\sum \aleph_i$ with υ as the error term. The financial development index (FDI) was computed using the principal component analysis on seven variables. The variables includes net interest margin, overhead cost to total assets, broad money (M2) to GDP, Bank Assets to Bank and Central Bank assets, Bank assets to GDP, Domestic credit to private sector as a percentage of GDP and liquid liabilities to GDP.

3.3.4 Data

To compute the degree of financial inclusion of African countries, this study used a panel of 49 countries from the African region sourced over the period 2004-2016. The choice of period is informed by the availability of data on the World Development Indicators (WDI) Databases, which provides data for 189 countries across the globe. The WDI Database is much broader and contains significant details on financial inclusion and other variables. In addition, it facilitates better comparison across countries. However, this database's major limitation is that several countries have missing data. The study excluded countries[5] which had missing data in several years.

3.4. Empirical Results

Table 3.1 provides a summary of the indicators of financial inclusion used in this study. The data show the presence of great discrepancies between various indicators of financial

[5] For instance, countries such as Congo and Sudan were excluded for integrity and paucity of data, resulting from their economies that have been ravaged by wars.

inclusion. For example, the mean number of ATMs per area in Africa is only 12 which differs greatly from East Asia and Pacific and the Middle East which have 215 and 125, respectively. This figure is also far from the average World figure of 75, thereby providing evidence why financial exclusion is high in Africa. Generally, the African region ranks lowest on almost all indicators of financial inclusion, except on branches of commercial banks per 1 000 km^2 and the number of ATMs per 1000 adults where it is ranked second lowest and also the indicators of financial inclusion in the African region rank far below world average. The region also ranks below average, even when compared to other countries in the same income groups. Numerous studies also allude to the same (Demirgüç-Kunt, Beck, and Honohan, 2008; Beck *et al*., 2008; Allen *et al*., 2011; Aterido *et al*., 2013). On average the East Asia and Pacific continent and Europe and Central Asia have recorded the highest levels of financial inclusion over the period under review. Although financial inclusion has been contemplated as a universal challenge, the situation in Africa requires immediate action. These large discrepancies may be as a result of a number of political or socio-economic reasons like regime durability and transition, levels of autocracy, executive and legislative electoral competitiveness, checks and balances, gender, age, bank concentration in rural areas, but it is still interesting to realise that these differences are widespread in almost all the variables. Both policymakers and private sectors should make a united effort towards improving financial inclusion within Africa.

Table 3. 1: Summary Statistics-Indicators of Financial Inclusion

Table 3.1: Summary Statistics-Indicators of Financial Inclusion

Variable	World			EAP	LAC	ECA	ME	SA	NA	Africa	LICs
	Mean	Max	Min	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Outstanding deposits with comm. banks (% of GDP)	53.9	496.3	1.2	72.2	47.7	58.4	63.6	43.8	60.3	31.5	38.1
ATMs per 1 000 km2	74.8	3963	0.01	214.2	36.9	84.1	124.2	36.0	18.4	9.7	12.0
ATMs per 100 000 adults	60.0	288.6	0.01	47.2	40.9	67.6	47.6	8.3	198.3	10.2	18.6
Branches of commercial banks per 1 000 km2	34.8	1418	0.01	73.7	19.1	54.5	53.5	31.8	5.3	6	8.6
Branches of commercial banks per 100 000 adults	18.8	287.2	0.1	14.3	20.1	34.9	17.4	9.4	29.5	6.3	12.8
Borrowers at commercial banks per 1 000 adults	198.9	1233	0.01	238.4	206.5	306.8	321.6	67.6	N/A	52.6	80
Commercial banks deposit accounts per 1 000 adults	1149.6	7988	1.3	1515	963.8	2033	1333.2	642.6	N/A	409.9	505
Depositors with commercial banks per 1 000 adults	673.5	3380	0.4	763	679.8	1108	781.3	458	N/A	250.7	101.1
Commercial banks loan accounts per 1000 adults	307.9	1854	0.4	266.8	411.1	601.8	402.5	83.4	N/A	81.5	119.3
Number of countries	184			24	32	49	20	8	2	49	77

Key: EAP- East Asia and Pacific, ME- Middle East, LAC- Latin America and Caribbean, LICs- Low Income Countries, SA- South Asia, ECA- Europe and Central Asia, NA- North America

Source: Financial Access Survey -International Monetary Fund (2017)

3.4.1 Pearson Correlation and Multi-collinearity Test

Correlation analysis helps in tracing the existence of multicollinearity and endogeneity problems associated with a number of econometric models. This study, therefore, inspected correlation among the indicators of financial inclusion using Pearson Product correlation coefficient to critically examine the strength, magnitude and nature of co-movements between financial inclusion and growth variables in Africa. Table 3.2 presents the empirical correlations matrix between the variables under study. As shown in Table 3.2, a strong significant correlation exists among the financial inclusion indicators. The 0.96 significant correlation coefficient between ATMs per 1000 km^2 and bank branches per 1000 km^2 indicates a near perfect multi-collinearity scenario. It simply indicates that ATMs per 1000 km2 and bank branches per 1000 km^2 have a 0.96 significant positive relationship. The findings also indicate 0.87 significant positive correlation between ATMs per 1000 km^2 and outstanding loans as a percentage to GDP. The variable ATMs per 1000 km^2 was dropped to deal with the problem of multicollinearity.

Table 3. 2: Correlation Financial Inclusion Indicators

	ATMs per Pop.	**ATMs per area**	**Bank Branches per pop.**	**Bank Branches per area.**	**Outstanding Loans (% GDP**	**Bank Accounts per pop.**
ATMs per pop.	1.000					
ATMs per area.	0.689*	1.000				
Bank Branches per pop.	0.643*	0.312*	1.000			
Bank Branches per area	0.572*	0.958*	0.243*	1.000		
Outstanding Loans (% GDP)	0.741*	0.876*	0.552*	0.890*	1.000	
Bank Accounts per pop.	0.768*	0.661*	0.642*	0.549*	0.747*	1.000

Standard error in parentheses; * $p < 0.05$

Source: Authors' calculations from World Bank Development Indicators (2017)

3.4.3 Financial Inclusion Index Results

Table 3.3 shows the summary statistics of the financial inclusion indices for the African countries for the period 2004-2016. This summary shows some remarkable features of the nature of financial inclusion in the African region. The study found that the average financial inclusion in Africa range between 0 in 2011-2013 and 0.88 in 2016 as portrayed by the maximum and minimum values. The implication is that despite the fact that some countries have low financial inclusion levels, others have high degrees of financial inclusion supporting the view that Africa is characterised by severe financial inclusion disparities (Ndlovu, 2017). However, despite the existence of large disparities in financial inclusion within Africa, their mean values are close to the standard deviation than to the minimum value. Two possible implications can be construed from this. Firstly, it is implied that there are very few countries with high financial inclusion levels. This is in keeping with literature; using the Boone indicator, the study found that banking sectors in Africa are somehow concentrated. The descriptive statistics also show severe gaps between the maximum values and minimum values thereby confirming the presence of wide variations in all sample indicators across economies. These figures indicates the existence of severe financial exclusion within the African region.

Table 3. 3: Financial Inclusion Index Summary Statistics-Africa

Year	Mean	Standard Deviation	Maximum	Minimum
2004	0.13	0.16	0.80	0.01
2005	0.14	0.17	0.84	0.01
2006	0.10	0.17	0.17	0.00
2007	0.14	0.18	0.82	0.01
2008	0.15	0.18	0.83	0.01
2009	0.16	0.18	0.78	0.01
2010	0.16	0.18	0.77	0.01
2011	0.16	0.18	0.75	0.00
2012	0.16	0.18	0.79	0.00
2013	0.16	0.19	0.86	0.00
2014	0.17	0.18	0.86	0.02
2015	0.17	0.18	0.87	0.03
2016	0.17	0.19	0.88	0.02
Average	0.15	0.18		

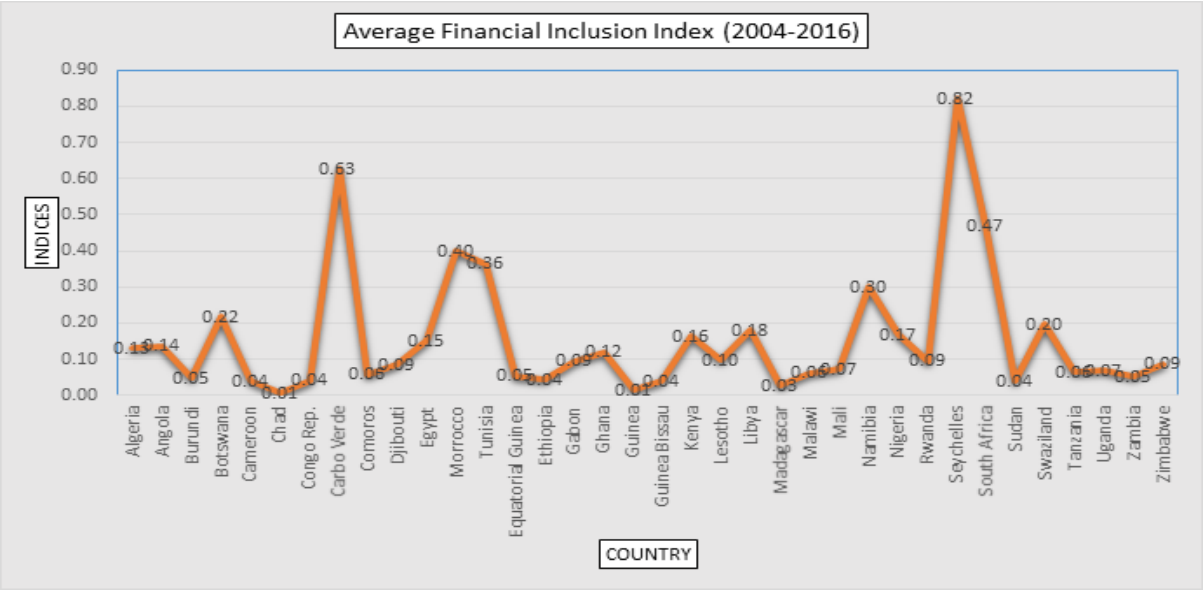
Source: Author's Estimation (2018)

3.4.4. Financial inclusion analysis

Figure 3.5, Figure 3.6, and Table 3.4 portrays the financial inclusion index results, giving a picture of the analysis of the financial inclusion trend in the regions between the periods 2004 to 2016. Precisely, Figure 3.5 indicates the country analysis of financial inclusion providing a pictographic view of the descriptions of financial inclusion. It serves to say that the graph clearly shows wide discrepancies in financial inclusion among the countries of the region, with Chad and Guinea having the least at 0.01 and Seychelles and Cape-Verde with the

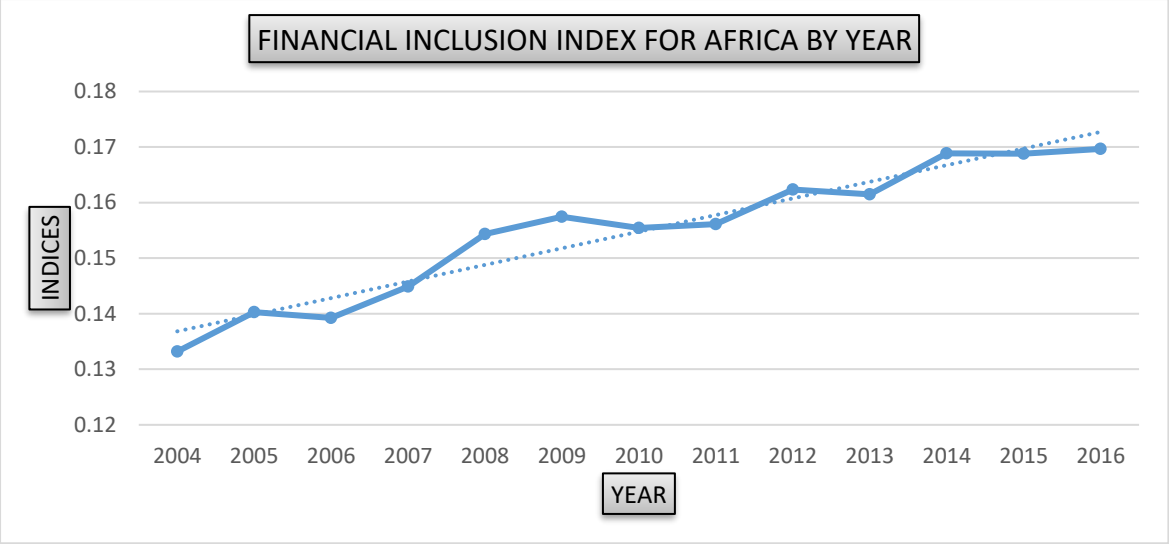
highest at 0.82 and 0.63, respectively. Over the period 2004 to 2016, only Cape-Verde and Seychelles had an average financial inclusion index above 50 percent as shown in Figure 3.5, and the majority were below 40 percent. This validates further the argument this study raised earlier that, the African region is characterised by very high levels of financial exclusion and also confirms the argument that most African countries need immediate intervention although financial exclusion is a global concern. These findings are also consistent with those obtained by Ndlovu (2017), who used fewer indicators and data span in his study. Mauritius was however excluded from the sample due to the unavailability of data on bank accounts per 1000 adults; however, it had higher values for the other indicators of financial inclusion. The average index of financial inclusion is 0.15, which would suggest that the average financial inclusion level is at 15 percent based on the index.

Figure 3.6 portrays the evolution of year-on-year access to finance in the African region from 2004 to 2016. The indices were highest in 2016 at 0.17 and least in 2004 at 0.13. The study noted an upward trend in financial inclusion from the graph over the period as shown by the trend line. This upward movement continued between 2004 and 2016.



Source: Own Calculations from International Monetary Fund - Financial Access Survey (2017)

Figure 3. 5: Average African Financial Inclusion Index by Country (2004-2016)



Source: Own Calculations from International Monetary Fund - Financial Access Survey (2017)

Figure 3. 6: Average African Financial Inclusion Index by Year (2004-2016)

Table 3.4 indicates the rankings of African countries depending on their FII values. Borrowing from Sarma (2008), those countries that fall within the 0-0.3 range are classified as having low financial inclusion, those from 0.3-0.5 are classified as having medium financial inclusion, and those from 0.5 to 1 are classified as having high financial inclusion. As shown in Table 3.4, Seychelles, Cape Verde and South Africa have the highest overall FII values over the period 2004-2016. On the other end of the spectrum, Chad, Guinea and Madagascar had the lowest overall rank of FII at most of the years during these periods. The overall index shows that only Seychelles falls within the high-level FII category. In addition, the medium level FII category varies across the years. Thus, there were only three countries in this category, in 2004, while there were only four in 2010 and 2016. More than 95 percent of the African countries fall within the low financial inclusion range thereby justifying the call for immediate action in Africa. The FII values that the study computed across the African countries is consistent with other studies which concluded that financial exclusion is high in Africa (Ndlovu, 2017). The study computed the mean FII by aggregating the index of financial inclusion values for each country between 2004 and 2016 and dividing by 13 which is the time interval between 2004 and 2016. The ranking of countries is done according to the alphabetical order of the sampled countries.

Country	2004	Ranking	2005	Ranking	2006	Ranking	2007	Ranking	2008	Ranking	2009	Ranking	2010	Ranking
Algeria	0,15	19	0,14	10	0,13	11	0,14	11	0,13	12	0,14	11	0,12	12
Angola	0,03	29	0,06	15	0,07	15	0,09	14	0,10	14	0,15	10	0,14	11
Burundi	0,06	26	0,05	16	0,05	17	0,05	18	0,05	18	0,04	20	0,05	17
Botswana	0,22	6	0,21	7	0,21	7	0,27	6	0,25	5	0,24	7	0,22	6
Cameroon	0,03	29	0,04	17	0,04	18	0,04	19	0,04	19	0,04	20	0,04	18
Chad	0,01	31	0,01	20	0,01	20	0,01	21	0,01	22	0,01	23	0,01	20
Congo Rep.	0,01	31	0,01	20	0,01	20	0,02	20	0,02	21	0,02	22	0,03	19
Cape-Verde	0,46	2	0,49	2	0,53	2	0,59	2	0,62	2	0,65	2	0,69	2
Comoros	0,04	27	0,03	18	0,03	19	0,03	20	0,03	20	0,04	20	0,05	17
Djibouti	0,06	26	0,05	16	0,05	17	0,06	17	0,07	16	0,09	15	0,10	13
Egypt	0,20	8	0,20	8	0,17	9	0,16	10	0,15	10	0,13	12	0,12	12
Morocco	0,29	5	0,35	5	0,33	5	0,36	5	0,37	4	0,43	4	0,43	4
Tunisia	0,37	4	0,38	4	0,37	4	0,38	4	0,37	4	0,37	5	0,38	5
Equatorial Guinea	0,03	29	0,03	18	0,04	18	0,04	19	0,05	18	0,05	19	0,05	17
Ethiopia	0,06	26	0,06	15	0,05	17	0,05	18	0,05	18	0,04	20	0,04	18
Gabon	0,08	24	0,09	13	0,08	14	0,08	15	0,08	15	0,08	16	0,07	15
Ghana	0,11	22	0,12	11	0,11	12	0,12	12	0,12	13	0,12	13	0,10	13
Guinea	0,01	31	0,01	20	0,01	20	0,01	21	0,01	22	0,01	23	0,01	20
Guinea Bissau	0,01	31	0,01	20	0,01	20	0,02	20	0,03	20	0,04	20	0,03	19
Kenya	0,10	23	0,10	12	0,10	13	0,11	13	0,14	11	0,15	10	0,16	9
Lesotho	0,08	24	0,10	12	0,10	13	0,09	14	0,08	15	0,08	16	0,09	14
Libya	0,21	7	0,19	9	0,18	8	0,17	9	0,16	9	0,16	9	0,15	10
Madagascar	0,03	29	0,03	18	0,03	19	0,03	20	0,03	20	0,03	21	0,04	18
Malawi	0,04	28	0,05	16	0,05	17	0,06	17	0,06	17	0,07	17	0,07	15
Mali	0,07	25	0,07	14	0,07	15	0,07	16	0,07	16	0,06	18	0,06	16
Namibia	0,21	7	0,22	6	0,22	6	0,22	7	0,28	6	0,30	6	0,31	5
Nigeria	0,12	21	0,12	11	0,11	12	0,16	10	0,20	8	0,24	7	0,18	8
Rwanda	0,02	30	0,04	17	0,03	19	0,04	19	0,10	13	0,10	14	0,10	13
Seychelles	0,80	1	0,84	1	0,82	1	0,82	1	0,83	1	0,78	1	0,77	1
South Africa	0,41	3	0,44	3	0,45	3	0,47	3	0,51	3	0,52	3	0,50	3
Sudan	0,01	31	0,02	19	0,04	18	0,04	19	0,04	19	0,04	20	0,04	18
Swaziland	0,18	18	0,21	7	0,21	7	0,21	8	0,22	7	0,20	8	0,19	7
Tanzania	0,06	26	0,06	15	0,06	16	0,06	17	0,07	16	0,06	18	0,07	15
Uganda	0,05	27	0,06	15	0,06	16	0,06	17	0,08	15	0,07	17	0,07	15
Zambia	0,03	29	0,04	17	0,04	18	0,05	18	0,07	16	0,06	18	0,05	17
Zimbabwe	0,14	20	0,14	10	0,14	10	0,09	14	0,08	15	0,06	18	0,07	15

Country	2011	Ranking	2012	Ranking	2013	Ranking	2014	Ranking	2015	Ranking	2016	Ranking	overall	Ranking
Algeria	0,11	12	0,11	15	0,12	12	0,13	12	0,15	12	0,11	15	0,13	11
Angola	0,14	11	0,18	10	0,17	9	0,17	10	0,18	10	0,28	8	0,13	11
Burundi	0,05	17	0,05	21	0,05	19	0,05	17	0,04	20	0,01	21	0,05	17
Botswana	0,20	7	0,21	7	0,21	7	0,19	7	0,21	8	0,43	5	0,22	7
Cameroon	0,04	18	0,04	22	0,04	20	0,04	18	0,04	20	0,05	19	0,04	18
Chad	0,00	22	0,00	25	0,00	24	0,00	20	0,01	23	0,01	21	0,01	19
Congo Rep.	0,03	19	0,03	23	0,04	20	0,14	12	0,07	17	0,11	15	0,04	18
Cape-Verde	0,69	2	0,70	2	0,67	2	0,65	2	0,64	2	0,63	4	0,61	2
Comoros	0,10	13	0,08	18	0,08	16	0,07	15	0,07	17	0,06	18	0,06	16
Djibouti	0,09	14	0,09	17	0,09	15	0,13	13	0,10	15	0,13	13	0,08	14
Egypt	0,15	10	0,14	12	0,14	11	0,13	13	0,15	12	0,21	10	0,16	10
Morocco	0,43	4	0,43	4	0,43	4	0,42	4	0,42	4	0,37	7	0,39	4
Tunisia	0,39	5	0,38	5	0,38	5	0,18	9	0,40	5	0,41	6	0,37	5
Equatorial Guinea	0,05	17	0,04	22	0,04	20	0,06	16	0,08	16	0,12	14	0,05	17
Ethiopia	0,03	19	0,04	22	0,04	20	0,04	18	0,04	20	0,00	22	0,04	18
Gabon	0,07	15	0,10	16	0,11	13	0,15	11	0,11	14	0,20	11	0,09	13
Ghana	0,10	13	0,12	14	0,12	12	0,13	13	0,15	12	0,07	17	0,12	12
Guinea	0,01	21	0,01	24	0,01	23	0,02	19	0,03	21	0,02	21	0,01	19
Guinea Bissau	0,04	18	0,04	22	0,04	20	0,13	13	0,05	19	0,06	18	0,04	18
Kenya	0,17	9	0,17	11	0,19	8	0,22	6	0,23	7	0,12	14	0,16	10
Lesotho	0,10	13	0,10	16	0,10	14	0,10	14	0,10	15	0,21	10	0,09	13
Libya	0,19	8	0,20	8	0,19	8	0,13	13	0,23	7	0,06	18	0,18	9
Madagascar	0,02	20	0,02	24	0,02	22	0,02	19	0,02	22	0,03	20	0,03	19
Malawi	0,06	16	0,08	18	0,07	17	0,07	15	0,05	19	0,07	17	0,06	16
Mali	0,06	16	0,07	19	0,07	17	0,13	13	0,08	16	0,06	18	0,07	15
Namibia	0,33	6	0,33	6	0,33	6	0,34	5	0,35	6	0,90	3	0,29	6
Nigeria	0,17	9	0,17	11	0,16	10	0,17	10	0,17	11	0,23	9	0,16	10
Rwanda	0,10	13	0,13	13	0,12	12	0,13	13	0,12	13	0,07	17	0,09	13
Seychelles	0,75	1	0,79	1	0,86	1	0,86	1	0,87	1	1,00	1	0,82	1
South Africa	0,48	3	0,47	3	0,44	3	0,46	3	0,46	3	0,96	2	0,47	3
Sudan	0,03	19	0,03	23	0,03	21	0,13	13	0,02	22	0,06	18	0,04	18
Swaziland	0,19	8	0,19	9	0,17	9	0,19	8	0,19	9	0,43	5	0,19	8
Tanzania	0,06	16	0,06	20	0,06	18	0,06	16	0,07	17	0,08	16	0,06	16
Uganda	0,07	15	0,07	19	0,06	18	0,13	13	0,06	18	0,05	19	0,07	15
Zambia	0,05	17	0,06	20	0,05	19	0,05	17	0,06	18	0,15	12	0,05	17
Zimbabwe	0,07	15	0,07	19	0,06	18	0,13	13	0,06	18	0,05	19	0,09	13

Source: Own computation from World Development Indicators Database

Table 3. 4: Ranking of Countries according to Financial Inclusion Index

3.4.5. Econometric Analysis

3.4.5.1 Descriptive Statistics

Having ranked countries in line with their financial inclusion index, the study then analysed the determining factors of financial inclusion. Table 3.5 shows the descriptive statistical results of the variables employed for estimation.

Table 3. 5: Descriptive Statistics of Variables Used for Estimations

Variable	Observations	Mean	Std Dev.	Minimum	Maximum
Financial Inclusion	462	0.15	0.176	0	0.87
Financial Development	670	0.295	0.123	0	0.69
Inflation	643	48.296	105.48	-35.84	750.03
Population density	631	34.804	119.35	2.44	622.4
GDP per capita	674	2399.38	3376.33	127.43	22742.38
Population	657	2.01e+07	2.85e+07	824.75	1.85e+08
Money Supply (M2GDP)	609	38.527	24.733	4.533	131.72
Private Credit (% GDP)	617	21.95	18.83	0.70	106.26

Source: Author's Computation

Table 3.5 shows that there exists low financial inclusion and financial development levels in Africa, which are 0.14 and 0.32, respectively. The descriptive statistics also support the existence of large disparities in these two variables shown by maximum levels of 0.87 and 0.68 for financial inclusion and financial development respectively and a minimum value of zero. The mean inflation rate for the region was 48.3 per cent which is high, the maximum being 750.03 per cent[6]. The average population density and money supply level for the region was 34.8 per cent and 38.5 per cent respectively.

[6] These figures excluded an inflation rate of 24411 which was reached by Zimbabwe in 2008 which was dropped as an outlier.

3.4.5.2 Correlation Analysis

The correlation between the exogenous and the endogenous variables are reported in Table 3.6. The study found a strong positive association between financial inclusion and other variables such as financial development, GDP per capita, and money supply (M2GDP). Interestingly, the results suggest a negative association between financial inclusion and other variables such as inflation and population size. This means policymakers should find ways of reducing inflation and population size as they hinder financial inclusion. This could be as a result of a negative dependency ratio in line with Allen *et al.*, (2014) which suggests that countries with large population sizes have difficulties in extending access to financial services as high dependency ratios result from high population ratios, which are associated with negative externalities such as poverty, unemployment and reduced saving, thus reducing the supply and demand for financial services. Overall, the correlations suggest that there is no problem of multicollinearity among the estimation variables.

Table 3. 6: Cross-Correlation between Variables

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Financial Inclusion	1.000							
Fin Development	0.546***	1.000						
p-Value	0.000							
Inflation	-0.017	-0.092**	1.0000					
p-Value	0.724	0.020						
Log GDP per capita	0.535***	0.370***	-0.0438	1.0000				
p-Value	0.000	0.000	0.2690					
Population Density	0.027	0.247***	-0.0221	0.0055	1.0000			
p-Value	0.582	0.000	0.5822	0.8907				
Log Pop Size	-0.361***	-0.064*	0.0156	-0.31***	-0.249*	1.000		

p-Value	0.000	0.102	0.6927	0.0000	0.000			
Money Supply	0.597***	0.740***	-0.08***	0.543***	0.21***	-0.18***	1.000	
p-Value	0.000	0.000	0.0566	0.0000	0.000	0.0000		
PrivateCredit (GDP)	0.681	0.868	-0.0871	0.460	0.325	-0.0848	0.796	1.00
p-Value	(0.000)	(0.000)	(0.0311)	0.0000	(0.000)	(0.0352)	(0.00)	

Note: (*), (**), and (***) shows significance at 10%, 5% and 1% levels, respectively.

Source: Authors' Estimation, using the World Bank-Global Financial Development2018 Database

3.4.5.3 Panel unit root tests

Stationary series have to exhibit a regressive mean and constant variance (Gujarati, 2003). For robustness reasons and also to avoid high size distortions, two unit root tests are applied so as to determine the order of integration of the variables. The researcher conducted two first generation panel unit root tests which assumes panel cross sectional independence; the Maddala and Wu-Fisher Chi-square using Augmented Dickey Fuller and Phillips and Perron tests (Maddala & Wu, 1999). These two tests also works well given the unbalanced nature of the panel data. The results of the tests show a mixed order of integration across all the test techniques. Inflation, INFL, and income level, Log GDPPC variables are stationary at level and others financial inclusion, FII, financial development, FDI, broad money, BROAD, population density, POPDENS, population size, log POP, and private credit (CREDIT) are stationary in first differences. This situation makes the dynamic panel data approach an appropriate method of estimation (Maddala and Wu, 1999; Pesaran, 1997; Pesaran and Shin, 1999; Pesaran and Smith, 1995; Pesaran *et al*., 2001).

Table 3. 7: Fisher-ADF and Fisher-PP unit root test results

Variable	*Levels (Fisher-ADF-p-Value*	*First Difference (Fisher-ADF-p-Value)*	*Levels (Fisher-PP-p-Value)*	*First Difference (Fisher-PP-p-Value)*	*Order of Integration*
FII	0.0357**	0.0005***	0.3258	0.0000***	I(1)
FDI	0.0848*	0.0000***	0.0000***	0.0000***	I(1)
Inflation (INFL)	0.0000***	0.0000***	0.0000***	0.0000***	I(0)
BROAD(M2GDP)	0.6263	0.0000***	0.0566*	0.0000***	I(I)
Log GDPPC	0.0001***	0.0000***	0.0000***	0.0000***	I(0)
Population Density	1.0000	0.0000***	1.0000	0.0000***	I(1)
Population (log POP)	1.000	0.0000***	0.9930	0.0000***	I(1)
Private Credit to GDP	0.8393	0.0000***	0.9741	0.0000***	I(1)

Source: Author's calculations

Note: (*), (**), and (***) shows the rejection of the unit root hypothesis at the 10%, 5% and 1% levels, respectively.

3.4.5.4 Econometrics Analysis

The financial inclusion index computed through the PCA as a proxy of financial inclusion (FII) is regressed against total population, financial development index, income (GDP per capita), inflation, broad money (Money), population density and proportion of domestic credit provided by financial sector to GDP (Credit). The regression results using Arellano-Bond and Arrelano-Bover/Bundell-Bond system dynamic panel-data are shown in Table 3.8.

Table 3.9 shows the economic implications of the regressions of significant variables in Table 3.8. It illustrates in percentage how one standard deviation increase in the dependent variable economically impacts on financial inclusion.

Table 3. 8: GMM Regression Result

Dependent Variable: FII	**Arrelano-Bond GMM Model (FII)**	**Arrelano-Bover/Bundell-Bond**
Lagged FII	0.121***	0.549***
p-Value	(0.000)	(0.000)
Financial Development Index	0.062***	0.189***
p-Value	(0.004)	(0.000)
Money (M2GDP)	-0.0001	-0.0005
p-Value	(0.184)	(0.332)
Inflation	-0.0385***	-0.0426***
p-Value	(0.000)	(0.000)
Population (log Pop)	-0.022	-0.101***
p-Value	(0.149)	(0.000)
Population Density	0.0001	-0.00001
p-Value	(0.184)	(0.617)
Income (log GDP per capita)	0.024***	0.059***
p-Value	(0.000)	(0.000)
Credit (% GDP)	0.003	0.002
p-Value	(0.128)	(0.294)

Constant	0.118 (0.239)	0.488*** (0.000)
Observations	360	395
R-Squared		
Wald (Chi^2)	6374.99	10732.83
Prob>F/Chi^2 =	0.000	0.000
Sargan Test	0.130	0.285
AB Test	0.516	0.702

Standard error; ** $p < 0.05$, *** $p < 0.01$,

Source: Author's Estimation (2018)

3.5 Economic Implications of Regression

Table 3.9 indicates the economic impacts of the variables wherein the study regressed financial inclusion measures that are significant in explaining financial inclusion in Africa. The coefficients on the lagged FII are of singular interest in the setting of these last two dynamic models. Contingent on the regression coefficients signs, the values in Table 3.9 indicate how in percentage one standard deviation increase in the independent variables economically impact financial inclusion. A glance at the results showed that the lagged value of financial inclusion (L.FII) is positive and strongly significant indicating that financial inclusion in the past period has a significant effect in attesting financial inclusion in the current period and is persistent over time. A statistically significant lagged FII estimates means that the lagged financial inclusion has a significant impact on contemporary financial inclusion and would hence indicate a "catch-up effect." A zero coefficient implies a full catch-up, and a between zero and one coefficient would denote partial catch-up, which is the case in the models of this study. Since the lagged financial inclusion estimates fall between

zero and one, it implies that countries with undersized financial inclusion have a propensity to recover most of any financial inclusion deficit incurred in the past. The lagged financial inclusion has an impact of up to 0.42 percent on the current financial inclusion of the African continent.

The study also found financial development to be positive and strongly related to financial inclusion. This is also in line with the theoretical expectations and coefficient of correlation obtained earlier on. An increase in financial development also increases financial inclusion. In fact, the economic implication indicates that a one standard deviation increase in financial development increases financial inclusion by 4.3 percent in line with Ndlovu (2017) and Lenka and Barik (2018). The economic implication of the outcome of the regression of money supply (M2GDP) and financial inclusion shown in Table 3.9 shows that a one standard deviation in money supply results in a fall of 7 percent in financial inclusion. This could have been caused by too much money that is circulating in the informal financial system. For example, more than 40 percent of the population in Africa set aside or saves money regularly, but only half of them does so in the formal financial system (Demirgüç-Kunt and Klapper, 2012).

Table 3. 9: Economic Impacts of Regression Results

Dependent Variable: FII	FII
Financial Development Index	0.0426
Money (M2GDP)	-0.0696
Inflation	-0.3087
Population (log Pop)	-0.4011

Population Density	-0.0068
Income (log GDPPC)	0.1609
Credit (% GDP)	0.2117

Source: Author's Estimation, 2018, from Table 3.8 with Economic

$$\text{Impact}=\frac{SD\ of\ independent\ variable * R.C\ of\ independent\ variable}{SD\ of\ dependent\ variable}$$

Where R.C is regression coefficient and S.D is standard deviation

The study found a significant inverse relationship between inflation and financial inclusion. The study found the economic implication of inflation being negative as a one standard deviation increase in inflation significantly reduced financial inclusion by 31 percent. The inverse relationship signifies that economic volatility and price increase lower the level of financial access. Since inflation erodes the time value of money, lenders normally increase interest rates to compensate for the loss. The significant inverse relationship signifies that an increase in financial inclusion reduces inflation which is at times used to proxy the effectiveness of the monetary policy in Africa. The implication is that it is vital to enhance the drive for financial inclusion at basic level since financial inclusion stabilises prices and curbs inflation which is vital for economic growth. Also, headline inflation is the most relevant for the conduct of monetary policy in an economy with a low level of financial inclusion, but as more consumers are on board, central banks may focus more on core inflation to improve welfare. This is in keeping with Hung (2016), who found the same results in his study.

Similarly, the study found a significant inverse association between population and financial inclusion and also between population density and financial inclusion though the effect was insignificant. The result of the study shows a significant inverse relationship between population size and financial inclusion. This is consistent with Allen *et al*. (2014), despite their coefficient being insignificant. This shows that countries with large population size are not immune to challenges in enhancing financial inclusion. This could be a result of high dependency from the high population, which may be caused by negative externalities like unemployment, reduced savings and poverty, which reduces the demand and supply of financial services. Beck and De la Torre (2007), found that most African countries are characterised by a lower bankable population than the banked. This suggests the implementation of policies aimed at improving financial inclusion by focusing on increasing the bankable population, by either taking advantage of economies of scale or by encouraging banks to expand services to the unbanked or by liberalising the market to increase foreign market and non-bank participation.

The study also found a significant and positive economic impact of the level of income on financial inclusion. This also reiterates the literature rooting for levels of income as the fundamental reasons for financial inclusion (Chithra and Selvam, 2013; Tuesta *et al*., 2015 and Fungáčová and Weill, 2015). This shows that countries with high income per capita have financial systems which are highly inclusive. Countries with low-income levels have comparatively lower literacy rates and poorer connectivity and appear to be more financially exclusive. High income is expected to be correlated with higher usage of formal credit and accounts. It is thus vital for policymakers to craft and implement policies that facilitate productive employment thereby boosting income and increased use of financial services to spur economic growth. Financial status of people always plays a fundamental role in accessing financial services. Poor people with low income face challenges in accessing financial services. Finally, the economic implication of credit availability on financial inclusion is significant and positive. This was anticipated and could be as a result of variables such as lack of credit information and collateral amongst others which extremely subdue credit in Africa. This result contradicts Chithra and Selvam (2013), who found a significant association between credit and deposit penetration and the level of financial inclusion in

India. Policymakers should come up with credit registry or other means of identifying creditworthy customers such as 'know your customer' to enhance the distribution of credit. Overall, the results are in agreement with the GMM regression model requirements as shown in Table 3.8 above. The fitness of the overall result is good as shown by the Wald test probability, and the Hansen J statistics results give the confidence that the instruments are not over-identified and AR(2) confirms the absence of serial correlation. The model also passed the over-identification of instruments tests given by the Sargan test.

3.6 Summary

The study used the financial inclusion index computed through the PCA to analyse the financial presence condition in Africa. The study constructed composite indicators of financial inclusion and found wide discrepancies in financial inclusion amidst the 49 African countries that have been considered, with Chad and Guinea having the least at 0.01 and Seychelles and Cape-Verde with the highest at 0.82 and 0.63, respectively. Over the period 2004 to 2016, only Seychelles and Carbo-Verde had an average financial inclusion index above 50 percent, and the majority are below 40 percent. This validates further the argument that the African region is characterised by very high levels of financial exclusion and thus needs immediate intervention. The study found that lagged financial inclusion, financial development, income, credit and inflation are significant factors in explaining financial inclusion. Interestingly, the study found an insignificant inverse link between financial inclusion and population density and population size.

CHAPTER FOUR

FINANCIAL INCLUSION AND ECONOMIC GROWTH IN AFRICA

4.1 Introduction

The nexus between financial inclusion and economic growth has gained substantial attention in the literature on economic growth. There is no consensus on the interplay between the two variables. Some studies argue that financial inclusion contributes positively to economic growth (Andrianaivo and Kpodar, 2011; Hariharan and Marktanner, 2012; Oruo, 2013; Wang'oo, 2013; Babajide and Oyedayo, 2014; Adegboye and Omankhanlen, 2015; Onaolapo, 2015; Nkwede, 2015; Sharma, 2016; Gretta, 2017; Lenka and Sharma, 2017; Okoyo *et al*., 2017; Saidi and Emara, 2017, Gretta, 2017; Iqbal and Sami, 2017; Evans, 2017; Uchenna and Anyanwaokoro, 2017; Mwaitete and George, 2018). Others maintain that economic growth significantly impacts positively on financial inclusion and not otherwise (Evans, 2015). The interdependent approach or secondary view opines that the link between economic growth and financial inclusion may be bi-directional (Evans and Lawson, 2017; Kim, Yu and Hassan, 2017), others view the relationship as unimportant or absent (Witjas, 2016; Simpasa *et al*., 2017). Evidence on the nexus between financial inclusion and economic growth in Africa has been mixed, warranting further investigation. Existing studies have only investigated association and causation between financial inclusion and the growth of economies but have ignored the transmission effect. To the best knowledge of the researcher, no study has used the panel SVAR technique to investigate the transmission effect between economic growth and financial inclusion in Africa. This study bridges this gap. This research examines the interplay between financial inclusion and economic growth in the African context for the period 2004 to 2016 using the panel SVAR model. A thorough understanding of the causal link between the variables is essential, given the held view that financial inclusion is a catalyst for economic growth in the region.

Among the developing and emerging economies, financial inclusion is lowest in Africa (Mehrotra and Yetman, 2015). The region is also characterised by a wide heterogeneity in account ownership across countries. While 82 percent, 75 percent and 70 percent of the adult population in countries like Mauritius, Kenya and South Africa are respectively banked, only 7 percent have a formal bank account in Burundi, Guinea and Niger (Demirgüç-Kunt *et al*., 2015). On the other hand, the African region has for more than a decade recorded an unparalleled high economic growth rate, globally ranked one of the highest, despite the global economy's gloomy state (IMF, 2013). Thus, the region has attracted lots of interest from researchers, investors, and other stakeholders as they endeavour to either better understand the growth dynamics or take advantage of this growth trajectory within the region. Empirical evidence shows that financially inclusive economies tend to record economic growth (Beck, Demirgüç-Kunt, and Levine, 2007). Therefore, although improved financial inclusion is a global challenge, the situation in Africa poses a unique economic challenge, not only because the region ranks among the lowest in terms of financial inclusion compared to other regions, but also because of the heterogeneity that exists within the region and the seeming anomaly between financial inclusion and the level of economic growth. Given the generally believed view that financial inclusion enhances economic growth in the region, numerous questions have to be asked. Will efforts to enhance financial inclusion lead to viable economic growth? Which mechanism transmits financial inclusion to economic growth? Is it financial inclusion that enhances economic growth or merely the expected future economic growth that enhances financial inclusion? In other words, what sort of financial inclusion-growth nexus exists in the African context? This study attempted to answer these questions.

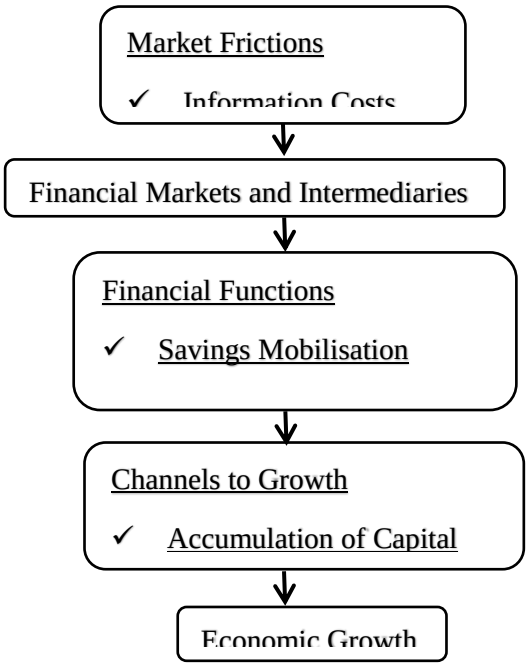
Extant literature so far shows that there is no empirical literature on the transmission mechanism between financial inclusion and economic growth in Africa using P-SVAR. Empirical evidence on this relationship is deficient for LDCs. This justifies the need for empirical research between countries, given the benefits from the implication that countries would get from these findings. Africa is proof positive, and this study is one of the pioneering research in this area on the continent. This study applies a co-integrated P-SVAR model to examine the possible links between financial inclusion and the growth of economies in Africa from 2004 to 2016. The use of this model is hinged on the advantages of using Shan, Morris

and Sun (2001), autoregressive framework. They stressed three reasons why the P-SVAR is the best model to apply in any multivariate relation analysis. Firstly, the Wald statistic used in testing of causality does not affect the order of integration between variables since it is in time-series model. Secondly, the model does not require any functional form. Finally, it reduces the possibility of simultaneous bias that can occur in time-series single-equation models. Furthermore, the power of the co-integrated P-SVAR to determine the dynamic response of the variables of interest to various disturbances within the system justifies its adoption in this study.

This study aims to analyse financial inclusion in Africa in light of mobile phones penetration, bank competition, stability and economic growth, using the P-SVAR model. The motive is to use the past mobile phones penetration, bank stability and competition and economic growth in Africa to estimate the current status of financial inclusion, and consequently forecast into the near future. This will give acumen into policy issues in the enhancement of financial inclusion. Therefore, this study aligns with the literature dealing with financial inclusion, and, primarily, the apprehensions on the transmission channels which relate financial inclusion to economic growth (Akande and Kwenda, 2017). A good understanding of the channels, through which the relationship between the two variables works is essential *vis-à-vis* the explicit pronouncement by the World Bank of achieving the Universal Financial Access by 2020. In addition to contributing to the body of knowledge on the interplay between financial inclusion and growth of economies, the findings will also bring light on policy making. The contribution of this study involves the use of the unique P-SVAR to explore the direction of causality and also to recover some interesting behaviour patterns in financial inclusion measured in the structural model. The findings of the study suggest that economic growth shocks contribute the most to variations in financial inclusion, while mobile phones subscriptions come second. On the other hand, mobile phones penetration shocks contribute the most on economic growth followed by financial inclusion. Therefore, the findings of this study support the demand following hypothesis where economic growth Granger cause financial inclusion in the link between the two variables in Africa.

4.2. Financial Inclusion and Economic Growth: Theoretical and Empirical Outlook

Financial inclusion has been identified as an important driver of economic growth (Claessens, 2006; Claessens and Perotti, 2007). Akinboade and Kinfack (2014), have pointed out that improvements in the financial service sector result in an efficient resources allocation which leads to economic growth. According to Andrianaivo and Kpodar (2011) and Hariharan and Marktanner (2012), financial inclusion can enhance efficiency of intermediation, increase the savings portfolio of the financial sector and enhancement of entrepreneurial activities which eventually lead to economic growth. In addition, Khan (2011), expounded that financial access increase employment opportunities for rural households as more people get involved in economic activities. Also, the disposable income for the rural household would rise, resulting in more savings and deposits which will lead to economic growth through the multiplier effect. Levine (1997) and Nirupam et al., (2008) suggest that a well-established financial institution introduce appraisal techniques, information gathering and sharing mechanisms which enables them to curb market frictions thereby promoting growth as they increase investments and risk management.



Sources: Levine (1997) and Nirupam et al., (2008)

Figure 4. 1: Theoretical Approach of Financial Inclusion and Economic Growth

Numerous empirical studies have investigated the interplay between financial inclusion and economic growth (Andrianaivo and Kpodar, 2011; Hariharan and Marktanner, 2012; Oruo, 2013; Wang'oo, 2013; Babajide and Oyedayo, 2014; Adegboye and Omankhanlen, 2015; Onaolapo, 2015; Nkwede, 2015; Sharma, 2016; Gretta, 2017; Lenka and Sharma, 2017; Okoyo *et al*., 2017; Saidi and Emara, 2017, Gretta, 2017; Iqbal and Sami, 2017; Evans, 2017; Uchenna and Anyanwaokoro, 2017; Mwaitete and George, 2018). Some have concluded that financial inclusion catalyses economic growth; the supply-leading hypothesis (see Sharma, 2016; Lenka and Sharma, 2017; Okoyo *et al*., 2017; Iqbal and Sami, 2017; Uchenna and Anyanwaokoro, 2017). Others have concluded that economic growth drives financial inclusion; the demand-following hypothesis (see Zang and Kim, 2007; Babajide *et al*., 2015; Olaniyi, 2015). Others have observed a reciprocal causality between the two variables (Pradhan *et al*., 2016; Gour'ene and Mendy, 2017 and Kim, Yu and Hassan, 2018). Others argue that there is simply independence or unimportant influence between financial inclusion and the growth of economies (Gour'ene and Mendy, 2017).

4.2.1 Supply-leading hypothesis

This approach also recognised as "finance-led growth", hypothesises that financial inclusion leads to economic growth. This relationship emanates from the fact that financial inclusion promotes economic growth by making available the formal financial services to the financially excluded people at affordable cost. As Akinboade and Kinfack (2014), have pointed out, improvements in the financial service sector lead to an efficient allocation of resources which leads to economic growth. Growth in the financial service sector can debatably be achieved by increasing the deposit base because of the financial inclusion initiative. The resource allocation role by banks to sectors of the economy which are productive drives the economic growth. This then assists the productive sectors to diversify and expand productivity leading to economic growth. As Babajide *et al.*, (2015), have pointed out, there are four distinctive channels of economic growth through financial inclusion: (i) the role of financial intermediation in allocation of resources from the surplus units to the deficit units thus improving resource distribution (Odeniran and Udeaja, 2010 and

Sharma, 2016); (ii) providing low cost reliable way of payment to all, especially for those groups with low income; (iii) providing information on potential investment and capital availability within the system (Levine, 2005); (iv) risk management (Bencivenga and Smith, 1991). This view is in agreement with the findings of many studies (Andrianaivo and Kpodar, 2011; Hariharan and Marktanner, 2012; Oruo, 2013; Gretta, 2017; Bayar and Gavriletea, 2018) on pooled countries' time series. It suggests a link between financial inclusion and growth of economies. Countries with high levels of financial inclusion are likely to enjoy a continued period of economic growth and studies endorse the causal link where the financial inclusion drives economic growth (Oruo, 2013; Babajide and Oyedayo, 2014). Studies conducted in developing countries made the same conclusion, either as a panel (Gretta, 2017; Iqbal and Sami, 2017; Saab, 2017) or considered individually, such as Evans, (2017) and Mwaitete and George, (2018) research in Nigeria and Tanzania, respectively.

Similarly, Sethy and Sethi (2018), investigation of the dynamic interplay between financial inclusion and economic growth in India for the period 2004 to 2014 concluded that financial inclusion drives economic growth. Otiwu *et al*., (2018), examined whether financial inclusion contributes more to the growth of the Nigerian economy between 1992 and 2013. The study found a positive interaction between financial inclusion and growth of the economy. Lenka and Sharma (2017), Saidi and Emara (2017) and Uchenna and Anyanwaokoro (2017) explored the interplay between financial inclusion and the growth of the Nigerian economy, using country-based model and concluded that financial inclusion is a catalyst for economic growth. Expressed differently, enhanced financial inclusion increases bank credit supply and aids the growth of small firms that need external finance (Berger and Udell, 1998, Beck, Demirgüc-Kunt, Laeven and Levine, 2008). Bruhn and Love (2014), provide evidence from Mexico using randomised evaluation of a positive relationship between better access to financial services and economic development as it keeps individuals employed. Employing a causality test to explore the linkage between financial inclusion (access) and economic growth from a European perspective, Bayar and Gavriletea (2018), found evidence that financial inclusion promotes economic growth in Central and Eastern European Union countries by ensuring a productive and effective allocation of funds by the banking institutions.

4.2.2 Demand-following hypothesis: Economic growth leads to financial inclusion

This approach also known as "growth-led finance" states that economic growth increases the demand for financial services following demand from other economic agents including investors (Shan *et al*., 2001). As the economy grows, private businesses and individuals are likely to make investments which enhances their demand for financial services (see Gurley and Shaw, 1955; and Babajide *et al*., 2015). Improved firms' performance may cause firms to demand more capital for expansion, denoting that financial inclusion positively responds to economic growth. Businesses and individuals borrow more from banks to exploiting opportunities that will be available. Olaniyi (2015) studied the link between financial inclusion and economic growth in Africa between 2005 and 2014 found that economic growth Granger cause financial inclusion. Likewise, Evans and Alenoghena (2017), assessed the link between financial inclusion and economic growth for selected African countries using Bayesian VAR over the period 2005 – 2014 and concluded a unidirectional causality from economic growth to financial inclusion, in support of the demand-following hypothesis.

4.2.3 Bidirectional causality between financial inclusion and economic growth

The reciprocal causality between financial inclusion and economic growth refers to the mutual effect of these variables. This indicates that financial inclusion drives economic growth and vice-versa. Patrick (1966), contended that the causation between financial inclusion and economic growth varies with the phase of growth. At an initial phase of economic growth, the economy requires funds for investments and innovations from the financial sector as a real impulse. When the economy latter gets to a self-sustainability level, individuals save, and investors intensify their borrowing, to invest in new projects as they see opportunities. Pradhan *et al*., (2016), Gour'ene and Mendy (2017) and Kim, Yu and Hassan (2018), found a reciprocal causality between economic growth and financial inclusion in ASEAN Regional Forum, WAEMU countries, and OIC countries, respectively. A complementary relationship was observed between the two variables. Evans and Evans

(2017) and Sethi (2018), reached the same conclusion in a study on the financial inclusion-economic growth link for developed and developing countries. This indicates that the two variables are in reciprocal influence. However, Kim, Yu and Hassan (2018), stressed that financial inclusion had more influence on economic growth than did economic growth on financial inclusion. They added that this link seems to be less pronounced in high-income countries.

4.2.4 Independence between financial inclusion and economic growth

The absence of any association between financial inclusion and economic growth presents an exception to the previous hypothesis. It shows that financial inclusion and economic growth do not influence each other. Furthermore, no unidirectional relationship is plausible between the two variables. Some studies found no evidence for the direct effect of financial inclusion on economic growth. Witjas, (2016), concluded that financial inclusion plays only a minor role in enhancing economic growth and others found a negative effect of financial inclusion on economic growth (Simpasa *et al*., 2017). Nkwede (2015), contradicts numerous studies that support the "financial inclusion positively affects economic growth" view. He investigated the interplay between financial inclusion and economic growth in Nigeria for the periods 1981-2013. By extrapolating time series financial inclusion data, the multiple regression model anchored on Ordinary Least Squares (OLS) was adopted in estimating the contribution of the variables. The evidence shows a significant negative impact of financial inclusion on the growth of the Nigerian economy. Nkwede (2015), accredited high level of financial exclusion of bankable adults from financial services as a result of non-availability, non-accessibility of financial services and under utilisation of banking services in Nigeria as the cause of the result. However, his study had limitations in that it used financial deepening indicators, loan-to-deposit ratio and liquidity ratio as a proxy of financial inclusion. Later, Okoye *et al*. (2017) also joined Nkwede (2015) in criticising the existence of a positive relationship between financial inclusion and economic growth. Using the Ordinary Least Squares technique to examine the interplay between financial inclusion and the growth and development in Nigeria between 1986 and 2015, the study found a significant negative effect of bank credit which is an indicator of financial inclusion on economic growth. The study thus concluded that financial inclusion had not supported economic growth in Nigeria. Also,

Barajas, Yousef and Chami (2011), found an inverse effect of private credit on financial inclusion of MENA countries. Lack of competition and lack of capital in MENA countries have been highlighted as the major causes of the negative effect of the relationship.

Khalaf and Ali (2015), Gour'ene and Mendy (2017) and Witjas (2016), found no relationship between financial inclusion and economic growth in Iraq, WAEMU and SSA countries, respectively. Khalaf and Ali (2015), used the ARDL to examine the nexus between financial inclusion and economic growth for Iraq over the period 1990 to 2015 and found no relationship between the variables. Using Multiscale heterogeneity analysis for the period 2006-2015, Gour'ene and Mendy's (2017), empirical study of the financial inclusion-growth channel in WAEMU countries found the relationship to be non-existent in the short run. On the same note, Otiwu *et al*., (2018), recently used the OLS method and Johansen cointegration tests to establish the interplay between financial inclusion and the growth of the Nigerian economy between 1992 and 2013. The study discovered an inverse relationship between financial inclusion (total deposits) and economic growth and stressed the diversion of borrowed funds to non-productive activities as one of the possible reasons for the relationship.

It is crystal clear that studies of the same nature have reached different conclusions. While some found that, the relationship between economic growth and financial inclusion resulted in finance lead growth (Gretta, 2017; Iqbal and Sami, 2017; Saab, 2017; Lenka and Sharma, 2017; Saidi and Emara, 2017; Uchenna and Anyanwaokoro, 2017; Bayar and Gavriletea, 2018; Sethy and Sethi, 2018), others found the reverse. This suggests that economic growth drives financial inclusion (Babajide *et al*., 2015; Olaniyi, 2015; Evans and Alenoghena, 2017). Other studies found the relationship to be bi-directional (Gour'ene and Mendy, 2017; Olaniyi and Olaniyi, 2017; Kim, Yu and Hassan, 2018; and Sethi, 2018), and a few established no relationship (Witjas, 2016; Gour'ene and Mendy, 2017; and Simpasa *et al*., 2017). In the quest to explain these variations, Demetriades and Hussein (1996), show that the variables used determines the directional causality. They argue that the individual characteristic of each country determines the result. The current study, therefore, contributed empirical literature in this field where no consensus has been reached. This study applies a co-integrated P-SVAR model to examine the possible links between the financial inclusion and economic growth in Africa for the period 2004 to 2016. The P-SVAR model used in

testing of causality does not affect the order of integration between variables and also reduces the possibility of simultaneous bias that can occur in time-series single-equation models. Furthermore, the model has power to determine the dynamic response of the variables of interest to various disturbances within the system. Table 4.1 summarises some of the notable empirical findings on the interplay between financial inclusion and economic on individual and panels of countries, including a number of developing African countries.

Table 4. 1: Summary of Findings on the Interplay between Financial Inclusion and Economic Growth

Study	Sample Used	Period	Methodology	Findings
Andrianaivo and Kpodar (2011)	African countries	1988-2007	GMM Method	FI contributes positively to economic growth
Wang'oo (2013), Babajide and Oyedayo (2014)	Kenya, Nigeria	2005-2011 1992-2007	Correlation and regression	Positive relationship between FI and economic growth
Onaolapo (2015)	Nigeria	1982-2015	Regression analysis	Significant positive relationship between the two variables
Nkwede (2015)	Africa (Nigeria)	1981-2013	Multiple regression-OLS	FI has a significant negative impact on growth in Nigeria
Olaniyi (2015)	African countries	2005-2014	FMOLS	Economic growth has a significant impact on FI
Sahay *et al*. (2015)		1980-2010		Positive impact of FI on economic growth
Sharma (2016)	India	2004-2013	Panel VAR	Positive association between GDP and FI Indicators
			Granger Causality	Unidirectional causal relationship from FI to GDP
Pradhan *et al.* (2016)	ASEAN Regional Forum (ARF)	1988-2012	Granger Causality	Short run bidirectional causation between insurance market penetration (financial inclusion) and economic growth
Evans (2017)	Nigeria	1981-2014	FMOLS	FI has a positive impact on economic diversification
Evans and Alenoghena (2017)	15 African countries	2005-2014	Bayesian VAR	Economic growth has a significant impact on FI
				FI has an insignificant positive impact on economic growth
Gour'ene and Mendy (2017)	WAEMU countries	2006-2015	Multiscale Heterogeneity	No causality between the two variables in the short run
				bidirectional relationship between FI and economic growth in LR

			Panel Causality Approach	
Gretta (2017)	MENA & BRICS	2004-2015	Panel VAR	FI positively impacts on economic growth
Iqbal and Sami (2017)	India		Multiple Regression	Positive significant impact of FI on GDP
Saab (2017)	MENA countries		VAR regression	Bidirectional causality between FI and economic growth
Lenka and Sharma (2017)	India	1980-2014	ADL & ECM	FI Granger cause economic growth in a unidirectional
Okoye *et al.* (2017)	Nigeria	1986-2015	OLS regression	FI has a significant negative effect on economic growth
Olaniyi and Olaniyi (2017)	Nigeria	1981-2013	Cointegration Granger Causality	Bidirectional causality between FI and economic growth
Saidi and Emara (2017)	MENA Countries	1965-2016	GMM dynamic panel model	FI positively impacts GDP per capita
Simpasa *et al*. (2017)	African Countries & Angola	2004-2015	Panel data dynamic estimation GMM Method	Negative effect of FI on economic growth for all variables
Uchenna and Anyanwaokoro(2017)	Nigeria	2006-2015	Bivariate Correlation Analysis	FI significantly correlate with economic growth
Mwaitete and George (2018)	Tanzania	2008-2015	Regression Analysis	Strong positive relationship between FI and economic growth
Bigirimana and Hongyi (2018)	Rwanda	2004-2016	ARDL	Long-run relationship between financial inclusion and economic growth

Sethy and Sethi (2018)	India	1975-2014	ARDL approach	Long-run relationship between financial inclusion and economic growth
		2004-2014	Toda–Yamamoto Granger causality test.	FI Granger cause economic growth
Otiwu *et al.* (2018)	Nigeria	1992-2013	OLS regression Johansen Cointegration	FI contributes positively to economic growth
Sethy (2018)	Developed and developing countries	2004-2010	FE, RE regression Panel Cointegration Panel Granger Causality	Positive and Long run relationship between financial inclusion and economic growth Bidirectional causality between FI and economic growth
Bayar and Gavriletea (2018)	Central and Eastern European Union	1996-2014	Dumitrescu and Hurlin (2012) causality test.	unilateral causality from financial markets access to the economic growth
Kim, Yu and Hassan (2018)	55 OIC Countries	1990-2013	Panel VAR, IFRs & Granger Causality	FI has a positive effect on economic growth
Park and Mercado (2018)	151 countries	2011-2014 2014-2016	Regression analysis	Bidirectional relationship between FI and economic growth Economic growth has no significant effect on FI in low income economies and vice versa for High and middle income economies
Nwafor and Yomi (2018)	Nigeria	2001-2016	2-Stage OLS regression	FI has significant impact on economic growth
Ezenwakwelu (2018)	Nigeria	2007-2015	OLS regression	No significant relationship between FI and GDP

Source: Own construction

4.3 Additional variables that relate to financial inclusion

The interplay between financial inclusion and economic growth often take place through several channels. Although there is no comprehensive consensus on the exact number of channels through which financial inclusion affects economic growth, the main channels found in the literature are bank competition, financial stability and mobile phones penetration. Bank stability and bank competition channels are usually captured through bank Z-scores and Boone indicators acquired from the World Bank database. Therefore, this study, in keeping with other studies like Liang and Teng (2006), and Gries *et al*. (2009), applies generalised system method of moments to the study of financial inclusion and growth in Africa by adding bank competition, financial stability and mobile phones penetration. These additional variables could offer channels wherein financial inclusion influences economic growth.

4.3.1 Competition and Financial Inclusion

Theoretical predictions on the effect of bank competition on financial inclusion have been ambiguous. On one side, the conventional market power hypothesis claims that bank competition increases the availability of credit as finance costs are reduced. On the other side, the information hypothesis suggests that in the presence of agency costs and information asymmetries, competition can reduce financial access by making it more unattractive for banks to internalise the returns from investing in lending, especially, with opaque clients (Marquez (2002).

4.3.1.1 Market power hypothesis

The traditional market power view argues that bank competition reduces the finance cost and increases financial services availability (Berger and Hannan, 1998). Banks and other industries view market power as detrimental. The Structure-Conduct-Performance model, together with the Monte-Klein model (Klein, 1971; Monti, 1972), posits that higher concentration on the market

increases interest rates and reduces the supply of funds. Besanko and Thakor (1992), used a theoretical model to examine deposit and loan markets where banks can distinguish themselves from competitors. The model demonstrates that removing entry barriers reduces the equilibrium loan rates increase deposit interest rates. Barth *et al.* (2009), propose a channel where competition may be indirectly beneficial for financial inclusion. Corruption in lending emasculates the efficient allocation of scarce capital. In a simple bargaining model, they show that the higher the bank concentration, the more the bank-lending corruption. Finally, Hainz *et al*. (2008), draw attention to another channel where competition can ease credit constraints for small firms. Limited competition may force banks to ask for collateral in loan contracts. Ryan, O'Toole and McCann, (2014), studied 20 selected countries in Europe using the Lerner index and found that more market power leads to increased obstacles for SMEs corroborating the market power hypothesis.

4.3.1.2 Information hypothesis

The information hypothesis makes it easy to understand the informational asymmetry between borrowers and lenders in the credit market. Information asymmetries lead to the risk of moral hazard and adverse selection and hence credit rationing (Stieglitz and Weiss, 1981). Since the 1990s, academics have researched how banks might alleviate information problems in opaque firms lending. The information hypothesis contends that market power may ease the information wedge between borrowers and lenders through monitoring and screening activities. Beck, Demirgüc-Kunt and Maksimovic (2003). establish that low competition increases the difficulty in attaining finance.

Furthermore, the World Bank (2012) contended that lack of competition in South Africa's banking sector holds back access to financial services. Moreover, Hannan (1991), and Corvoisier and Gropp (2002), also argued that borrowers in markets with low competition face higher costs for loans. The high cost of borrowing impacts negatively on small businesses that need to grow which go a long way to affect the growth of the economy and employment. Fangacova *et al*. (2015), use HHI, CR5 and Lerner & H-stats for 20 selected European countries. They find that

bank competition increases cost of credit. Their findings are in line with the information hypothesis which states that when more competition obtains banks will have less incentive to invest in relationship building (Rajan and Peterson, 1995). Both measures employed in their study provided similar results. Beck *et al.* (2004), studied 74 countries both in developed and developing regions. Using surveys, they find that low competition hinders access to finance in countries with low levels of economic and institutional development.

4.3.2 Bank Stability and Financial Inclusion

Bank stability could be another channel wherein financial inclusion affects economic growth. The debate on determinants of bank stability continues, but less is known on the relationship between financial inclusion and bank stability. Studies on the various possible linkages between the two variables are new and largely realised by those institutions, policymakers, international bodies, regulators responsible for safeguarding financial inclusion and stability. Until recently, the majority of the documents consisting of case studies from countries or regions gathered in speeches or working documents, which do not demonstrate nor explore empirically the proposed links. They also failed to apply a concrete conceptual framework. Different authors have emphasised the need for solid and rigorous theoretical and empirical analysis into these links.

Cull *et al*. (2012) pointed out four distinctive ways wherein financial inclusion relates to bank stability. First, they argue that since financial inclusion attracts small savers, such savings boost stability at the household and individual level and they potentially enhance financial stability given their large numbers. Second, the authors argued that financial inclusion could also contribute to enhanced financial stability as an inclusive financial system results in healthier small business sector and households. Third, since, evidence at country level suggests financial inclusion can result in greater financial intermediation, this may strengthen sound investment cycle and domestic savings and consequently leads to greater stability. Fourth, Cull et al. (2012), argued that greater clientele diversification which is related to financial inclusion is expected to lead to a more resilient and more stable economy. Hadad (2010), argues that financial inclusion

is strongly related to financial stability since well-functioning financial intermediation leads to bank stability.

4.3.3 Mobile Phones and Financial Inclusion

Good financial systems are essential to provide access to credit, saving and risk management to help the poor vulnerable start and expand businesses, absorb financial shocks and invest in education (Demirgüç-Kunt *et al.*, 2015). Constraints to greater financial inclusion include the high cost of accounts, lack of required documents, lack of money to use an account, long travel distances to financial institutions, onerous bank regulation and poor road infrastructure (Goss, Mas, Radcliffe and Stark, 2011; Boston Consulting Group, 2011, Demirgüç-Kunt., and Klapper, 2012). Mobile phones have a great capacity for delivering financial services to a wider base of customers due to their massive uptake by a large number of the poor and the unbanked in developing countries.

Notably, mobile phones have become a vital tool in promoting financial inclusion to the unbanked in developing countries (Kanobe, Alexander, and Bwalya, 2017). Due to their distinctive features such as being a small personalised devices, mobility, and always-on availability, mobile phones have diffused rapidly in most developing countries to overcome socio-economic and geographical barriers. Mobile phones are forging new alliances between banking and telecommunications companies bringing financial services to the mass market. Mobile-wallets are also altering consumer behaviours as consumers find new ways to use the service. There are fewer chances for wage earners to spend all of their cash if they do not receive it in cash form. Family members supporting others can also send money more regularly in smaller amounts, better managing the family's finances. Distance, costs and bureaucracy are the major barriers to financial inclusion (World Bank, 2014). Mobile phones reduce banks costs since they can switch from large fixed infrastructure costs in rural and poorer areas to a per-transaction variable cost structure. It is particularly cost-efficient for customers, as it reduces travelling costs to and from distant branches. Besides costs reduction, mobile phones also allow customers to network with their bank, initiate transactions and check balances more directly from

wherever they are since the device offers convenience, a level of control and immediacy to customers that cannot be provided by other channels. The interaction between banks and their clients through mobile phones creates an opportunity for information capturing which is one of the barriers to financial inclusion.

Mobile financial services lower indirect and direct costs of conducting financial transactions. Traditional banking architecture is associated with higher costs, as certain services and privileges are tied to having an account. Opportunity costs might include the transportation costs to and from the physical bank location, time spent in bank queues, and security. Lowering these costs means more financial savings, access and usage for greater numbers of people. Mobile financial services are cheaper for everyone. Just three years after the launch of M-Pesa, 9.5 million users are using it to save and access formal financial products. Evans (2015), found a significant contribution of remittances towards financial inclusion. Physical and costs barriers to financial inclusion can be overcome through the digitisation of remittances as remittances can be sent using mobile internet which is able to reach rural areas and is also cheaper. Mobile phones can improve the processes of remittance by reducing transaction costs and time. In Zimbabwe, Econet is also doing wonders, bringing on board many people who were financially excluded. The mobile initiated EcoCash Diaspora service offers convenient ways of sending remittances, especially to rural areas. There also exists a possibility of reverse causality from financial inclusion to mobile phone diffusion. There is an opportunity for people to either save or borrow and buy mobile phones as they get financially included.

Mihasonirina and Kangni (2011), examined the interplay between mobile phones and economic growth for African countries from 1988 to 2007 using the GMM approach. They found that mobile phones enhance borrowing (financial inclusion) and hence stimulate economic growth. Maria and Frida (2014) also used the GMM approach and came up with the same conclusion that mobile phones boost financial inclusion. In the same vein, Andrianaivo and Kpodar (2012), used the same methodology to assess whether mobile phone rollout fosters economic growth in Africa over the period 1988 to 2007. The authors found that significant positive effect of mobile phones on economic growth in African countries through enhancing greater financial inclusion. Sengy

(2017), used the propensity score matching to examine the interplay between mobile phones penetration and financial inclusion in Cambodia for 2014. The study suggests that mobile phones are most likely to encourage households to engage in credit offered by microfinance institutions. These findings are consistent with those of Sekantsi and Motelle (2016), who employed time series techniques to explore the proliferation of mobile phones and its effect on financial inclusion in Lesotho for the period 2013 to 2015 using monthly data. The findings revealed stable positive relationship between the two variables in the long run and that mobile phones Granger cause financial inclusion in the short and long run in Lesotho. A similar result was also reported by Beck *et al*. (2010), that the ownership of a cell phone increased the likelihood of using financial services in Kenya.

Ouma, Odongo and Were (2017), employed both descriptive and empirical analyses to determine the interplay between usage of mobile phone money and savings mobilisation in Sub-Sahara Africa. Their findings show that usage and availability of mobile phones promote the probability of household saving. They also found a significant impact of mobile phones usage and availability on the amounts saved as a result of the convenience and frequency with which such transactions can be carried out using a mobile phone. Lenka and Barik (2018), recently investigated the effects of internet use and the growth of mobile phone on financial inclusion from 2004 to 2014 in the Asian continent. Applying the PCA to construct a financial inclusion index that functioned as a proxy variable for financial inclusion using three different models-the random effect, fixed effect, and panel correction standard errors models, the study revealed a positive and significant relationship between the financial inclusion growth and expansion of both internet services and mobile phones in the SAARC countries. In addition, an empirical study of the control variables reveals that the levels of education and income were positively associated with financial inclusion, while unemployment and the size of the rural population were negatively related to financial inclusion. Moreover, the empirical estimates postulate that mobile services Granger cause financial inclusion in the SAARC countries.

4.4 Methodology

This section discusses the methods used to analyse the linkage between financial inclusion and economic growth using selected variables. It sets the structural VAR, the model for estimating the relationship under investigation centered on previous theoretical and empirical studies. It delineates the variables included in the model, the diagnostic tests and the plausible existence of a cointegrating relationship. The following tests (unit root tests, lag length selection, serial correlation tests, normality tests and heteroskedasticity tests) were also conducted.

4.4.1 Unit Root Tests

According to Christopoulos and Tsionas (2004), and Dendramis, Spungin and Tzavalis (2014), one of the preconditions to implementing any cointegration and VAR estimation is that all data series must be integrated of the same order. The stationarity analysis of the variables series is normally conducted using graphical plots, and correlogram. Stationary series should display a regressive mean and constant variance trend (Gujarati, 2003). Variable series have unit root if they are non-stationary. The use of such variables as regressors may lead to spurious results, which can mislead in policy formulation or decision making (Davidson and MacKinnon, 2004). Therefore, one has to test the variables for unit root prior to making any kind of estimation. If the variables have unit root, they have to be transformed into one that is stationary by differencing of order *d* before getting to I (0). Hence, this study follows Ibrahim and Amin (2005), Peersman and Smets (2005), Uhlig (2005), Vonnak (2005), Elbourne (2008), Fève and Guay (2010), Kutu and Ngalawa (2016), Akande and Kwenda (2017) among others, that used VAR in levels. They argued that the estimation of SVAR or VAR when all series are at levels would inhibit efficiency loss or loss of essential information about the data sets usually associated with differenced VARs and SVARs. Afandi (2005), also argues that this procedure also has the upper hand in that it produces consistent parameter estimates regardless of whether the time series are integrated or not, thereby making it produce a more robust result than a cointegrated VAR or SVAR model. Moreover, Berkelmans (2005), contemplates that the inclusion of lagged lengths in the SVARs or VARs variables enables the residual to be stationary even with I (1).

Before data analysis is carried out, more specifically time series and or panel data structure, there is need to test the presence of unit root by determining the order of integration (Choi, 2001; Hadri, 2000). If any series is integrated of higher order than 0, it implies there is an underlying trend which can distort results by biasing standard errors. For robustness reasons and also to avoid high size distortions, three unit root tests are applied so as to determine the order of integration of the variables. The researcher conducted three first generation panel unit root tests which assumes panel cross sectional independence; the Maddala and Wu-Fisher Chi-square using Augmented Dickey Fuller and Phillips and Perron tests (Maddala & Wu, 1999)and Im, Pesaran and Shin test (Im, Pesaran, & Shin, 2003. Luintel and Khan (1999) and Liang and Teng (2006) have noted that the ADF and PP tests have hitches of lower power in rejecting the null of a unit root. The CIPS has large powers over the conventional unit root test; as such it is used to serve as complementary to the results of ADF and PP tests.

4.4.2 Lag length selection

Having determined the nature of stationarity between the variables under study, the number of lags to use in the study was then selected. Lag selection is a significant component of VAR estimation (Canova, 2007). Too many lags could upsurge the error in the forecasts and waste degree of freedoms, while too few lags could overlook relevant information (Stock and Watson, 2007). An appropriate lag offers accurate and more robust dynamics, without excessively shortening the estimation sample which would compromise the degrees of confidence. Similarly, it allows for no serial correlation in the residuals (Kutu and Ngalawa, 2016; Akande and Kwenda, 2017). The SVAR lag length is selected centring on a likelihood ratio (LR) test (Hatemi and Hacker, 2009). Five commonly used information criterion procedures that are used to determine the optimal number of lags to use is Schwarz's Bayesian information criterion (SIC), Final Prediction Error (FPE), Hannan and Quinn information criterion (HQC), Akaike's information criterion (AIC), and the Sequential Modified LR test. These different lag selection criterions were used to determine the optimal lag lengths. Gujarati (2003), contends that the better model is the one with a lower value of criteria statistics.

4.4.3 Other econometric issues

For robustness, various diagnostic tests such as serial correlation tests, normality tests and heteroskedasticity tests were conducted. These tests serve to substantiate the optimal lag selection procedure carried out since a misspecified model based on wrong lag length would give rise to problems of serial correlation. Stability tests were also conducted before exploring the shocks transmission on the VAR system. This study carried out an SVAR's stability analysis to decide the model's stability and a guarantee of variance decomposition and impulse response that has meaning. If all the eigenvalues have a modulus of less than one, then the VAR is considered stable (Hatemi, 2004). The Panel SVAR which diagnoses and account for transmissions and the effect of one unit on another as globalisation has made global dependency apparent was used (Canova and Ciccarelli, 2014). No breaks were predicted in the model series because policies are undertaken at different points in time, although they are homogenous almost across regions. Besides Glynn, Perrera and Verma (2007), contend that the IPS unit root tests which are also carried out in this study account for issues of structural breaks, if present.

4.4.4 Cointegration Test

The existence of an equilibrium long-run relationship between VAR variables can affect the output of the model. This can cause any deviating variable to be slowly equilibrated with this cointegrating vector, (Hendry and Juselius, 2001). A set of cointegrated variables must, as a result, be detected before running the model, in order to discern the essentiality of an error correction term. An ordinary least squares are therefore unsuitable if variables are integrated of order I(1), as this will cause spurious regression estimates. The basis of cointegration is to test the presence of any long-run relationship(s) between non-stationary time series (Johansen and Juselius, 1990; Phillips and Perron, 1988; Johansen, 1988). In this study, the test assessed the existence of a possible long-run relationship(s) between mobile phones diffusion, financial

inclusion and economic growth in the SVAR model's reduced form. The maximum likelihood approach of Johansen and Juselius (1990) is used to perform the cointegration test: the maximal-eigenvalue statistic (λmax, ($\Upsilon, \Upsilon + 1$)and the trace statistic (λtrace (Υ)) given by:

λmax, ($\Upsilon, \Upsilon + 1$)= -T ln (1- $\hat{\lambda}_{\Upsilon+1}$)……..……..……..(4.1)

(λtrace (Υ)) = -T $\sum_{i=r+1}^{n}$ ln$(1 - \hat{\lambda}_i)$…….....……...……..... (4.2)

Where $\hat{\lambda}_i$is the projected value of the ith ordered eigenvalue of Matrix A and Υ represents the independent equilibrium relationships. The test settles for a long-run relationship if the maximal-eigenvalue statistic λ (Υ+1) and the trace statistic (λ (Υ)) exceeds the Johansen and Juselius (1990) critical values.

4.4.5 Panel S-VAR Model

The objective of this study is to explore the transmission mechanism from mobile phones to financial inclusion and then economic growth among African countries. The expansion of economic activities and the growing burst of entrepreneurship in the African economy has allowed it to ride on its growth momentum. Despite the growth momentum, the coverage of formal finance in Africa is inadequate and extremely lower than that of other continents. Above all, African countries are faced with a common enemy, poverty, leading to underdevelopment in their systems and economies. Andrianaivo and Kpodar (2011), Olaniyi (2015), Sahay *et al*. (2015), Evans and Alenoghena (2017), Gour'ene and Mendy (2017), Gretta (2017), Saidi and Emara (2017), Kim, Yu and Hassan (2018), have employed panel data analysis like Granger causality tests (VAR) and GMM to investigate the nexus between financial inclusion and the growth of economies. Hatemi and Hacker (2009), contend that a VAR model is in concurrence with economic theory and dynamic even though it is atheoretical. VAR models are considered to be potent tools for describing the dynamic behaviour of financial and economic data and to produce multivariate benchmarks which are reliable, in their diverse variants in applied

economics. Bernanke (1986) and Elbourne (2008), amongst others have criticised the VAR method which was pioneered by Sims (1980) in studying the impulse response functions between variables in the short run for failing to cater for the needs of researchers interested in shocks other than monetary policy shocks. The shortcomings of VAR gave birth to Structural VAR (S-VAR) which is superior to the prior alternatives of VAR models as it accounts for economic information that lays unembellished the rationale for the restrictions that helps identify other shocks. The other strength of panel SVAR models is that it uses economic theory to identify the concurrent relationships between variables (Canova, 2007). The SVAR, therefore, suits well as an alternative improvement to VAR approach. Several authors have recently applied SVAR in banking and finance-related studies. Love and Zicchino (2006) and Graeve and Karas (2010), have applied the VAR to study the bank run. However, the limitation of both the VAR and S-VAR is that they only handle time series data which restricts their applicability to one economy, and slow down the gains of S-VAR in terms of handling studies interested in shocks outside monetary policy but is still able to pool panel data for African countries. Further efforts to capture transmissions effects and interdependencies across countries and economic units led to the creation of the Panel VAR (PVAR) (Canova and Cicarrelli, 2014), plagued with the problem of dimensionality. Moreover, S-VARs overcome the limitation of PVARs while making certain that the dynamic behaviour of the VARs in the model is captured which corresponds to this study. In addition, S-VARs allow the recovery of interesting patterns in the VARs using the minimum amount of theory which is essential in fields with little or no theoretical consensus (Graeve and Karas, 2010), as in the case with this study. Furthermore, using SVARs, this study remains focused when faced with different countries under review, as it affords the flexibility and dynamic cross-section and slope heterogeneity (Cannova and Ciccarelli, 2014).

4.4.5.1 Model Specification

This study follows the P-SVAR approach of Gisanabagabo and Ngalawa (2017) and Akande and Kwenda (2017) to analyse the transmission effect from mobile phones to financial inclusion and growth of economies in Africa. Assuming that the structural form of the VAR can be represented in the following structural model:

$$\theta X_{it} = \alpha_{io} + \omega_1 X_{i\,t-1} + \omega_2 X_{i\,t-2} + \ldots\ldots + \omega_p X_{i\,t-p} + \kappa\varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots \quad (4.3)$$

where θ is an invertible (k× k) explaining the simultaneous relationship among the variables, X_{it} is a $(k \times 1)$ vector of endogenous variables such that X_t=X_{1t}, X_{2t}…….X_{nt}; α_{io} is a vector of constant denoting country specific intercept terms; $\omega_1, \omega_2\ and\ \omega_p$ are (k× k) matrix with a zero diagonal elements that take into account direct effects of some shocks on several endogenous system variable; and it is a vector of uncorrelated error terms (structural shocks or white noise innovation).

Since the P-SVAR Equation 4.3 above could not be directly estimated because of the response effect that is innate to the VAR process (MW and Enders, 2008), the reduced form representing X as the lagged form of X is estimated by multiplying through by the inverse of θ (Ngalawa and Viegi, 2011; Enders, 2004; Gujarati. 2003; Green, 2003) to produce;

$$X_{it} = \theta^{-1}\alpha_{io} + \theta^{-1}\omega_1 X_{i\,t-1} + \theta^{-1}\omega_2 X_{i\,t-2} + \ldots\ldots + \theta^{-1}\omega_p X_{i\,t-p} + \theta^{-1}\kappa\varepsilon_{it} \ldots\ldots \quad (4.4)$$

Further simplifying the ongoing equation, the researcher represented; $\theta^{-1}\alpha_{io}$=Y_i,$\theta^{-1}\omega_1 = Z_i$, for i=1…..p, $\theta^{-1}\kappa\varepsilon_{it}$=$\mu_{it}$. Therefore, Equation 4.5 becomes;

$$X_{it} = Y_i + Z_i X_{i\,t-1} + Z_2 X_{i\,t-2} + \ldots\ldots Z_p X_{i\,t-p} + \mu_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.5)$$

Equation 4.4 differs from Equation 4.5 as the latter is a primaeval system allowing all to have contemporary impact on one another, while the former is the standard/reduced form of P-SVAR where all the right-hand side variables are established at time *t* in advance with no variable having an immediate impact on another in the system. In addition, according to MW and Enders

(2008), the error term (μ_{it}) is composite shocks in X_{it}. Hence the reduced form of the P-SVAR from Equation 4.5 above can be rewritten as:

$$X_{it} = Y_i + Z(B)\ X_{it} + it \quad \text{..... (4.6)}$$

Where X_{it} is (n × k) vector variable given as:

$$X_{it} = (ZSCORE, FII, MOBILE, BOONE, GDPPCGR) \quad \text{..... (4.7)}$$

Equation 4.7 is a vector of endogenous variables for African countries used in the study where; ZSCORE is the stability measure, FII is the financial inclusion index, MOBILE is the mobile phones subscription per 100 adults, BOONE is the competition measure, and GDPPCGR is the economic growth measure.

From Equation 4.6, Y_i is the intercept terms of the country, Z(B) is the lag operator matrix of polynomial that captures the interplay between endogenous variables and their lags, and $\mu_{it} = \theta^{-1}\kappa\varepsilon_{it}$ and/ or $\theta it = \kappa\varepsilon_{it}$, is the random disturbance vector. This was employed to estimate the interaction between mobile phones, financial inclusion and growth of African economies.

To recover the structural model information, the researcher imposes restrictions in the Matrix θ and K in the system as contained in Equation 4.8. The identification scheme follows Akande and Kwenda (2017) and Gisanabagabo and Ngalawa (2017) whereby structural restrictions are used in the contemporaneous parameter mix.

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ \pi_{21} & 1 & 0 & \pi_{24} & 0 \\ 0 & \pi_{32} & 1 & 0 & 0 \\ \pi_{41} & 0 & 0 & 1 & 0 \\ \pi_{51} & \pi_{52} & \pi_{53} & \pi_{54} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{it}^{v} \\ \varepsilon_{it}^{w} \\ \varepsilon_{it}^{x} \\ \varepsilon_{it}^{y} \\ \varepsilon_{it}^{z} \end{bmatrix} = \begin{bmatrix} \tau_1 & 0 & 0 & 0 & 0 \\ 0 & \tau_2 & 0 & 0 & 0 \\ 0 & 0 & \tau_3 & 0 & 0 \\ 0 & 0 & 0 & \tau_4 & 0 \\ 0 & 0 & 0 & 0 & \tau_5 \end{bmatrix} \begin{bmatrix} \omega_{it}^{v} \\ \omega_{it}^{w} \\ \omega_{it}^{x} \\ \omega_{it}^{y} \\ \omega_{it}^{z} \end{bmatrix} \text{..... (4.8)}$$

The notations v, w, x, y and z are used to represent each variable Z-Score, FII, MOBILE, BOONE and GDPPCGR.

The terms $\boldsymbol{\epsilon_{it}^{v}}$, $\boldsymbol{\epsilon_{it}^{w}}$, $\boldsymbol{\epsilon_{it}^{x}}$, $\boldsymbol{\epsilon_{it}^{y}}$ and $\boldsymbol{\epsilon_{it}^{z}}$ are reduced-form disturbances residuals to both the exogenous and endogenous variables, which symbolise further the unexpected movements of each variable. The related structural shocks with the corresponding equations are signified with the following residuals; ω_{it}^{v},ω_{it}^{w},ω_{it}^{x}, ω_{it}^{y} and ω_{it}^{z}

4.4.6 Variance Decomposition and Impulse Response Function

The first proponent to introduce the impulse response function in VAR modelling was Sims (1980). It helps to highlight the state of an economic system in the future if there is a change in any of the components forecast error-variance. It analyses the innovation contributed by each variable on the other variables in the VAR system. The decomposition of variance is used when dealing with the dynamic stochastic system. It is the sum of error or unexplained variance and variance explained by the regression and is calculated as:

$$\sum_{i=1}^{m}(Y-\overline{Y})^2=\sum_{i=1}^{m}(Y-\overline{\hat{Y}})^2+\sum_{i=1}^{m}(\hat{Y}-\overline{\hat{Y}})^2 \text{.....4.9}$$

The IRF traces the time path of structural shocks in the VAR system (Bernanke and Mihov, 1997). Put differently; the IRF answers questions on how the future of a system is affected when

one of its variables change. Both VDC and IRFs are computed by re-specifying the autoregressive function.

To strengthen further the evidence on the nexus between financial inclusion and growth, this study, assessed the causation financial inclusion and economic growth using VAR Granger causality/block exogeneity Wald tests.

4.4.7 Data and Sources

The P-SVAR used in this study comprises five variables, namely, financial inclusion, proxied by the financial inclusion index (FII)computed through the principal component analysis, financial stability (Z-Score), bank competition (BOONE), mobile phones penetration (MOBILE), and the rate of economic growth (GDPPCGR). Data on financial inclusion, mobile phones subscriptions, bank competition, financial stability and economic growth was obtained from the World Bank's Global Development Indicators Database (GFDD), which provides data for 189 countries across the globe. The WDI Database is much broader and contains significant details on the variables under study. In addition, it facilitates better comparison across countries. However, this database's major limitation is that several countries have missing data, especially on financial inclusion indicators. Therefore, data availability largely determines the selection of countries. The study used a panel of 49 countries from the African region sourced over the period 2004 to 2016 (see Appendix A for a list of countries) and investigated the interplay between financial inclusion and growth of economies. The approach used in this study differs from earlier estimations using Panel S-VAR, as applied by Akande and Kwenda (2017) who used quarterly data to increase the number of observations under study. However, this study used annual data to capture the short-term effects of the variables under study, which may be eliminated through averaging over longer periods. Moreover, data on financial inclusion is highly limited, and therefore averaging over longer periods would potentially lead to biased estimates through a reduced sample size.

4.4.7.1 Measurement of Financial Inclusion

Following the footsteps of Amidžić, Massara and Mialou, (2014), Chakravarty and Pal (2010) and Sarma (2008, 2012), the study constructed an index of financial inclusion using ATMs and bank branches per population and per area, the ratio of outstanding loans to GDP and bank accounts per 1 000 adults as indicators of financial inclusion. To construct the index, the study began by normalising the variables followed by an estimation of sub-indices, then aggregation of the sub-indices and finally normalising the index.

a) Imputation of Missing Data

To ensure a solid dataset and deal with outliers, the study filled in the missing gaps in the data. This study used the imputation method of unconditional mean to find the missing values, with regard to the World Bank-Income Group Classification and appropriate period for the dataset. The study used the formula below to achieve a complete dataset:

$$\bar{\omega}_s^t = \frac{1}{m_s^t} \sum_{recorded} \omega_{s\,f}^t \quad \text{..... (4.10)}$$

Where: $\bar{\omega}_s^t$ specifies the average values allocated for the individual indicator *s*, for country *f*, at time *t*.

$\omega_{s\,f}^t$ signifies the individual indicator's random variable, *s*, for country *f*, at time *t*.

m_s^t denotes the number of values which are non-missing on ω_s at time *t*.

Having filled the missing data, the study also conducted diagnostic tests by using the Bartlett test of sphericity to check whether the individual indicators are correlated or not and the Kaiser-Meyer-Olkin (KMO) to measure sampling adequacy (Nardo *et al*., 2005; Hutcheson and Sofroniou, 1999).

b) Normalisation of Indicators

Since various units are used to capture the indicators of financial inclusion, the study first normalised each indicator to make the measurement unit immaterial. Various approaches have been used to normalise variables (see for example Amidžić *et al*., 2014; and Svirydzenka, 2016). This study used the Min-max technique to combine the variables and thus deal with the variations in measurement units as follows:

$$\Gamma_{i,t} = \frac{\psi_{i,t} - \psi_{min}}{\psi_{max} - \psi_{min}} \quad \text{……………………………………………………….…. (4.11)}$$

Where $\Gamma_{i,t}$ is the normalised indicator.

$\psi_{i,t}$ is the indicator for the country, *i*, at time *t*,

ψ_{max} and ψ_{min} are the comprehensive maximum and minimum value for the indicator.

The above normalisation procedure limits the indicator within the range 0 and 1. Therefore, 0 would be the lowest value for any given indicator, while 1 would be the highest, and the rest falls in-between the maximum and the minimum.

c) Aggregation of Indices

The study aggregated the normalised indicators into two sub-indices, capturing the usage and outreach of financial services. The study used principal component analysis (PCA) to statistically derive weights from the data instead of the arbitrary weighting function. The PCA explains the variance of the indicators rooted on linear aggregation of the original data. The sub-indices are thus determined as follows:

$$Usage_{i,t} = \sum_{i=1}^{n} W_i \, \Gamma_{i,t} \quad \text{……………………………………………………….…... (4.12)}$$

$Outreach_{i,t}=\sum_{i=1}^{n} W_i\ \Gamma_{i,t}$……..…. (4.13)

Where $Usage_{i,t}$ and $Outreach_{i,t}$ are aggregate indicators of usage and outreach of financial services respectively. W_i is a weight obtained through PCA, which determines the extent to which the outcome index is influenced by an indicator.

The linear aggregation helps to warrant full compensability among the indicators that influence the index. Therefore, the constructed index assumes perfect substitutability among the indicators, thereby guaranteeing full compensation between physical access to a bank branch and access to ATMs, that is, a country with limited access to the ATMs can compensate for this by increasing bank branch network outreach. This may be untrue, where face-to-face contact is not vital. However it turns out to be a valid assumption where measuring the degree of outreach is the objective. It is not ideal to assign a particular indicator more weight without assessing the quality dimension. To avoid the biased assignment of weights which leads to distortion of the overall index, the PCA is thus used (Svirydzenka, 2016).

The aggregation of the average weighted values of the normalised indices constitutes the sub-indices. Data for the outreach index suggests that the first component explains about 78.35 percent of the variation across the indicators with an eigenvalue of 3.13 (the only one above 1). Therefore, the outreach is constructed using the first component weights (the PCA factor loadings are 0.5323 for number of bank branches per 1 000km^2, 0.4971 for number of bank branches per 1 000 people, 0.5009 number of bank ATMs per 1 000 km^2, and 0.4676 for number of bank ATMs per 1000 people). The squared factor loadings from the PCA are used to ensure that the weights add-up to 1. The squared factor loadings show the degree of variation explained by each factor, such that more weight is assigned to an indicator with a higher contribution to the common variation.

Data on the usage index suggests that the first component as the only variable with an eigenvalue above 1 and explains about 90% of the variation across the indicators. Both variables contribute

equally to the index, as they have the same factor loadings. The final composite index is calculated in a similar way to the sub-indices, with the weights based on the sub-indices. The main assumption is that although the outreach and usage index are related, they capture different components of financial inclusion. The overall FII is a weighted average of the usage and outreach indices, and is constructed as follows:

$$FII_{i,t}=\sum_{i=1}^{n}(w_i Outreach_{i,t} + w_i Usage_{i,t}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(4.14)}$$

The Min-max normalisation is used to normalise the final composite index as outlined above, such that the composite index of 1 represents country, *i*, with the highest-level financial inclusion, and 0 for a country with the lowest financial inclusion. This study used the computed FII to examine the interplay between financial inclusion and other variables such as financial stability and bank competition, amongst others.

4.4.7.2 Measurement of Financial Stability

Data on financial stability comprise bank Z-scores, the ratio of -short-term funding and bank liquid assets to deposits, the ratio of non-performing loans (NPLs), the ratio of bank credit to deposits, and the proportion of bank regulatory capital, amongst others. However, the most widely used proxy for financial stability is the *Z*-score (Agoraki, Delis, and Pasiouras, 2011; Čihák *et al*., 2013; Schaeck and Čihák, 2014). This can be attributed to the fact that the data is readily available, and it also allows for comparison across institutions. The bank *z*-score enables the comparison of bank returns and capitalisation against the volatility of returns. It is inversely related to solvency - the higher it is, the lower the risk of bankruptcy. A higher *z*-score, therefore, designates a more stable banking system. However, the measure is subject to manipulation as it is based on accounting information. To smoothen the distribution, the Z-score is transformed into the natural logarithm since it is highly skewed. Following Akande and Kwenda (2017), the study

used bank Z-score to measure financial stability. The lower the value of bank-Z scores value the higher the possibility that the bank's system is near bankruptcy.

4.4.7.3 Measurement of Economic Growth

Theory suggests a positive link between financial inclusion and the growth of economies (Beck and Demirgüç-Kunt, 2008; Karlan and Morduch, 2010). All factors being constant, higher usage and demand for financial services should be experienced in more developed economies. Looked from another viewpoint, economies of scale in more developed economies is expected to enhance access to financial services. Therefore, the relationship between financial inclusion and growth of economies is expected to be positive. From another perspective, economic growth reduces the probability of banking sector instability all other factors being held constant. The neoclassical growth model however put forward that countries with high levels of economic growth, as measured by GDP per capita growth, normally have low marginal products of capital and thus lower per capita growth rates as a result of diminishing returns to capital (Barro, 1991; Barro and Sala-i-Martin, 1990; 1991). Accordingly, higher real economic growth may be adversely related to financial inclusion, since it may be related to poor economic development. Therefore, the impact of economic growth is not straight-forward and is slightly imprecise. This study followed the footsteps of Andrianaivo and Kpodar (2012); Chatterjee and Mendy (2017); Gourené and Mendy (2017) and Said and Emara (2017) who used GDP per capita growth as an indicator of economic growth. GDP per capita growth allows for cross-country comparisons and also captures income distribution effects. The values are obtained from the World Bank Development Indicators Database.

4.4.7.4 Measurement of Bank Competition

The interplay between competition and financial inclusion has generated conflicting theoretical and empirical results, leading to the emerging of two opposing hypotheses namely the market structure hypothesis and the information-based hypothesis. The market structure hypothesis

posits that competition makes banks efficient through innovation, while lack of competition leads to the "quiet life effect" (Love, Soledad, and Peria-Martinez, 2014). Alternatively, Demstez (1973) suggests that the presence of agency costs and information asymmetry impacts negatively on access leading to the information-based hypothesis (Love *et al*., 2014; and Marquez, 2002). Alternatively, lack of competition leads to more efficient financial resources distribution as it increases the incentive to screen borrowers (Cetorelli and Peretto, 2012). To examine this relationship, this study differs from Ndlovu (2017), who used the Lerner Index to capture bank competition. The study followed the footsteps of Delis (2012); Tabak *et al*. (2012); and Banya and Biekpe (2017) who used the Boone indicator as a proxy for bank competition. The Boone indicator is a more recent New Empirical Industrial Organisation methodology for measuring competition. Boone *et al*. (2004) and Boone (2000, 2001; 2004) formulated the Boone indicator, which measures the effect of efficiency on profits or market share. Recently, several papers have questioned the use of measures of concentration to represent competition, recommending the use of measures such as the Boone Indicators and Lerner Index which are non-structural. Claessen and Laeven (2004), contend that bank competition is determined by the degree of contestability and that concentration is not a noble predictor. This method needs only information on market shares or profits and costs. Unlike other measures of competition which combines the competitive nature of banking activities, the Boone indicator can be reduced to institution-specific and product specific competition (Van Leuvensteijn, Bikker, van Rixtel, and Kok Sørensen, 2011). In addition, some measures of competition such as the Lerner index have been found to possess some inconsistency (Boone, 2008; Bulow and Klemperer, 2002; Rosenthal, 1980). In addition, there are several missing observations on the Lerner index thus reducing the sample size. However, the Boone indicator has proved to be insensitive and robust to the underlying measures used. Higher Boone indicator values indicate a decline in the competitive behaviour of banks.

4.4.7.5 Measurement of Mobile Phones Subscriptions

This study followed the footstep of Andrianaivo and Kpodar (2012) and Erlandson (2014) by using mobile phone subscribers per 100 adult people as a proxy for mobile phone penetration. The data were sourced from the International Telecommunications Union (ITU).

4.5 Empirical Results and Discussion

The study estimated the cointegrating relationship between financial inclusion and economic growth using the Johansen and Juselius (1990) cointegration technique using E-Views 7. However, before undertaking the estimation, the study conducted diagnostic tests in the form of stationarity and normality tests, to understand its properties (Harris, 1995). While stationarity and normality tests are useful, they are not sufficient. The stability test and the selection of an appropriate lag-length of the system are important.

4.5.1 Descriptive Statistics

Table 4.2 below presents a summary statistic of the data used in this study over 13 periods (2004 to 2016). The summary statistics provide an intuition into the nature of data employed. Table 4.2 shows some remarkable features of the nature of financial inclusion in the African region. The study found that the average financial inclusion in Africa range between 0.01 and 0.88 as portrayed by the maximum and minimum values.

This implies that as some countries have very low financial inclusion levels, others have high levels of financial inclusion supporting the view that Africa is characterised by severe financial inclusion disparities (Ndlovu, 2017). However, despite the existence of large disparities in financial inclusion within the region, the mean is close to the standard deviation than to the minimum value. The following possible implications can be deduced. First, it is implied that

there are few countries with a high financial inclusion level and in some cases, there are isolated cases. The standard deviation confirms this suspicion providing credibility to the conclusion of a region characterised by low levels of financial inclusion. Also, the descriptive statistics show severe gaps between the maximum and minimum value thereby confirming the presence of wide variations in all sample indicators across economies. The statistic shows the existence of adamant financial exclusion within the African region.

Closely linked to financial inclusion is the stability measure. The study used the Z-score to estimate financial stability in Africa. The higher the Z-score level, the more stable a banking system is. The average measure of stability over the period hovers around 13 percent, which signifies a stable banking system. The banking system in Africa is also faced with a monopolistic competitive market, with a minimum average indicator of -3.2 and a maximum of 1.13 based on the Boone indicator. Higher Boone indicator values indicate a decline in the competitive behaviour of banks. It can be concluded that banks in Africa are less competitive over the period. In terms of mobile phones subscriptions, African countries had 58 mobile phones per 100 adults on average which is a high figure, thereby increasing the opportunity for bringing on board a large number of unbanked populations in Africa. The descriptive statistics show that the mean economic growth for African countries is 2.58 percent and on average the values range from -62 percent to 30 percent indicating a high disparity in economic performance.

Table 4. 2: Descriptive Statistics

	BOONE	FII	GDPPCGR	MOBILE	Z-SCORE
Mean	-0.083131	0.168477	2.578027	58.30474	12.54634
Median	-0.050000	0.109276	2.448667	50.63907	10.63000
Std. Dev.	0.265531	0.169514	4.841117	42.45680	8.703130
Maximum	1.130000	0.880000	30.35658	176.6859	63.87000
Minimum	-3.200000	0.006435	-62.22509	0.208422	1.400000
Kurtosis	75.39909	6.949192	85.96982	2.567370	10.36713
Skewness	-7.075556	1.955465	-5.417190	0.641617	2.361636
Jarque-Bera	89337.56	507.1352	114939.2	30.10579	1257.253
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	-32.75359	66.37979	1015.743	22972.07	4943.257
Sum Sq. Dev.	27.70908	11.29285	9210.509	708413.8	29767.58
Observations	394	394	394	394	394

Source: Author's computation based on The World Development Indicators Database (2018)

4.5.2 Stationarity Tests

The Johansen and Juselius (1990), cointegration technique was used to estimate the long run relationship between mobile phones diffusion, financial inclusion and economic growth. However, before undertaking the estimation, the study tested for the presence of unit root by determining the order of integration, to understand its properties (Choi, 2001; Hadri, 2000; Harris, 1995). If any series is integrated of a higher order than 0, it implies there is an underlying

trend which can distort results by biasing standard errors. The researcher conducted three first generation panel unit root tests which assumes panel cross sectional independence; the Maddala and Wu-Fisher Chi-square using Augmented Dickey Fuller and Phillips and Perron tests (Maddala & Wu, 1999), and Im, Pesaran and Shin test (Im, Pesaran, & Shin, 2003). The results of the unit root tests are shown in below, and they indicate stationarity (that is the absence of unit root) which was established at level- I(1). The results from Tables 4.3 and Table 4.4 respectively reveal that economic growth (GDPPCGR),mobile phones diffusion (MOBILE), bank competition (BOONE), financial stability (Z-SCORE) are level non-stationary and stationary after first difference and financial inclusion (FII) support the presence of a unit root at the level and after first difference. Meanwhile, since four out of five unit roots tests for Mobile phones diffusion, economic growth and Financial Inclusion indicate I (1) series, it is thus concluded that all variables are I (1) series.

Table 4. 3: IPS, ADF and PP Unit Root Test @ I (0) Level

	IPS		**ADF**		**PP**	
	statistics	**p-value**	**statistics**	**p-value**	**statistics**	**p-value**
GDPPCGR	-0.82270	0.2053	49.2592	0.5030	71.3228	0.0255
MOBILE	1.36505	0.9139	40.2330	0.8367	45.6002	0.6504
FII	-4.91861	0.0000	74.9299	0.0045	107.756	0.0000
BOONE	-0.77402	0.2195	59.7416	0.0840	119.639	0.0000
Z-SCORE	-1.50592	0.0660	61.6248	0.1254	75.6720	0.0110

Table 4. 4: IPS, ADF and PP Unit Root Test @ I (1) Level

	IPS		ADF		PP	
	statistics	**p-value**	**statistics**	**p-value**	**statistics**	**p-value**
GDPPCGR	-1.99073	0.0233	68.0191	0.0458	89.8449	0.0005
MOBILE	-3.06285	0.0011	86.1722	0.0011	85.8807	0.0012
FII	-7.34936	0.0000	125.812	0.0000	281.428	0.0000
BOONE	-4.57784	0.0000	100.588	0.0000	315.677	0.0000
Z-SCORE	-4.08750	0.0000	99.1543	0.0000	217.248	0.0000

Source: Author's calculations

Note: (*), (**), and (***) specify the rejection of the unit root test hypothesis at the 10%, 5% and 1% levels, respectively.

4.5.3.1 Lag Selection

Having determined the nature of stationarity between the variables under study, the researcher selected the number of lags to use in the study. Table 4.5 shows the results of the lag length selection criteria. Given the importance of lag length selection for VAR models estimations as highlighted by Canova (2007), the researcher carried out an optimum lag length selection criteria procedure and found 5 lags to be the optimal lag length based on the five most commonly used information criteria. According to Stock and Watson (2007), using the optimum selection helps to achieve the best results as too few lags omits information that could result in a misspecified equation with the problem of autocorrelation while too many lags also pose the danger of wastage of degrees of freedom including increasing errors in the forecasts. The choice of the 5 lags by this study underscores the need for an accurate and more robust dynamics without necessarily overly shortening the estimation sample, which would compromise the degrees of confidence. According to Kutu and Ngalawa (2016), issues of serial correlation in the residuals are resolved with the right lag length selection.

Table 4. 5: Lag Length Selection Criteria

Lag	LogL	Likelihood Ratio test	Final Prediction Error	Schwarz Information Criteria	Akaike Information Criteria	Hannan and Quinn Criteria
0	-4486.877	N/A	739.7706	20.84281	20.79573	20.81432
1	-2371.346	4172.297	0.046327	11.39987 *	11.11734	11.22888
2	-2362.107	18.00670	0.049836	11.70828	11.19031	11.39480
3	-2349.272	24.71854	0.052729	12.00004	11.24663	11.54408
4	-2329.901	36.85987	0.054133	12.26154	11.27269	11.66308
5	-2100.885	430.4652 *	0.021058 *	11.55247	10.32817 *	10.81152 *
6	-2096.853	7.485262	0.023216	11.88498	10.42525	11.00154
7	-2091.734	9.385084	0.025472	12.21246	10.51729	11.18654
8	-2084.956	12.26850	0.027740	12.53227	10.60165	11.36385

Source: Author's calculations

* Specifies lag order selected by the criterion.

For robustness, the researcher also conducted diagnostic tests in the form of LM test for autocorrelation, normality tests (skewness, kurtosis and Jarque-Bera), heteroscedasticity tests and VAR stability tests to see how good the model specifications are. The results are presented below.

4.5.3.2 Serial Correlation Test

Having determined the optimal lag length, some diagnostic tests were conducted in the form of serial correlation tests for robustness. The null of the LM test is that there exists no autocorrelation up to some lag. Table 4.6 shows the results of the serial correlation tests. The results show the absence of serial correlation at Order 5, thus validating the optimal lag length selected. A misspecified model based on a wrong lag length would result in serial correlation problems. The absence of serial correlation at Order 5 is consistent with the optimal lag length selection thus also indicating the non-existence of cross-sectional dependence across time. This not notwithstanding, the operations of PSVAR ensures that it accounts for interdependence

across economic units and panels as according to Canova and Cicarelli (2014). PVAR recognises and accounts for transmission effects of one economy on another which comes with globalisation's global interdependence. This study did not envisage any structural breaks in the model series because although regions have a common goal of enhancing financial inclusion and growth, they are embarked on at different points in time. In addition, Glynn, Perera and Verma (2007), argues that the IPS unit root test carried out (see Table 4.3 and Table 4.4) accounts for issues of structural breaks if present.

Table 4. 6: VAR Residual Serial Correlation LM Tests

Null Hypothesis: No serial correlation at Lag order h		
Lags	**LM Statistic**	**Probability**
1	5.690026	1.0000
2	5.835284	1.0000
3	7.244694	0.9998
4	200.7533	0.0000
5	4.811412	1.0000
Logs from Chi-square with 25 df.		

Source: Author's calculations

4.5.3.3 Normality Tests

Table 4. 7: VAR Normality Tests (SVAR)

	Kurtosis				Skewness				Jarque-Bera		
Component	Statistic	Chi-sq.	df	Prob*	Statistic	Chi-sq.	df	Prob*	Statistic	df	Prob
1	86.4659	135847.	1	0.000	4.54725	1612.84	1	0.000	137461	2	0.000
2	35.3403	20394.8	1	0.000	1.32966	137.903	1	0.000	20532.8	2	0.000
3	17.5342	4119.22	1	0.000	-0.6832	36.4075	1	0.000	4155.63	2	0.000
4	20.1912	5762.98	1	0.000	0.58602	26.7871	1	0.000	5789.77	2	0.000
5	13.8102	2278.77	1	0.000	-1.8747	274.145	1	0.000	2552.92	2	0.000
Joint		168404	5	0.000		2088.08	5	0.000	170492	10	0.000

*-Approximate p-values do not account for coefficient estimation

Source: Author's calculations

The normality of the data was tested using skewness, kurtosis and Jarque-Bera as shown in Table 4.7. Rejecting the null for skewness would invalidate the statistic for the SVAR. The results show that for the forty-nine countries, all the variables passed normality tests both individually and jointly. The probability values for the model indicates that they all passed the normality test at 1 percent significance level, the implication being that the residuals of the model for the forty-nine countries are normally distributed in line with Akande and Kwenda (2017).

Table 4. 8: Heteroskedasticity Tests

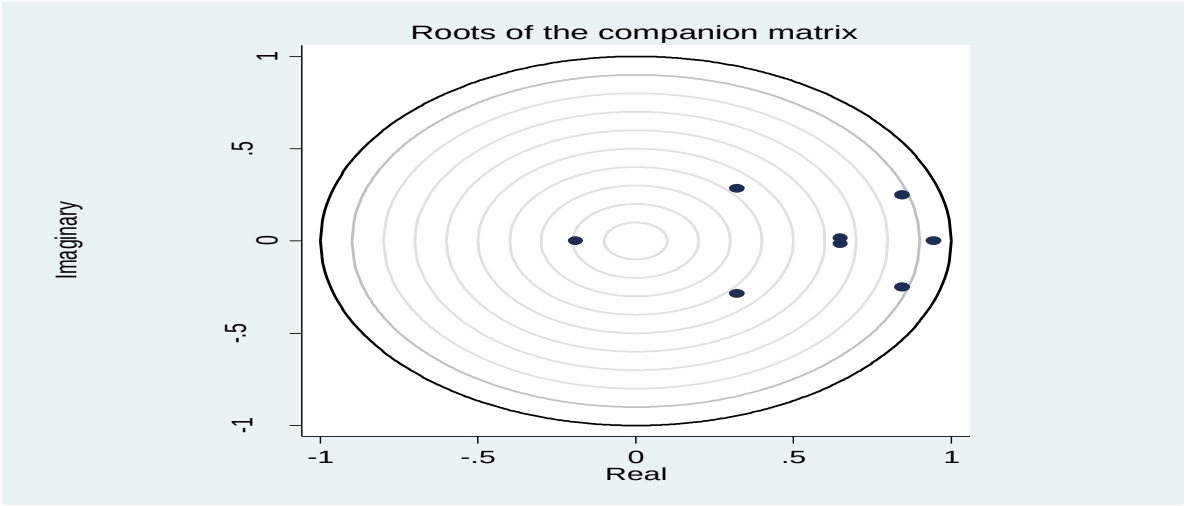
Joint Test:					
No Cross Term			Includes Cross Term		
Chi-sq.	df	Prob.	Chi-sq.	df	Prob.
1274.642	750	0.0000	4 005.838	3 000	0.0000

Source: Author's calculations

The study accepted the null that there is no heteroscedasticity.

4.5.3.4 Stability Test

The stability of the model was tested, and the stability condition was satisfied as all the eigenvalues lie inside the unit circle (see also Appendix F). As a result, the study concluded that panel VAR satisfies stability conditions.



Source: Author's calculations

Figure 4. 2: Model Stability test

4.5.4 Cointegration Test

Once the diagnostic tests have been conducted, the next step is to determine the relationship between the variables, in the long run, using the Johansen and Juselius (1990) procedure (Gujarati, 2003). A cointegration test is performed given the conclusiveness of the above tests, and the results are presented in Table 4.7. The maximum eigenvalue and trace test indicate the existence of three cointegrating relationships. This, therefore, shows that there exists a positive long-run relationship between economic growth and financial inclusion in line with Sethi (2018) and Sethi and Sethy (2018). Following the validation of the presence of cointegrating relationships, the study analysed the short-run dynamics through IRFs and VDs among the variables considered in this study.

Table 4. 9: Cointegration test results

No of CEs	Eigenvalue	Statistic	Critical Value	Prob. **
None*	0.159884	118.4414	69.81889	0.0000
At most 1*	0.114014	67.36137	47.85613	0.0003
At most 2*	0.074964	31.89261	29.79707	0.0283
At most 3	0.028870	9.061128	15.49471	0.3598
At most 4	0.001629	0.477745	3.841466	0.4894

Source*: Author's calculations*

** signifies rejection of the hypothesis at the 0.05 level*

*** p-values of MacKinnon-Haug-Michelis (1999)*

4.5.5 Panel S VAR Results

Based on the identification scheme of Amisiano and Giannini (1997), 35 or $2n^2 - n(n+1)/2$ restrictions were imposed on the A and B matrices combined (where n is the number of variables) for the 5-variable P–SVAR. 20 maximum restrictions are imposed on the diagonal matrix B so that the A matrix absorbed the remaining 15 restrictions for the system to be exactly identified. Given that the non-recursive P–SVAR imposes 15 zero restrictions on A, the system is over-identified and, 10 free parameters in the A matrix with the 5 in the B matrix were estimated, as in Equation 14.

The P-SVAR used in this study contains five variables. MOBILE is a mobile phone diffusion surrogate, FII is the financial inclusion index, Z-score is a stability measure, BOONE is a bank competition surrogate, and GDPPCGR is an economic growth surrogate. The position of the variables and their ordering in the identification scheme is informed by the way the variables influence each other as mainly informed by theories and empirical models. One exceptional strength of SVAR is its ability to provide flexibility when faced with cases without underlying theories (Davoodi, Dixit and Pinter, 2013), thereby justifying its applicability in this study.

The study explored the transmission mechanism from mobile phone to financial inclusion and then to economic growth. To effect this, as noted in the methodology section, we fixed a 5-variable Panel Structural Vector Autoregressive (PSVAR) model of mobile phone diffusion, competition, financial inclusion, financial stability and economic growth based on theory (Mostak, 2015) to to capture the relationship above. Thus, the study proposes a model where mobile phone diffusion creates banking system competition (Hauswald and Marquez, 2003) which eventually results in financial inclusion where finance is much more available to businesses and entrepreneurs hence enhancing financial system stability and eventually economic growth. This argument is in line with Hauswald and Marquez (2003), who posit that mobile phones penetration improves the capacity to process information in addition to the

easiness with which information can be transmitted. As the ability of clients to propagate information increases, intense competition is expected as there will be a more level playing field between intermediaries operating in those markets.

Conversely, for intermediaries whose progress depends on the use of computing equipment, for example, for credit scoring or risk assessment models, the gulf between the informed and the uninformed is expected to increase. In addition, mobile phones penetration reduces information asymmetry across lenders thus levelling the playing field. Endogenizing competition, Hauswald and Marquez (2002), analysed the impact of mobile phones penetration on competition in financial services and found that mobile phones improve information processing, and also lead to low costs of information. They show that the net effects on competition hinge on the overall effect of the technological progress.

Beck *et al*. (2004) and Mostak and Sushanta (2017), posit that financial inclusion relies on bank competitiveness which is also an important determinant of bank stability. In addition, O'Toole and McCann, (2014), established bank competition as a vital element in broadening financial inclusion. The finance-growth hypothesis which postulates that finance leads to economic growth. Khan and Semlali (2000), Almeida and Wolfenzon (2006), and Apergis *et al*. (2007), amongst others, support the view, of a significant relationship between growth in finance and economic growth. Countries with financial systems which are well developed are inclined to enjoy a continued period of growth. Studies applied to develop countries such as Christopoulos and Tsionas (2004), and Kargboll and Adamu (2009), also reached the same conclusion. The mobile phones surrogates are deemed to determine the level of financial inclusion and growth of African economies. The researcher also expects some sort of transmission from financial inclusion to economic growth via bank stability given the finance-stability view and also via bank competition given the competition-growth view.

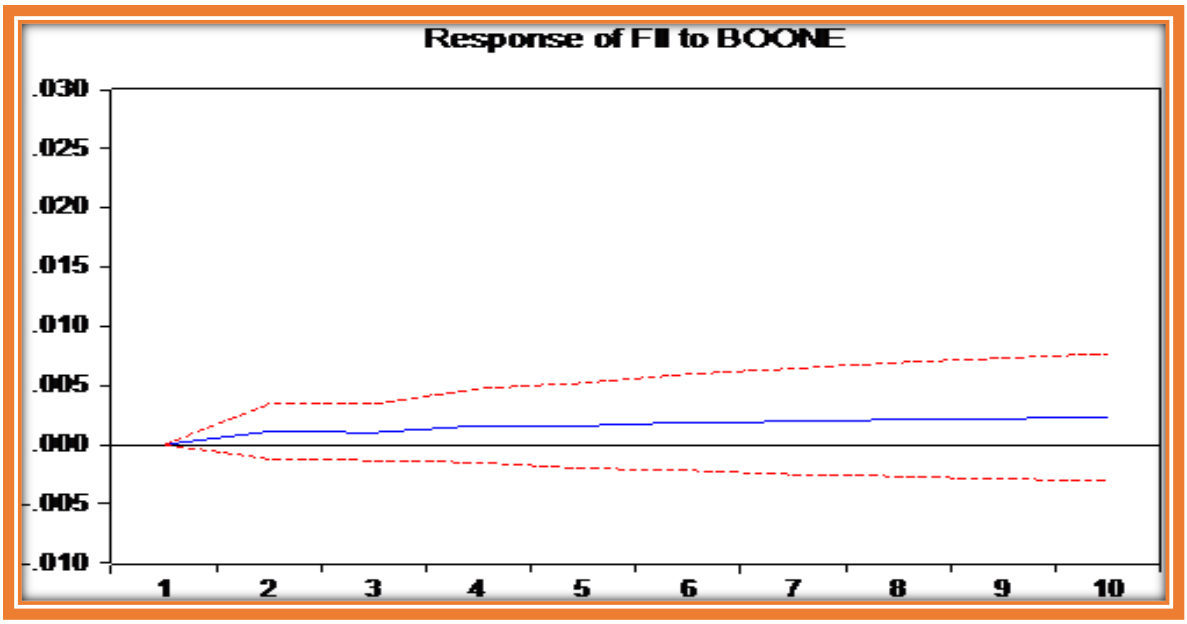
4.5.6 Impulse Response Analysis

First introduced by Sims (1980) in VAR modelling, the analysis of the impulse response function provides an insight into the future state of an economic system resulting from any changes in its components. In other words, with the impulse response function, the reasons as to how changes in a systems variable affect its components in the future are explained, depicting the length of time in the future those variables react to one another. According to Stock and Watson (2001) and Ziegel and Enders (1995), the assumption that shocks reverts to zero in the successive periods with all other shocks been equal to zero allows the detection of the time path of the future and current worth of each variable to a unit rise in the present-day VAR value of a shock. Bernanke and Mihov (1997), argued that the impulse response function is a quantitative measure of the response of each variable to innovations in different systems equation. Appendix F shows the results of the VAR stability test carried out suggesting that suggesting that the VAR is stable to provide a robust examination of the impulse response of the responses of mobile phones diffusion, competition, financial inclusion, financial stability and economic growth. The X-axis of the impulse response graph contains the periods covered by the analysis on an annual basis.

4.5.6.1 Response of Financial Inclusion to Bank Competition

Figure 4.3 shows the impulse responses of financial inclusion to shocks in bank competition over the next 10 periods, that is the next ten years approximately. As indicated in Figure 4.3, in line with a priori bank competition has direct bearing on financial inclusion. Bank competition is positive and strongly significant in explaining its relationship with financial inclusion in the African region. In a competitive banking system, low-profit margins banks may attempt to grow their outreach and increase efficiency, and grow into more client-driven (Boot and Thackor, 2000), thus enhancing the accessibility and availability of financial services. This is consistent with the results of Claessens and Laeven (2005) and Carbo, Rodriguez and Udell (2009); World Bank, 2012 amongst others who find a positive effect of bank competition on financial inclusion. Beck, Demirgüc-Kunt and Maksimovic (2003), established that low competition increases the difficulty in attaining finance.

Furthermore, the World Bank (2012), contended that lack of competition in South Africa's banking sector holds back access to financial services. They established in their studies that bank competition increases credit availability through reduced finance cost thereby supporting the conventional market power hypothesis. The traditional market power hypothesis argues that bank competition reduces finance costs thereby increasing the availability of financial services (Berger and Hannan (1998). However, this result does not fully support the findings of the proponents of the information hypothesis who claim that when there are agency costs and information asymmetries, competition can reduce access as it becomes complicated for banks to internalise the returns from investing in lending, especially, with opaque clients (Stieglitz and Weiss, 1981; Marquez, 2002; Petersen and Rajan (1995). Using the Lerner and H-statistics for 20 European countries, Fangacova *et al*. (2015), find that bank competition increases cost of credit. Their findings are in line with the information hypothesis which states that when there is more competition banks will have less incentive to invest in relationship building (Rajan and Peterson, 1995). In terms of a transmission mechanism, this study found a positive response of financial inclusion to innovation in bank competition. The financial inclusion and bank competition relationship confirms the expectation that bank competition can have a direct effect on financial inclusion and is consistent with the literature on financial inclusion which posits that the essence of bank competition is engendering financial inclusion (Claessens and Laeven, 2005). From the result in Figure 4.3, financial inclusion will increase over the period with any increase in the subsisting bank competition in Africa. Every time bank competition decreases, it has consequences for the financial inclusion within the region. It is thus essential for policymakers and regulators to implement policies that support bank competition leading to higher financial system efficiency. The policies should be able to permit the entry of well-managed and capitalised institutions and the exit of insolvent ones in time.



Source: Author's computation from Stata

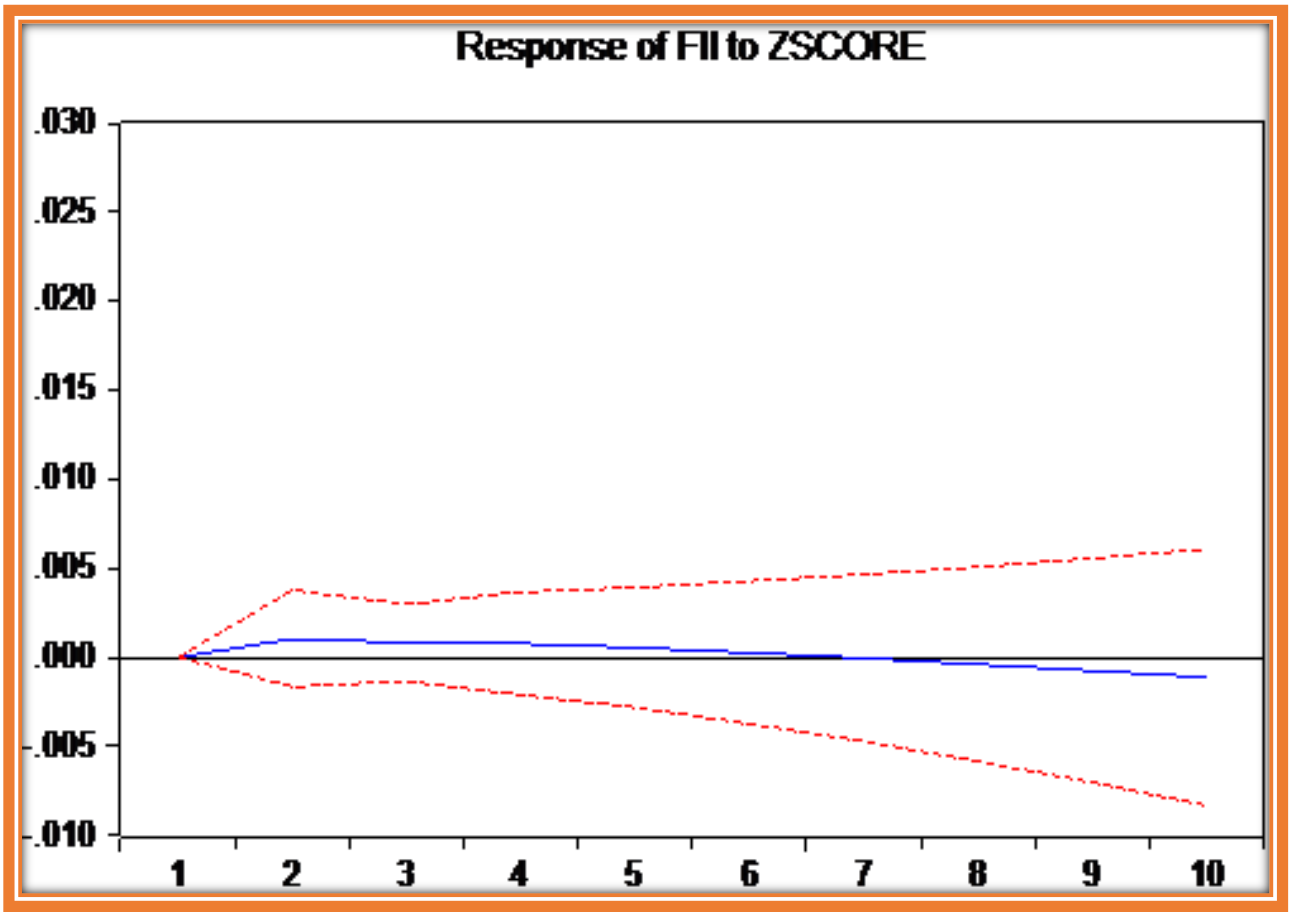
Figure 4. 3: Response of Financial Inclusion to Bank Competition

4.5.6.2 Response of Financial Inclusion to Financial Stability

Figure 4.4 and Figure 4.5 show the reaction of financial inclusion to financial stability and vice versa. The study found financial inclusion responding significantly and positively to a one standard deviation shock in financial stability as shown in Figure 4.4. Although the response is insignificantly different from zero between Period 1 and Period 4, financial inclusion does rise in response to a shock in financial stability of one standard deviation from Period 5 to Period 10. This suggests that a decrease in financial stability may significantly reduce financial inclusion for the next 10 years. These findings are consistent with the results of Hannings and Jensens (2010), Khan (2011), Dermiguc-Kunt (2012) and Ahmed and Mallik (2014) who observed that financial stability could enhance financial inclusion through enhanced trust in the financial system.

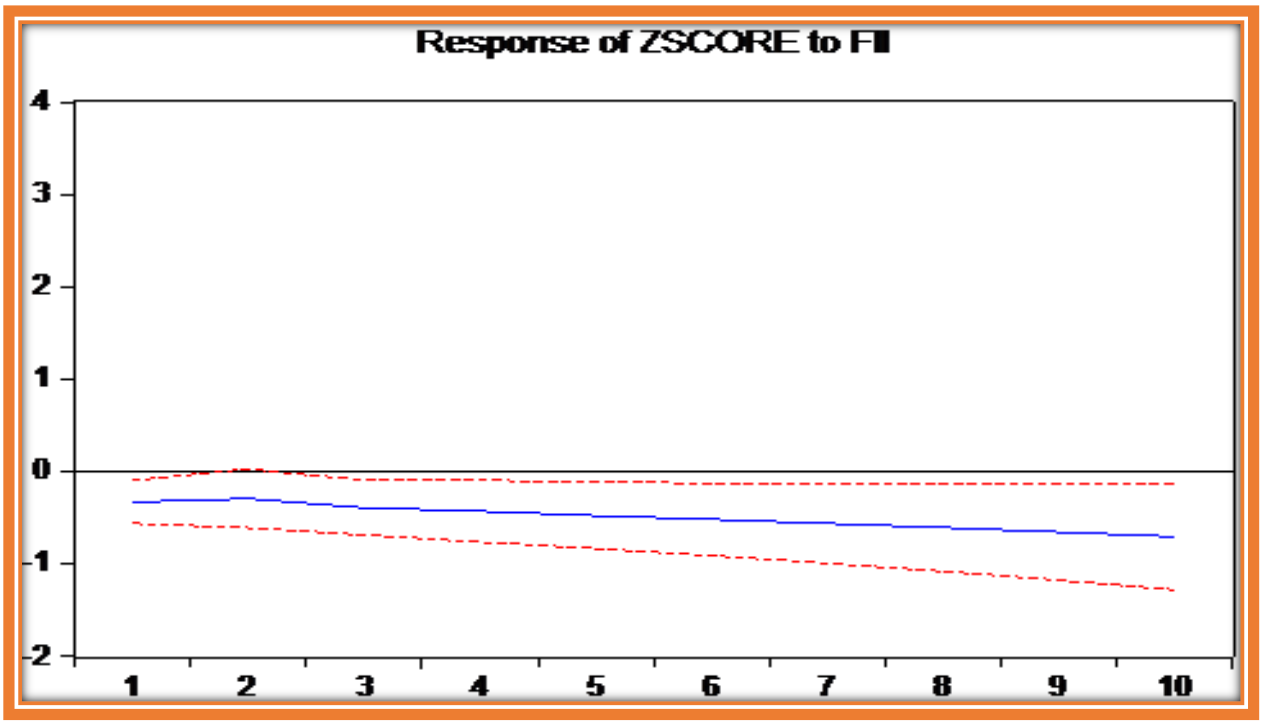
On the other hand, as highlighted in Figure 4.5, the study found a negative relationship between financial inclusion and stability showing that financial inclusion can derail stability if expanded

to uncreditworthy clients and to unfamiliar areas which lead to an increase in credit risk due to a large number of borrowers who are difficult to monitor, thus, leading to erosion of credit standards and bad reputation risk consistent with Adasme *et al*. (2006) and Khan (2011). For example, the US financial crisis which led to the loan and savings debacle of the 1980s, the collapse of Continental Illinois Bank in 1984, the Eurozone financial crisis and the 2007 subprime global financial crisis had their roots in liberal credit extension which ended up disrupting the financial sector. Policy initiatives should revolve around improving financial inclusion without compromising stability.



Source: Author's computation from Stata

Figure 4. 4: Response of Financial Inclusion to Financial Stability



Source: Author's computation from Stata

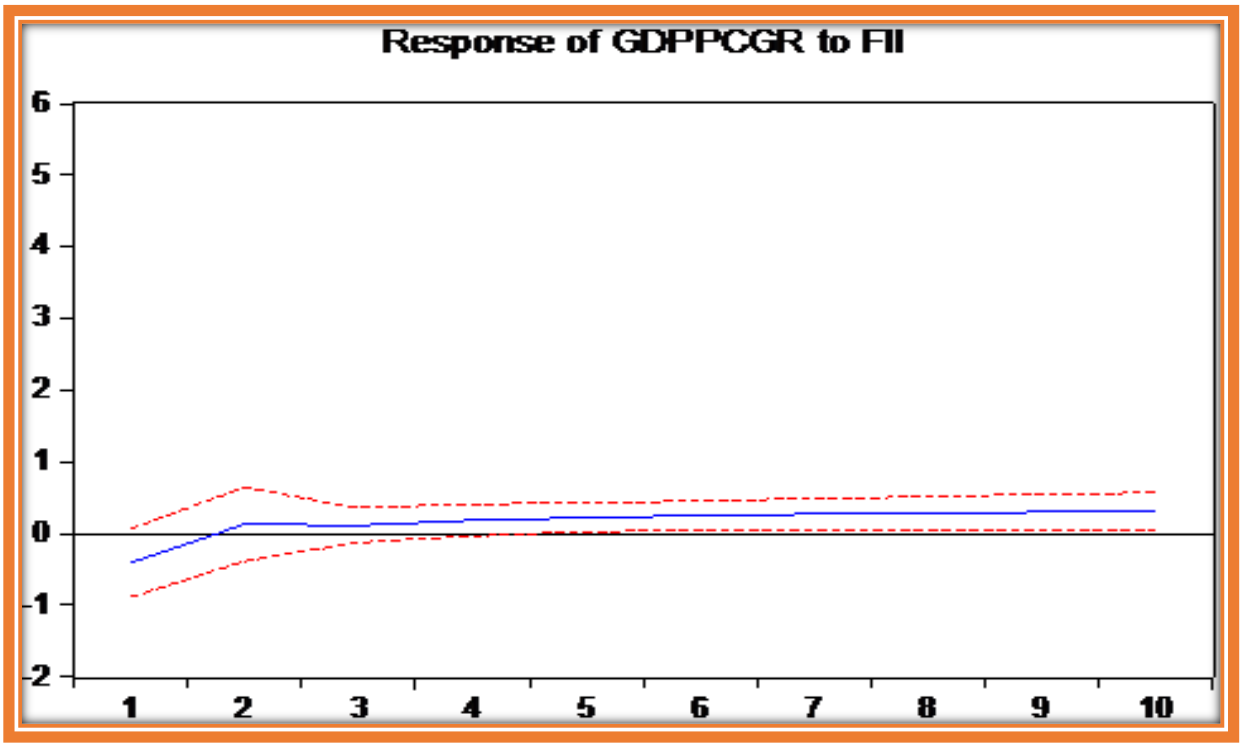
Figure 4. 5: Response of Financial Stability to Financial Inclusion

4.5.6.3 The response of Economic Growth to Financial Inclusion

The reaction of economic growth to financial inclusion is shown in Figure 4.6. Financial inclusion is positive but insignificant in terms of explaining economic growth in the short-term. In other words, despite being positive, economic growth does not react significantly over the study period and at some points is close to zero. Although various studies have argued for and against the financial inclusion and economic growth relationship (Wang'oo, 2013; Iqbal and Sami, 2017; Saidi and Emara, 2017; Mwaitete and George, 2018, among others), the argument by Onaolapo and Odetayo (2012), and Oruo (2013), that financial inclusion only provides an enabling environment for economic growth may explain well why this relationship is insignificant in the short-term. In terms of transmission mechanism, the study found a flat

response of economic growth to an innovation in financial inclusion over the significant periods in line with Evans and Osi (2017), Evans and Alenoghena (2017), Okoyo *et al.* (2017), Simpasa *et al*. (2017), Witjas (2016), and Nkwede, 2015) who found a positive but insignificant impact of financial inclusion on the growth of economies. This result appears counterintuitive given numerous empirical evidences that financial inclusion is key to economic growth. The insignificant positive impact of financial inclusion on the growth of economies obtained in this study means that the low levels of financial inclusion in Africa have not affected economic growth in the region between 2004 and 2016 in the short and long run. This outcome is expected since the region is characterised by other intervening barriers which lead to higher levels of financial exclusion which is projected around 90 percent thereby not contributing to economic growth as expected. Tackling these barriers could significantly increase economic growth. This entails the need for more efforts to increase financial inclusion in Africa. Credit risks and low financial literacy block utilisation of financial services. Regulators have to advocate for a cost-effective identification tool, and also educate clients with low financial literacy. However, this finding contradicts the results of several researchers (Hariharan and Marktanner, 2012; Onaolapo and Odetayo, 2012; Oruo, 2013; Wang'oo, 2013; Babajide and Oyedayo, 2014; Adegboye and Omankhanlen, 2015; and Onaolapo, 2015; Iqbal and Sami, 2017; Saidi and Emara, 2017; Mwaitete and George, 2018) who find a significant positive relationship between the two variables.

On the other hand, Okoyo *et al*. (2017), Simpasa *et al.* (2017) and Nkwede (2015), posit that financial inclusion has a significant negative impact on the growth of economies thereby disputing the result of this study. They cited high level of financial exclusion as the major cause of the result. Some studies even found no evidence for the direct effect of financial inclusion on economic growth (Witjas, 2016), concluding that financial inclusion plays only a minor role in enhancing economic growth.



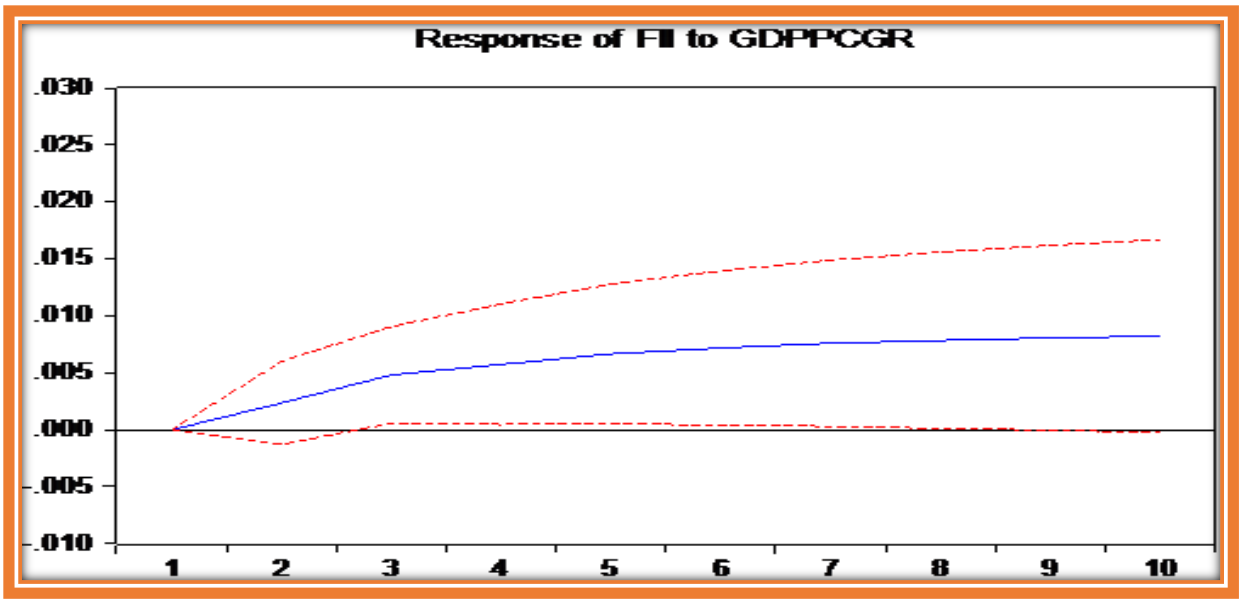
Source: Author's computation from Stata

Figure 4. 6: Response of Economic Growth to Financial Inclusion

4.5.6.4 The response of Financial inclusion to Economic Growth

As indicated in Figure 4.7, and in line with a priori, economic growth is expected to have a direct bearing on financial inclusion since economic growth generates extra demand for financial services following demand from other economic agents including investors (Shan *et al*., 2001). Economic growth also motivates private businesses and individuals to plan investments that enhance the need for financial services (see Zang and Kim, 2007; and Babajide *et al*., 2015). Improved firms' performance infers an increased need for capital for expanding the business,

meaning financial inclusion positively responds to economic growth. Private investors and individuals borrow from financial intermediaries to finance their investments as they seek to exploit available opportunities. In terms of transmission mechanism, this study found a significant positive response of financial inclusion to an innovation in economic growth over the significant periods in line with the "growth-led finance" approach in line with Evans (2015), who studied the linkage between economic growth and financial inclusion in Africa between 2005 and 2014 and found that economic growth unilaterally causes financial inclusion. Likewise, Evans and Alenoghena (2017), assessed the link between financial inclusion and economic growth for selected African countries using Bayesian VAR over the period 2005 – 2014 and concluded that there exists a unidirectional causality from economic growth to financial inclusion, hence supporting the demand-following hypothesis.



Source: Author's computation from Stata

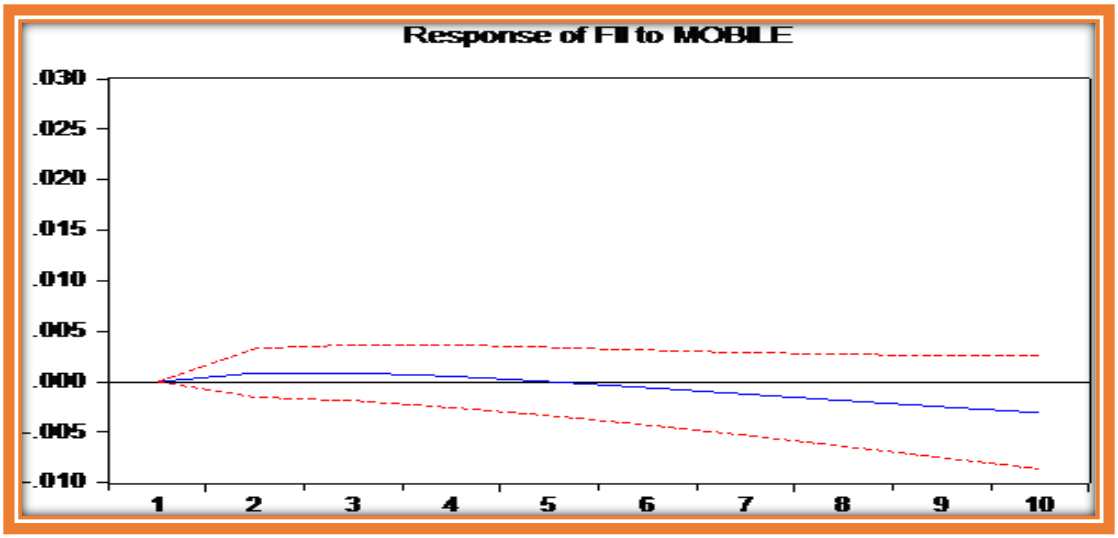
Figure 4. 7: Response of Economic growth to Financial Inclusion

4.5.6.5 Response of Financial Inclusion to Mobile Phones Penetration

The reaction of financial inclusion to mobile phones penetration is shown in Figure 4.8. Mobile phones penetration is positive but insignificant in terms of explaining financial inclusion in the short-term. In other words, financial inclusion does not react significantly in the short run, even though it is positive over the first two periods and at some points became negative. In the long run from Period 9 to Period 10, financial inclusion started increasing (as shown in Table 4.10) indicating a significant positive long-run relationship between the two variables. Although various studies have argued for the mobile phones penetration and financial inclusion relationship (Kpodar and Andrianaivo, 2011; Mihasonirina and Kangni, 2011; Maria and Frida, 2014; Lenka and Barik, 2018), it seems that mobile phones only provide an enabling environment for financial inclusion or otherwise of the continent may well explain why this relationship is insignificant in the short-term. Interestingly, this indicates that financial inclusion does not generate an immediate response from mobile phones. This might seem to controvert recent empirical evidence and expectations on the effect of mobile phones on financial inclusion at face value. The trend could be as a result of several reasons explained below. The introduction of mobile money was faced with resistance from banks as they feared unfair competition from mobile network operators (MNOs) who are not bound by strict financial regulation that impede banks. This perception changed with time as banks appreciated the complementary role of MNOs. Other MNOs even partnered with banks on mobile insurance and credit products. For example, in Kenya, the CBA bank partnered Safaricom, the network operator to launch M-Shwari; in Tanzania, CBA partnered with Vodacom to offer M-Pawa, and in Uganda, CBA partnered with MTN to launch MoKash. These are comprehensive banking products which enable clients to borrow unsecured loans or to save money with earning interests.

Moreover, while mobile money appears to be the solution to financial inclusion in Africa, it has several challenges including limited interoperability, regulations which are stringent, low-income levels, scarcity of qualified agents and low levels digital and financial literacy. Despite the potential for mobile broadband to enhance financial inclusion, broadband network coverage is more confined to urban areas in Africa where there is less population. Many people in Africa do not have ample access to the internet in the short run. The inability for regulators to strike a balance between effecting regulations and supporting innovations also pose another challenge. This could have affected the effect of mobile phones in the short run however with time,

interoperability and internet connection improved, enhancing the chances of increasing financial inclusion in the long run. Managing stakeholder tension is thus vital for policymakers and regulators. They should also introduce a regulatory environment to boost financial inclusion while monitoring risks associated with rapid growth of mobile money transactions.



Source: Author's computation from Stata

Figure 4. 8: Response of Financial Inclusion to Mobile Phones Penetration

4.5.7 Variance Decomposition

Variance decomposition provides further insight into explaining the proportion of the variation of the variables in the VAR system that is explained by the other variables in the system. In another way, variance decomposition describes the degree to which exogenous shocks explain the forecast error variance of each variable to other remaining variables. With variance decomposition, the information on the movements' rate in a sequence that is as a result of the shock in the variable itself and other shocks identified are accounted for (Ziegel and Enders, 1995). Hence variance decomposition implies that the second shock does not affect the first

variable contemporaneously, but both shocks can have a contemporaneous effect on all following variables. Hence the ordering of variables is important. It is recommended to try various orderings to see whether the resulting interpretations are consistent. The principle is that the first variable should be selected such that it is the only one with potential immediate impact on all other variables. The second variable may have an immediate impact on the last components but not on the first component, and so on.

Table 4.10 below presents the variance decomposition for mobile phone diffusion. The table shows a marginal contribution of shocks from the other variables in the systems to the variation in mobile phone diffusion. A cursory look shows that economic growth followed by financial stability in that order have the highest impact on the variation in the changes in mobile phones penetration. For want of generality, only economic growth and financial stability contributed a little to the shocks in mobile phones as others are relatively insignificant contributing less than 1 percent. Economic growth contributes 2.65 percent, 2.88 percent, 2.83 percent, 2.78 percent, 2.76 percent, 2.77 percent, 2.79 percent, 2.84 percent, 2.89 percent and 2.95 percent over the periods 1 to 10. Contributing next to economic growth to the variation in the shocks to mobile phones diffusion is financial stability that contributes between 0.46 percent in period 2 and 1.09 percent in period 10. The contributions, however, increase gradually over the periods. Next is financial inclusion, making up 0.56 percent, 0.7 percent, 0.61 percent, 0.51 percent up to 0.35 percent and 0.41 percent in period 9 and period 10 respectively. The case is not fundamentally different from bank competition which contributes the least to the shocks in mobile phone diffusion over the periods with maximum conferment at 0.33 percent in period 10. This suggests a short run negative effect of mobile phones on financial inclusion; however, the trend started increasing in the long run from period 9 to period 10. Overall, mobile phones positively contribute to financial inclusion in the long run in line with Mihasonirina and Kangni (2011), Andrianaivo and Kpodar (2012), Maria and Frida (2014), Sekantsi and Motelle (2016) and Sengy (2017). These findings are consistent with those of Sekantsi and Motelle (2016), who investigated the interplay between mobile phones and financial inclusion in Lesotho for the period 2013 to 2015 using monthly data. Sekantsi and Motelle (2016) found a steady positive link between financial inclusion and mobile phones in the long run and also that mobile phones

Granger cause financial inclusion in the long and short run in Lesotho. It becomes ostensible that even though shocks in mobile phones have no significant influence on financial inclusion, the impact appeared indirect and conveyed through other variables such as bank competition and financial stability providing credibility to the hypothetical transmission from mobile phones to financial inclusion via bank competition in the literature (Schaeck and Cih´ak, 2014).

Table 4. 10: Variance Decomposition of Mobile Phones

Variance Decomposition of Mobile Phones:						
Period	S.E.	FII	GDPPCGR	MOBILE	Z-SCORE	BOONE
1	7.042299	0.556516	2.645478	96.79801	0.000000	0.000000
2	11.95505	0.699742	2.881260	95.89805	0.462590	0.058355
3	15.81327	0.607366	2.828818	95.77395	0.674989	0.114878
4	18.79378	0.511825	2.783628	95.73439	0.807559	0.162594
5	21.09448	0.426543	2.763718	95.70934	0.894440	0.205964
6	22.88141	0.363268	2.768278	95.67049	0.955922	0.242044
7	24.28084	0.327362	2.793765	95.60437	1.002047	0.272458
8	25.38597	0.322280	2.835538	95.50754	1.037937	0.296702
9	26.26555	0.350466	2.889879	95.37740	1.066540	0.315718
10	26.97073	0.413760	2.953657	95.21327	1.089449	0.329859

Source: Author's Computation using Stata

A cursory look at the variance decomposition of financial stability in Table 4.11 shows that shocks to mobile phones penetration followed by shocks to economic growth and shocks to financial inclusion in that order have over 1 percent impact on the variation in financial stability. Mobile phones contribute 2.44 percent in period 2 and gradually increased to 9.02 percent in period 10. Economic growth follows with 5.6 percent contribution being the highest short run

contribution. The contribution gradually decreased from 5.07 percent in period 2 to 4.89 percent in period 6 before gradually rising to 5.47 percent in period 10. Contributing next to economic growth to the variation in the shocks to mobile phones diffusion is financial inclusion that contributes between 2.48 percent in period 1 and 4.15 percent in period 10. The contributions, however, increase gradually over the periods. The least in contribution is bank competition that insignificantly contributed less than 1 percent to the shock in bank stability. It becomes apparent as well that although shocks in competition insignificantly influence stability, the impact appeared indirect and transmitted through other variables such as financial inclusion providing weight to the hypothetical transmission from competition to stability via financial inclusion in the literature (Schaeck and Cih´ak, 2014).

Table 4. 11: Variance Decomposition of Z-Score

Variance Decomposition of Z-Score:						
Period	S.E.	FII	GDPPCGR	MOBILE	Z-SCORE	BOONE
1	2.093706	2.483779	5.605456	0.121623	91.78914	0.000000
2	2.900741	2.308987	5.072887	2.448921	89.94158	0.227627
3	3.633950	2.629099	4.901452	4.376276	87.84077	0.252400
4	4.307579	2.861651	4.827639	5.731024	86.38430	0.195389
5	4.946348	3.092371	4.891302	6.721746	85.00789	0.286688
6	5.563324	3.312544	4.983413	7.425334	83.95296	0.325751
7	6.168069	3.524853	5.106236	7.963203	82.98494	0.420766
8	6.766880	3.734568	5.230139	8.381644	82.16334	0.490309
9	7.365129	3.941469	5.354951	8.726889	81.40353	0.573159
10	7.966513	4.147748	5.472590	9.019309	80.71930	0.641049

Source: Author's Computation using Stata

Table 4.12 indicates the extent to which shocks in mobile phone diffusion, competition, financial inclusion and financial stability explain the variation in economic growth. The results show that

mobile phones contribute the most within the periods to the variations in economic growth. Mobile phones penetration contributes the most from 0.53 percent in the 1st period, up to 8.14 percent in the 10th period. Following is the index of financial inclusion which contributed 0.82 percent in the first period increasing up to 1.41 percent in period 5 and increased significantly to 2.42 percent in the 10th period. Although in increasing order, competition consistently contributed less than 0.50 percent to the variation in the shocks in economic growth throughout the periods, contributing 0.09 percent in the first period to 0.21 percent in the tenth period. The study found from Table 4.12 that shocks in mobile phones penetration substantially account for the variation in the economic growth of the continent, followed by financial stability and financial inclusion. It also becomes apparent that shocks to bank competition contribution the least to economic growth.

Table 4. 12: Variance Decomposition of GDPPCGR

Variance Decomposition of GDPPCGR						
Period	S.E	FII	BOONE	Z-SCORE	GDPPCGR	M-PHONES
1	4.480300	0.820304	0.087143	0.058929	87.11721	0.000000
2	4.778319	0.878923	0.078822	0.299610	87.72774	0.531402
3	4.921403	0.970815	0.144395	0.497825	87.03157	1.314405
4	4.995539	1.175057	0.160686	0.785564	85.71789	2.370510
5	5.052608	1.408444	0.191153	1.087307	84.18724	3.531709
6	5.102590	1.645033	0.200110	1.398713	82.66459	4.672352
7	5.148263	1.869021	0.208798	1.699435	81.24018	5.724213
8	5.189666	2.074849	0.210190	1.988769	79.95897	6.653799
9	5.226915	2.261183	0.210591	2.261212	78.82582	7.456701
10	5.260143	2.429051	0.209115	2.518009	77.83347	8.139018

Source: Author's Computation using Stata

Table 4.13 presents the various contributions of each shock to changes in bank competition. The table shows that all the variables have a marginal effect on bank competition, accounting for less than 2 percent of bank competition fluctuations throughout the period under analysis. Financial inclusion, on the other hand, makes a comparatively larger contribution to bank competition fluctuations. Financial inclusion accounts for an average of over 0.90 percent of the variation in bank competition over the periods, with 0.796 percent, 0.957 percent, 0.849 percent, 0.921 percent, 0.914 percent, 0.951 percent, 0.969 percent, 0.997 percent, 1.017 percent, and 1.041 percent from period 1 to period 10, in that order. Interestingly, the effect is progressive throughout the periods. Economic growth follows in influence accounting for approximately 0.5 percent which is insignificant. Both mobile phones and financial stability contribute most insignificantly to changes in bank competition, with the Z-score contributing the least at approximately 0.3 percent during the period. The study, therefore, concludes that the effect of financial inclusion is more distinct than the effect of bank stability on bank competition despite there being a marginal direct effect in both cases. It is therefore clear that bank competition enhances financial inclusion in line with the structure performance hypothesis.

Table 4. 13: Variance Decomposition of BOONE

Variance Decomposition of BOONE						
Period	S.E	FII	BOONE	Z-SCORE	GDPPCGR	M-PHONES
1	0.210801	0.795921	98.01929	0.000000	0.000000	0.000000
2	0.214392	0.957007	96.39703	0.235792	0.012122	0.001224
3	0.241233	0.848886	96.32552	0.1914048	0.494300	0.003172
4	0.244411	0.920552	95.82303	0.2606601	0.590746	0.014700
5	0.251604	0.913912	95.61541	0.2487066	0.810404	0.064352
6	0.253129	0.951112	95.31400	0.2799091	0.895889	0.148357
7	0.256003	0.968968	95.07303	0.2856562	0.992929	0.273295
8	0.257091	0.996652	94.80772	0.3070307	1.040301	0.425016
9	0.258294	1.017016	94.55551	0.3189328	1.080248	0.596145
10	0.258900	1.041120	94.30433	0.3356710	1.100313	0.774335

Source: Author's Computation using Stata

Finally, on variance decomposition is Table 4.14 which shows that variations in economic growth (GDPPCGR) and bank competition better explain the fluctuations in financial inclusion. The contribution of economic growth to variations in financial inclusion (FII), increased from 0.64 percent in period 2 to 2.15 percent in period 3, then more than doubled to 4.38 percent in period 5 then increased to 7.07 percent in period 10. The contribution of bank competition to financial inclusion also increases from 0.16 percent in period 2 to 0.36 percent in period 4 then to 0.68 percent after 10 periods. These results are in line with Park and Mercado (2015), who found that GDP per capita growth significantly influences financial inclusion in Asia. Again, this study finds that the shocks impacting on the variation in financial inclusion relate to factors outside the system as the combination of the shocks of mobile phone diffusion, competition, financial stability and economic growth do not contribute up to 5 percent of this variation with the exception of economic growth. Both mobile phone diffusion and competition contribute quite insignificantly to this variation with former making a marginal contribution of 0.02 percent in period 2 to 0.43 percent in period 10, while the highest contributions of the later is 0.12 percent in period 10.

Table 4. 14: Variance Decomposition of FII

Variance Decomposition of FII						
Period	S.E	FII	BOONE	LGZSCORE	GDPPCGR	M-PHONES
1	0.023019	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.028761	98.76600	0.163197	0.001723	0.644489	0.015606
3	0.034497	97.23354	0.232754	0.017630	2.147228	0.015656
4	0.039414	95.89223	0.367584	0.059773	3.326657	0.017611
5	0.044015	94.66531	0.451639	0.136022	4.381542	0.063811
6	0.048362	93.55044	0.538614	0.246327	5.212894	0.179558
7	0.052540	92.52222	0.595517	0.389218	5.875309	0.371681
8	0.056601	91.54660	0.641668	0.565283	6.386021	0.635513
9	0.060580	90.61155	0.669818	0.771672	6.777079	0.960958

10	0.064504	89.70343	0.687855	1.007463	7.067359	1.335557

Source: Author's Computation using Stata

4.6 Granger Causality Test

To strengthen and confirm further the evidence on the interplay among mobile phones penetration, financial inclusion and economic growth nexus, this study assessed the direction of causality among the variables using pairwise Granger causality tests. Table 4.15 presents the results with five lags, the optimal lag selected using the lowest AIC value. The results of the Granger causality tests further support the presence of a unidirectional relationship flowing from economic growth to financial inclusion in Africa in line with the demand following hypothesis. Consistent with the hypothesis, the study found that mobile phones diffusion Granger cause financial inclusion in Africa and not otherwise and this is consistent with Andrianaivo and Kpodar (2012), Lenka and Barik (2018) and Olaniyi (2018).Mobile phones penetration and financial stability Granger cause economic growth in a unidirectional manner. South Africa and Kenya had successful experiences on the positive effect of mobile financial services on financial inclusion. In this digital and fast-moving age, mobile phones have the potential to drive financial inclusion in Africa. For example, mobile phones can reduce bank access costs as banks can remove infrastructure costs thus lessening the burden for poor customers who can transact in the comfort of their homes using mobile phones. The success story in Kenya is that of M-PESA which should be imitated throughout Africa. Given the limited numbers of physical bank branches in rural areas, mobile phones have the potential to become the game changer. Therefore, strategies to boost financial inclusion in Africa must consider incentives that can speed up the diffusion of internet-based mobile devices to bring on board the unbanked population. Easier access to mobile phones may significantly contribute to greater financial inclusion. Policies should encourage the increased use of mobile phones to enhance financial inclusion in Africa.

Table 4. 15: Granger Causality Test

Z-SCORE does not Granger Cause BOONE	456	0.21431	0.8072
BOONE does not Granger Cause ZSCORE		2.88186	0.0571
GDPPCGR does not Granger Cause FII	380	5.59137	0.0040
FII does not Granger Cause GDPPCGR		0.99786	0.3696
MOBILE does not Granger Cause FII	393	0.35364	0.0012
FII does not Granger Cause MOBILE		6.86015	0.7024
MOBILE does not Granger Cause GDPPCGR	528	5.66084	0.0037
GDPPCGR does not Granger Cause MOBILE		2.23409	0.1081
Z-SCORE does not Granger Cause GDPPCGR	484	5.96838	0.0028
GDPPCGR does not Granger Cause ZSCORE		0.90983	0.4033
Z-SCORE does not Granger Cause MOBILE	491	0.66056	0.5170
MOBILE does not Granger Cause ZSCORE		6.49562	0.0016

Source: Author's Computation using E-Views

4.7 Summary

This chapter investigated the link between financial inclusion and economic growth in Africa between 2004 and 2016. The study applied a cointegrated P-SVAR procedure containing five variables, namely, financial inclusion (FII), financial stability (Z-Score), bank competition (BOONE), mobile phones penetration (MOBILE), and the rate of economic growth (GDPPCGR). The cointegration test finds the presence of a positive long-run link between financial inclusion and economic growth in line with Sethi (2018) and Sethi and Sethy (2018). In terms of the transmission mechanism, this study found a significant positive response of financial inclusion to an innovation in economic growth over the significant periods in line with the

"growth-led finance" approach in line with Olaniyi (2015) who researched on the linkage between economic growth and financial inclusion in Africa between 2005 and 2014 and found that economic growth unilaterally causes financial inclusion. Likewise, Evans and Alenoghena (2017), assessed the link between financial inclusion and economic growth for selected African countries using Bayesian VAR over the period 2005 – 2014 and concluded that the causal relationship runs from economic growth to financial inclusion, hence backing up the demand-following hypothesis. The result is not in keeping with Pradhan *et al*. (2016), Gour'ene and Mendy (2017), Olaniyi and Olaniyi (2017) and Kim, Yu and Hassan (2018) who found a complementary relationship between financial inclusion and economic growth in ASEAN Regional Forum, WAEMU countries, Nigeria and OIC countries, respectively. The study also found a positive impact of bank stability and bank competition on financial inclusion in Africa thereby supporting the conventional market power hypothesis. Mobile phones penetration is another transmission channel through which financial inclusion is enhanced as it facilitates bank competition and stability.

The findings also show that variations in economic growth and bank competition better explain the fluctuations in financial inclusion. This suggests that financial inclusion increased significantly following a shock in bank competition and economic growth. This shows that the relationship between financial inclusion and economic growth in Africa corresponds with the unilateral causality hypothesis, meaning that economic growth enhances financial inclusion. These findings are not in agreement with similar studies on developing countries (Olaniyi and Olaniyi, 2017 and Sethi, 2018).

The study established that the growth of a nation depends significantly on the expansion of banking and financial services to the financially-excluded populations of the country, as they possess unexplored and untapped valuable potentials that will be of tremendous value to the country.

CHAPTER 5

THE IMPACT OF INSTITUTIONS AND GOVERNANCE ON FINANCIAL INCLUSION IN AFRICA

5.1 Introduction

The literature on financial inclusion has identified high-quality institutions, strong contract enforcement, efficient legal rules and political stability as the determinants of financial inclusion (Allen *et al*., 2016). Lack of deeper understanding of these issues results in ill-informed policy designs. Examining the role of governance and economic freedom in Africa is fundamental since a successful and sustainable transformation process targeting at promoting financial inclusion, and economic growth calls for their efficient and robust presence. A recent report of UNECA (2016) that centres on the importance of implementing and putting in practice the principles of economic freedom and good governance, highlight how effective economic freedom and governance institutions are essential for inclusive development in Africa. Tenets of the conservative wisdom on good institutions and economic freedom hint at market-oriented reforms, strong contract enforcement, adequate regulatory/legal frameworks and strong enforcement mechanisms, and effective checks and balances, all factors that are critical to guarantee efficient resources allocation and economic growth in line with the mainstream policy thinking. However, these assumptions have been largely reconsidered in the last two decades, with authors such as Stiglitz (2002, 2008, 2014), arguing that it is crucial for reforms to be implemented in the right sequence and at the right speed for economic liberalisation to succeed. Hence, this study contributes to the literature by investigating the impact of institutional governance and economic freedom on financial inclusion, using panel data analysis from African countries. The study employed the system GMM methodology, which deals with the bias of endogeneity while estimating the empirical models on a panel of 49 African countries.

5.2 Review of Financial Inclusion, Governance and Economic Freedom

The proponents of institutional economics highlighted the discussion of institutions as a topical economics issue in recent years (Maki, 1993; Prasad, 2003). While the definitions of "institutions" may differ across studies, the results are strong and consistent (Persson, 2004). Broadly, institutions that have been linked with the performance of economies commonly relate to measures of corruption, government expropriation risk, bureaucratic quality, the rule of law, openness to trade, government repudiation of contracts, and civil liberties. There exists only a basic understanding of the extent to which institutions matter in developing countries. Besides, the channels of influence and causality of the various links between the institutional set-up and economic growth are still not fully understood (Jutting, 2003).

Governance consists of the institutions and traditions by which authority is exercised in a country. This includes the accountability, the rule of law and transparency in the way governments are designated, monitored and replaced. Literature finds a strong positive correlation between governance indicators and financial inclusion. Ali, Yusop and Chin (2016), examined the interplay between institutional quality and financial inclusion across 52 developing countries for 2004-2010 using the generalised panel method of moment (GMM) technique. The study found that institutional quality promotes financial inclusion in developing countries. Furthermore, the results show that financial openness and economic growth positively and significantly influence financial inclusion for the countries under investigation. The study concluded that absence of violence, effective government, political stability and regulatory quality could be good instrument that may promote financial inclusion. Zulkhibri and Ghazal (2017), used the Probit regression to investigate the impacts of institutions and governance on financial inclusion for developing economies and Muslim countries. The results found a positive effect of governance on financial inclusion. Institutional quality affects the way in which economic agents interact and behave, and thus plays a pivotal role in shaping the economic behaviour of market participants. A weak institutional framework causes increased uncertainty, dysfunctional markets and misallocation of resources (Demetriades and Law, 2006). An improved institutional framework leads to an elimination of bureaucracy due to improved

governance structures, the rule of law and reduction in corruption, among others (Bräutigam and Knack, 2004). Hence, a poor institutional environment complicates contract enforcement due to increased information asymmetry, leading to non-price screening and monitoring techniques, thus reducing both outreach and usage. Knack and Keefer (1995), found a positive link between institutional quality indicators and financial inclusion outcomes.

5.2.1 Financial Inclusion and Corruption

Galli, Marcia and Rossi (2017), investigated the effect of corruption on SMEs financing for 11 Euro area countries between 2009 and 2014. The results show that small businesses in countries with a high rate of corruption face greater chances of self-discipline concerning their loan applications than small firms situated in low-corruption economies. Adeyeye and Bamidele (2016), also investigated the effect of corruption on access to finance in Nigeria using a quantitative approach and found an inverse relationship between the two variables. Emanuele and Mounu (2017) also investigated the effect of corruption on access to finance for firms in Brazil. They found that corrupt firms invest more, increase borrowing and leverage, reallocate labour inside the firm, restructure the organizational design by increasing hierarchical layers, rely less on government contracts, and grow faster. Also Adeyeye and Oshinowo (2017) investigated the effect of bribery and corruption on access to finance for new market pioneering by Knowledge- Intensive Businesses (KIBs) SMEs in Nigeria. Using a quantitative approach on a sample of 510 KIBs SMEs at Lagos, their results indicate that bribery and corruption has an inverse impact on KIBs owners/managers ability to acquire finance from the institutions.

5.2.2 Economic Freedom and Financial Inclusion

Economic freedom is a measure of the market allocation of resources and private ownership, instead of government control and ownership. Berggren (2003), defines economic freedom as the extent to which an economy voluntarily enters into contracts inside the framework of a predictable and the stable rule of law that protects private property and upholds contracts, with

limited government intervention in the form of regulations, government ownership, and taxes. In Europe, Carbo *et al.* (2007), found that institutional structure, existing economic or financial systems and political styles significantly affect financial inclusion. Ghosh (2016) investigated the impact of economic freedom in influencing bank risk taking by MENA banks employing bank-level data for 2000-2012. Employing panel data techniques to explore the relationship he findings that economic freedom exerts a significant and non-negligible impact on bank risk taking which also has an indirect effect on financial inclusion through enhanced bank lending.

5.2.3 Factors that influence financial inclusion

5.2.3.1 Banking Sector Size

The problem of financial inclusion (access to financial services) in developing countries is aggravated by a triad challenge of smallness (*i.e.* small financial institutions, small market size and small transactions). As a result, it becomes expensive and difficult to serve the unbanked population, since the market can accommodate only a few players, resulting in less competition and unprofitable institutions. In addition, institutions cannot benefit from economies of scale since they are relatively small, and the size of the transactions increases operational costs with marginal increases in profits. This would suggest that underdeveloped economies and financial systems might be limited in their ability to expand financial services. Using the World Bank's Enterprise Surveys data, Beck, *et al.* (2013), examined the types of financial institutions that ease financial access for small to medium-sized firms and found that dominance of banks leads to lower access. However, diverging from theoretical expectations, they found that the size of financial institutions does not affect access. Also, Gimet and Lagoarde-Segot (2012), examined the interplay between firms' access to financial services and financial structure for 138 countries from 2002 to 2009. Specifically, they studied how access to finance is affected by banking sector size. Their findings suggest the need to enhance capital market development, competition and

institutional, supervisory policies and effective regulation, rather than focus on the banking sector size.

5.2.3.2 Natural Resources

Contradictory theories have been made on financial inclusion in natural resource-rich countries. Resource wealth is expected to impact positively on the financial sector. On the funding and deposit side, higher natural resource rents can give rise to higher deposit funding for a domestically served country's banking system. Natural resources might also bring about higher loan demand, particularly consumer credit, hence deepening the financial system. However, on the dark side: extra gains can cause a shift of wealth outside the domestic financial system, either into offshore sovereign wealth funds or, foreign investment conduits. Hodler, 2006; Kronenberg, 2004; James and Aadland, 2011 and Ploeg (2011), among others, have drawn interest in the natural resource curse puzzle following the Sachs and Warner (1999, 2001) seminal work on the natural-resource curse hypothesis, which is centred on the evidence that, contrary to expectations, economies with abundant natural resources tend to grow at a slower rate. Research interest on the interplay between resource abundance and other development indicators has increased. One such study is by Beck (2011), who examines the interplay between natural resource abundance and financial inclusion (outreach and usage) from several countries across the world. The study found that, although banking systems from economies which are rich in resources have, on average, higher liquidity, profitability, and capitalisation levels, this does not translate into improved financial inclusion levels, as they simultaneously show limited bank outreach and low access to loans. Such evidence indicates that the natural resource curse may also hold when it comes to financial inclusion.

5.2.3.3 Market Size

Financial institutions are normally motivated to expand their service provision if there is a significant market for their product.

Table 5.1 summarises prior studies on the role national governance structure, economic freedom and corruption play in encouraging financial inclusion.

Table 5. 1: Prior studies on economic freedom, governance and financial inclusion

Economic Freedom, Governance and Financial Inclusion		
Sources	**Key Findings on Variables**	**Direction of Association**
Carbo *et al.* (2007)	The existing financial eco-system, institutional structure and political styles promote financial inclusion.	Positive
Beck and Levine (2008)	Private contractual arrangements, enforcement of legal and property rights and protection especially among investors, act as catalysts to incentivise economic agents (intermediaries and individual savers) to finance firms; thus positively influence inclusion.	Positive
Jensen and Meckling (1976)	The extent to which courts can enforce laws and statutory laws play a significant role in resolving agency problems that arise out of contracts.	Positive
Corruption and Financial Inclusion		
Detragiache, Gupta, and Tressel, (2005	Corruption is negatively associated with private credit.	Negative
Weill (2011)	Banks' lending reduces with corruption.	Negative

		(*)
Altunbas and Thornton (2012)	Bank credit to the private sector reduces corruption	Negative(*)
Governance and Financial Inclusion		
Ali, Yusop and Chin (2016)	Institutional quality promotes financial inclusion in developing countries.	Positive
Zulkhibri and Ghazal (2017)	Governance positively influences financial inclusion by increasing the number of savings and bank accounts in formal financial institutions but impacts negatively on borrowing behaviour.	Positive or Negative
Knack and Keefer (1995)	The positive relationship between institutional quality indicators and financial inclusion outcomes.	Positive

Source: Author's review of literature

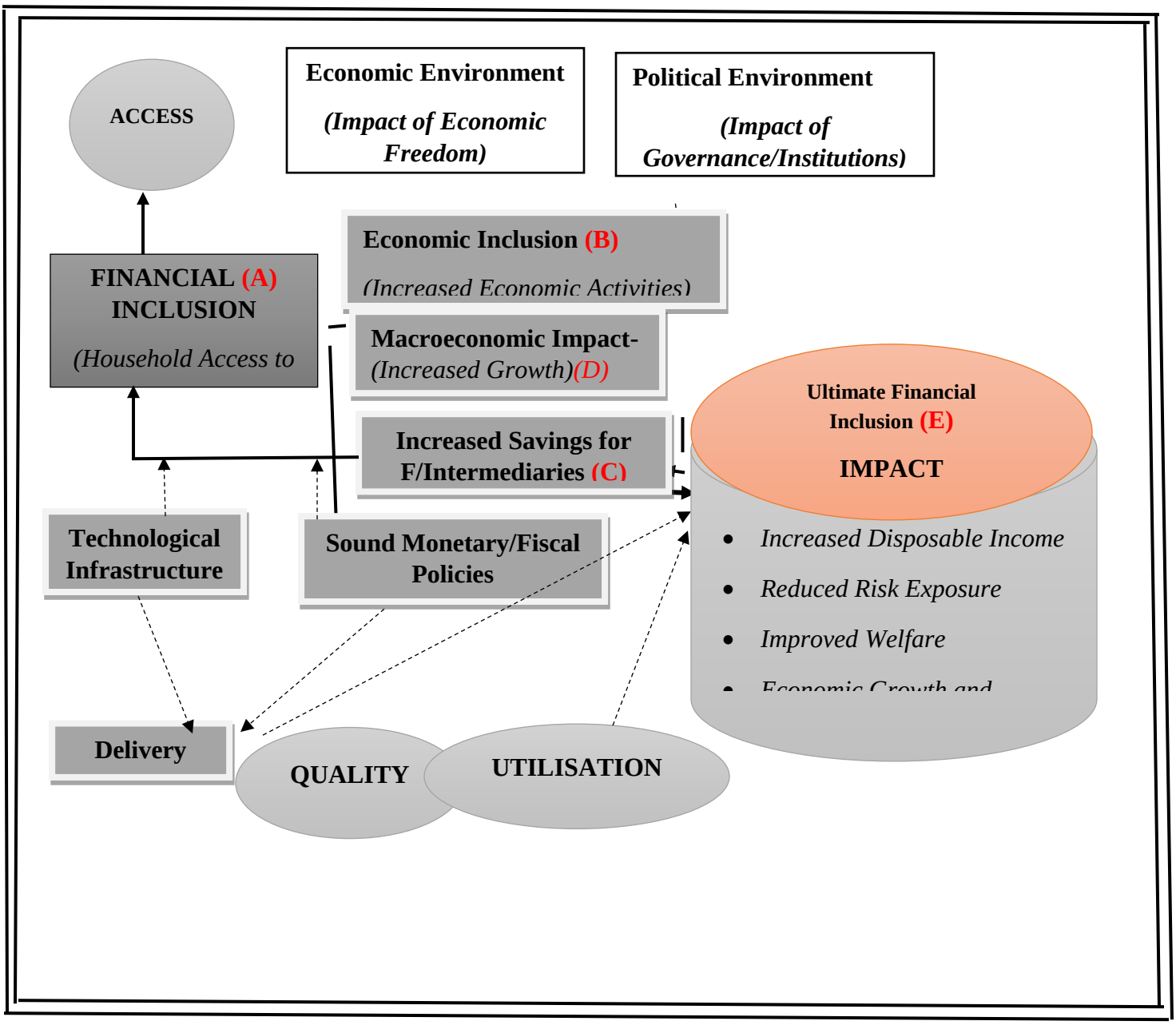
Note: (*) = reverse causality

5.2.4 Conceptual Framework

The conceptual framework below entails the trajectory and dimensions of financial and economic inclusions. It also shows theoretical links on how economic freedom and governance affect financial inclusion. The framework shows that economic freedom and governance contribute to financial inclusion through economic inclusion which leads to increased availability, accessibility and usage of formal financial services. It also shows other avenues of enhancing financial inclusion which were discussed in the preceding chapters. Starting from (A) financial inclusion starts when previously excluded households take part in the financial system. Access to affordable financial services increases a household economic engagement which is

called economic engagement (B). The transformation from A to B suggest that the impact of inclusion occurs only when financial inclusion transforms into economic inclusion. An increase in economic participation after financial inclusion will lead to an increase in national output (D), Active participation of households increases disposable households income which further fuels more inclusion when agents saves to increase their chances of accessing more credit from financial intermediaries. The interaction between D and C is essential to determine the sustainability of an inclusion policy.

The model emphasise the pivotal role institutional and economic environments play towards both economic and financial inclusion. This shows that inclusion does not occur in isolation. The role played by sound monetary or financial policies and governance quality cannot be downplayed. Technology enhances quality of service provision. These enables inclusion. Technology also reduces transaction costs (Kpodar and Andrianaivo, 2011; Donovan, 2012b), thereby assuring quality delivery, Financial inclusion is actively facilitated by such platforms.



Source: Author's construction (2018)

Figure 5. 1: Model showing trajectory and dimensions of financial and economic inclusion

5.3 Methodology and Model Specification

Various methods have been employed in literature to investigate the interplay between financial inclusion, institutional governance and economic freedom in Africa. Notable among these methods are Probit regression (Zulkhibri and Ghazal, 2017), Autoregressive Distribution Lag (ARDL) (Oleka and Onyia, 2017), OLS and Quantile Regression (Aghyekim, Wellalage and Locke, 2016), correlation analysis (Ndlovu, 2017). Each of these methods has its own demerits and merits. The above methods are inconsistent in the presence of endogenous regressors. However, this study employed the robust system GMM because of its capability to deal with issues of endogeneity that is inherent in the regression of financial inclusion and the independent variables (institutional governance and economic freedom) and other control variables. This makes the study different from Zulkhibri and Ghazal (2017) who studied the implication of economic freedom and institutional governance on financial inclusion in Africa with Probit regression that does not account for endogeneity.

5.3.1 A Probit regression model

It is a way to perform regression for binary outcome variables. Binary outcome variables are dependent variableswith two possibilities, like yes/no, positive test result/negative test result or single/not single. The word “probit” is a combination of the words probability and unit; the probit model estimates the probability a value will fall into one of the two possible binary (i.e. unit) outcome.

5.3.2 Quantile Regression

Traditional modelling, such as OLS and GLM, is to model the conditional mean of the target variable against the covariates, while Quantile Regression is to model conditional percentiles of the target variable against the covariates.The technique has been used in other industries and researches, such as ecology, healthcare, and financial economics, where data is volatile and

extremes are important. The quantile regression has the following advantages. There is no distribution assumptions. The model is also robust in handling extreme value points and outliers for the target unlike OLS. It is also comprehensive as a more “complete” picture of the relationship between the target and the covariates.

5.3.3 Autoregressive Distribution Lag

The adoption of the autoregressive distribution lag (ARDL)cointegration technique does not require pretests for unit roots unlike other techniques. The technique is preferable when dealing with variables that are integrated of different order, I(0), I(1) or combination of the both and, robust when there is a single long run relationship between the underlying variables in a small sample size. The long run relationship of the underlying variables is detected through the F-statistic (Wald test). In this approach, long run relationship of the series is said to be established when the F-statistic exceeds the critical value band. The major advantage of this approach lies in its identification of the cointegrating vectors where there are multiple cointegrating vectors. However, this technique will crash in the presence of integrated stochastic trend of I(2). To forestall effort in futility, it may be advisable to test for unit roots, though not as a necessary condition. Based on forecast and policy stance, there is need to explore the necessary conditions that give rise to ARDL cointegration technique in order to avoid its wrongful application, estimation, and interpretation. If the conditions are not followed, it may lead to model misspecification and inconsistent and unrealistic estimates with its implication on forecast and policy.

5.3.4. Generalised Method of Moments

This study used the Arellano and Bond (1991) and Arellano and Bover (1995) GMM modelled in Law and Saini (2012) to regress the relationship between institutional governance, economic freedom and financial inclusion in Africa. The adoption of the GMM approach was motivated by many factors, such as the need to deal with the occurrence of cross-sectional dependence and to

account for possible endogeneity as the method is presumed to be identically and independently distributed (ibid). Furthermore, the application of dynamic panel data (DPD) analysis has been motivated by the increased usage of the panel data technique, which allows individual cross-section dynamics in economics and finance studies. Moreover, it is capable of dealing with the incorporation of lagged endogenous variables in a model with individual effects that the conventional DPD estimators such as pooled OLS, first difference, and GLS, among others, are inefficient at handling. Also, GMM is a regression technique that is normality-free, with great data generating process and adaptability assumptions with dependent variables being instrumented by their lagged variables. The choice of panel analysis helps to study financial inclusion of countries in the African region that would otherwise be deprived in terms of studies because of inadequate information[7]. Baltagi (2008), argued that panel analysis is efficient as it provides an additional degree of freedom compared to cross-sectional data and time series.

Moreover, the technique accommodates the analysis and creation of more difficult behavioural models and also offers more explanatory analysis. For example, it can explore the behaviour of monetary policy without a complete arrangement of the macroeconomy. Panel analysis generally means controlled heterogeneity, fewer collinearity problems and more variability within individual datasets (Baltagi, 2008). This study follows Roodman (2006), who recommended the use of Arellano and Bover (1995) orthogonal deviation option for unbalanced panel analysis. Roodman (2006), states that the GMM-difference estimator proposed by Arellano and Bond (1991) works well when the data feature a large number of countries (N) relative to the time period (T) which is the case in this study where T =13 (2004-2016) and N=36.

Based on the literature reviewed in the study area, this study surrogates financial inclusion index, economic freedom index and governance index for financial inclusion, economic freedom and institutional governance respectively. The financial inclusion index is best at measuring financial inclusion as it covers all the dimensions of financial inclusion making it a better choice for the study as it also has a strong theoretical basis. Economic freedom and institutional governance

[7] Countries with inadequate data could be studied in a panel data analysis and still have good inferences made for them.

indexes have been widely applied in literature, and it measures the overall economic freedom and institutional governance in Africa. Modelling the relationship between the financial inclusion and institutional governance and economic freedom in the African region with the linear dynamic panel model as follows;

$$\Gamma_{i,t} = \Theta_i \Gamma_{i,t-1} + \varphi_{i,t}\Theta + E_{i,t} \qquad (5.1)$$

Where i= 1, 2, 3 ….N, t =1, 2, 3 …T, φ is a $(1\times k)$ vector of explanatory variables, Θ is a $(k \times 1)$ vector of coefficients to be estimated and $E_{i,t} = \aleph_{i,t} + \Psi_{i,t}$; where $\aleph_{i,t}$ denotes the individual fixed effects capturing individual differences of the cross–sections, and $\Psi_{i,t}$ is the idiosyncratic term such that $\aleph \backsim iidN\ (0, \sigma^2_{\aleph})$, $\Psi \sim iidN(0, \sigma^2_{\Psi})$ assuming that;

$$E\ (\aleph_{i,t}) = (\aleph_{i,t}\Psi_{i,t}) = 0 \qquad (5.2)$$

Since $\Gamma_{i,t}$ brings out DPB given that $\aleph_{i,t}$is correlated with $\Gamma_{i,t}$, it hence follows that, if $\Gamma_{i,t}$ is a function of $\aleph_{i,t}$, then $\Gamma_{i,t-1}$will also be a function of $\aleph_{i,t}$making one of the explanatory variables to correlate with one of the error terms thus giving rise to endogeneity problem.

Ordinary Least Squares could not be applied to estimate Equation 5.2 since the correlation between $\Gamma_{i,t-1}$ and $E_{i,t}$ is greater than 0, leading to overestimation of Θ_i making the result biased upward and inconsistent. To fix this endogeneity bias data was transformed by removing the individual fixed effects. Another option is to look for a valid lagged endogenous variable instrument. For simplicity, assuming a model of financial inclusion, economic freedom and institutional governance relationship with just one regressor;

$$\Gamma_{i,t} = \Theta_i \Gamma_{i,t-1} + E_{i,t} \ldots\ldots (5.3)$$

Taking one more lag from Equation 5.3will remove individual fixed effects;

$$\Gamma_{i,t-1} = \Theta_i \Gamma_{i,t-2} + E_{i,t-1} \ldots\ldots (5.4)$$

This gives;

$$\Gamma_{i,t} - \Gamma_{i,t-1} = \Theta_i(\Gamma_{i,t-1} - \Gamma_{i,t-2}) + (\aleph_{i,t_i} - \aleph_{i,t}) + (\Psi_{i,t} - \Psi_{i,t-1}) \ldots\ldots (5.5)$$

Therefore;

$$\Delta \Gamma_{i,t} = \Theta_i \Delta \Gamma_{i,t-1} + \Delta\Psi_{i,t} \ldots\ldots (5.6)$$

Where $\Delta = (1-L)$ represents the first difference operator. The transformation has a problem of dropping first T –period observation (loss of degree of freedom) which could cause a serious challenge for unbalanced panel data. Notwithstanding, Griliches (1998) suggests the first differencing transformation can get rid of the individual effects. Assuming that $\psi \sim$ iidN (0, σ^2), the transformation also has MA (1) for $\Delta\Psi_{i,t}$. This therefore requires the application of GLS that is able to transform data through subtracting the time averaged model from Equation 5.1.

$$\bar{\Gamma}_i = \Theta_i \bar{\Gamma}_{i,t-1} + \bar{\aleph}_i + \bar{\Psi}_i \ldots\ldots (5.7)$$

The transformed model thus becomes;

$$(\Gamma_{i,t} - \bar{\Gamma}_i) = \Theta_i\,(\bar{\Gamma}_{i,t-1} - \bar{\Gamma}_{i,-1}) + (\aleph_{i,t_i} - \aleph_{i,t_i}) + (\Psi_{i,t} - \bar{\Psi}_i) \ldots\ldots\ldots\ldots\ldots\ldots \quad (5.8)$$

In Equation 5.8, OLS within group estimator is used to regress $(\Gamma_{i,t} - \bar{\Gamma}_i)$ on $\bar{\Gamma}_{i,t-1} - \bar{\Gamma}_{i,-1}$. Although within group estimator eliminate individual effects (Nickell, 1981), it varies because of its inability to handle dynamic panel bias. Thus, the first difference conversion is a better approach in resolving endogeneity issues than the within group conversion. For example, previous error term realised in the model is included in the first difference transformation, whilst, the within group conversion incorporates all preceding realisations into the model. Hence, all OLS estimators are incapable of resolving dynamic panel bias and thus require an alternative approach.

Equation 5.8 requires the implementation of the instrumental variable estimator as the first difference conversion is incapable of recovering consistency when the OLS estimator is applied. Anderson and Cheng (1982), proposed a two-stage least square (2SLS) approach to deal with this, since it can eliminate the fixed effects using the first difference transformation, in addition to employing the explained variable lags to instrument the transformed lag endogenous variable. The logic is that since $\Gamma_{i,t}$ is a component of $\Delta\,\Gamma_{i,t-1}$, it is correlated with $E_{i,t-1}$which is also contained in $\Delta E_{i,t}$, then the error term is not correlated with deeper explanatory variables lags, and might be used as an instrument . $\Gamma_{i,t-2}$ was proposed by Anderson and Hsiao (1981) to be used as an instrument for $\Delta\,\Gamma_{i,t-1}$ since it is correlated with $\Gamma_{i,t-1}-\ \Gamma_{i,t-2}$ but orthogonal to $\Delta E_{i,t}$, if error terms are assumed to be serially uncorrelated. All the same, 2SLS does not exploit all the available valid instruments, thus suffering a similar setback as the OLS of not being efficient. Therefore, the study applied the GMM proposed by Arellano and Bond (1991) to estimate the impact of governance and economic freedom on financial inclusion consistently and efficiently for the African region in Equation 5.1.

GMM considers equations both in levels and in first difference with its specific sets of instrumental variables. First, difference is taken as in Equation 5.1 to deal with banks' specific

effects, and the use of the appropriate lag instruments needed solves the correlation issues between $\Gamma_{i,t} - \Gamma_{i,t-1}$ and $\Psi_{i,t} - \Psi_{i,t-1}$. The same approach is set up to generate instruments for other regressors that are allowed to be dependent on the current and past realisation of the explained variable. Given the assumptions that the error term is devoid of serial correlation and that regressors are weakly exogenous, the dynamic GMM used the following moments conditions;

$$E[\Gamma_{i\,j\,t-\phi}\,(E_{i,j\,t} - E_{i,j\,t-1})] = 0 \text{ for } \phi \geq 2, t = 2, \ldots \ldots T \quad (5.9)$$

$$E[\chi_{i\,j\,t-\phi}\,(E_{i,j\,t} - E_{i,j\,t-1})] = 0 \text{ for } \phi \geq 2, t = 2, \ldots \ldots T \quad (5.10)$$

The first difference GMM is produced by the above outcomes of the moments of the condition. One major drawback of the first difference GMM is that there are higher chances that the lagged levels may be a weak instrument for the first-differenced variables where the lagged endogenous variables and the regressors are persistent overtime. Hence, amount to finite bias will reduce the accuracy concluding to the need to regress at levels as well to complement the regression at the first differences. The lagged first differences apply the same regression variables so that supplementary moments of condition for the regression in levels are as stated below.

$$E[(\Gamma_{i\,j\,t-\phi} - \Gamma_{i,j\,t-\phi-1}) \,.\, (\aleph_i + E_{i,j\,t-1})] = 0 \text{ for } \phi = 1 \quad (5.11)$$

$$E[(\chi_{i\,j\,t-\phi} - \chi_{i,j\,t-\phi-1}) \,.\, (\aleph_i + E_{i,j\,t-1})] = 0 \text{ for } \phi = 1 \quad (5.12)$$

This study, however, applied the Arellano and Bover (1995), orthogonal deviation which Roodman (2006) contends to be more applicable for unbalanced panels. GMM is a dynamic instrumental variable modelling approach whereby the lags of the dependent variable (financial inclusion) and the differences of explanatory variables (governance, economic freedom, rural to total population and bank size) are used together as instruments to control for any bias (simultaneity bias, endogeneity bias, and missing variable bias) introduced, hence avoiding

inconsistency of the standard estimator's results. The GMM approach by Arellano and Bover (1995) and Blundell and Bond (1998) is computed from two equations, the original equation and the "System Generalised Method of Moments" which is transformed equation. Arellano and Bond (1991) derived both the one-and two-step GMM estimators using moment conditions where the instruments for the differenced equation are lagged levels of both predetermined and dependent variables. To be consistent, the Hansen J statistics was used to validate the instrument of the GMM regressors. Also, the Arellano-Bond test for serial correlation test was used to validate the GMM results.

To estimate the relationship between financial inclusion, economic freedom and governance of the African region, therefore, the study employed the following estimation equation;

$$FII_t = \sum_{j=1}^{p} \gamma_i \, FII_{t-j} + \beta_1 GOVERN_{i,t} + \beta_2 FREEDOM_{i,t} + \beta_3 BANKSIZE_{i,t} + \beta_4 NATURAL + \beta_5 LOGPOP + \psi_i + \upsilon_{i,t}$$

…… (5.13)

Where i = 1… N and t=1 …T_i

-*FII* : represents financial inclusion index

- *GOVERN* : represents the institutional governance index

-*FREEDOM* : represents economic freedom index

-*BANKSIZE* : represents bank size proxied by broad money as a percentage of GDP

-*LOGPOP* : represents market size

-*NATURAL* : represents natural resources

-ψ_i : represents the panel-level effects (fixed effect which may be correlated with covariates GOVERN, FREEDOM, SIZE, and NATURAL).

- $\upsilon_{i,t}$: is the idiosyncratic error term

5.3.5 Data and Variable Description

Besides the institutional governance index (GOVN) and economic freedom index (FREE) that were compiled from world governance indicators (WGI) and world economic freedom index (WEFI), this study sourced data from world development indicators (WDI). An unbalanced panel of 49 African countries for years 2004–2016 was considered because of data availability. The table in Appendix A shows the list of countries that are contained in the sample.

5.3.5.1 Measurement of Economic Freedom

The economic freedom index measures the level of economic freedom, utilising ten broad categories namely freedom on business, corruption, fiscal, trade, government spending, financial, monetary, investment, property rights, and labour, on a scale from zero to one hundred, with one hundred representing higher degrees of freedom. Economic freedom empowers people with opportunities to decide for themselves how to trail and realise their dreams, subject to honest competition and the basic rule of law. Governments that promote and respect economic freedom offer the best atmosphere for innovation, experimentation, and progress, which enables humankind to grow in prosperity and well-being. The study used annual index of economic freedom sourced from the database of The Heritage Foundation. Demirgüç-Kunt *et al*. (2003), find a significant negative relationship between a banks' interest rate margins and an index of economic freedom, suggesting that economic freedom foster financial inclusion through a reduced cost of credit.

5.3.5.2 Measurement of Institutional Governance

The study also focused on the role of institutional governance on financial inclusion. It may appear incomplete to discuss institutional factors that affect financial inclusion in Africa without

national governance matters. Because the reason is that the continent is confronted with a myriad of governance issues (Kaufmann, Kraay, and Mastruzzi, 2009; Beck *et al*., 2011), which inadvertently shape the delivery of financial services in those countries. Relating financial inclusion and good governance is plausible. For instance, established contract enforcement mechanisms and governance determine the wider participation and legal rights of borrowers and creditors in the financial market (Beck *et al*., 2011). Koeda and Dabla-Norris (2008), used a Probit model and found a significant positive relationship between the rule of law and firms access to credit. This study followed the footsteps of Kaufmann, Kraay, and Mastruzzi (2009; 2011), who obtained institutional governance data from the Worldwide Governance Indicators (WGI) collected by the World Bank. Six dimensions, namely, Regulatory quality, Political Stability and Absence of Terrorism/Violence, Rule of Law, Voice and Accountability, Government Effectiveness and Control of Corruption for more than two hundred territories and countries are used to measure the WGI. A normalised composite index is estimated as the first principal component of the six indicators.

i. Construction of Institutional Governance Index

The study used the Principal Component Analysis (PCA) which plays a pivotal role in transforming a large number of variables into a more coherent and smaller set of orthogonal principal components. This study used the PCA to combine institutional governance indicators into a comprehensive index (Boelhouwer and Stoop, 1999). Several researchers have used PCA, to compute institutional governance indices (Antony and Rao, 2007; Fukuda, Nakamura, and Takano, 2007; Vyas and Kumaranayake, 2006). Computationally, the PCA is easy, and also it avoids many of the problems related to the traditional methods, such as aggregation, standardisation, and nonlinear relationships of variables affecting institutional governance (Vyas and Kumaranayake, 2006).

ii. Assessing Outliers, Normality, and Linearity

Several issues need to be taken into account when trying a factor analysis (Nardo, Saisana, Saltelli, and Tarantola, 2005). The presence of outliers can affect the results and interpretations of factor analysis; outliers affect correlations and hence distort factor analysis. STATA

procedures were used to check the presence of outliers, such as the histogram where each observed score value is plotted against the descriptive statistics, such as mean. Outliers in all values were detected and removed prior to the performing factor analysis. In addition, descriptive statistics, such as skewness and kurtosis were used to detect the type of distribution. Small negative and positive values further validate the asymmetry. Finally, the study conducted another normality test using the Kolmogorow-Smirnov statistic.

iii. Testing the Appropriateness of a Factor Analysis

This study checked for the multicollinearity problems using correlation tests. As highlighted in Table 5.2 correlation between all variables is very high thereby leaving chances of multicollinearity. Multicollinearity could increase the factor loadings standard error, making them difficult to label and less reliable. Some researchers, either eliminate or combine collinear variables prior to factor analysis while others forgo factor analysis altogether.

Table 5. 2: Correlation Matrices for Institutional Governance

Variables	**1**	**2**	**3**	**4**	**5**	**6**
Corruption	1.000					
Govt. Effectiveness	0.8509*	1.000				
p-Value	0.0000					
Political Stability	0.6544*	0.5885*	1.000			
p-Value	0.0000	0.0000				
Regulatory Quality	0.7784*	0.8692*	0.5779*	1.000		
p-Value	0.0000	0.0000	0.0000			
Rule of Law	0.8903*	0.9073*	0.6975*	0.8765*	1.000	
p-Value	0.0000	0.0000	0.0000	0.0000		
VOA	0.7144*	0.6492*	0.5647*	0.6762*	0.7395*	1.000

p-Value	0.0000	0.0000	0.0000	0.0000	0.0000

Standard error in parentheses; * $p < 0.05$

Source: Own calculation using data obtained from the World Governance Indicators (2017)

Table 5.2 presents the empirical correlations matrix between the indicators of institutional governance. As shown in Table 5.2 a strong and significant correlation exists between the indicators of institutional governance. The 0.8903 significant correlation coefficient between the rule of law and corruption; 0.8765 significant correlation between the rule of law and regulation and the 0.9073 significant correlation between the rule of law and government effectiveness indicates a near perfect multi-collinearity scenario. While the indicators are significant and strongly correlated with each other, there is a risk of a multicollinearity problem, which can cause certain misleading inferences. However, this issue is overcome by using a PCA and measuring a comprehensive index. To measure the sample size adequacy, the study also performed the Bartlett test of sphericity and the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA) as the next requirements. A 0.9 and above MSA value is considered sufficient, meritorious if it 0.8 and above, middling if it is 0.70 and above, mediocre if it is 0.60 and above, miserable if it is 0.50 and above, and unacceptable if the value is below 0.50 (Hair *et al*., 2009). As shown in Table 5.3 and Table 5.4, the overall MSA for financial inclusion and institutional governance variables included is meritorious, that is 0.8551 and 0.8992, respectively. The probability of Bartlett's Test of Sphericity must be less than the level of significance ($p<0.001$), which meets the requirement for both indices.

Table 5. 3: Testing for Sampling Adequacy (Financial Inclusion)

Kaiser-Meyer-Olkin	**Bartlett's Test of Sphericity**		
	Chi-square	**Degrees of freedom**	**Significance**
0.8551	14001.6	235	0.00

Source: Own calculation from the Stata

Table 5. 4: Testing for Sampling Adequacy (Institutional Governance)

Kaiser-Meyer-Olkin	**Bartlett's Test of Sphericity**		
	Chi-square	**Degrees of freedom**	**Significance**
0.8992	13566.6	235	0.00

Source: *Own calculation from the Stata*

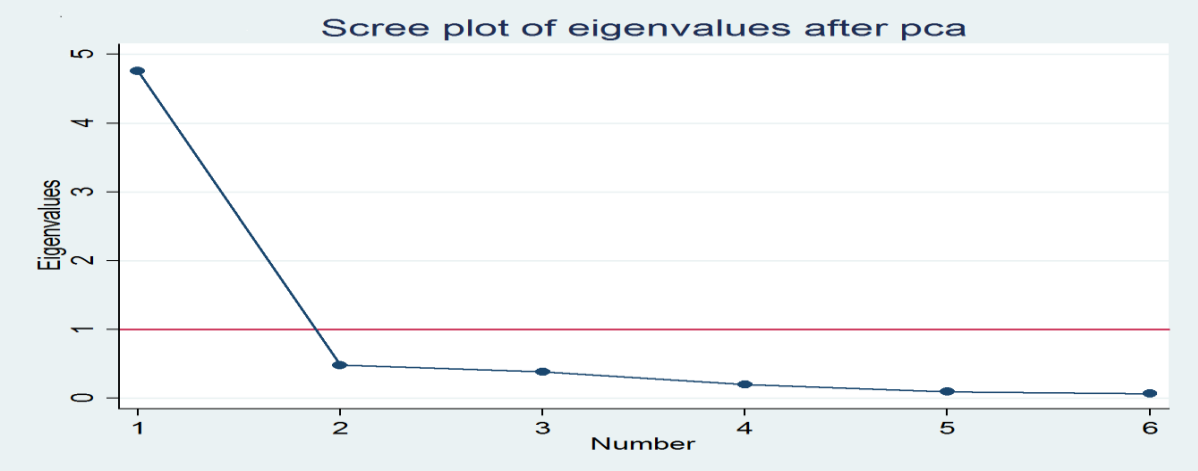
This study then used the PCA method to determine the index of institutional governance. As shown in Table 5.5, data for the institutional governance index suggest that the first component explains about 79.32 percent of the variation across the indicators with an eigenvalue of 4.75945 (the only one above 1). Therefore, the first principal component is a more appropriate measure of institutional governance, as it better explains the variations of the dependent variable than any other linear combination of explanatory variables. Hence, the first principal component information is considered to form a composite indicator as justified by the scree plot diagram in Figure 5.2. The squared factor loadings from the PCA are used to ensure that the weights add-up to 1. The squared factor loadings show the degree of variation explained by each factor, such that

more weight is assigned to an indicator with a higher contribution on the common variation. Thus, a composite institutional governance indicator (IG index) is obtained.

Table 5. 5: Extraction method: principal component analysis

Principal Component	Eigenvalues	Variance (%)	Cumulative (%)
1	4.75945	0.7932	0.7932
2	0.485314	0.0809	0.8741
3	0.387239	0.0645	0.9387
4	0.203389	0.0339	0.9726
5	0.0984133	0.0164	0.9890
6	0.0661912	0.0110	1.0000

Source: Own computation from the Stata



Source: Own computation from the Stata

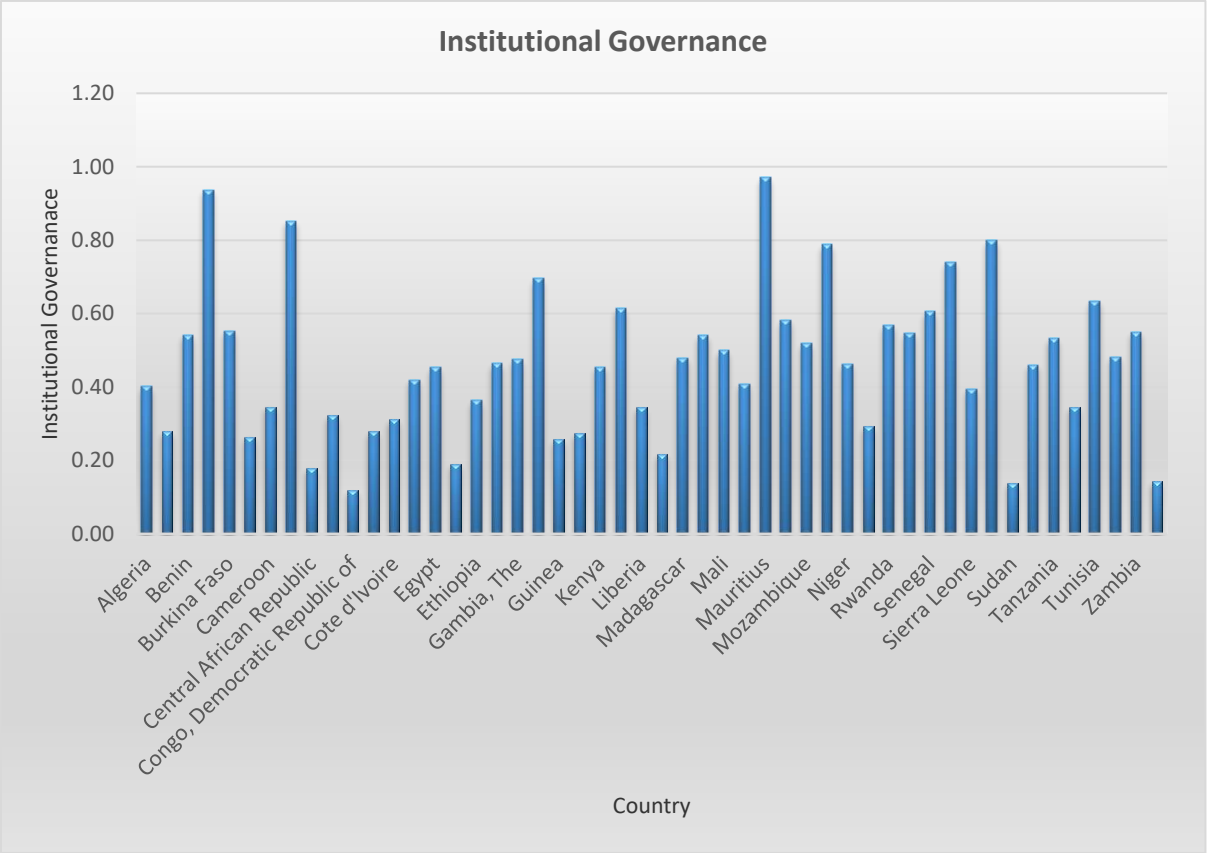
Figure 5. 2: Screen plot of components

Table 5. 6: Components score coefficient matrix (1980-2011)

Variables	**Component 1**
Corruption	0.4258
Government Effectiveness	0.4257
Political Stability	0.3531
Regulation Quality	0.4165
Rule of Law	0.4442
Voice and Accountability	0.3769

Extraction method: principal component analysis

Source: Own computation from the Stata



Source: Own calculations from the World Bank- Global Governance Indicators (WGI) *Database (2018)*

Figure 5. 3: Institutional Governance Index –African Countries

5.3.5.3 Measurement of the banking sector size

To control for financial sector size, this study followed the footsteps of Law and Singh, 2014, Rousseau and Wachtel, 2011, Asli Demirgüç-Kunt and Levine, 1996, who used broad money (M3) to GDP to measure the overall size of financial activity. Banking sector size is expected to positively influence financial inclusion as institutions benefit from economies of scale and increased profits for large banking sectors.

5.3.5.4 Measurement of Natural Resources

To control for the natural-resource curse, this study used Natural Resources Rents as a percentage of GDP[8]. The study hypothesised a positive influence of natural resource abundance on financial inclusion as higher natural resource rents could give rise to higher deposit funding for a country's banking system if they are domestically saved. They might also bring about higher loan demand, particularly consumer credit.

5.3.5.5 Market Size

In line with Barajas *et al*., 2013 and Beck and Feyen, 2013, this study used population size as a proxy for market size. Larger population size is expected to promote financial inclusion due to scale effects, which hypothetically result in efficient service provision in bigger economies compared to smaller ones, whose population may be less urbanised and more highly dispersed. A higher coefficient would hence suggest higher 'returns to scale' (Beck and Feyen, 2013). The variables are expressed in logarithms in the model estimation. This study hypothesised a positive relationship between market size and financial inclusion due to scale effects.

[8] Often, the value of natural resources is estimated through their economic rents- *i.e.* resource rents. It is calculated by deducting the production/extraction costs from gross extraction revenue. Total natural resources rents include, soft and hard coal rents, mineral rents, natural gas rents, forest rent and oil rents. Data are extracted from World Bank development indicators.

5.3.5.6 Rural concentration

Generally, urban people are financially included to a greater degree than those residing in rural areas. In rural areas, financial illiteracy, fewer opportunities for employment, low income, and bank isolation hinder residence from full participation in the formal banking system. This study expects a negative relationship between rural concentration and financial inclusion. The financial inclusion variable was measured in the previous chapters.

5.4 Empirical Results

The summary statistics provide an insight into the data used in this study.

Table 5. 7: Summary Statistics

Year	FREE	GOVN	NATURAL	MKTSIZE	BANKSIZE	RURAL
2004	0.43	0.46	12.04	7.25	37.50	60
2005	0.21	0.46	13.45	7.26	38.20	60
2006	0.19	0.47	13.84	7.28	38.28	59
2007	0.33	0.47	15.11	7.28	38.30	59
2008	0.31	0.48	16.47	7.29	38.45	58
2009	0.06	0.47	12.50	7.30	38.50	58
2010	0	0.47	13.23	7.31	38.70	57
2011	0.25	0.47	15.17	7.32	38.72	57
2012	0.26	0.47	14.53	7.34	38.75	57
2013	0.38	0.47	13.67	7.35	38.91	56
2014	0.73	0.47	12.04	7.36	39.00	56

2015	0.82	0.47	10.41	7.37	39.28	55
2016	1	0.47	11.51	7.38	39.50	55
Overall	0.38	0.47	13.38	7.31	38.70	57

Source: Author's computation (2018)

Table 5.7 presents the summary statistics which deliver an understanding into the data used in the study. The mean values of the listed variables indicate that Africa is a less resilient continent. The economic freedom (FREE) and institutional governance (GOVN) supports this assertion as their mean over the period are weak and falls below the global benchmark of 0.5. The data suggest the presence of poor governance structures in Africa, based on the aggregate normalised institutional governance index. The average index for the sampled countries in Africa is 0.47, which corroborates a long-standing finding by the World Bank (1989), that governance crisis is the main factor underlying the petitions of Africa's development problems. Bräutigam and Knack (2004), suggest a multiplicity of reasons for poor governance in Africa including corruption, underdeveloped legal systems and poor institutional framework, amongst others. The mean economic freedom index in Africa is 0.38 which also falls below the benchmark of 0.5. Recalling the Fraser Institute methodology, lower ratings of the indices correspond to heavy-handed government interventions in markets whilst higher ratings correspond to more economic freedom. The governance indicators database also shows that higher ratings of governance correspond to good governance and vice versa. Since the overall mean index of economic freedom and governance falls below the benchmark of 0.5, it shows that African economies are characterised by poor governance and heavy-handed government interventions which are likely to affect access to finance. This could be due to over-reliance on government budgets and political decision makings. Gwartney, Lawson and Hall (2016), opines that the GOVN index tends to be high in countries where rent-seeking is not an issue, that is when countries depend more on government budgets and political decision-making than personal choice. The 2016 edition of the global Economic Freedom report, co-published by the Fraser Institute and the Cato Institute, found that globally Africa ranked at the bottom with regard to economic freedom (Gwartney, Lawson and Hall, 2016). Also, the 2016 report by the World Bank on Ease of Doing

Business reckoned Africa as the most difficult region for starting a business in the world due to poor governance and violated economic freedom (Gwartney, Lawson and Hall, 2016). Policymakers should therefore craft policies that promote sound institutional governance and strong institutional and legal frameworks

Based on Table 5.7, 10.41 to 16.47 per cent for the sampled countries in the region are dependent on natural resources rents share of GDP. The mean market size (log POP) and banking sector size in Africa are 7.31 and 38.7 per cent respectively. Rural concentration, which is the ratio of the rural population to total population indicates that the African region has the highest percentage of its population residing in rural areas at 57 percent, further complicating the poverty structure. This factor potentially has a significant negative impact on household income and the call for financial services[9]. Such unique features within Africa make the region ideal for examining the dynamic interplay between the dual effect of economic and financial under performance on financial inclusion. This study regressed financial inclusion on institutional governance and economic freedom and provided other variables that determine financial inclusion in the African region. The study proceeded to analyse the correlation between the exogenous and endogenous variables of interest in Table 5.8.

Correlation analysis indicates the likelihood of multicollinearity and endogeneity problems associated with a number of econometric models. A positive coefficient infers that the variables move in the same direction while a negative coefficient indicates movement of variables in opposite directions (Stead, 2007). Table 5.8 above shows that a significant positive correlation exists between financial inclusion and other variables such as institutional governance, banking sector size (broad money to GDP) and economic freedom. Interestingly, the results suggest a negative association between financial inclusion and other variables such as natural resources, population size (market size) and rural concentration. Population size reduces the level of financial inclusion in Africa which signals that rapid population growth put deep pressure on

[9] Rural concentration for South Asia and North America was 70.91% and 19.4% respectively, whilst that of East Asian Pacific, Middle East, Europe and Central Asia and Latin America and Caribbean was 50%, 20%, 34% and 39% respectively.

household income leaving them with little or no income to enable them to have account with formal financial institutions.

Table 5. 8: Correlation Results

Variable	1	2	3	4	5	6	7
FII	1.0000						
GOVN	0.5430*	1.0000					
p-Value	0.0000						
NATURAL	-0.3212*	-0.4512*	1.0000				
p-Value	0.0000	0.0015					
LGPOPSIZE	-0.3608*	-0.2347*	0.1804*	1.0000			
p-Value	0.0000	0.0000	0.0000				
BANKSIZE	0.6384*	0.4460*	-0.3148*	-0.1839*	1.0000		
p-Value	0.0000	0.0000	0.0000	0.0000			
FREEDOM	0.2844*	0.7048*	-0.4584*	-0.0050	0.3221*	1.0000	
p-Value	0.0000	0.0000	0.0000	0.9022	0.0000		
RURAL	-0.3538*	-0.1255*	-0.1769*	0.3050*	-0.4446*	0.0036	1.0000
p-Value	0.0000	0.0000	0.0000	0.0000	0.0000	0.9299	

Standard error in parentheses; * $p < 0.05$

Source: Author's Computation from Stata

The results imply that per capita income is a key factor for financial inclusion in Africa and that involuntary financial exclusion may be greatly determined by a high-risk profile and inadequate household income rather than by weak implementation of contract agreements and market failures in line with Honohan (2008). This is in line with Yorulmaz (2016), who finds a negative relationship between financial inclusion and rural population for European Union countries. The

negative effect of natural resources could suggest the presence of the natural resource curse (Sachs and Warner, 1999; 2001) in Africa where countries with the abundant natural resource are associated with reduced financial inclusion. Overall, the study found a strong association with mixed signs and more significances between the variables.

Figures 5.4 and 5.5 show the association between the financial inclusion index and economic freedom, and governance (measured by the index of governance) respectively. The data suggest the presence of a non-linear positive relationship between indicators of financial inclusion, economic freedom and governance index. These findings are in line with Rioja and Valev (2004), Rousseau and Wachtel (2011), Law and Singh (2014) and Arcand, *et al*. (2015) when examining the link between financial inclusion, economic freedom and governance. This would suggest that improved governance and economic freedom has a potential of expanding the financial inclusion for African countries.

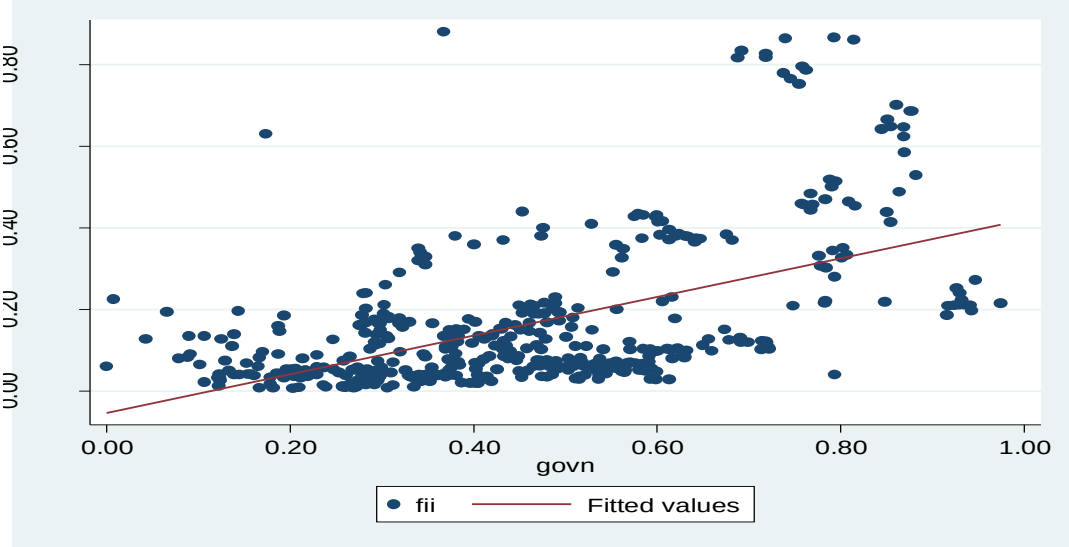


Figure 5. 4: Relationship between Financial Inclusion and Institutional Governance

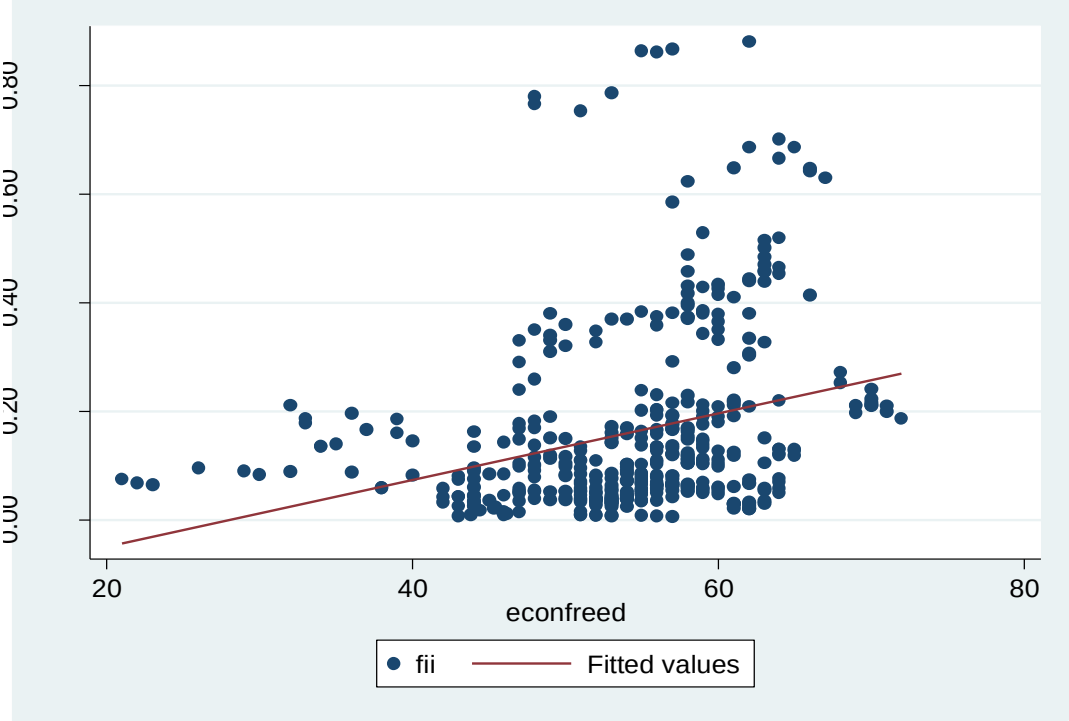


Figure 5. 5: Relationship between Financial Inclusion and Economic Freedom

5.4.1 Two-Step System GMM Analysis

The dynamic panel model used the robust two-step system GMM with orthogonal deviation, the results being displayed in Table 5.9. This can handle unbalanced panel data analysis and was proven in resolving panel data bias. Table 5.9 shows that the results meet the various requirements of the regression models, in particular, the Wald test probability for the GMM indicates the goodness of the overall fitness of the result. In addition, the result of the Hansen J statistics and AR2 confirms the absence of over-identification of the instruments and serial correlation. The study thus analysed and further discuss the results. A rather interesting result was obtained from the GMM regression.

Table 5. 9: The Results from Two Step-GMM Approach

Dependent Variable: FII	**GMM Model (FII)**	
Independent Variables	**Coefficient**	**Probability**
Lagged Financial Inclusion Index	0.4708***	(0.000)
Economic Freedom	0.0042***	(0.000)
Governance Index	0.297***	(0.000)
Bank Size	0.0024***	(0.000)
Natural Resources	-0.0024***	(0.000)
Log Population	-0.1475***	(0.000)
Rural Concentration	-0.0048***	(0.000)
Constant	1.028***	(0.000)
Observations		407
R-Squared		
Wald $Chi^2(6)$		761.73
Prob>$F/Chi^2 =$		0.000
AR (2) Probability		0.36
Hansen J-Statistic		0.516

Note: Standard errors in parentheses; *** $p < 0.05$, ** $p < 0.1$.

Source: Author's computation from Stata

Table 5.10 shows in percentage how one standard deviation increase in the dependent variable economically impacts on financial inclusion.

5.4.2 Economic Implications of Regression

An analysis of the results shows that the lagged values of financial inclusion exhibit positive and strong significance, signifying past financial inclusion levels impact positively on current levels of financial inclusion. The study found financial inclusion to be strongly significant and positively related to the governance (GOVN) and economic freedom (FREE), implying that improvement in governance and economic freedom increases financial inclusion. In terms of economic implication, a one standard deviation increase in governance and economic freedom increases financial inclusion by 34 per cent and 18 per cent respectively. This result is consistent with Zulkhibri and Ghazal (2016) who found financial inclusion to be positively related to institutional governance in Muslim and developing economies. The economic implication shows that one standard deviation increase in governance and economic freedom will significantly increase financial inclusion by 34 percent and 18 percent respectively. This confirms existing theories and empirical literature that posit a positive relationship between governance and financial inclusion and also between economic freedom and financial inclusion.

The study, however, found financial inclusion to be inversely related to rural concentration (RURALTTPOP), natural resources (NATURAL) and market size (LOGPOP). The implication is that natural resources, rural concentration and market size do not pose any complicity for financial inclusion in the region, as a one standard deviation increase in natural resources, rural concentration and market size lowers financial inclusion by 0.24 per cent, 0.48 per cent and

14.75 per cent, respectively. Also, the size of banking sector exhibits a positive and strong significance in relation to financial inclusion. Hence, as the banking sector size increases so does the financial inclusion. This is also in line with Uddin, Chowdhury and Islam (2017), who found size as a significant determinant of financial inclusion in Bangladesh. The sign is the same for the economic implications as a one standard deviation increase in rural concentration and natural resources rents reduces financial inclusion by 0.5 percent and 0.17 percent, respectively. This result on market size and rural population is better explained by an understanding of, the relationship between financial inclusion and the dependency ratio in line with Allen *et al.* (2014), although their coefficients are not significant.

Financial service provision in rural centres is not cost effective due to the dispersion of the population in many African countries. The inverse relationship could also be a result of infrastructure related barriers in rural areas like limited number of ATMs and branches against the population. To compound the situation, the literature has stressed that the absence of a convenient transport network to ATMs and bank branches as well as a reliable mobile telephone communication, and the absence of the infrastructure itself hinders financial inclusion. It is difficult to achieve financial inclusion if there is no access to reliable and secure payment and settlement systems (Miethe and Pothier, 2016). Policymakers should come up with policies that encourage the construction of road networks, infrastructure and improves on network availability. The availability of infrastructure makes it cheaper for financial institutions to provide their services (Zins and Weill, 2016). This may, in turn, have a positive impact on business activities since customers are more likely to face reduced transaction costs, thus increasing the overall demand for financial services.

Table 5. 10: Economic Impacts of Regression Results

Dependent Variable: FII	FII
Economic Freedom	0.1799
Governance	0.3428
Rural concentration	-0.4699
Natural Resources	-0.1768
bank size	0.3350

Source: Author's Estimation (2018), from Table 3.8 with Economic Impact=$\frac{SD\ of\ independent\ variable * R.C\ of\ independent\ variable}{SD\ of\ dependent\ variable}$

Where R.C is regression coefficient and S.D is the standard deviation

Overall, the result is in agreement with the requirements of the regression models as displayed in Table 5.9.

5.4.3 Discussion of Findings

This section presents a discussion of findings and suggests possible policy implications. The significant positive and tenacious relationship of financial inclusion in the immediate past period with the current, suggesting that a financially inclusive economy in the past period has a propensity to replicate the same pattern in the present and future and even to increase unless some policies are implemented to reverse the trend. This is a wakeup call for an unrelenting effort in ensuring inclusive financial inclusion at all time for enhanced economic growth in Africa as in the words of Dermiguc Kunt *et al*. (2015), financial inclusion is so pivotal to economic growth to the extent that the modern economic growth is crippled by financial exclusion. The results of the relationship between institutional governance, economic freedom and financial inclusion conform to the expectations of this study and provide evidence that is consistent with the Zulkhibri and Ghazal (2016) view. Political stability and the quality of regulation are good examples of how applicable the governance indicators are to financial inclusion. These two indicators determine the degree of the trustworthiness of a financial system. If the political situation of a country is bad, the people will not engage seriously in any financial activities due to lack of trust. This is evidence that an enhanced institutional quality and economic freedom contributes substantially to financial inclusion within economies especially for the poor segments of the society. The results also suggest that good governance is essential for raising and development of financial inclusiveness prospects. However, many developing countries incur challenges in this regard. A number of developing countries are ranked below global averages for measures of the rule of law, government effectiveness and political stability (Holmes *et al.*, 2014). Closer attention must be paid to institutional quality (governance) and economic freedom if financial inclusion is to produce benefits for the region. Macroprudential policies must be strengthened and the right form of government policies that do not exacerbate financial inclusion must be adopted by these African countries. Furthermore, improved level of governance reduces the informality in the financial markets thereby helps to reach out to individuals in the informal markets. However, the results are not consistent with Oleka and Onyia (2017), who investigated the impact of institutional quality on financial inclusion in Nigeria and concluded that institutional quality has no significant impact on financial inclusion for Nigeria over the period 1988 to 2015 in the short run though it is significant in the long run.

The study found evidence of a significant positive relationship between bank size and financial inclusion in line with Uddin, Chowdhury and Islam (2016), and Nawaz (2018). This could be as a result of efficiency and economies of scale enjoyed by large banks. Reasonable bank size is needed for the ongoing viability of the banking system. However, this must be managed to avoid the negative side of undertaking excessive credit supply that could threaten economic growth as a result of bad loans. However, this finding is not in line with Beck *et al.* (2013), who used data from The World Bank's Enterprise Surveys for 33 countries from emerging and developing and established that lower access results from the dominance of banks in a financial system.

Contrary to theoretical expectations, Beck, *et al*. (2013), find no evidence that the size of financial institutions affects access to finance. Additionally, using a panel of 138 countries, Gimet and Lagoarde-Segot, (2012), examined the relationship between financial structure and firms' access to financial services over the period 2002–2009. These researchers' findings suggest that there is a need to enhance competition, improve capital market development and institute effective regulatory and supervisory policies instead of focusing on banking sector size, to effectively promote access to finance. The policy implication is that access to credit and savings from big banks could lead to monopolies which in future could lead to instabilities thus affecting growth. Furthermore, policymakers should make policies that strike a balance between small and big banks. The inverse relationship between financial inclusion and rural concentration found in this study is in line with Ndlovu (2017). Therefore, it is essential to improve 'state variables' in rural areas to reduce institutions' operation costs. Also, in rural areas, fewer employment opportunities, less availability of bank branches, low levels of financial education, low income and other socio-economic factors inhibit local residents from fully participating in banking services. In terms of policy implications, it is vital to come up with financial literacy programs that equip people with knowledge of credit options and saving. Financial education can raise awareness of different benefits and uses of mobile banking. It also gives a customer an understanding of the basic concepts of finance. Policymakers can take advantage of the rise in secondary education to spread awareness on the advantages of financial inclusion. This financial awareness encourages consumers not to invest or borrow in informal financial sectors thereby protecting themselves from unfair practices.

5.5 Chapter Summary

This study investigated the impact of institutions and governance on financial inclusion in Africa for the period 2004 and 2016. Overall, the study finds a positive impact of institutional quality and governance on financial inclusion within the region. Hence, individual countries should devise effective ways of ensuring quality institutions and good governance. The results of the study suggest the presence of a positive relationship between the lagged value of financial inclusion, institutional governance, economic freedom, banking sector size and financial inclusion for African countries. However, rural to total population, population (market size) and natural resources negatively influence financial inclusion in Africa. Based on the estimations, a high concentration of population in rural areas is related to financial underperformance. Economic insight would suggest that this is an outcome of both demand and supply factors. As a result of poor development of 'state variables' in rural areas, supply is normally reduced as financial institutions find it difficult to operate in such areas.

On the other hand, people residing in rural areas generally have less demand for financial services, bringing about low usage. Thus, institutions would concentrate on high-value transaction areas, resulting in reduced access in low-value transaction areas (Beck and de la Torre, 2007). Therefore, it is essential to improve 'state variables' in rural areas to reduce institutions operation costs. The findings of this study present considerable policy relevance. Bearing in mind that formal finance can be used as a tool to combat poverty and social exclusion and to increase economic growth, increasing transparent legal framework, removing corruption and enhancing fair administration and judicial proceedings are vital for the raising and development of financial inclusiveness prospects. In addition, improving the level of economic freedom and governance reduces the informality in the financial markets. It is essential to attract individuals who are operating in informal markets, irrespective of how poor they are, as they are said to participate in numerous financial activities to build assets, cover daily transactions and prepare for life events and emergencies.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Summary

This study explored the interplay among mobile phones diffusion, financial inclusion and economic growth among countries in Africa. It comprises six chapters which are divided into three sections. The first section covers the background to the study and Chapter 2 which comprised an overview of financial systems, mobile phones diffusion and economic growth in Africa. The objectives of the study were covered in the second part of the thesis which is the main body. This has three chapters that comprise; Chapter 3-financial inclusion condition, Chapter 4-financial inclusion and economic growth, and Chapter 5-institutional quality, governance and financial inclusion. The third and last section-Chapter 6, summarised the findings, gave policy recommendations and areas for further research.

Chapter 1 introduced the thesis by calling for an increase in financial inclusion condition of countries in the African continent as a way of stemming the tides of poor economic growth. It became essential to understand the framework of financial inclusion and its implication for economic growth and the role that mobile phones, economic freedom and governance could play in striking an acceptable balance. The chapter also underscored some contributions and significance to regulators, academics, practitioners and policymakers alike. Generally, Chapter 2 gave an overview of financial systems in Africa. It reiterated the level of financial inclusion, bank competition, financial stability, bank profitability, economic freedom and governance in Africa.

In Chapter 3 the study combined the normalised weights from the principal component analysis of Camara and Tuesta (2014) with Sarma's (2008), multidimensional approach to address the weaknesses of each methodology in the assessment of the state of financial inclusion in African economies. The concept of financial inclusion is multidimensional and thus cannot be completely measured by a single proxy variable. Thus, several researchers have used the PCA method to compute a single composite index of financial inclusion based on various financial proxies such as bank branches in proportion to 1 000 adults, saving and credit bank accounts in proportion to 1 000 adults, bank employees as a ratio of bank branches, deposits and credits as a percentage of GDP (Arora, 2010; Chakravarty and Pal, 2013; Sharma, 2016; Sarma, 2015; Lenka and Sharma, 2017). This study constructed a unique financial inclusion index for 49 African economies by combining the normalised weights from the PCA of Camara and Tuesta (2014) with Sarma's (2008) multidimensional approach to address the weaknesses of each methodology. Regulators can formulate policymaking use of the findings in relation to the nature and state of financial inclusion in Africa and the determinants. The study then analysed the drivers of financial inclusion in Africa.

Chapter 4 investigated the transmission effect and directional relationship between financial inclusion and economic growth in Africa. The thrust was to explore the transmission mechanism/channels among the variables. The study employed a unique and robust Cointegrated P-Structural Vector Autoregressive (P-SVAR) model on annual data for the period 2004 to 2016 to explore this relationship. To the best of the researcher's knowledge, this study is the first to use P- SVAR to investigate the transmission effect and causality between economic growth and financial inclusion in Africa. The central argument was that identifying the mechanics through which financial inclusion relates to economic growth in Africa is essential *vis-à-vis* the governments of Africa's belief that the financial inclusion can catalyze economic growth in the region. The outcomes of the study thus provided insights on the short-term interplay between variables with profound policy implications.

Chapter 5 investigated the impact of institutional quality and governance on financial inclusion in Africa using the S-GMM model. Institutional quality was proxied by the comprehensive economic freedom index computed using the PCA. The governance measure was the index of governance also computed using the PCA. The study regressed institutional quality, governance, rural concentration, bank size variables on financial inclusion using the robust S-GMM method. Economic implications of significant coefficients of the GMM were also computed and analysed. Regulators can formulate policymaking use of the findings in relation to reducing poor governance and enhancing institutional quality of economies.

6.2 Summary of findings and Conclusion

Several key findings become obvious, given the summary above. The review of the financial system in Africa indicated that financial inclusion gaps remain severe and are also very low in several countries in Africa. The continent is also characterised by high concentration levels indicating very low levels of competition among banks with serious consequences in terms of financial exclusion. By not bringing on board those financially excluded, the economy may not grow to its fullest potential.

The review also spotted Africa as a less resilient continent with poor and weak institutional quality and governance which fall below the global benchmark of 0.5. Governance crisis is the main factor underlying the petitions of Africa's financial inclusion and development problems. Reasons for poor governance in Africa include corruption, underdeveloped legal systems and poor institutional framework, amongst others. The continent is also characterised by heavy-handed government interventions in markets. This could be due to over-reliance on government budgets and political decision makings. Africa is the most difficult region for starting a business in the world due to poor governance and violated economic freedom. Policymakers should, therefore, craft policies that promote sound institutional governance and strong institutional and legal frameworks, failure of which will distress the economy.

The first objective was to assess the financial inclusion condition in Africa using the PCA for the period 2004 to 2016. Combining the normalised weights from the principal component analysis of Camara and Tuesta (2014), with Sarma's (2008), multidimensional approach to address the weaknesses of each methodology and latter following the footsteps of the OECD's handbook in constructing composite indicators of financial inclusion, the findings reveal that wide discrepancies in financial inclusion exist in the 49 African countries that have been considered, with Chad and Guinea having the least at 0.01 and Seychelles and Cape-Verde with the highest at 0.82 and 0.63 respectively. Over the period 2004 to 2016, only two countries in Africa (Seychelles and Carbo-Verde) had an average financial inclusion index above 50 percent, and the majority had below 40 percent. In addition, the study found average financial inclusion to range between 0.13 in 2004 and 0.17 in 2016 giving the minimum and the maximum indices across the African countries considered over the study period of 2004-2016. The statistics show the existence of higher levels of financial exclusion within the African region thereby confirming the argument that most African countries need immediate intervention. The study found further that financial development, income (log GDPPC), credit and inflation are the major factors driving financial inclusion in Africa. Population density and size hinder financial inclusion in Africa. This financial inclusion environment must be harnessed by regulators and government alike by considering several policies to make financial services better inclusive for economic growth. The government should make sure that their central banks function their traditional role as the government's bank. This will force banks to reconsider their strategies and focus better on competing for financial intermediation services. Such competition will drive down rates and costs thereby making it cheaper for the vulnerable populations to access finance. In addition, policymakers could incentivise banks through, for example, corporate income tax reductions, provide social and financial infrastructure thereby breaking barriers of access as banks will be able to penetrate areas which were once considered unprofitable.

The second objective was to investigate the interplay among mobile phones, financial inclusion and economic growth in Africa for the period 2004 to 2016 applying a cointegration procedure and a robust and unique panel structural VAR. Using five variables, namely, financial inclusion index, financial stability, bank competition, mobile phones penetration, and the rate of economic

growth, the cointegration test finds the presence of a positive and long-run relationship among the variables. In terms of causality, the study provides evidence that the relationship between financial inclusion and economic growth is growth-led, supporting the demand following hypothesis in the intermediation link between financial inclusion and economic growth in Africa in line with Evans and Alenoghena (2017), Okoyo *et al*. (2017), and Simpasa *et al*. (2017). This provides evidence that the relationship between financial inclusion and economic growth in Africa is unidirectional, flowing from economic growth to financial inclusion. The study also found a transmission mechanism from economic growth to financial inclusion through bank competition and financial stability thereby supporting the conventional market power hypothesis. Mobile phones penetration is another transmission channel through which financial inclusion is enhanced as it facilitates bank competition and stability. The conclusion of these results echoes clearly the suggested trade-off relationship between economic growth and financial inclusion, and s policymakers can take this point seriously. In other words, while financial inclusion is desired, a cut-off point has to be specified which if exceeded the gains become a curse for the continent and systemic stability as it was in the case of the subprime global financial crisis of 2007, among others. Regulators and policymakers must develop a framework like the credit score models in the financial system that can gauge the level of financial inclusion that is deemed to be healthy for the continuing efficiency of the financial system as a whole. The gains of financial inclusion can be maintained that way without invoking the demerits. The low financial inclusion levels in Africa which hinder the effective transmission to economic growth could be a result of other intervening barriers such as financial illiteracy, low income and rural concentration. Regulators have to advocate for a cost-effective identification tool, and also educate clients with low financial literacy on the benefits of financial inclusion.

The inverse relationship between financial inclusion and rural concentration could be as a result of fewer employment opportunities, less availability of bank branches, low levels of financial education, low income, and other socio economic factors which inhibit local residents from fully participating in banking services. In terms of policy implications, it is vital to come up with financial literacy programs that equip people with knowledge of credit options and savings. Financial education can raise awareness of different benefits and uses of mobile banking. It also

gives a customer an understanding of the basic concepts of finance. Policymakers can take advantage of the rise in secondary education to spread awareness on the advantages of financial inclusion. This financial awareness encourages consumers not to invest or borrow in informal financial sectors thereby protecting themselves from unfair practices. Policymakers should also come up with policies that encourage the construction of road networks, infrastructure and improve on network availability. The availability of infrastructure makes it cheaper for financial institutions to provide their services. This may, in turn,, have a positive impact on business activities since customers are more likely to face reduced transaction costs, thus increasing the overall demand for financial services.

The third objective was to investigate the impact of institutional quality and governance on financial inclusions in Africa. The results show that the economic impacts of the lagged value of financial inclusion, institutional governance, economic freedom and banking sector size on financial inclusion were positive and significant for African countries; however, rural concentration, market size and natural resources had negative economic impacts on financial inclusion. Poor governance and violated economic freedom make Africa the most difficult region to start a business in the world. Regulators and policymakers can intensify efforts at crafting policies that promote sound institutional governance and strong institutional and legal frameworks which encourage investments and savings. User-friendly policies attract even foreign players in the banking system thereby increasing competition which enhances financial inclusion.

Methodologically, the study employed two unique methods, P-SVAR and PCA; these two constitute the main contributions to literature. Although literature may have used PCA in the construction of a financial inclusion index, this study has employed it for the first time in a new way and using a longer period and current data to measure the levels of financial inclusion for each country in Africa. To the best of the researcher's knowledge, this is the first study of this nature. This study also employs for the first time the P-SVAR that takes into account the dimensionality of curse in PVAR rising from the imposition of Cholesky decomposition by using

structural restriction in panel. Combining the strengths of both SVAR and PVAR while evading their shortcomings, the P-SVAR was strong enough to handle cross-sectional dependence that may arise. In addition, the P-SVAR enabled the study to analyse the effect of past banking trends in Africa on what is being faced now and the likely future trend in the area of financial inclusion and economic growth. Furthermore, this study avails facts which can be meditated on by policymakers and regulators alike in the formulation of financial inclusion policy decisions.

Having analysed the various objectives in this study, the study came up with some far-reaching conclusions. African countries were found to be less financially inclusive with severe financial inclusion gaps. The study found economic growth to be significantly related to financial inclusion on the continent. Specifically, the result is in line with the demand following hypothesis, implying that economic growth breeds financial inclusion in Africa and not the other way. However, in terms of the transmission effect, economic growth positively affects financial inclusion through bank competition, mobile phones and financial stability. The result of the pairwise Granger causality test provides evidence of a unilateral causality from economic growth and mobile phones diffusion to financial inclusion upholding the assertion that mobile phones may be a channel of boosting financial inclusion.

Furthermore, the study found a positive economic impact of economic freedom, governance and bank size on financial inclusion. The economic implication of natural resources and rural concentration on financial inclusion is negative, suggesting the presence of the natural resource curse in Africa. Based on these findings, the study found evidence to conclude that economies in Africa are less financially inclusive and have severe financial inclusion gaps. However, financial inclusion is detrimental to stability beyond a certain threshold. The study also concluded that financial inclusion responds positively to mobile phones diffusion, economic freedom and governance. Income level, rural concentration, natural resources, bank size, population density, money supply, inflation and availability of credit determines financial inclusion.

6.3 Recommendations

The study made the following recommendations centred on the findings. It recommends policymakers to take the trade-off relationship between economic growth and financial inclusion seriously. Despite the desire for financial inclusion, a cut-off point has to be specified which, if exceeded, the gains become a curse for the continent and systemic stability as it was in the case of the subprime global financial crisis of 2007, among others. Regulators and policymakers must develop a framework like the credit score models in the financial system that can gauge the level of financial inclusion that is deemed to be healthy for the continuing efficiency of the financial system as a whole. The gains of financial inclusion can be maintained that way without invoking the demerits. The study also recommends caution in the way policies are directed towards growing financial inclusion further in the region. The preoccupation of financial inclusion policies in Africa should be to maximise financial inclusion. Financial inclusion and regulation policies should not be crafted in isolation. Regulation must give attention to the force of mobile phones and competition to be allowed, which should temporarily be made and reviewed over time.

The results of the study found that African countries rank below global averages in terms of governance. The study, therefore, recommends African countries to exercise good governance (a transparent legal framework, lack of corruption, and fair judicial proceedings and administration amongst others) as they are essential for raising and development of financial inclusiveness prospects. Closer attention must be paid to institutional quality (governance) and economic freedom if financial inclusion is to produce benefits for the region. Macroprudential policies must be strengthened and the right form of governance policies that do not exacerbate financial inclusion must be adopted by African countries. The study also recommends governments to promote and respect economic freedom as it offers the best atmosphere for innovation, experimentation, and progress, and it is through these that financial inclusion is enhanced.

Also, in line with the above mentioned, the results of this study assume that maintaining and driving a justifiable banking competition in Africa is a welcome development and is most

ultimate. However, the challenge rests on boosting competition to accomplish the desired goal of making certain the dynamic efficiency of the financial sector that would prompt stability and subsequently, economic growth which has a positive effect on financial inclusion.

Policymakers are recommended to come up with financial literacy programs that equip people with knowledge of credit options and savings. Financial education can raise awareness of different benefits and uses of mobile banking. It also gives a customer an understanding of the basic concepts of finance. Policymakers can take advantage of the rise in secondary education to spread awareness on the advantages of financial inclusion. This financial awareness encourages consumers not to invest or borrow in informal financial sectors thereby protecting themselves from unfair practices. Given that most people reside in rural areas and are illiterate, the above recommendation can bring the desired results.

Since mobile phones penetration and financial stability, Granger cause economic growth which enhances financial inclusion in a unidirectional manner; policymakers are recommended to learn from South Africa and Kenya who had successful experiences on the positive effect of mobile financial services on financial inclusion. In this digital and fast-moving age, mobile phones are useful and potential tools to boost financial inclusion in Africa. Therefore, strategies to boost financial inclusion in Africa must consider incentives that can speed up the diffusion of internet-based mobile devices to bring on board the unbanked. Policies should encourage more people to use mobile phones to enhance financial inclusion within Africa. There should also be efficient network so as not to disrupt the execution of transactions

6.4 Limitations

Like any research, this study had its impediments. The major restraint of this study was data limitation across African countries, especially in their financial sectors. Firstly, in terms of the scope of the study, the primary intention was to cover about three decades. However, because the

unavailability of financial inclusion data prior to 2004, the starting point was 2004 when the World Bank launched its first database on world development indicators, up to 2016.

Data on the borrowers' characteristics did not cover all borrower characteristics. For example, data on educational level, employment status, income, outstanding loans with other financial institutions, and credit history were not available. Data on financial inclusion were only partially available for most countries. In spite of these shortcomings, the study achieved its overall objectives. The study established the directional link between financial inclusion and economic growth in Africa that is bi-directional; found that the African region has large financial inclusion gaps and has adamant financial exclusion. It can, therefore, be concluded that it is possible for financial inclusion to contribute to economic growth and vice-versa in Africa, which is the view taken by the African governments; and they should also consider the other perspective where economic growth leads to financial inclusion.

6.5. Suggestions for future research

For research in this area to be ongoing, this study suggests the following area for further study. Since the current study uses panel data estimation methods, it does capture unique country-specific relations. There is a possibility that certain relationships observed in this study may vary from one country to another. Therefore, future studies may seek to ascertain the extent to which these relationships hold in country-specific settings. However, this study has focused on the 'bright side' of financial inclusion. Unfortunately, there can be a dark side too where too fast' or 'too much' finance can lead to future financial crises or financial instability. It would thus be of interest to explore the threshold beyond which financial inclusion may adversely affect financial stability. Future researchers can also look into this area as it was not covered in this study which only covered a limited period. The issue of bank concentration in Africa has been much talked about. Hence, studies in view of mergers and acquisitions and their impact on financial inclusion are encouraged.

Appendices

Appendix A: Countries used in the study

North America	South Asia	Middle East	East Asia and Pacific	Africa	Europe and Central Asia	Latin America and Caribbean
Canada and United States	Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri-Lanka	Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Malta, Oman, Qatar, Saudi	Australia, Brunei Darussalam, Cambodia, China, Fiji, Indonesia, Japan, Korea, Republic, Lao PDR, Malaysia, Micronesia, Fed. States., Mongolia, Myanmar, New Zealand, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands,	Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Democratic Republic of Congo, Djibouti, Congo Republic, Côte d'Ivoire, Equatorial Guinea, Ethiopia, Egypt, Gabon, The Gambia, Ghana, Guinea, Guinea-	Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kazakhstan, Kosovo, Kyrgyz Republic, Latvia, Lithuania, Luxembourg, Macedonia, FYR,	Antigua and Barbuda, Argentina, Bahamas, The Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname,

			Thailand, Timor-Leste, Tonga, Vanuatu, Vietnam	Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe	Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, San Marino, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Tajikistan, Turkey, Ukraine, United Kingdom, Uzbekistan	Trinidad and Tobago, Uruguay, Venezuela, RB

Appendix B: Unit Root Test Output

. **xtunitroot llc mobile**
Levin-Lin-Chu unit-root test for mobile

Ho: Panels contain unit roots Number of panels = 22
Ha: Panels are stationary Number of periods = 12
AR parameter: Common Asymptotics: N/T -> 0
Panel means: Included
Time trend: Not included
ADF regressions: 1 lag
LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)

Statistic p-value

Unadjusted t -6.1909
Adjusted t* -5.0012 0.0000

. **xtunitroot llc mobile, demean**
Levin-Lin-Chu unit-root test for mobile

Ho: Panels contain unit roots Number of panels = 22
Ha: Panels are stationary Number of periods = 12
AR parameter: Common Asymptotics: N/T -> 0
Panel means: Included
Time trend: Not included Cross-sectional means removed
ADF regressions: 1 lag
LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)

Statistic p-value

Unadjusted t -6.3611
Adjusted t* -3.2390 0.0006

. xtunitroot llc Z-score
Levin-Lin-Chu unit-root test for Z-score

Ho: Panels contain unit roots Number of panels = 22
Ha: Panels are stationary Number of periods = 12
AR parameter: Common Asymptotics: N/T -> 0
Panel means: Included
Time trend: Not included

ADF regressions: 1 lag
LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)

Statistic p-value

Unadjusted t -7.9166
Adjusted t* -4.4540 0.0000

. **xtunitroot llc Z-score , demean**
Levin-Lin-Chu unit-root test for Z-score

Ho: Panels contain unit roots Number of panels = 22
Ha: Panels are stationary Number of periods = 12
AR parameter: Common Asymptotics: N/T -> 0
Panel means: Included
Time trend: Not included Cross-sectional means removed
ADF regressions: 1 lag
LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)

Statistic p-value

Unadjusted t -10.4042

Adjusted t* -6.9334 0.0000

. xtunitroot llc Boone
Levin-Lin-Chu unit-root test for Boone

Ho: Panels contain unit roots Number of panels = 22
Ha: Panels are stationary Number of periods = 12
AR parameter: Common Asymptotics: N/T -> 0
Panel means: Included
Time trend: Not included
ADF regressions: 1 lag
LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)

Statistic p-value

Unadjusted t -7.1286
Adjusted t* -4.0374 0.0000

. xtunitroot llc compet , demean
Levin-Lin-Chu unit-root test for Boone

Ho: Panels contain unit roots Number of panels = 22
Ha: Panels are stationary Number of periods = 12
AR parameter: Common Asymptotics: N/T -> 0
Panel means: Included
Time trend: Not included Cross-sectional means removed
ADF regressions: 1 lag
LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)

Statistic p-value

Unadjusted t -11.5166
Adjusted t* -7.7482 0.0000

. xtunitroot llc FII
Levin-Lin-Chu unit-root test for FII

Ho: Panels contain unit roots Number of panels = 22
Ha: Panels are stationary Number of periods = 12
AR parameter: Common Asymptotics: N/T -> 0
Panel means: Included
Time trend: Not included

ADF regressions: 1 lag
LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)

Statistic p-value

Unadjusted t -22.3493
Adjusted t* -20.0256 0.0000

. xtunitroot llc finscore , demean
Levin-Lin-Chu unit-root test for FII

Ho: Panels contain unit roots Number of panels = 22
Ha: Panels are stationary Number of periods = 12
AR parameter: Common Asymptotics: N/T -> 0
Panel means: Included
Time trend: Not included Cross-sectional means removed
ADF regressions: 1 lag
LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)

Statistic p-value

Unadjusted t -8.6220
Adjusted t* -2.6928 0.0035

. **xtunitroot llc gdppcgr**
Levin-Lin-Chu unit-root test for gdppcgr

Ho: Panels contain unit roots Number of panels = 22
Ha: Panels are stationary Number of periods = 12
AR parameter: Common Asymptotics: N/T -> 0
Panel means: Included
Time trend: Not included
ADF regressions: 1 lag
LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)

Statistic p-value

Unadjusted t -11.2793
Adjusted t* -7.0305 0.0000

. **xtunitroot llc gdppc , demean**
Levin-Lin-Chu unit-root test for gdppcgr

Ho: Panels contain unit roots Number of panels = 22
Ha: Panels are stationary Number of periods = 12
AR parameter: Common Asymptotics: N/T -> 0
Panel means: Included
Time trend: Not included Cross-sectional means removed
ADF regressions: 1 lag
LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)

Statistic p-value

Unadjusted t -9.5581
Adjusted t* -5.3783 0.0000

Appendix C: Structural VAR Estimates

Date: 03/6/18 Time: 05:57				
Sample (adjusted): 2006Q2 2015Q4				
Included observations: 468 after adjustments				
Estimation method: Maximum likelihood via Newton-Raphson (analytic				
derivatives)				
Convergence achieved after 46 iterations				
Structural VAR is over-identified				
Model: Ae = Bu where E[uu']=I				
A =				
1	0	0	0	0
C(1)	1	0	0	0
0	0	1	0	0
0	0	C(3)	1	0
0	C(2)	C(4)	C(5)	1
B =				
C(6)	0	0	0	0
0	C(7)	0	0	0
0	0	C(8)	0	0
0	0	0	C(9)	0
0	0	0	0	C(10)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	-0.000399	0.000139	-2.867124	0.0041
C(2)	-5.178440	8.956079	-0.578204	0.5631
C(3)	-1.207389	0.412462	-2.927274	0.0034
C(4)	4.189170	4.369897	0.958643	0.3377
C(5)	-0.376879	0.486052	-0.775388	0.4381
C(6)	11.23971	0.367381	30.59411	0.0000
C(7)	0.033848	0.001106	30.59411	0.0000
C(8)	0.070477	0.002304	30.59411	0.0000
C(9)	0.628858	0.020555	30.59411	0.0000
C(10)	6.600793	0.215754	30.59411	0.0000
Log likelihood	-2292.797			
LR test for over-identification:				
Chi-square(5)	71.28799		Probability	0.0000
Estimated A matrix:				
1.000000	0.000000	0.000000	0.000000	0.000000
-0.000399	1.000000	0.000000	0.000000	0.000000
0.000000	0.000000	1.000000	0.000000	0.000000
0.000000	0.000000	-1.207389	1.000000	0.000000
0.000000	-5.178440	4.189170	-0.376879	1.000000
Estimated B matrix:				
11.23971	0.000000	0.000000	0.000000	0.000000
0.000000	0.033848	0.000000	0.000000	0.000000
0.000000	0.000000	0.070477	0.000000	0.000000
0.000000	0.000000	0.000000	0.628858	0.000000
0.000000	0.000000	0.000000	0.000000	6.600793

Estimated S matrix:				
11.23971	0.000000	0.000000	0.000000	0.000000
0.004486	0.033848	0.000000	0.000000	0.000000
0.000000	0.000000	0.070477	0.000000	0.000000
0.000000	0.000000	0.085093	0.628858	0.000000
0.023230	0.175280	-0.263170	0.237003	6.600793
Estimated F matrix:				
33.51454	-7.759256	95.50237	166.7932	-5.940575
-0.278993	0.659835	-0.023749	0.039623	0.101425
0.780843	0.293505	0.411146	-3.224002	-0.403659
35.18092	12.64695	-76.02899	-142.8562	3.661366
6.079305	3.988501	23.95130	38.36131	26.34178

Appendix D: Variance Decomposition Estimates

Variance Decomposition of MBD:						
Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	11.23971	100.0000	0.000000	0.000000	0.000000	0.000000
2	15.25084	99.96927	0.002121	0.003951	0.024171	0.000490
3	17.95038	99.89754	0.006892	0.013293	0.080697	0.001578
4	19.95153	99.78460	0.014126	0.028191	0.169866	0.003213
5	20.45020	96.99716	0.074599	0.029050	0.399403	2.499789
6	20.80492	95.24221	0.155948	0.032531	0.551575	4.017736
7	21.05850	94.10585	0.257531	0.039117	0.653197	4.944306
8	21.24069	93.34713	0.377996	0.049289	0.720658	5.504929
9	21.65569	92.81347	0.363889	0.177131	0.789307	5.856205
10	22.00802	92.30876	0.355128	0.269816	0.803417	6.262877
Variance Decomposition of COMPET:						
Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.034144	1.726176	98.27382	0.000000	0.000000	0.000000
2	0.047368	1.255391	98.72232	0.000255	0.006343	0.015693
3	0.056980	0.928163	99.00297	0.000826	0.020075	0.047961
4	0.064693	0.720672	99.14476	0.001691	0.040136	0.092737
5	0.067043	1.925682	97.26725	0.001628	0.326467	0.478973
6	0.069228	3.140485	95.52639	0.001552	0.569115	0.762457

7	0.071262	4.342711	93.90551	0.001708	0.779228	0.970847
8	0.073155	5.515464	92.39364	0.002230	0.964843	1.123827
9	0.075658	5.520717	92.45545	0.013484	0.935694	1.074651
10	0.077909	5.572964	92.47379	0.021310	0.902900	1.029037
Variance Decomposition of FINSCORE:						
Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.070477	0.000000	0.000000	100.0000	0.000000	0.000000
2	0.098792	0.007379	0.000231	99.97152	1.19E-06	0.020866
3	0.119961	0.021493	0.000660	99.91457	3.24E-06	0.063277
4	0.137363	0.039737	0.001194	99.83749	5.85E-06	0.121574
5	0.140970	0.039461	0.005766	98.82230	0.973930	0.158539
6	0.144302	0.038180	0.008512	97.88472	1.792058	0.276531
7	0.147411	0.040990	0.010133	96.98540	2.480005	0.483472
8	0.150329	0.048224	0.011057	96.11090	3.057408	0.772413
9	0.156991	0.268714	0.011707	95.77443	2.914334	1.030815
10	0.163047	0.432316	0.012464	95.49654	2.813129	1.245554
Variance Decomposition of FINSTAB:						
Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.634589	0.000000	0.000000	1.798047	98.20195	0.000000
2	0.894096	0.029673	0.001856	1.888087	98.07622	0.004159
3	1.091348	0.090173	0.005798	1.979292	97.91235	0.012383
4	1.256310	0.173482	0.011455	2.071674	97.72003	0.023357
5	1.419289	1.458205	0.021770	2.180757	95.65848	0.680783
6	1.567044	2.452149	0.030796	2.326797	94.25428	0.935982
7	1.703691	3.259475	0.038970	2.493367	93.19772	1.010468
8	1.831769	3.931104	0.046490	2.672287	92.34892	1.001200
9	1.929344	4.224818	0.054188	2.679086	92.08671	0.955201

10	2.023582	4.505535	0.063199	2.700461	91.84598	0.884828
Variance Decomposition of GDPG2:						
Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	6.612651	0.001234	0.070261	0.158387	0.128457	99.64166
2	8.831730	0.121310	0.120836	0.240081	0.103167	99.41461
3	10.25047	0.357024	0.184099	0.342485	0.082354	99.03404
4	11.25365	0.685085	0.258499	0.465898	0.068334	98.52218
5	11.66445	1.702830	0.240618	1.472847	2.506946	94.07676
6	11.96574	2.825566	0.229250	2.380988	4.255762	90.30843
7	12.20641	3.969254	0.222480	3.233228	5.544277	87.03076
8	12.41366	5.062718	0.219833	4.048162	6.499468	84.16982
9	12.44225	5.342817	0.237486	4.032957	6.543404	83.84334
10	12.46353	5.524887	0.266674	4.040599	6.542193	83.62565
Factorization: Structural						

Appendix E: VAR Residual Correlation LM Tests

Sample: 2004Q1 2016Q4

Null hypothesis: No serial correlation at lag h						
Lag	**LRE*Stat**	**d.f**	**Prob.**	**Rao F-Stats**	**d.f**	**Prob.**
1	5.690026	25	1.0000	0.226384	(25, 1610.0)	1.0000
2	5.835284	25	1.0000	0.232173	(25, 1610.0)	1.0000
3	7.244694	25	0.9998	0.288376	(25, 1610.0)	0.9998
4	200.7533	25	0.0000	8.487759	(25, 1610.0)	0.0000
5	4.811412	25	1.0000	0.191375	(25, 1610.0)	1.0000

VAR Residual Correlation LM Tests

Null hypothesis: No serial correlation at lag 1 to h						
Lag	**LRE*Stat**	**d.f**	**Prob.**	**Rao F-Stats**	**d.f**	**Prob.**
1	5.690026	25	1.0000	0.226384	(25, 1610.0)	1.0000
2	12.82481	50	1.0000	0.254209	(50, 1955.3)	1.0000
3	22.13908	75	1.0000	0.291533	(75, 2030.3)	1.0000
4	212.6716	100	0.0000	2.186115	(100,2043.9)	0.0000
5	213.5568	125	0.0000	1.745699	(125,2037.4)	0.0000

***Edgeworth expansion corrected likelihood ratio statistic**

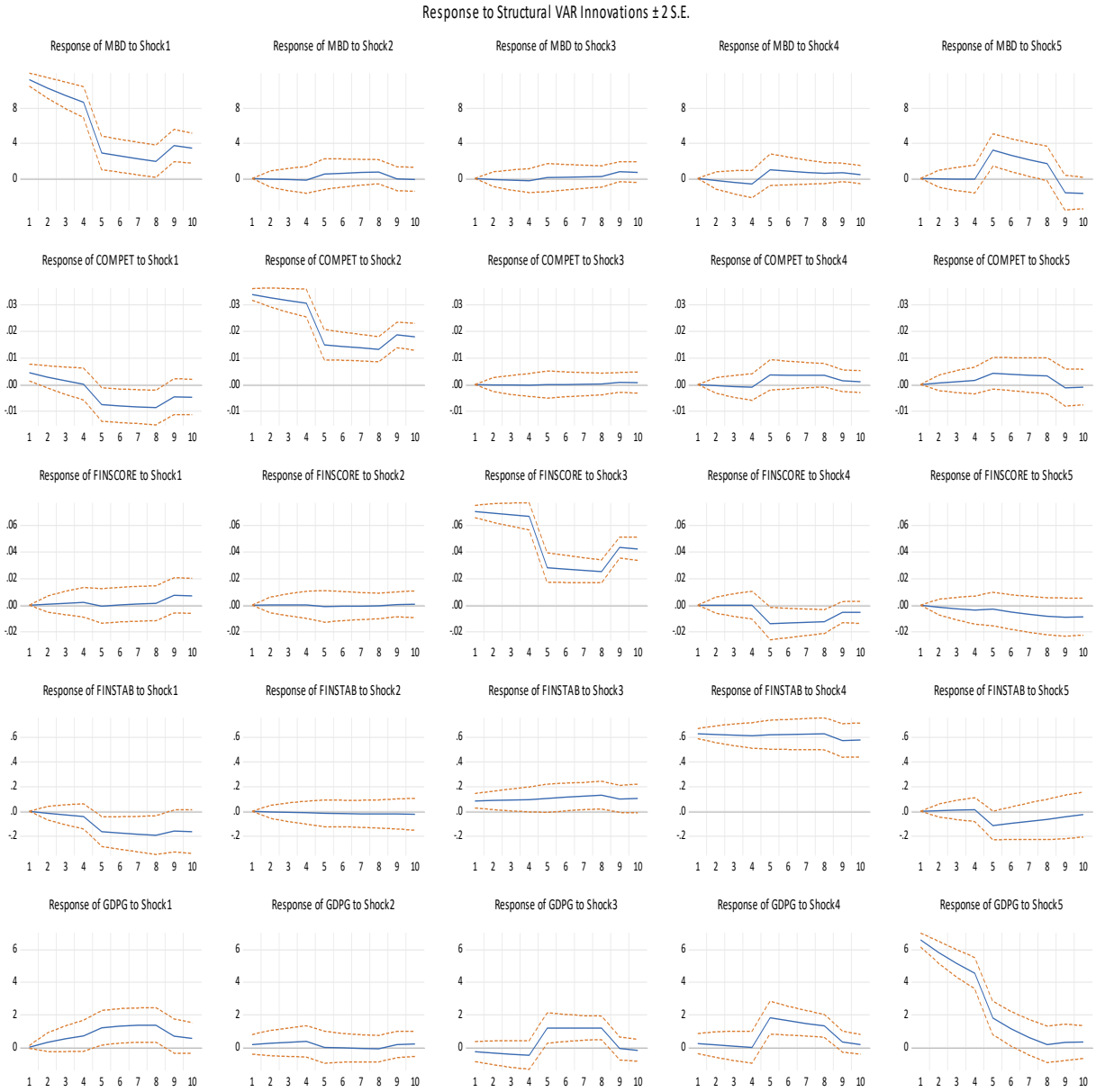
Appendix F: Roots of Characteristic Polynomial

Endogenous variables; MOBILE, BOONE, Z-SCORE, FII, GDPPCGR

Root	**Modulus**
-0.808185 + 0.587181i	0.998971
-0.808185 - 0.587181i	0.998971
0.308699 + 0.950078i	0.998971
0.308699 - 0.950078i	0.998971
0.998971	0.998971
0.302933 + 0.932332i	0.980312
0.302933 - 0.932332i	0.980312
0.980312	0.980312
-0.793089-0.576213i	0.980312
-0.793089 + 0.576213i	0.980312
0.951162	0.951162
-0.769506-0.559079i	0.951162
-0.769506+0.559079i	0.951162
0.293925+0.904609i	0.951162
0.293925-0.904609i	0.951162
-0.755741-0.549078i	0.934147
-0.755741+0.549078i	0.934147
0.934147	0.934147
0.288667+0.888427i	0.934147
0.288667-0.888427i	0.934147

-0.727543-0.528591i	0.899292
-0.727543+0.528591i	0.899292
0.899292	0.899292
0.277897+0.855278i	0.899292
0.277897-0.855278i	0.899292
No root lies outside the unit circle. VAR satisfies the stability condition.	

Appendix G: Response to SVAR Innovation


Response to Structural VAR Innovations ± 2 S.E.
Response of MBD to Shock1
Response of MBD to Shock2
Response of MBD to Shock3
Response of MBD to Shock4
Response of MBD to Shock5
Response of COMPET to Shock1
Response of COMPET to Shock2
Response of COMPET to Shock3
Response of COMPET to Shock4
Response of COMPET to Shock5
Response of FINSCORE to Shock1
Response of FINSCORE to Shock2
Response of FINSCORE to Shock3
Response of FINSCORE to Shock4
Response of FINSCORE to Shock5
Response of FINSTAB to Shock1
Response of FINSTAB to Shock2
Response of FINSTAB to Shock3
Response of FINSTAB to Shock4
Response of FINSTAB to Shock5
Response of GDPG to Shock1
Response of GDPG to Shock2
Response of GDPG to Shock3
Response of GDPG to Shock4
Response of GDPG to Shock5

Appendix H: Ethical Clearance Letter

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

24 October 2018

Mr Tough Chinoda (216076555)
School of Accounting, Economics & Finance
Westville Campus

Dear Mr Chinoda,

Protocol reference number: HSS/1928/018D
Project title: The Nexus between mobile phones diffusion, financial inclusion and economic growth: Evidence on African countries

Full Approval – No Risk / Exempt Application

In response to your application received on 08 August 2018, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL.**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....
Professor Shenuka Singh (Chair)

/ms

cc Supervisor: Dr Farai Kwenda
cc Academic Leader Research: Professor Josue Mbonigaba
cc School Administrator: Ms Seshni Naidoo

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Appendix I: Certificate of Editing

EDITORIAL CERTIFICATE

Author/s: Tough Chinoda

Document title: The nexus between mobile phones diffusion, financial inclusion and economic growth: Evidence on African countries

Date issued: 13/11/2018

SUPREME EDITOR

This document certifies that the above manuscript was proofread and edited by Dr Gift Mheta (PhD, Linguistics).

The document was edited for proper English language, grammar, punctuation, spelling and overall style. The editor endeavoured to ensure that the author's intended meaning was not altered during the review. All amendments were tracked with the Microsoft Word "Track Changes" feature. Therefore, the authors had the option to reject or accept each change individually.

Kind regards

Dr Gift Mheta

SUPREME EDITOR

References

Aga, G. A., & Peria, M. S. M. (2014). *International remittances and financial inclusion in Sub-Saharan Africa*. The World Bank.

Agoraki, M. E. K., Delis, M. D., & Pasiouras, F. (2011). Regulations, competition and bank risk-taking in transition countries. *Journal of Financial Stability*, *7*(1), 38-48.

Adeola, O., & Evans, O. (2017). Financial inclusion, financial development, and economic diversification in Nigeria. *The Journal of Developing Areas*, *51*(3), 1-15.

Adeyeye, M. M. P., & Bamidele, W. O. P. Effect of Corruption on Access to Finance For Market Pioneering In Nigeria: Evidence From Knowledge-Intensive Businesses. -2016

Afandi, A. (2005). Monetary policy transmission mechanism and structural breaks in Indonesia|.

AFDB. (2015, May). Overview: Towards more inclusive, place-based development strategies in Africa. In African Economic Outlook. OECD Publishing.

Ahamed, M. M., & Mallick, S. K. (2017). Is financial inclusion good for bank stability? International evidence. *Journal of Economic Behavior & Organization*.

Akande, J. O., & Kwenda, F. (2017). P-SVAR Analysis of Stability in Sub-Saharan Africa Commercial Banks. *SPOUDAI-Journal of Economics and Business*, *67*(3), 49-78.

Aker, J. C., & Mbiti, I. M. (2010). Mobile phones and economic development in Africa. *Journal of Economic Perspectives*, *24*(3), 207-32.

Allan, A., Massu, M., & Svarer, C. (2013). Banking on change: Breaking barriers to financial inclusion. *Plan, Barclays and Care*.

Allen, F., Demirguc-Kunt, A., Klapper, L., & Peria, M. S. M. (2012). The foundations of financial inclusion: Understanding ownership and use of formal accounts.

Allen, F., Demirguc-Kunt, A., Klapper, L., & Peria, M. S. M. (2016). The foundations of financial inclusion: Understanding ownership and use of formal accounts, Journal of Financial Intermediation.

Allen, F., Otchere, I., & Senbet, L. W. (2011). African financial systems: A review.

Review of Development Finance, 1 (2), 79-113.

Ali, K., Khalid, U., & Khalid, Z. (2012). Promoting Financial Inclusion and Literacy in Pakistan via G2P Payment Programs. *Pakistan Microfinance Network. Google Scholar*.

Alliance for Financial Inclusion (2011): "The G20 Principles for Innovative Financial Inclusion; Bringing the Principles to Life – Eleven Country Case Studies."

Almeida, H. V., & Wolfenzon, D. (2006). A theory of pyramidal ownership and family business groups. *The Journal of Finance*, *61*(6), 2637-2680.

Aloo, C. (1988). Development of telecommunications infrastructure in Africa: network evolution, present status and future development. *Africa Media Review*, *2*(3), 19-34.

Altunbaş, Y., & Thornton, J. (2012). Does financial development reduce corruption? *Economics Letters*, *114*(2), 221-223.

Amidzic G., Massara A., André Mialou A. (2014). Assessing Countries' Financial Inclusion Standing—A New Composite Index. IMF Working Paper WP/14/36

Amisano, G., Cesura, M., Giannini, C., & Seghelini, M. (1997). The transmission mechanism among Italian interest rates. *Statistica*, *57*(4), 465-497.

Anderson, T. W., & Hsiao, C. (1981). Estimation of dynamic models with error components. *Journal of the American Statistical Association*, *76*(375), 598-606.

Anderson, T. W., & Hsiao, C. (1982). Formulation and estimation of dynamic models using panel data. *Journal of Econometrics*, *18*(1), 47-82.

Andrews, D.W.K. and Lu, B. (2001) Consistent Model and Moment Selection Procedures for GMM Estimation with Application to Dynamic Panel Data Models. Journal of Econometrics, 101, 123-164.

Andrianaivo, M., & Kpodar, K. (2012). Mobile phones, financial inclusion, and growth. *Review of Economics and Institutions*, *3*(2), 30.

Anthony Simpasa, Amandine Nakumuryango, Young Yoon and Joel Daniel Muzima (2017). Financial inclusion and Economic growth in Africa, implications for Angola; XXI FESA Scientific-Technical Conference Luanda, Angola

Ardic, O. P., & Damar, H. E. (2006). Financial sector deepening and economic growth: Evidence from Turkey.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*(1), 29-51.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic studies*, *58*(2), 277-297.

Arora, R. U. (2010). Measuring financial access. *Griffith Business School Discussion Papers Economics*.

Arun, T., & Kamath, R. (2015). Financial inclusion: Policies and practices. *IIMB Management Review*, *27*(4), 267-287.

Atkinson, A., & Messy, F. A. (2013). Promoting financial inclusion through financial education. *International Journal of Economics and Financial Issues*, *4*(2).

Ayres, R. U., & Warr, B. (2006). Economic growth, technological progress and energy use in the US over the last century.

Baltagi, B. H. (2008). Forecasting with panel data. *Journal of Forecasting*, *27*(2), 153-173.

Berggren, N. (2003). The benefits of economic freedom: a survey. *The Independent Review*, *8*(2), 193-211.

Babajide, A. A., Adegboye, F. B., & Omankhanlen, A. E. (2015). Financial inclusion and economic growth in Nigeria. *International Journal of Economics and Financial Issues*, *5*(3).

Bagli, S., & Dutta, P. (2012). A study of Financial Inclusion in India. *Radix International Journal of Economics & Business Management*, *1*(8), 1-18.

Baltagi, B. (2008). *Econometric analysis of panel data*. John Wiley & Sons.

Barro, R. J., & Sala-i-Martin, X. (1990). *Economic growth and convergence across the United States* (No. w3419). National Bureau of Economic Research.

Bayar, Y., & Gavriletea, M. D. Financial Inclusion and Economic Growth: Evidence from Transition Economies of European Union.

Beck, T. (2016). Financial Inclusion–measuring progress and progress in measuring. In *preparation for the Fourth IMF Statistical Forum Lifting the Small Boats: Statistics for Inclusive Growth, November, available at https://www. Imf.org/external/np/seminar/eng/2016/statsforum/pdf/beck-paper.pdf*

Beck, T., & Cull, R. (2013). *Banking in Africa. World Bank policy research*, Working paper, 6684.

Beck, T., Demirgüc-Kunt, A., & Maksimovic, V. (2004). Bank competition and access to finance: international evidence. Journal of Money, Credit and Banking, 36, 627–648.

Beck, T., Demirgüç-Kunt, A., & Maksimovic, V. (2008). Financing patterns around the world: Are small firms different? *Journal of Financial Economics*, *89*(3), 467-487.

Beck, T., Demirguc-Kunt, A., & Martinez Peria, M. S. (2006). *Banking services for everyone? Barriers to bank access and use around the world*. The World Bank.

Beck, T., Demirgüc-Kunt, A., & Peria, M. S. M. (2007). Reaching out: Access to and use of banking services across countries. *Journal of Financial Economics*, *85*(1), 234-266.

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2007). Finance, inequality and the poor. *Journal of economic growth*, *12*(1), 27-49.

Beck, T., Demirgüç-Kunt, A., & Honohan, P. (2009). Access to financial services: Measurement, impact, and policies. *The World Bank Research Observer*, *24*(119-145).

Beck, T., & De la Torre, A. (2008). *The basic analytics of access to financial services*. The World Bank.

Beck, T., & Feyen, E. (2013). *Benchmarking financial systems: introducing the financial possibility frontier*. The World Bank.

Berggren, N. (2003). The benefits of economic freedom: a survey. *The Independent Review*, *8*(2), 193-211.

Bernanke, B. S., & Mihov, I. (1998). Measuring monetary policy. *The Quarterly Journal of Economics*, *113*(3), 869-902.

Ben Naceur, S., & Zhang, R. (2016). Financial development, inequality and poverty: some international evidence.IMF working paper no. 16/32

Bencivenga, V. R., & Smith, B. D. (1991). Financial intermediation and endogenous growth. *The Review of Economic Studies*, *58*(2), 195-209.

Berkelmans, L. (2005). Credit and monetary policy: An Australian SVAR, *The Quarterly Journal of Economics*, *182*(4), 602-745.

Bhanot, D., Bapat, V., & Bera, S. (2012). Studying financial inclusion in north-east India. *International Journal of Bank Marketing*, *30*(6), 465-484.

Blanco, Juan, et al. (2014), Models and Barriers for Financial Inclusion, Financial Inclusion 2020- CFI, retrieved from http://cfiblog.org/2014/10/21/models-and-barriers-for-financial-inclusion/ on October 21, 2014, pp. 14-22.

Boelhouwer, J., & Stoop, I. (1999). Measuring well-being in the Netherlands: The SCP index from 1974 to 1997. *Social Indicators Research*, *48*(1), 51-75.

Bräutigam, D. A., & Knack, S. (2004). Foreign aid, institutions, and governance in sub-Saharan Africa. *Economic Development and Cultural Change*, *52*(2), 255-285.

Boone, J. (2000), 'Competition', CEPR Discussion Paper Series No. 2636, December.

Boone, J. (2001), 'Intensity of competition and the incentive to innovate', International Journal of Industrial Organization, 19, 705–726.

Boone, J. (2004), 'A New Way to Measure Competition', CEPR Discussion Paper Series No. 4330, March.

Boone J., R. Griffith, and R. Harrison (2004), 'Measuring Competition', presented at the Encore Meeting 2004 'Measuring competition'.

Boone, J., (2008), 'A new way to measure competition', Economic Journal, 118, 1245 -1261.

Boyd, J. H., & Prescott, E. C. (1986). Financial intermediary-coalitions. *Journal of Economic theory*, *38*(2), 211-232.

Breitung, J. 2000.The local power of some unit root tests for panel data. *Advances in Econometrics, Volume 15: Nonstationary Panels, Panel Cointegration, and Dynamic Panels*, ed. B. H. Baltagi, 161–178. Amsterdam: JAY Press.

Breitung, J., and S. Das. 2005. Panel unit root tests under cross-sectional dependence. *Statistica Neerlandica* 59: 414–433.

Cámara N., Tuesta D. (2014). David Measuring Financial Inclusion: A Multidimensional Index. BBVA Research. Working Paper, Nº 14/26

Camara, N., Pena, X., & Tuesta, D. (2014). Factors that matter for financial inclusion: Evidence from Peru (No. 1409).

Canning, D., & Pedroni, P. (2008). Infrastructure, long-run economic growth and causality tests for cointegrated panels. *The Manchester School*, *76*(5), 504-527.

Canova, F., and Ciccarelli, M., 2009. Estimating Multi-country VAR models. International Economic Review, 50, 929-961.

Carbo, S., Gardener, E. P., & Molyneux, P. (2007). Financial exclusion in Europe. *Public Money and Management*, *27*(1), 21-27.

Castells, M. (1998). End of millennium (Vol. 3). *Malden, MA: Blackwell*.

Chakravarty S., Pal R. (2010). Measuring Financial Inclusion: An Axiomatic Approach. Indira Gandhi Institute of Development Research, Working Paper No. WP 2010/003

Chakravarty, S. R., & Pal, R. (2013). Financial inclusion in India: An axiomatic approach. *Journal of Policy Modelling*, *35*(5), 813-837.

Chattopadhyay, S. K. (2011). Financial Inclusion in India: A case study of West Bengal, Reserve Bank of India Working Paper, Volume July 2, WPS (DEPR):8/2011

Chithra, N., & Selvam, M. (2013). Determinants of financial inclusion: An empirical study on the inter-state variations in India.

Choi, I. (2001). Unit root tests for panel data. *Journal of International Money and Finance* 20: 249–272.

Christen, R. P., Rosenberg, R., & Jayadeva, V. (2004). Financial Institutions with a 'Double Bottom Line': Implications for the Future of Microfinance. *CGAP Occasional Paper*, *8*, 18-22.

Cimoli, M., Dosi, G., Maskus, K. E., Okediji, R. L., Reichman, J. H., & Stiglitz, J. E. (Eds.). (2014). *Intellectual property rights: legal and economic challenges for development*. Oxford University Press.

Claessens, S., & Laeven, L. (2005). Financial dependence, banking sector competition, and economic growth. *Journal of the European Economic Association*, *3*(1), 179-207.

Clamara, N. P. X., and Tuesta, D. (2014). *Factors that matter for financial inclusion: Evidence from Peru*.

Claessens, S. (2006). Access to financial services: a review of the issues and public policy objectives. *The World Bank Research Observer*, *21*(2), 207-240.

Corvoisier, S., & Gropp, R. (2002). Bank concentration and retail interest rates. *Journal of Banking & Finance*, *26*(11), 2155-2189.

Dabla-Norris, M. E., Ji, Y., Townsend, R., & Unsal, D. F. (2015). *Identifying constraints to financial inclusion and their impact on GDP and inequality: A structural framework for policy* (No. 15-22). International Monetary Fund.

Davidson, R., & MacKinnon, J. G. (2004). *Econometric theory and methods* (Vol. 5). New York: Oxford University Press.

Davoodi, M. H. R., Dixit, M. S., & Pinter, G. (2013). *Monetary transmission mechanism in the East African Community: An empirical investigation* (No. 13-39). International Monetary Fund.

De Koker, L., & Jentzsch, N. (2013). Financial inclusion and financial integrity: Aligned incentives? *World Development*, *44*, 267-280.

Demetriades, P., & Hook Law, S. (2006). Finance, institutions and economic development. *International Journal of Finance & Economics*, *11*(3), 245-260.

Demirgüç-Kunt, A., Honohan, P., & Beck, T. (2008). *Finance for all: Policies and Pitfalls in Expanding Access*. World Bank.

Demirgüç-Kunt., & Klapper, L. (2012). Measuring Financial Inclusion: The Global Financial Inclusion Index. *Washington, DC: World Bank/Resources/FinInclusionBrochureFINALWEB. Pdf*.

Demirguc-Kunt, A., and Klapper, L. (2013). Measuring financial inclusion: explaining variation in use of financial services across and within countries. *Paper Economic Activity*, Spring.

Demirgüç-Kunt, A., & Levine, R. (1996). Stock markets, corporate finance, and economic growth: an overview. *The World Bank Economic Review*, *10*(2), 223-239.

Dendramis, Y., Spungin, G. E., & Tzavalis, E. (2014). Forecasting VaR models under different volatility processes and distributions of return innovations. *Journal of Forecasting*, *33*(7), 515-531.

Didier, T., Love, I., & Martínez Pería, M. S. (2012). What explains co-movement in stock market returns during the 2007–2008 crisis? *International Journal of Finance & Economics*, *17*(2), 182-202.

Didier, T., Love, I., & Martínez Pería, M. S. (2012). What explains co-movement in stock market returns during the 2007–2008 crisis? *International Journal of Finance & Economics*, *17*(2), 182-202.

Dupas, P., Green, S., Keats, A., & Robinson, J. (2012). *Challenges in banking the rural poor: Evidence from Kenya's western province* (No. w17851). National Bureau of Economic Research.

Efobi, U., Beecroft, I., & Osabuohien, E. (2014). Access to and use of bank services in Nigeria: Micro-econometric evidence. *Review of Development Finance*, *4*(2), 104-114.

Enders, W. (2008). *Applied econometric time series*. John Wiley & Sons.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica: Journal of the Econometric Society*, 251-276.

Ergungor, O. E. (2010). Bank Branch Presence and Access to Credit in Low-to Moderate-Income Neighbourhoods. *Journal of Money, Credit and Banking*, *42*(7), 1321-1349.

Erlandsson, F., & Lundqvist, M. (2014). The Diffusion of Mobile Phones and its Impact on Financial Inclusion and Economic Growth in Africa.

Evans, O. (2015). The Effects of Economic and Financial Development on Financial Inclusion in Africa.

Evans, O. (2016). Determinants of Financial Inclusion in Africa: A Dynamic Panel Data Approach. https://mpra.ub.uni-muenchen.de/81326/1/MPRA_paper_81326.pdf

Evans, O., & Osi, A. R. (2016). Financial Inclusion and GDP Per Capita in Africa: A Bayesian VAR Model.

Evans, O., & Lawanson, O. (2017). A Multi-Sectoral Study of Financial Inclusion and Economic Output in Nigeria. *Ovidius University Annals, Economic Sciences Series*, *17*(1), 195-204.

Ezenwakwelu, G. C. (2018). Effects of Financial Inclusion on Selected Macroeconomic Variables In Nigeria. *Global Journal of Applied, Management and Social Sciences*, *15*.

Friedline (2017), "An open internet is essential for financial inclusion, FinTech revolution, HuffPost", available at *www.huffingtonpost.com/entry/an-open-Internet-is-essential-for-financial-inclusion_us_5a3345dce4b0e1b4472ae520*

Fungacova, Z., & Weill, L. (2014). Understanding financial inclusion in China. *BOFIT Discussion Papers*, *2014*(10), 1.

Fungáčová, Z., & Weill, L. (2015). Understanding financial inclusion in China. *China Economic Review*, *34*, 196-206.

Fukuda, Y., Nakamura, K., & Takano, T. (2007). Higher mortality in areas of lower socioeconomic position measured by a single index of deprivation in Japan. *Public Health*, *121*(3), 163-173.

Okoye, L. U., Erin, O., & Modebe, N. J. (2017). Financial Inclusion as a Strategy for Enhanced Economic Growth and Development. *The Journal of Internet Banking and Commerce*, 1-14.

García, N., Grifoni, A., López, J. C., & Mejía, D. (2013). Financial Education in Latin America and the Caribbean.

Garg, A. (2014). Cloud computing for the financial services industry. Sapient. December 14.

Ghosh, S. (2012). Determinants of banking outreach: An empirical assessment of Indian states. *The Journal of Developing Areas*, 269-295.

Gimet, C., & Lagoarde-Segot, T. (2012). Financial sector development and access to finance. Does size say it all? *Emerging Markets Review*, *13*(3), 316-337.

Gisanabagabo, S., & Ngalawa, H. (2017). Financial intermediation and economic growth: evidence from Rwanda. *Journal of Economic and Financial Sciences*, *10*(2), 253-273.

Glynn, J., Perera, N., & Verma, R. (2007). Unit Root Tests and Structural Breaks: A Survey with Applications//Contrastes de raíces unitarias y cambios estructurales: un estudio con aplicaciones.

Gourené, G. A. Z., & Mendy, P. (2017). Financial Inclusion and Economic Growth in WAEMU: A Multiscale Heterogeneity Panel Causality Approach.

Goss, S., Mas, I., Radcliffe, D., & Stark, E. (2011). *The Next Challenge: Channeling Savings through Mobile Money Schemes*. Discussion Paper. Seattle, WA: Bill and Melinda Gates Foundation

GPFI and CGAP (2011), The G20 Basic Set of Financial Inclusion Indicators, www.gpfi.org/sites/default/files/G20 Basic Set of Financial Inclusion Indicators.pdf

Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica: Journal of the Econometric Society*, 424-438.

Greenwood, J., & Jovanovic, B. (1990). Financial development, growth, and the distribution of income. *Journal of Political Economy*, *98*(5, Part 1), 1076-1107

Gretta, S. A. A. B. (2017). Financial inclusion and growth. *The Business & Management Review*, *8*(4), 434.

Guièze, J. L. (2014). Financial inclusion in Sub-Saharan Africa. *World*, *3*(3.6), 3-9.

Gujarati, D.N. (2003). Basic Econometrics, 4th ed., McGraw-Hill, New York.

Gupte, R., Venkataramani, B., & Gupta, D. (2012). Computation of financial inclusion index for India. *Procedia-Social and Behavioral Sciences*, *37*, 133-149.

Gwartney, J., & Holcombe, R. (2016). Robert Lawson, and Joshua Hall, "*Economic Freedom of the World: 2016 Annual Report", Fraser Institute*.

Hall, J. C. (2016). Institutional convergence: exit or voice? *Journal of Economics and Finance*, *40*(4), 829-840.

Hannig, A., & Jansen, S. (2010). Financial inclusion and financial stability: Current policy issues.

Hariharan, G., & Marktanner, M. (2012). The growth potential from financial inclusion. In *Atlanta Fed/GSU International Development Economics Workshop*.

Hendry, D. F., & Juselius, K. (2001). Explaining cointegration analysis: Part II. *The Energy Journal*, 75-120.

Hodler, R. (2006). The curse of natural resources in fractionalized countries. *European Economic Review*, *50*(6), 1367-1386.

Holtz-Eakin, D., Newey, W., & Rosen, H. S. (1988). Estimating vector autoregression with panel data. *Econometrica: Journal of the Econometric Society*, 1371-1395.

Honohan, P. (2008). Cross-country variation in household access to financial services. *Journal of Banking & Finance*, *32*(11), 2493-2500.

Hussain, M., & Mustapha, N. (2010). Determinants of bank competition.

Hutcheson, G. D., & Sofroniou, N. (1999). *The multivariate social scientist: Introductory statistics using generalized linear models*. Sage.

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics, 115*(1), 53-74.

I. Motelle, S., & Biekpe, N. (2014). Financial intermediation spread and stability of the banking system in the Southern Africa Customs Union. *Managerial Finance*, *40*(3), 276-299.

IMF (2014), "Regional economic outlook, Sub-Saharan Africa – Fostering durable and inclusive growth", April 2014, World Economic and Financial Surveys.

International Monetary Fund, & International Monetary Fund. (2013). *Regional Economic Outlook, April 2013, Asia and Pacific*. Washington, DC: International Monetary Fund.

International Telecommunication Union. (2004). *World telecommunication development report*. International Telecommunication Union.

International Telecommunication Union. (2007). *World telecommunication development report*. International Telecommunication Union.

International Telecommunication Union. (2008). *World telecommunication development report*. International Telecommunication Union.

International Telecommunication Union. (2016). *World telecommunication development report*. International Telecommunication Union.

Iqbal, B. A., & Sami, S. (2017). Role of banks in financial inclusion in India. *Contaduría y Administración*, *62*(2), 644-656.

James, J., & Versteeg, M. (2007). Mobile phones in Africa: how much do we really know? *Social Indicators Research*, *84*(1), 117.

James, A., & Aadland, D. (2011). The curse of natural resources: An empirical investigation of US counties. *Resource and Energy Economics*, *33*(2), 440-453.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behaviour, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305-360.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, *12*(2-3), 231-254.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with applications to the demand for money. *Oxford Bulletin of Economics and statistics*, *52*(2), 169-210.

Johansen, S. (1995). *Likelihood-based inference in cointegrated vector autoregressive models*. Oxford University Press on Demand.

Julie, O. (2013). The relationship between financial inclusion and GDP growth in Kenya. *Unpublished Manuscript submitted with the University of Nairobi*.

Kamboj, S. (2014). Financial inclusion and growth of Indian economy: An empirical analysis. *The International Journal of Business & Management*, *2*(9), 175.

Kanobe, F., Alexander, P. M., & Bwalya, K. J. (2017). Policies, Regulations and Procedures and their Effects on Mobile Money Systems in Uganda. *The Electronic Journal of Information Systems in Developing Countries*, *83*(1), 1-15.

Kargbo11, S. M. and P. A. Adamu (2009). "Financial development and economic growth in Sierra Leone." Journal of Monetary and Economic Integration 9 (2): 30 - 61.

Karlan, D., & Morduch, J. (2010). Access to finance. In *Handbook of development economics* (Vol. 5, pp. 4703-4784). Elsevier.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2009). *Governance Matters VIII: Aggregate and individual governance indicators 1996-2008*. The World Bank.

Kempson, E., Atkinson, A., & Pilley, O. (2004). Policy level response to financial exclusion in developed economies: lessons for developing countries. *Report of Personal Finance Research Centre, University of Bristol*.

Kendall, J., Ponce, A., & Mylenko, N. (2010). *Measuring financial access around the world*. The World Bank.

Kefela, G. T. (2010). Promoting access to finance by empowering consumers-Financial literacy in developing countries. *Educational Research and Reviews, 5*(5), 205-212.

Kesavan, V. (2015). Financial inclusion in India–A roadmap towards growth of initiatives and achievements. *IOSR Journal of Economics and Finance (IOSRJEF), 6*, 26-39.

Khan, H. R. (2011). Financial inclusion and financial stability: are they two sides of the same coin — s*peech at BANCON*.

Kim, D. W., Yu, J. S., & Hassan, M. K. (2018). Financial inclusion and economic growth in OIC countries. *Research in International Business and Finance, 43*, 1-14

Klapper, L., Laeven, L., & Rajan, R. (2006). Entry regulation as a barrier to entrepreneurship. *Journal of financial economics*, *82*(3), 591-629.

Klein, M. A. (1971). A theory of the banking firm. *Journal of Money, Credit and Banking*, *3*(2), 205-218.

Knack, S., & Keefer, P. (1995). Institutions and economic performance: cross-country tests using alternative institutional measures. *Economics & Politics*, *7*(3), 207-227.

Koeda, J., & Dabla-Norris, M. E. (2008). *Informality and bank credit: Evidence from firm-level data* (No. 8-94). International Monetary Fund.

Kodan, A. S., & Chhikara, K. S. (2011). Status of financial inclusion in Haryana: An evidence of commercial banks. *Management and Labour Studies*, *36*(3), 247-267.

Korynski, P and Pytkowska J. Measuring Financial Inclusion in the EU: Financial Inclusion Score Approach; Journal of Microfinance

Kpodar, K., & Andrianaivo, M. (2011). *ICT, financial inclusion, and growth evidence from African countries* (No. 11-73). International Monetary Fund.

Kronenberg, T. (2004). The curse of natural resources in the transition economies. *Economics of Transition, 12*(3), 399-426.

Kumar, K. J., & Thomas, A. O. (2006). Telecommunications and development: The cellular mobile 'revolution' in India and China. *Journal of Creative Communications*, *1*(3), 297-309.

Kumar, C., Mishra,S., (2009). Banking Outreach and Household level Access: Analyzing Financial Inclusion in India, Indira Gandhi Institute of Development Research (IGIDR), Mumbai.

Kutu, A. A., & Ngalawa, H. (2016). Monetary policy shocks and industrial output in BRICS countries. *SPOUDAI-Journal of Economics and Business*, *66*(3), 3-24.

Kwiatkowski, D., Phillips, P. C., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root? *Journal of Econometrics, 54*(1-3), 159-178.

Lagarde, Christine. 2011, "Empowerment through Financial Inclusion" Keynote address at the International Forum for Financial Inclusion, Mexico City. https://www.imf.org/external/np/speeches/2011/062614a.htm.

Law, S. H., & Azman-Saini, W. N. W. (2012). Institutional quality, governance, and financial development. *Economics of Governance*, *13*(3), 217-236.

Law, S. H., & Singh, N. (2014). Does too much finance harm economic growth? *Journal of Banking & Finance, 41*, 36-44.

Lee, S. H., Levendis, J., & Gutierrez, L. (2012). Telecommunications and economic growth: an empirical analysis of sub-Saharan Africa. *Applied Economics*, *44*(4), 461-469.

Lenka, S. K., & Sharma, R. (2017). Does financial inclusion spur economic growth in India? *The Journal of Developing Areas*, *51*(3), 215-228.

Lenka, S. K., & Barik, R. (2018). Has expansion of mobile phone and internet use spurred financial inclusion in the SAARC countries? *Financial Innovation*, *4*(1), 5.

Levine, R., Loayza, N., & Beck, T. (2000). Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics*, *46*(1), 31-77.

Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics*, *108*(1), 1-24.

Levine, R. (2005). Finance and growth: theory and evidence. *Handbook of economic growth*, *1*, 865-934.

Love, I., & Martínez Pería, M. S. (2014). How bank competition affects firms' access to finance. *The World Bank Economic Review*, *29*(3), 413-448.

MacKinnon, J. G. (1996). Numerical distribution functions for unit root and cointegration tests. *Journal of Applied Econometrics*, 601-618.

MacKinnon, J. G., Haug, A. A., & Michelis, L. (1999). Numerical distribution functions of likelihood ratio tests for cointegration. *Journal of Applied Econometrics*, 563-577.

Macmillan, R., Paelo, A., & Paremoer, T. (2016). The “evolution” of regulation in Uganda’s mobile money sector1. *The African Journal of Information and Communication*, *2016*(17), 89-110.

Maddala, G. S., & Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and statistics*, *61*(S1), 631-652.

Maimbo, S. M., & Gallegos, C. A. H. (2014). *Interest rate caps around the world: still popular, but a blunt instrument*. The World Bank.

Mehrotra, Aaron, and James Yetman. (2015). "Financial Inclusion – Issues for Central Banks." BIS Quarterly Review. Bank for International Settlements, Basel.

Mehrotra, N., Puhazhendhi, V., Nair, G. G., & Sahoo, B. B. (2009). *Financial inclusion: An overview*. National Bank for Agricultural and Rural Development, Occasional Paper 48, Mumbai.

Menkhoff, L., & Tolksdorf, N. (2000). *Financial market drift: Decoupling of the financial sector from the real economy?* Springer Science & Business Media.

Michael, O. B., & Sharon, O. O. (2014). Financial system, financial inclusion and economic development in Nigeria. *International Journal of Management Sciences*, *2*(3), 139-148.

Micco, A., & Panizza, U. (2005, February). Public Banks in Latin America. In *background paper prepared for the conference Public Banks in Latin America: Myths and Reality, Inter-American Development Bank, Washington, DC*.

Miethe, J., & Pothier, D. (2016). Brexit: What's at Stake for the Financial Sector? *DIW Economic Bulletin*, *6*(31), 364-372.

Mlachila, M., Park, S. G., & Yabara, M. (2013). Banking in Sub-Saharan Africa: The

macroeconomic context (Vol. 7; Tech. Rep.). European Investment Bank (EIB).

Mohammed, J. I., Mensah, L., & Gyeke-Dako, A. (2017). Financial inclusion and poverty reduction in Sub-Saharan Africa. *African Finance Journal*, *19*(1), 1-22.

Monti, M. (1972). *Deposit, credit and interest rate determination under alternative bank objective function*. North-Holland/American Elsevier.

Mowatt, R. (2001). Prospects for Financial Sector Reform in the Context of Regional Integration in SADC? *Report available at: http://www. tips. org. za*.

Moïse, B. & Xu, H. (2018). Financial Inclusion in Rwanda: An Analysis of Role Played by Commercial Banks. *International Journal of Management Science and Business Administration, 4(2),* 25-31

Mujeri, M. K. (2015). Improving access of the poor to financial services. *General Economics Division of the Planning Commission, Bangladesh*.

Musau, S., Muathe, S., & Mwangi, L. (2018). Financial Inclusion, GDP and Credit Risk of Commercial Banks in Kenya. *International Journal of Economics and Finance*, *10*(3), 181.

Mwaitete, C.P., George, L.A. (2018). Financial Inclusion and Economic Growth A Regression Analysis. Imperial Journal of Interdisciplinary Research, 4(1), 265-288.

Naceur, S. B., Cherif, M., & Kandil, M. (2014). What drives the development of the MENA financial sector? *Borsa Istanbul Review*, *14*(4), 212-223.

Nardo, M., Saisana, M., Saltelli, A., Tarantola, S., Hoffman, A., & Giovannini, E. (2005). Handbook on constructing composite indicators.

Ndlovu, G (2017), Access to financial services: Towards an understanding of the role and impact of financial exclusion in Sub-Saharan Africa, Doctoral thesis, UCT.

Ngalawa, H., & Viegi, N. (2011). Dynamic effects of monetary policy shocks in Malawi. *South African Journal of Economics*, *79*(3), 224-250.

Ngugi, D. (2015). Relationship between mobile banking and financial inclusion in Kenya. *Unpublished MBA Project University of Nairobi*.

Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica: Journal of the Econometric Society*, 1417-1426.

Nissanke, M., & Stein, H. (2003). Financial globalization and economic development: toward an institutional foundation. *Eastern Economic Journal*, *29*(2), 287-308.

Nkwede, F. (2015). Financial inclusion and economic growth in Africa: Insight from Nigeria. *European Journal of Business and Management*, *7*(35), 71-80.

Nwafor Florence Uchenna and Anyanwaokoro M. A (2017). Financial Inclusion and Growth of the Nigeria Economy, International Digital Organization for Scientific Research, ISSN: 2550-7966 2(1): 26-38, 2017

NWAFOR, M. C. (2018). The Nexus between Financial Inclusion and Economic Growth: Evidence from Nigeria. *International Journal of Science and Innovation in Social Science*, *2*(4).

Okoye, L. U., Erin, O., & Modebe, N. J. (2017). Financial Inclusion as a Strategy for Enhanced Economic Growth and Development. *The Journal of Internet Banking and Commerce*, 1-14.

Okoye, L. U., Adetiloye, K. A., ERIN, O., & Modebe, N. J. (2016). Financial Inclusion: A Panacea for Balanced Economic Development.

Oleka and Onyia (2016). Improvement in institutional quality and financial inclusion in Nigeria, IDOSR, ISSN: 1032, Volume 2.

Olumayowa Okediran (2013), "Africa's Promise of Liberty" in Tom G. Palmer, ed., Why Liberty (Ottawa, Illinois: Jameson Books), pg. 79.

Onaolapo, A. A., & Odetayo, T. A. (2012). Financial inclusion as tools for survival in globally competitive environment: Lessons for Nigerian microfinance banks. *American Journal of Business and Management*, *1*(4), 241-247.

Onaolapo, A. R. (2015). Effects of Financial Inclusion on the Economic Growth of Nigeria (1982-2012). *International Journal of Business and Management Review*, *3*(8), 11-28.

Oruo, J. (2013). *The relationship between Financial Inclusion and GDP growth in Kenya* (Doctoral dissertation, University of Nairobi).

Ouma, S. A., Odongo, T. M., & Were, M. (2017). Mobile financial services and financial inclusion: Is it a boon for savings mobilization? *Review of Development Finance*, *7*(1), 29-35.

Park, C. Y., & Rogelio Jr, V. *Mercado Jr. 2015. "Financial Inclusion, Poverty, and Income Inequality in Developing Asia."* (No. 426). ADB Economics Working Paper Series.

Pradhan, R. P. (2010). Financial deepening, foreign direct investment and economic growth: are they cointegrated — *International Journal of Financial Research*, *1*(1), 37.

Patrick, H. T. (1966). Financial development and economic growth in underdeveloped countries. *Economic development and Cultural Change*, *14*(2), 174-189.

Peachey, S., & Roe, A. (2006). Access to Finance: Measuring the Contribution of Savings Banks. *World Savings Banks Institute, Brussels, Belgium* Sarma, M. (2008). *Index of Financial Inclusion* (No. 215). Working paper.

Peersman, G., & Smets, F. (2005). The industry effects of monetary policy in the euro area. *The Economic Journal*,*115*(503), 319-342.

Petersen, M. A., & Rajan, R. G. (1995). The effect of credit market competition on lending relationships. *The Quarterly Journal of Economics*, *110*(2), 407-443.

Pedroni, P. (1997). On the role of cross-sectional dependency in panel unit root and panel cointegration exchange rate studies. *Indiana University manuscript*.

Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric Theory*, *20*(3), 597-625.

Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, *75*(2), 335-346.

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*, *22*(2), 265-312.

Pidun, U., Rubner, H., Krühler, M., Untiedt, R., Boston Consulting Group, & Nippa, M. (2011). Corporate portfolio management: Theory and practice. *Journal of Applied Corporate Finance*, *23*(1), 63-76.

Product, G. D. (2018). World Development Indicators database, World Bank.

Rioja, F., & Valev, N. (2004). Does one size fit all? a reexamination of the finance and growth relationship. *Journal of Development Economics*, *74*(2), 429-447.

Rodrick Witjas (2016), The Impact of Financial Inclusion on Sub-Saharan African Economic Growth; http://www.academia.edu/34049758/The_Impact_of_Financial_Inclusion_on_Sub-Saharan_African_Economic_Growth

Roodman, D. (2006). How to do xtabond2: An introduction to difference and system GMM in Stata. No. 28, National Bureau of Economic Research.

Roycroft, T. R., & Anantho, S. (2003). Internet subscription in Africa: policy for a dual digital divide. *Telecommunications Policy*, *27*(1-2), 61-74.

Rousseau, P. L., & Wachtel, P. (211). What is happening to the impact of financial deepening on economic growth? *Economic Inquiry*, *49*(1), 276-288.

Ryan, R. M., O'Toole, C. M., & McCann, F. (2014). Does bank market power affect SME financing constraints? *Journal of Banking & Finance*, *49*, 495-505.

Sachs, J. D., & Warner, A. M. (1995). *Natural resource abundance and economic growth* (No. w5398). National Bureau of Economic Research.

Sahay, R., Čihák, M., N'Diaye, P., & Barajas, A. (2015). Rethinking financial deepening: Stability and growth in emerging markets. *Revista de Economía Institucional*, *17*(33), 73-107.

Sahrawat, R. (2010). Financial inclusion from obligation to opportunity. *Tata Consultancy Service Ltd*.

Saidi A.E and Emara N (2017), Financial Inclusion and Economic Growth; The role of governance in selected MENA countries, editorialexpress.com/cgi-bin/conference/download.cgi?db_name=MEEA18&paper_id=90

Salathia, P., & Andotra, N. (2015). Demographic extent and measurement of financial inclusion in Jammu Division. *Journal of Commerce and Accounting Research*, *4*(3).

Sarma, M. (2008). *Index of financial inclusion* (No. 215). IMF Working Paper.

Sarma, M. (2012). Index of Financial Inclusion–A measure of financial sector inclusiveness. *Money, Trade, Finance, and Development Competence Center in cooperation with DAAD Partnership and Hochschule für Technik und Wirtschaft Berlin University of Applied Sciences. Working Paper*, (07).

Sarma, M., & Pais, J. (2008, September). Financial inclusion and development: A cross-country analysis. In *Annual Conference of the Human Development and Capability Association, New Delhi* (pp. 10-13).

Sarma, M., & Pais, J. (2011). Financial inclusion and development. *Journal of International Development*, *23*(5), 613-628.

Saxegaard, M. (2006). 'Excess liquidity and effectiveness of monetary policy: Evidence from Sub-Saharan Africa'. IMF Working Paper,WP/06/115.

Schwarz, G. (1978). Estimating the dimension of a model. *The annals of statistics*, *6*(2), 461-464

Sekantsi, L. P., & Motelle, S. I. (2016). The Financial Inclusion Conundrum in Lesotho: Is Mobile Money the Missing Piece In The Puzzle?

Seng, K. (2017). Considering the Effects of Mobile Phones on Financial Inclusion in Cambodia.

Shan, J. Z., Morris, A. G., & Sun, F. (2001). Financial Development and Economic Growth: An Egg-and-Chicken Problem? *Review of International Economics*, *9*(3), 443-454.

Sharma, D. (2016). Nexus between financial inclusion and economic growth: Evidence from the emerging Indian economy. *Journal of Financial Economic Policy*, *8*(1), 13-36.

Sharpe, S. A. (1990). Asymmetric information, bank lending, and implicit contracts: A stylized model of customer relationships. *The Journal of Finance*, *45*(4), 1069-1087.

Shinozaki, A., & Urakawa, K. (2017). Do mobile phones improve per-capita income? Granger causality test based on cross-country dataset. *Infocom review*, (68), 68-76.

Simar, L., & Wilson, P. W. (1998). Sensitivity analysis of efficiency scores: How to bootstrap in nonparametric frontier models. *Management Science*, *44*(1), 49-61.

Sims, C. A. (1980). Macroeconomics and reality. *Econometrica: Journal of the Econometric Society*, 1-48.

Sridhar, K. S., & Sridhar, V. (2006). Telecommunications and growth: Causal model, quantitative and qualitative evidence. *Economic and Political Weekly*, 2611-2619.

Stiglitz, J. E. (2014). *Intellectual property rights, the pool of knowledge, and innovation* (No. w20014). National Bureau of Economic Research.

Stiglitz, J. E., & Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American economic review*, *71*(3), 393-410.

Svirydzenka, K. (2016). *Introducing a new broad-based index of financial development*. International Monetary Fund, Bank of England Working Paper.

The Economist (2008), "Halfway there the economist", available at www.economist.com/node/11465558, 29th May.

Thorat, S. (2007, August). Economic Exclusion and Poverty: Indian Experience of Remedies against Exclusion. In *IFPRI and ADB Conference in Manila, August* (pp 9-10).

Tornell, A., Westermann, F., & Martinez, L. (2003). Liberalization, growth, and financial crises: Lessons from Mexico and the developing world. *Brookings Papers on Economic Activity*, *2003*(2), 1-112.

Triki, T., & Faye, I. (2013). Financial inclusion in Africa. *Tunis, Tunisia: African Development Bank*.

Tuesta, D., Sorensen, G., Haring, A., & Camara, N. (2015). *Financial inclusion and its determinants: the case of Argentina* (No. 1503).

UNECA, A. S. B. E. (2016). A Policy Handbook. *UN Economic Commission for Africa (UNECA), Addis Ababa*.

Van der Ploeg, F. (2011). Natural resources: curse or blessing? *Journal of Economic Literature*, *49*(2), 366-420.

Van Leuvensteijn, M., Bikker, J. A., Van Rixtel, A. A., & Sørensen, C. K. (2011). A new approach to measuring competition in the loan markets of the euro area. *Applied Economics*, *43*(23), 3155-3167.

Van Oudheusden, P., Klapper, L., Demirguc-Kunt, A., & Singer, D. (2015). The global index database 2014: measuring financial inclusion around the world. *World Bank, Washington, DC Google Scholar*.

Vonnák, B. (2005). *Estimating the effect of Hungarian monetary policy within a structural VAR framework* (No. 2005/1). MNB Working Papers.

Von Thadden, E. L. (2002). An incentive problem in the dynamic theory of banking. *Journal of Mathematical Economics*, *38*(1-2), 271-292.

Vyas, S., & Kumaranayake, L. (2006). Constructing socio-economic status indices: how to use principal components analysis. *Health Policy and Planning*, *21*(6), 459-468.

Wang'oo, E. (2013). The relationship between financial inclusion and economic development in Kenya. *Unpublished MBA thesis, University of Nairobi*.

Wainaina, M. C. (2012). *Telecommunication infrastructure and economic growth: a case of Sub-Saharan Africa (1988-2010)* (Doctoral dissertation, Kenyatta University).

Wolde, H., & Bhattacharya, M. R. (2010). *Constraints on Trade in the MENA Region* (No. 10-31). International Monetary Fund.

World Bank. (2012). *Global financial development report 2012: Financial Inclusion*. World Bank Publications.

World Bank Group. (2014). *World development indicators 2014*. World Bank Publications.

World Bank Group. (2017). *World development indicators 2017*. World Bank Publications.

Yorulmaz, R. (2016). *Essays on Global Financial Inclusion* (Doctoral dissertation, University of Sheffield).

Zang, H., & Kim, Y. C. (2007). Does financial development precede growth? Robinson and Lucas might be right. *Applied Economics Letters*, *14*(1), 15-19.

Ziegel, Eric R. "Applied Econometric Time Series." (1995): 469-470, Francis and Taylor, Book

Zins, A., & Weill, L. (2016). The determinants of financial inclusion in Africa. *Review of Development Finance*, *6*(1), 46-57.

Zulkhibri, M., & Ghazal, R. (2016). *Financial Inclusion, Governance, and Institutions: Evidence from Developing Economies* (No. 2016-3).

Zulfiqar, K., Chaudhary, M. A., & Aslam, A. (2016). Financial inclusion and its implications for inclusive growth in Pakistan. *Pakistan Economic and Social Review*, *54*(2), 297.