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Studies on Financial Inclusion in Africa

By

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A Doctoral Thesis Submitted in Fulfillment of the Requirements for the Award of Doctor of Philosophy Degree in the Field of Finance

The Graduate School of Business Administration, University of the Witwatersrand

Supervisor: Professor Jones Odei-Mensah

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PAPERS UNDER REVIEW

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ABSTRACT

Financial inclusion has recently been an important concern for policy makers and researchers due to its relevance to the financial system, poverty reduction and the growth of economies. In spite of the enormous policy relevance of financial inclusion, empirical evidence on this nexus suffers many limitations in findings and measurement, particularly the measurement of financial inclusion and financial development. Significantly, the context of Africa where financial exclusion is more pronounced remains relatively less explored in the financial inclusion-financial stability nexus, a void this study intends to fill. Using Africa as a case, this thesis consists of four self–contained chapters with each investigating a critical gap relying on several advanced econometric techniques.

In the first essay, we investigate the influence of financial inclusion on financial development in Africa using data from 22 African countries over a 12-year period, from 2007 to 2018. We investigate this relationship using the Generalized Method of Moments (GMM) approach to panel data. We find financial inclusion, measured with the financial inclusion index, to be significant and positively related to financial development, measured with the financial development index. However, employing single measures of financial development as dependent variables, we find financial inclusion to exert an insignificant effect on financial development. In conclusion, using indexes to measure financial inclusion and financial development provide a more comprehensive measure which provides robust findings that can effectively assist policy makers in designing initiatives and strategies.

In the second essay, we examine the indirect effect of financial inclusion in the relationship between financial development and income inequality in Africa using the three-stage least squares (3SLS) approach with data that covers a 12-year period, from 2004 to 2015. We find financial development to indirectly exert a negative effect on income inequality in Africa. However,

financial development eventually reduces income inequality as financial services are extended to the marginalized as the sector further develops. The main conclusion is that, financial inclusion is essential in the achievement of income equality in Africa.

The third essay investigates the impact of financial inclusion on stability in the African banking system. We employ the quantile regression approach to examine this relationship with data from 22-African countries over a 12-year period, from 2004 to 2015. We provide comprehensive evidence that greater financial inclusion enhances the stability of the African banking system. Although financial inclusion enhances the stability of banks at all levels of stability, our finding shows that, the impact of financial inclusion on stability is more pronounced in highly stable banking systems. Nonetheless, financial inclusion also enhances the stability of banks in relatively less stable banking systems. We conclude therefore that, with a more inclusive financial sector, banks enjoy greater stability.

In the final essay, we investigate the non-linear relationship between financial inclusion and economic growth in Africa, with investment as the mediating/threshold variable. We employ the Hansen's sample splitting approach to examine this relationship. We provide evidence that, investment does not only significantly influence the relationship between financial inclusion and economic growth, but also, the level of investment in the country is important in determining the sign and magnitude of this effect. Specifically, we find that, below the threshold level of investment, financial inclusion exerts a negative and significant influence on economic growth whereas above the threshold level of investment, financial inclusion affects economic growth positively and significantly. We conclude that, for financial inclusion to affect economic growth positively, the level of investment in the country must be equal to or exceed a threshold level of investment identified in this study.

Keywords: Financial Inclusion, Financial Development, Income Inequality, Bank Stability, Investment, Economic Growth, Threshold.

JEL Classifications: C23, C26, D63, E44, G21, I31, O11, O43, O47.

DECLARATION

I, Kwasi Poku, hereby declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in fulfillment of the requirements for the award of Doctor of Philosophy degree in the field of Finance at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.



Kwasi Poku

Signed at ……. Wits Business School (WBS) …….

On the …… day of …… 2022.

DEDICATION

I dedicate this work to my mum, Mrs. Cecilia Poku and my late father, Mr. Benjamin Sebastian Poku.

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LIST OF ABBREVIATIONS

3SLS – THREE STAGE LEAST SQUARES

AfDB – AFRICAN DEVELOPMENT BANK

AFI – ALLIANCE FOR FINANCIAL INCLUSION

AR – AUTOCORRELATION

ARDL – AUTOREGRESSIVE DISTRIBUTED LAG

ATMS – AUTOMATED TELLER MACHINES

BRICS – BRAZIL, RUSSIA, INDIA, CHINA AND SOUTH AFRICA

CGAP – CONSULTATIVE GROUP TO ASSIST THE POOR

DOLS – DYNAMIC ORDINARY LEAST SQUARES

ECM – ERROR CORRECTION MODEL

FI – FINANCIAL INCLUSION

FINTECH – FINANCIAL TECHNOLOGY

FMOLS – FULLY MODIFIED ORDINARY LEAST SQUARES

G20 – THE GROUP OF TWENTY

GDP – GROSS DOMESTIC PRODUCT

GMM – GENERALIZED METHOD OF MOMENTS

GPFI – GLOBAL PARTNERSHIP FOR FINANCIAL INCLUSION

ICT – INFORMATION AND COMMUNICATION TECHNOLOGY

IMF – INTERNATIONAL MONETARY FUND

LDCS – LEAST DEVELOPED COUNTRIES

MENA – MIDDLE EAST AND NORTH AFRICA

MFIS – MICROFINANCE INSTITUTIONS

OIC – ORGANIZATION OF ISLAMIC COOPERATION

OLS – ORDINARY LEAST SQUARES

PCA – PRINCIPAL COMPONENT ANALYSIS

PVAR – PANEL VECTOR AUTOREGRESSION

QR – QUANTILE REGRESSION

SAARC – SOUTH ASIAN ASSOCIATION FOR REGIONAL COOPERATION

SME – SMALL AND MEDIUM ENTERPRISES

SSA – SUB-SAHARAN AFRICA

SUR – SEEMINGLY UNRELATED REGRESSION

VAR – VECTOR AUTOREGRESSION

CHAPTER ONE

INTRODUCTION

1.1. Background to the Study

Many governments and development partners continue to make strides in the regulatory and policy fronts in collaboration with financial institutions to deliver a more inclusive financial environment that supports inclusive growth, economic development and financial deepening (Vo et al., 2020). The development of the financial system has been noted as an important precursor to fostering financial inclusion, with increased levels of financial inclusion also expected to engender greater financial development. Conceptually, financial development and financial inclusion are complementary (Hlophe, 2018; and Anarfo et al, 2019). Hlophe (2018) asserts that the development of the financial sector helps to improve financial inclusion as size is a component of the dimensions of financial development.

When financial institutions become larger, they necessarily strive to reach out to as many clients as possible to support their growth agenda. At the same time, when more people get included in the financial system, financial institutions develop capacity to meet the growing numbers and the associated needs, thereby enhancing financial sector development (Hlophe, 2018). A similar argument has been put forward by Anarfo et al (2019) who posit that financial development is enhanced by increased financial inclusion as the former relies on the number of people who have access to financial services, and the development of the financial system creates the avenue for financial inclusion.

Related to the concept of financial development-financial inclusion nexus is the role of financial inclusion in the relationship between financial development and income inequality. Financial development has long been identified as a conduit for bridging the rich-poor divide as it provides

the avenue for the poor and the marginalized to get financially included, get access to credit and engage in meaningful economic activities that help to narrow the income disparity (Bittencourt et al, 2019; Altunbas and Thornton, 2019; and Jung and Vijverberg, 2019). The nature and extent of the impact of financial development on income inequality, however, is far from clear, both from theoretical and empirical perspectives.

Three theoretical perspectives exist on the relationship between financial development and income inequality (Baiardi and Morana, 2018). One of them, following the works of Becker and Tomes (1979), Banerjee and Newman (1993) and Galor and Zeira (2004), hypothesizes that when there is increased financial development, income inequality reduces as more people gain access to the financial system and obtain credit for business and other economic activities. The second theoretical perspective, following the works of Haber (2004) and Lamoreaux (1995), hypothesizes that increased financial development rather worsens the income inequality situation. The argument is that, when there is increased financial development, it rather enhances services provided to those who already have access to the financial system as opposed to being extended to fresh clients. As a result, inequality widens further. The third theoretical perspective, following the work of Greenwood and Jovanovic (1990), hypothesizes that the interrelation between financial development and income inequality is rather an inverted u-shape. The argument is that at the beginning of financial development, only the privileged have access to credit and so the inequality situation worsens but as the economy grows, more people get included and they can also access credit which helps to narrow inequality in income (Baiardi and Morana, 2018; and Jung and Vijverberg, 2019).

Beyond the welfare spectrum is the argument in the literature that the financial institutions themselves require financial inclusion for their own stability. The theoretical foundation of this

burgeoning literature is multi-faceted. One of the theoretical paradigms is to the effect that banks are able to mobilize cheaper and stable retail deposits by reaching out to more retail customers as opposed to the reliance on wholesale funding sources that tend to be volatile in crisis periods in particular (Ahamed & Mallick 2019; Neaime & Gaysett 2018; Han & Melecky 2013; Hannig & Jansen, 2010). The argument is that banks, in addition to deposits, also borrow (wholesale funding sources) to on-lend. These wholesale sources dry up during financial crisis period with consequential effect on the liquidity and stability of these banks (Hannig & Jansen, 2010). A related argument is that institutional and wholesale depositors tend to be more informed than the retail depositors and therefore more likely to spot stress signals and make substantial withdrawals that exacerbate the weak positions of these banks and their stability invariably. By reaching out to numerous retail depositors, banks can garner more stable retail deposits that foster liquidity and stability (Huang & Ratnovski, 2011; Demirguc-Kunt & Huizinga, 2010).

The other theoretical paradigm postulates that by increasing the proximity with clients, banks are able to reduce information asymmetry, which strengthens the financial system. Additionally, by increasing clientele base through financial inclusion, banks can reduce operational cost by spreading it over a large number of clientele base. The cost reduction is even more prominent when the banks adopt innovative and low-cost financial delivery models in today's technological world to serve large clientele base. Significantly, by creating a larger clientele base, the banks are able to diversify their operations and lending into different sectors of the economy (see Beck et al 2011; Demirguc-Kunt et al 2008).

It is increasingly becoming an axiom that Financial Inclusion (FI) fosters economic growth. Theoretically, FI impacts economic growth through investment. FI spurs on investment when the previously excluded individuals now get access to credit and embark on numerous economic

activities. Integration of finance facilitates accessibility to resources in finance and quicker activity in the economy. The exclusion of certain groups from accessing financial resources may have unfavorable effects on various parts of the economy (Huang et al., 2021). Thus, as more people get included in finance, they are able to access financial services and products such as credit which encourages investment in real productive activities. This further translates into a higher level of output and subsequently leads to economic growth. Investment therefore performs a key function in the connection between FI and growth in economies.

Nanda and Kaur (2016) posit that, FI enhances economic growth by creating value from small businesses which spills over positively on human development factors such as health and education; contributing to a decrease in inequality and poverty. Nonetheless, Madichie et al (2014) posit that, output growth in an economy cannot be possible without the combined role of investment and human capital which are made possible through improved accessibility to financial products and services as per conventional wisdom. The roles played by human capital and investment in the development and growth of an economy cannot be underestimated, in research and in practice.

Although some authors (Hajilee et al, 2017; and Inoue and Hamori, 2016) have controlled for investment as one of the regressors in line with standard neoclassical growth equation, the nature of the theoretical foundation in the context of inclusion-growth nexus necessarily makes investment a conduit through which inclusion impacts growth. To treat inclusion and investment as separate regressors in inclusion-growth nexus is to obscure the theoretically prescribed mediating role of investment, which necessarily runs counter with the theoretical foundation of the very relationship they seek to study.

1.2. Statement of the Problem

1.2.1. Financial Development and Financial Inclusion

In spite of the enormous policy relevance of financial development in promoting financial inclusion as espoused earlier, empirical evidence on the nature and extent of the relationship is surprisingly limited (Anarfo et al, 2019). To the best of our knowledge, the studies that relate to financial inclusion and financial development are Allen et al (2014), Olaniyi (2015), Hlophe (2018) and Anarfo et al (2019). However, these studies suffer a number of limitations. A common limitation of these studies lies in the measurement of financial development. These studies used credit to the private sector as a percentage of GDP to measure financial development although additional measures such as ratio of liquid liabilities in the banking system to GDP (Allen et al (2014) and money supply as a percentage of GDP (Olaniyi, 2015) were also used. However, these measures, as argued by Svirydzenka (2016), only capture the depth of the financial system to the neglect of the other dimensions of financial development such as access and efficiency. Meanwhile, policymakers require an accurate understanding of the relationship between financial development and financial inclusion and so to measure financial development on the basis of one dimension is to confound the true relationship between financial development and inclusion.

Additionally, the work of Allen et al (2014) in particular fell short of the nexus between financial development and financial inclusion as they considered the determinants of financial development and financial inclusion, and whether financial inclusion and financial development disparities (gaps) existed between African countries and other regions in the category of developing countries. Moreover, with the exception of Anarfo et al (2019), the measure of financial inclusion by Allen et al (2014), Olaniyi (2015) and Hlophe (2018) is problematic as these authors used single

measures of financial inclusion when the concept involves multi-layered dimensions that prevail concurrently.

Following the work of Svirydzenka (2016), we use a more representative measure of financial development that encompasses depth, efficiency and access and a more comprehensive measure of financial inclusion (using an index) that takes usage and access into consideration in our study of Sub-Saharan Africa where financial development and financial inclusion fall behind their counterparts in other regions of the world. The new comprehensive measure of financial development by Svirydzenka (2016), despite its appeal and usage in the financial development-growth nexus, has not been applied in the context of financial development-financial inclusion nexus, making our study the first in this context. To deal with endogeneity issues, given the possible reverse causality between financial development and financial inclusion, we employ the generalized method of moments (GMM) in a panel setting.

The choice of the estimation technique adds to the contributions of our study as previous studies on the financial inclusion-financial development nexus have used techniques such as ordinary least square (Allen et al, 2014) and fully modified ordinary least squares (Planiyi, 2015) which fail to deal with endogeneity problems. Hlophe (2018) used granger causality test which is limited to two variables but we argue that other control variables such as economic growth, income per capita and human capital development play a significant role in the nexus between financial inclusion and financial development. Although Anarfo et al (2019) used panel vector autoregressive approach (PVAR) which deals with endogeneity, it has a limitation that it fails to capture targeted and systematic policy on financial inclusion and financial development because VAR only captures unexpected changes.

1.2.2. Financial Development, Financial Inclusion and Income Inequality

Although financial development is theoretically supposed to impact income inequality indirectly through financial inclusion, empirical literature has tended to ignore this intermediary role of financial inclusion and considered a more direct financial development-income inequality nexus, an approach that is not only far from theoretical stipulations but also a potential source of the inconclusive results obtained in the literature. Intuitively, financial development can only be meaningful to the poor and reduce inequality when the poor get included in the financial system.

We therefore consider an indirect approach, for the first time in the empirical literature, to the study of the financial development-inequality relationship in line with the theoretical underpinnings in the context of Africa. Africa is home to not just high poverty levels and significant income disparities, but also a sub region with relatively less developed financial systems and high levels of financial exclusion. We use the three stage least square approach by specifying a system of simultaneous equations that consider the effect of financial development on financial inclusion and the eventual effect on inequality. Given the possible reverse causality between financial development and financial inclusion with consequential endogeneity problem, our chosen estimation approach is capable of surmounting such endogeneity issues.

1.2.3. Financial Inclusion and Financial Stability

Even though the empirical literature on financial inclusion-financial stability nexus is growing, the results remain inconclusive. Whiles a greater number of these studies find that higher levels of financial inclusion enhance bank level stability (Neaime & Gaysett, 2018; Morgan & Pontines, 2014; Cull et al 2012; Hannig & Jansen, 2010), other studies find a negative relationship (Sahay et al, 2015; Amatus & Alirez, 2015; Mehrotra & Yetman, 2015). We argue that a fundamental flaw in the measurement of financial inclusion is at the heart of the inconclusiveness. Whereas

some authors use the number of bank accounts per 1,000 adults, number of SME borrowers to total borrowers and ratio of outstanding SME loans to total loans which relate to usage (Siddik & Kabiraj, 2018; Morgan & Pontines, 2014), others use the number of bank branches or ATMs per 1,000 adults which relates to access (Neaime & Gaysett, 2018; Evans, 2016; Mbutor & Uba, 2013). Meanwhile, financial inclusion encompasses usage and access.

To measure the concept of financial inclusion as either usage or access is to wrongly capture the multidimensionality of the concept. Indeed, even each of the usage and access sub dimensions have different measures and existing literature has largely dwelled on single measures of either of these sub dimensions. Meanwhile, getting the measurement right is critical for policy purposes. We therefore use an index of different measures of financial inclusion across the usage-access divide. Although few authors have used similar indices (Anarfo et al, 2020; Anarfo et al, 2019; Lenka & Bairwa, 2016), they are in the context of financial inclusion-financial regulation and financial inclusion-monetary policy nexus. The only study in the context of financial inclusion-financial stability nexus that has used an index, to the best of our knowledge, is the work of Ahamed and Mallick (2019) but they used a single measure of inclusion from the dimension of access and a single measure of inclusion from the dimension of usage, a limitation the authors concede in their work.

Additionally, the empirical literature on the inclusion-stability nexus on Africa is substantially limited. To the best of our knowledge, the only studies in the African context are Ahmad, 2018; Siddik & Kabiraj, 2018; Ackah & Asiamah 2016; Amatus & Alireza, 2015; Aduda & Kalunda, 2012. These studies, like their counterparts on the advanced economies, suffer the measurement problems. Importantly, the limited studies on Africa is puzzling given that it is the sub region where financial exclusion is more pronounced. In terms of account penetration for instance, the

number of people over 15 years of age who hold a bank account in Sub-Sahara Africa is an average of 24% compared to 89% in high-income countries, 55% in Pacific and East Asia, 45% in Central Asia and Europe, 39% in Caribbean and Latin America, and 33% in Southern Asia (Allen et al, 2016).

Importantly, it is also in Africa where financial institutions and markets are relatively less developed with the banking sector as the main source of funding for firms and individuals. The stability of banks in the African countries therefore is even more critical relative to the advanced economies where alternative financing sources exist. We therefore focus on financial inclusion-financial stability in the context of Africa where financial exclusion is more pronounced and where the banking sector is the major lifeline of the financial systems of these countries. In doing so, we use the quantile regression technique to capture inherent asymmetry in the bank stability measure. The bank z-score has been widely used in the literature to measure bank stability (Anarfo et al, 2020; Siddik & Kabiraj, 2018; Dwumfour, 2017; Čihák, Mare & Melecky, 2016; Morgan & Pontines, 2014). A key component of the measure of the bank z-score is return on assets. Returns necessarily exhibit tail dynamics as they swing between extreme losses and extreme profitability during crisis and boom periods respectively. To use approaches based on the mean, as in the literature (with the exception of Ahamed and Mallick, 2019), is to ignore these tail dynamics which have the greatest effect on bank stability.

1.2.4. Financial Inclusion, Investment, and Economic Growth

In spite of the theoretically prescribed mediating role of investment in the link between financial inclusion and economic growth, literature has basically approached the nexus in a manner that ignores investment. Few authors (Hajilee et al, 2017; and Inoue and Hamori, 2016) have included investment as one of the regressors in line with standard neoclassical growth equation. Much as

such an approach of controlling for investment as one of the regressors is standard in growth theories, it is far from the theoretical stipulation in the context of the interrelation between financial inclusion and economic growth. To treat inclusion and investment as separate regressors in inclusion-growth nexus is to obscure the theoretically prescribed mediating role of investment, which necessarily runs counter with the theoretical foundation of the very relationship they seek to study. The findings, as a result, are far from conclusive.

We argue that the effect of financial inclusion on economic growth would be incomplete without examining its linkages with investment as per the theoretical stipulations. Indeed, such a neglect of the important role of investment in the relationship between financial inclusion and economic growth may well be the source of the conflicting findings in the literature. This study makes a case for investment in the financial inclusion-growth nexus by incorporating investment as a threshold variable. The dire implications of financial exclusion leading to lower investment which further translates into lower economic growth warrants a study like this which provides a deep understanding of the linkage between financial inclusion, investment and economic growth. This undoubtedly has crucial implications for policy. This study makes a contribution to literature by employing investment as a channel through which inclusion may influence economic growth. The presence of the threshold level provides vital implications for policy which requires authorities to formulate effective strategies to adjust the degree of investment and FI to enhance economic growth.

1.3. Research Objectives

- Examine the relationship between financial development and financial inclusion by considering a more comprehensive measure of financial development and financial inclusion in the context of Africa.
- Consider an indirect approach to the examination of the relationship between financial development and income inequality by controlling for the role of financial inclusion.
- Assess the effect of financial inclusion on various quantile distributions of banking stability.
- Examine threshold effects in the nexus between financial inclusion and economic growth in Africa.

1.4. Research Questions

Following the problem statement, this study seeks to answer the following questions:

- What is the relationship between financial development and financial inclusion in Sub-Saharan Africa? Does the measurement of financial development and financial inclusion matter?
- Does financial inclusion matter in the financial development-income inequality nexus?
- How does financial inclusion influence the stability of banks at various quantile distributions of stability in Africa? Does the measurement of financial inclusion matter in the financial inclusion-financial stability nexus?
- Does investment matter in the relationship between financial inclusion and economic growth? Is there a threshold effect of investment in the nexus between financial inclusion and economic growth?

1.5. Significance of the Study and Contributions to Knowledge

The empirical literature on the relationship between financial development and financial inclusion is not only limited but the few studies also suffer measurement problems in respect of these two important concepts. Meanwhile, getting the measurement of the concepts right is as critical as the achievement of these development goals to inform the right policy. We situate our work in this context as we use comprehensive measures of financial development and financial inclusion. The contributions of this study in respect of the relationship between financial development and financial inclusion is twofold. First, we follow the work of Svirydzenka (2016) and use the financial development index recently released by the IMF as our measure of financial development. This is a more comprehensive measure of financial development as it encompasses depth, access and efficiency. Prior studies have used Private sector credit to GDP (Allen et al. 2014) and ratio of liquid liabilities in the banking system to GDP (Evans, 2015). These measures only capture the depth of the financial system to the neglect of other dimensions of the financial system.

Our study also contributes through a new measure of financial inclusion, by employing an index of financial inclusion. This index uses multidimensional factors of inclusion, that is, supply and demand-sides of financial inclusion. There are several weaknesses in the previous measures for financial inclusion. The non-parametric method which calculates the weights of the dimensions of the index results in possible biases (Camara & Tuesta, 2014). Also, the use of just the supply-side indicators proves inadequate for measuring the actual level of financial inclusion across countries (Abd Rahman, 2016). Our study, therefore, uses the two sides of inclusion in the creation of a new comprehensive financial inclusion index.

Again, given the possible reverse causality between financial development and financial inclusion, we deal with endogeneity issues by employing the GMM technique in a panel setting. The choice of GMM adds to our contribution because prior studies on the financial inclusion – financial development nexus have used techniques such as OLS (Allen et al, 2014) and FMOLS (Evans, 2015). Others have used PVAR (Anarfo et al, 2019) which deals with endogeneity issues. The PVAR however suffers a limitation in that targeted and systematic policy on financial inclusion and financial development cannot be captured by PVAR.

Despite theoretical stipulations to the effect that financial development is supposed to indirectly impact income inequality through financial inclusion, empirical literature has tended to ignore this intermediary role of financial inclusion and considered a more direct financial development-income inequality nexus, an approach that is not only far from theoretical stipulations but also a potential source of the inconclusive results obtained in the literature. Intuitively, financial development can only be meaningful to the poor and reduce inequality when the poor get included in the financial system.

Moreover, whereas a reasonably robust connection has been documented between financial development and economic growth, policymakers are also concerned about how the benefits from higher growth in the economy are distributed. This study provides meaningful insights on how financial development affects income distribution. Given public interests on income distribution, policymakers should be interested in knowing how policies affect both economic growth and income distribution. Further, this study provides a context through which finance can be used as an instrument to affect income inequality, which has largely been ignored in the literature. Financial inclusion is used in this study to provide a context through which financial development

can be used as a tool to reduce income inequality. Insights from this study will guide policymakers concerning the policies to implement in order to reduce the widening income gap in Africa.

Much as the empirical literature on financial inclusion and bank stability is growing, the results remain inconclusive. This study contributes greatly to literature by employing an advanced econometric technique, quantile regression, to the study of the inclusion-stability nexus. The estimation method employed helps to capture the influence of inclusion at various quantile levels of bank stability in Africa. The use of the quantile regression technique provides an avenue for tailored policies across the African region. Most studies on stability in Africa provide general recommendations for all economies, ignoring the different stability levels among countries. A clear understanding of this link is of immense managerial and economic importance for inclusive financial development and growth. Policies can then be made with reference to the level of stability in a country. Also, this study contributes to the literature on the determinants of financial stability, focusing solely on the African region where empirical evidence on the influence of financial inclusion and stability has been scanty.

Although theory stipulates that financial inclusion enhances economic growth by encouraging investment in the economy, literature has basically approached the nexus in a manner that ignores investment. This paper makes several contributions to policymaking and to current empirical literature in the following ways. Foremost, to policymakers, the threshold analysis is essential in determining the channel through which financial inclusion influences economic growth in Africa. Past studies such as Kim et al. (2018) have alluded to a linear association between financial inclusion and economic growth even though the relationship may also be non-linear (Nizam et al., 2020). This study makes a contribution to literature by employing investment as a channel through which inclusion may influence economic growth. The presence of the threshold level provides

vital implications for policy which requires authorities to formulate effective strategies to adjust the degree of investment and financial inclusion to enhance economic growth. By knowing the potential influence and the right investment threshold point, policymakers will be able to devise strategies that can ensure that financial inclusion benefits the economy.

1.6. Structure of the Thesis

The entire thesis report consists of four self–contained chapters with each investigating a critical gap relying on several advanced econometric techniques. Chapter two investigates the influence of financial inclusion on financial development in Africa. Chapter Three examines the indirect effect of financial inclusion in the relationship between financial development and income inequality. This chapter critically assesses the role of financial inclusion in reducing income inequality. In chapter four, we investigate the impact of financial inclusion on stability in the African banking system. Chapter five provides an empirical touch to the role of investment in the nexus between financial inclusion and economic growth in Africa. Chapter six concludes the research with some key implications and recommendations for policy. It also presents avenues for further research efforts.

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CHAPTER 2

FINANCIAL INCLUSION AND FINANCIAL SECTOR DEVELOPMENT

2.1. Introduction

Financial sector development is noted as an important precursor to fostering financial inclusion, with higher levels of financial inclusion also expected to engender greater financial development. Conceptually, development of the financial sector and financial inclusion are complementary (Hlophe, 2018). Hlophe (2018) asserts that financial sector development helps to improve financial inclusion as size is a component of the dimensions of financial development. When financial institutions become larger, they necessarily strive to reach out to as many clients as possible to support their growth agenda. At the same time, when a lot of people get involved in the financial system, financial institutions develop capacity to meet the growing numbers and the associated needs, thereby enhancing financial sector development (Hlophe, 2018). A similar argument has been put forward by Anarfo et al (2019) who posit that financial development is enhanced by increased financial inclusion as the former relies on the number of people who have access to financial services, and the development of the financial system creates the avenue for financial inclusion. Thus, there is the presence of an interdependence between financial inclusion and financial development in the empirical and theoretical literature (Anarfo et al, 2019; Hlophe, 2018).

Mohan (2006) postulates that a well-developed financial system broadens access to credit, thus increasing financial inclusion, whereas an underdeveloped financial system limits access to credit and may even constrain others from accessing their own funds. This suggests that, financial sector deepening and overall development in the financial system expands the accessibility of financial products and services to the marginalized, which in turn contributes to economic growth through

increased economic activities, termed by (Hlophe, 2018) as the extrapolative power of financial sector development in enhancing economic growth.

Allen et al (2016) argue that, increased financial inclusion is linked to lower cost of accounts, more closeness to financial intermediaries, tougher legal rights, and more stable political environments. It follows then, from this assertion, that, financial inclusion helps to improve cost efficiency in the financial sector, whiles positively influencing the overall legal and political environment of an economy. Other benefits of holding bank accounts include an increase in entrepreneurs' savings, consumption and productive investment. Owing to these and many other benefits, leaders around the world have dedicated and increased their efforts to meet the rising challenge of improving financial inclusion and financial sector development consequently. Hlophe (2018) opines that a system that is financially inclusive is suggestive of a financial system that is growing in efficiency and cost effectiveness. Studies that focus on the financially excluded in the United States of America (U.S.A), (Lusardi, 2010) have argued that not possessing bank accounts can have wide range of adverse effects including liquidity management and payment difficulties, and a reduction in the capacity to build wealth. There is now a recognition by policy makers of the significance of accessing finance by the marginalized as a device for social cohesion and alleviation of poverty. Evans (2015) notes that, accessing finance helps poor people in saving and borrowing, allows them to gain assets, make educational investments, and empowers small and medium-sized businesses to effectively utilize promising growth opportunities.

In spite of the information on the numerous advantages of financial inclusion, financial inclusion still remains a major challenge in economies of the world, especially in Africa. For instance, even though over 40% of the population in Sub-Sahara Africa saves regularly, only half of the 40% have providers of financial services at their disposal (Evans, 2015). As a result of concerns by the

G20 and other international forums, financial inclusion has received increased policy interest over the past decade (Evans, 2015). Johnson & Arnold (2012) also note a shift in policy focus from financial development to financial inclusion. This is owed largely to the increased recognition of the contribution of financial inclusion to the development of the financial system and the economy as a whole. Nonetheless, a shift in policy focus without assessing the interrelation between financial development and financial inclusion could be detrimental due to the role played by financial development in financial inclusion. Evans (2015) argues that, aside policy interests, financial inclusion performs a key function in poverty reduction and the promotion of growth in all essential theories of development.

Allen et al (2014) examined financial development and financial inclusion gaps in Africa and found a strong link between financial sector development and growth of the economy. The authors used the following five indicators as proxies for financial inclusion; commercial bank accounts per one thousand adults, commercial bank borrowers per one thousand adults, adult percentage using mobile phones to transfer money, receive money and pay bills. They found population density to be more important for financial development and inclusion in Africa than in all other regions of the world. Similarly, Evans (2015) examined the influence of economic and financial sector development on Africa's financial inclusion using the number of commercial bank depositors per 1000 adults as a financial inclusion proxy, and credit to private sector as a percentage of GDP as a financial development measure. The author found economic and financial sector development to positively influence financial inclusion. However, economic development was observed to exert a much stronger influence. Hlophe (2018) investigated the association between development of the financial sector and financial inclusion in Eswatini. Employing granger causality test, the author found development of the financial sector to granger cause financial inclusion. Using a financial

inclusion index, Anarfo et al (2019) opine that financial inclusion and financial sector development granger cause each other in Sub-Saharan Africa (SSA).

Despite the relevance of financial sector development in promoting financial inclusion and the realization of this sustainable development goal, empirical evidence on the conduct and scope of the link between financial development and financial inclusion is substantially sparse, an observation also made by Anarfo et al (2019). Importantly, the few studies suffer some limitations ranging from the measure of financial development and financial inclusion, to the estimation techniques used. With regards to the financial development measurement, Svirydzenka (2016) acknowledges this challenge and has developed an index of financial development. Svirydzenka (2016) argues that, since the 1970's, financial development has been approximated by two variables which measure financial depth – ratio of private credit to GDP, and stock market capitalization as a percentage of GDP. The development of this index has been necessitated by the fact that financial development is multidimensional and covers financial depth, efficiency and access.

The contributions of this study in respect of the association between financial sector development and financial inclusion is twofold. First, we follow the work of Svirydzenka (2016) and use the financial development index recently released by the IMF as our measure of financial development. This is a more comprehensive way of measuring financial development as it encompasses access, depth and efficiency. Prior studies have used Private sector credit to GDP (Allen et al. 2014) and ratio of liquid liabilities in the banking sector to GDP (Evans, 2015). These measures only capture the financial system's depth to the neglect of other dimensions of the financial system. We also contribute to the financial inclusion – financial development nexus by employing a financial inclusion index which is a more representative proxy for financial inclusion.

The use of the PCA technique to compute an index reduces the dimensionality of datasets, increases interpretability while at the same time minimizing information loss. This makes the use of an index better than single measures.

Second, given the possible reverse causality between development of the financial system and financial inclusion, we deal with endogeneity issues by employing the GMM technique in a panel setting. The choice of GMM adds to our contribution because prior studies on the financial inclusion – financial development nexus have used techniques such as OLS (Allen et al, 2014) and FMOLS (Evans, 2015) which fails to deal with endogeneity issues. Others have used PVAR (Anarfo et al, 2019) which deals with endogeneity issues. The PVAR however suffers a limitation in that targeted and systematic policy on financial inclusion and financial system development cannot be captured by PVAR. In Panel VAR, all variables are classified as endogenous and interdependent. As a result, the independent effects of other important macroeconomic variables are ignored when the Panel VAR is used, providing only a narrow picture to policy makers. The use of GMM in this study allows the inclusion of exogenous and independent variables which helps to provide more insight for policy making. According to Canova and Ciccarelli (2013), the large dimension of panel VARs typically makes the curse of dimensionality an issue especially when researchers are interested in examining the input-output links of a region, such as Latin America, or an area, such as the Euro area, where the time series dimension of the panel is short. The GMM, however, allows the consistent estimation of short panels.

Even though Anarfo et al (2019) examine the relationship between financial development and financial inclusion, our study differs from their study in various ways. Anarfo et al (2019) uses Panel VAR to examine the relationship between financial development and financial inclusion without controlling for the many other factors that influence this relationship. The literature is,

however, tilting towards identifying the factors explaining the differences in financial sector development, as noted by Ibrahim and Sare (2018). In the case of Africa, the financial systems are relatively underdeveloped and thin with the level of underdevelopment attributed to informality, weak governance, political and economic instability (Beck and Honohan, 2007), lack of institutional quality (Singh et al., 2009). It is pertinent, therefore, to control for these factors to provide a broader understanding on the subject.

The remaining of this chapter is organized as follows: the next section presents a background on financial inclusion/exclusion in Africa; Section 2.3 presents a review of the measures of financial inclusion while Section 2.4 reviews extensive literature on financial inclusion, financial sector development and income inequality linkages. Section 2.5 examines the nexus between financial inclusion and financial sector development. Section 2.6 provides the methodology while Section 2.7 presents the findings. Section 2.8 provides policy implications and recommendations while Section 2.9 provides a conclusion to the chapter.

2.2. Financial Inclusion/Exclusion in Africa

In the last two decades, the coverage of financial systems and institutions has gained much momentum globally (Anarfo et al., 2019). Sinclair (2013) views financial inclusion as how financial services in an economy incorporate low-income earners and the vulnerable in such a way that they are not marginalized from accessing financial products and services. In its most basic definition, Zins and Weill (2016) define financial inclusion as the fact that an individual possesses an account at a recognized financial institution. Such accounts allow the saving and borrowing of money formally, to purchase insurance or use payment services.

Similarly, the financial exclusion literature defines it in the setting of a bigger issue of socially excluding certain groups from the mainstream of the community. Leyshon and Thrift (1995) refer

to financial exclusion as the processes that work to prevent particular social groups and peoples from getting access to the mainstream financial system. Carbo et al. (2005) defines financial exclusion as mainly the incapacity (however occasioned) of certain groups in the society to gain access to the formal financial system. According to Conroy (2005), financial exclusion is a development that limits certain poor and underprivileged groups in the society from getting access to the mainstream financial system of their respective countries. Likewise, Mohan (2006) views financial exclusion as signifying the deficiency of access by some parts of the community to access, low-cost, reasonable and safe products and services from formal financial service providers.

Thus, the conceptual and functional definitions of financial inclusion and exclusion provide a suggestion that financial exclusion happens largely among individuals who operate at the margins of society. Further, the financial inclusion literature (Sarma, 2008) has also satisfactorily noted that the phenomenon is a complex one, with many dimensions including access, availability and usage. Therefore, a proper measure of financial inclusion must reflect this multidimensionality.

Globally, 62 percent of adults worldwide are deemed to own accounts with formal or mainstream financial institutions, either at banks or with mobile money providers (Demirgüc-Kunt et al., 2015). Global account ownership has however, increased from 51 percent to 76 percent between 2011 and 2021 (Demirgüc-Kunt et al., 2022). Ownership of accounts has been significantly increasing among the developing nations, showing 54 percent of the total population in 2014, particularly due to banking innovations such as mobile banking (Demirgüc-Kunt et al., 2015). Account ownership continues to increase in developing economies albeit at different rates (Demirgüc-Kunt et al., 2022). There have been some improvements in the number of formal account ownership in developing economies in recent times. 71 percent of adults in developing

economies now have a formal financial account, compared to 42 percent a decade ago (Demirgüc-Kunt et al., 2022).

Inadequate access to mainstream financial services is a particular concern in the economy of many African countries (Evans, 2016). Beck and Cull (2015) observe that African banking sectors are not very inclusive compared to other regions. Although formal account ownership has increased from 29% (2014) and 33% (2017) to 40% (2021), sub-Sahara Africa (40%) and the MENA region (52%) still have the lowest percentage of formal account ownership in the world (Demirgüc-Kunt et al., 2022). Europe and Central Asia have the most inclusive banking sectors (89%). Development of the financial sector has contributed to improving the process of growth but financial products are concentrated in major cities (Mlachila et al., 2013a). Nonetheless, there are current developments which can enhance or in the least, change the state of Africa's financial inclusion. For instance, the introduction of mobile banking and the increasing growth of the economy in many African countries are aiding this course.

The share of adults saving formally has increased over the past decade in both high-income and developing economies by 14 percentage points and 7 percentage points, respectively (Demirgüc-Kunt et al., 2022). In developing economies, especially, sub-Sahara Africa, the increase in formal saving and account ownership is largely driven by the use of mobile money services (Demirgüc-Kunt et al., 2022). Because account ownership is a prerequisite for formal savings, it is no surprise that high-income economies, where account ownership is much higher, on average, than in developing economies, also have a higher average share of adults reporting that they saved formally. In Sub-Saharan Africa, the region in which mobile money account ownership is most widespread, 15 percent of adults, on average - or 39 percent of mobile money account owners - reported having saved using their mobile money account. On average, 26 percent of adults - or

about half of savers - saved formally in 2021 in Sub-Saharan Africa, up from 15 percent in 2017 (Demirgüc-Kunt et al., 2022).

Indeed, in Sub-Saharan Africa, the average share of adults saving using a mobile money account is equal to the share of adults saving at a financial institution, including about one-third (5 percent of adults) who used both a mobile money account and a financial institution account for that purpose. Saving using a mobile money account is especially widespread in Ghana and Kenya, where 37 percent of adults reported doing so, as well as in Senegal and Uganda, where about 30 percent did so. Meanwhile, in Gabon and Zambia between 22 and 26 percent did so, rounding out the list of economies with a mobile money savings share of at least 20 percent (Demirgüc-Kunt et al., 2022).

Throughout the years, countries in Africa have made conscious efforts and improvement towards the advancement of financial inclusion. The achievement of some innovations in financial tools such as mobile money provides great avenues mainly for the poor, young, dwellers in rural communities and small and medium enterprises (SMEs) to be included in the financial system to help reduce poverty (Abor et al., 2018). In 2004, a low-cost bank account termed ‘Mzansi’ was started in South Africa by the South African Banking Association for people who are financially excluded. Between 2014 and 2021, mobile money accounts have contributed to an 8% increase in account ownership in developing economies (Demirgüc-Kunt et al., 2022). In Sub-Saharan Africa in 2021, 55 percent of adults have an account, including 33 percent of adults who had a mobile money account - the largest share of any region in the world and more than three times larger than the 10 percent global average of mobile money account ownership. Sub-Saharan Africa is home to all 11 economies in which a larger share of adults only had a mobile money account rather than a bank or other financial institution account. These 11 economies are Benin, Cameroon, the

Republic of Congo, Côte d'Ivoire, Gabon, Guinea, Malawi, Sierra Leone, Tanzania, Zambia, and Zimbabwe. In 2014, mobile money accounts were concentrated in East Africa. Since then, these accounts have spread to West Africa and beyond, with mobile money account ownership in Gabon (Central Africa) increasing from just 7 percent in 2014 to 57 percent in 2021 and in Uganda (East Africa) from 35 percent in 2014 to 54 percent in 2021.

Demirgüc-Kunt et al. (2022) further note that, from 2017 to 2021, the average rate of account ownership in developing economies increased by 8 percentage points, from 63 percent to 71 percent. The authors cite mobile money as the driving force in account ownership, particularly in Sub-Saharan Africa, where 33 percent of adults have a mobile money account.

2.3. Measuring Financial Inclusion

How financial inclusion is defined and measured has evolved from the classification of individuals and firms as either included or not in a dichotomous division, to the view that financial inclusion is multi-dimensional. For instance, Sarma (2008) established an index of financial inclusion (IFI) that is multidimensional and includes information on three main dimensions of financial inclusion, which are access, usage and availability of banking services. The index is calculated in a way that includes information on the penetration of banking products, availability of formal banking products and services and usage of services in the banking sector, all in a single number that lies between 0 and 1. Financial inclusion has been generally measured along three key dimensions; Access, Usage and the Quality of financial services in a particular region. According to the Alliance for Financial Inclusion, the Access dimension of financial inclusion, also termed supply-side factors, deals with the availability and presence of formal financial services that are regulated, near to users and affordable. The usage dimension of financial inclusion encompasses the actual use of services from the financial sector, thus, regularity, frequency and duration of time used. The

factors in this dimension are usually termed as demand-side factors. The dimension of Quality measures how well financial products are designed to the needs of clients. It further assesses the right segmentation of developing products for all levels of income.

Largely in literature, financial inclusion has been defined and measured along these dimensions and have provided the underpinning for the collection of data. Anarfo et al. (2019) note that financial inclusion is mostly measured with a single variable. Most common among them are the number of ATMs per 100,000 adults, number of commercial bank depositors per 1000 adults and the number of bank branches per 1000 adults (e.g., Evans, 2016; Mbutor & Uba, 2013). These single variable measures capture a dimension of financial inclusion. Anarfo et al. (2019) have recently argued that using single variables to measure financial inclusion is weak and inappropriate.

The data working group of the Alliance for Financial Inclusion endorse some important group of indicators which include key indicators of financial inclusion from both the supply-side (Access) and the demand-side (Usage), formed by and for policymakers. The recent key set of indicators include two aspects of financial inclusion: usage and access. Similarly, the Global Partnership for Financial Inclusion (GPFI) by the G-20 also adapt a group of guiding variables that start with the AFI main group but modifies and adds other indicators. These indicators are shown in Table 2.1.

Table 2. 1. AFI and GPFI Financial Inclusion Indicators

Dimension	Category	Indicator	Source
Access	Capacity to use financial services,	Quantity of points of access per 10,000 adults at country level and grouped by type and important administrative units	AFI

	less barriers in opening accounts		
	Physical proximity Affordability	Share of population that live in administrative units with at least one point of access	AFI
	Service Points	Quantity of branches for every 100,000 adults	GPFI
Usage	Actual use of financial services and products	Quantity of deposit accounts per 10,000 adults	AFI
	Regularity Frequency Length of time used	Quantity of loan accounts for every 10,000 adults	AFI
Usage	Adults who are formally banked	Share of adults with accounts at formal financial institutions	GPFI
		Quantity of depositors for every 100,000 adults OR quantity of deposit accounts for every 100,000 adults	GPFI
Usage	Adults with credit from regulated institutions	Share of adults who have at least one outstanding loan from a regulated financial institution	GPFI
		Quantity of borrowers for every 1,000 adults OR Quantity of loans outstanding per 1,000 adults	GPFI

Usage	Formally banked enterprises	Share of SMEs with accounts at formal financial institutions	GPFI
		Quantity of SMEs who have deposit accounts or quantity of deposit accounts or quantity of SME depositors/number of depositors	GPFI
Usage	Enterprises with outstanding loan or line of credit from regulated institutions	% of SMEs who have outstanding loans or lines of credit	GPFI
		Quantity of SMEs with loans outstanding /quantity of loans outstanding or quantity of loans outstanding to SMEs/quantity of loans outstanding	GPFI

Source: Triki & Faye (2013)

Alliance for Financial Inclusion (2011) notes that, the three aspects of financial inclusion are not restrictive but only wide groupings where indicators can be categorized. The dimensions give a simple outline to serve as a guide to policymakers and researchers in designing a more adequate and robust measurement that mirrors the multiple dimensions of financial inclusion. However, in literature, most studies (Evans, 2016; Mbutor & Uba, 2013) have measured financial inclusion using many single-variable based measures to perform robustness checks. This approach, though good, treats the dimensions of financial inclusion as an 'either or' concept and captures only alternative dimensions or aspects.

Adopting a more broad and multidimensional measurement of financial inclusion is vital for moving past the often-erroneous supposition that financial inclusion will certainly be attained

through either an increase in access or usage of financial services. As an alternative, a more comprehensive understanding and measurement of financial inclusion must show how clients frequently use financial products (Usage), whether the products are effective and meet their needs (Quality) and if customers can easily access financial services and products (Access). Efforts to increase financial inclusion must seek to simultaneously advance these dimensions. Recently, increased attention is being given to the idea of an index of financial inclusion that includes many factors into a combined measurement (Triki & Faye, 2013). Such measures can put together variables and data from supply and demand sides, and across the dimensions of access, usage, and quality to form a complete image of financial inclusion.

This thinking has informed the recent movement of the measurement of financial inclusion to a new broad-based index (Financial Inclusion Index), which captures all the dimensions and serve as a more robust measure of financial inclusion. To overcome the shortcomings of using single indicators as proxies for financial inclusion, recent studies such as Anarfo et al. (2019) and Ahamed and Mallick (2019) have adopted the approach of Sarma (2008) to develop a multidimensional and a more representative measure of financial inclusion. This approach calculates financial inclusion by creating a number of indices that summarizes the financial inclusion dimensions. An index of financial inclusion is then constructed with the use of Principal Component Analysis (PCA) after deriving weights.

2.4. Relationship Between Financial Inclusion and Financial Development

Financial inclusion has been given a lot of attention in the literature in the last two decades primarily because of its immense contributions to socio-economic development. Consequently, increased access to mainstream financial services has now been given priority by central banks and policy makers in both developed and developing economies. Recent studies have revealed that

inclusive finance enhances efficiency in allocating productive resources, eventually reducing the cost of capital (Sarma, 2008); increases savings (Allen et al, 2016); brings down income inequality and reduces poverty (Mushtaq & Bruneau, 2019; Li, 2018).

Allen et al (2014) conducted a study to find out whether there are gaps for financial development and financial inclusion in Africa. Financial development was proxied by ratio of banking sector liquid liabilities to GDP and the ratio of private sector credit to GDP. The authors used the following five variables as proxies for financial inclusion; commercial bank accounts per one thousand adults, commercial bank borrowers per one thousand adults, share of adults who use mobile phones transfer, receive money and pay bills. Using Ordinary Least Squares (OLS), they find a strong link between the development of the financial sector and the growth of the economy.

They also find that population density is substantially more vital for Africa's financial sector development and inclusion than in other regions of the globe. In terms of scope, this study covers Sub-Saharan Africa but there are still weaknesses with regards to the measures of financial inclusion and financial development. Svirydzenka (2016) acknowledges this challenge and has developed an index of financial development. Svirydzenka (2016) argues that, since the 1970's, financial development has been approximated by two proxies of financial depth – the ratio of private credit to GDP, and by capitalization of the stock market as a percentage of GDP. The development of this index has been necessitated by the fact that financial development is multidimensional and covers financial depth, efficiency, access and stability.

Evans (2015) examined the influence of economic and financial sector development on inclusive finance in Africa. The study used number of commercial bank depositors per 1000 adults as a measure for financial inclusion, and credit to the private sector % of GDP as a proxy for development of the financial sector. Using annual data for 44 African nations and applying the

Fully Modified Ordinary Least Squares (FMOLS) estimation technique, they find that economic growth positively influences financial inclusion, suggesting that nations with higher economic growth have more financially inclusive systems. The study also shows that both financial and economic development enhance financial inclusion but the impact of economic development is much stronger.

Using data from the IMF and World Bank from 2004-2015, Hlophe (2018), examined the association between financial sector development and inclusive finance in Eswatini. The authors used the number of ATMs per 100,000 adults as a measure of financial inclusion, and domestic credit to private sector % of GDP as a measure of development in the financial sector. Using cointegration analysis and Granger causality tests, they find that financial inclusion positively affects economic growth through financial development in Eswatini. A fundamental flaw in this study however, is the use of single variables such as the number of ATMs per one hundred thousand adults and domestic credit to the private sector as proxies for financial inclusion and financial development respectively.

Rasheed et al (2016) analyze the part played by financial inclusion in developing the financial sector among 97 countries across the world from 2004 to 2012. The authors used a system generalized method of moments (System GMM) and measured financial inclusion with two single variable proxies; commercial bank branches per one hundred thousand adults and ATMs per one hundred thousand adults. Financial development is proxied by domestic credit to private sector as a bank-level variable and stocks traded turnover ratio as a capital market-based variable. Both of the indicators are shown as a % GDP. The study finds a statistically significant effect of inclusive finance on financial development. On the influence of financial development on financial

inclusion, the capital-market variable, stocks traded turnover ratio, is found to exert no significant influence on financial inclusion.

Moyo (2018) examine the nexus between financial inclusion and financial development in Zimbabwe from 2009 to 2015. Financial development is proxied with domestic credit to the private sector % of GDP which is a measure of the depth of financial institutions and total traded stock market value as a % of GDP. Financial inclusion indicators were ATMs for every one hundred thousand adults, bank accounts for every one thousand adults, commercial bank borrowers for every one thousand adults, bank branches for every one thousand adults and the value of mobile transactions as a % of GDP which is a measure of financial technology innovations. Using correlation analysis and t-tests, the author finds a positive link between financial inclusion and development of the financial sector in Zimbabwe. The author, nevertheless, classifies this positive association as being comparatively weak. The study establishes that, the positive effect is attributed to the banking system's expansion into formerly marginalized and markets that are unbanked. The positive association is also partly due to the rise in the use of financial and mobile technology-based financial products.

In a related study, Anarfo et al (2019) investigate the dynamic relationship between financial inclusion and financial sector development in Sub-Saharan Africa. The authors used the Panel Vector Auto-regressive (PVAR) technique and calculated a financial inclusion index with the use of principal component analysis (PCA). The indicators used in calculating the index are; ATM's per 1000 adults, bank branches for every 100,000 adults, bank accounts per 1000 adults, commercial bank borrowers for every per 1000 adults and commercial bank depositors for every 1000 adults. Financial development was measured by domestic credit by the financial sector as a percentage of GDP. They find the existence of a reverse causality between inclusive finance and

financial sector development in Sub-Saharan Africa (SSA). Even though the scope of their study is wider (SSA), and they computed an index for financial inclusion, using a single variable (private credit to private % GDP) to proxy for development in the financial sector is inadequate.

The empirical literature largely points to a positive association between financial inclusion and financial sector development. However, these empirical works have used diverse proxies for both financial inclusion and financial development, which largely focus on some dimensions of inclusion and development. The measurements for financial inclusion and financial development matter as all their aspects must be captured to better reflect the multidimensional nature of these factors whiles providing accurate and reliable empirical results for policy consideration.

2.5. Financial Technology, ICT and Financial Inclusion

Financial technology and ICT have influenced inclusive finance, especially in Africa. Arun & Kamath (2015) note that technology performs a key function in financial inclusion. Financial Technology (FinTech) is a major tool helping to shape the financial services industry of Africa (Sy et al., 2019). Mushtaq and Bruneau (2019) posit that the diffusion of Information and Communication Technology (ICT), including financial technology, plays a key role in community advancement. Financial Technology and ICT, in general, can help reach out to the poor and marginalized in a number of ways including; e-banking, mobile banking and mobile ATMs.

The advancement of financial technology has been evident in the African financial system. To aid financial inclusion, there has been the development of tech-based financial products including mobile money, online payment processing and investment. Sarma and Pais (2011) show that ICT and its related infrastructure boosts financial inclusion. Financial technological advancements have allowed the unbanked to have access to savings and payment systems that would not reach them through the traditional banking system.

There is a general believe that ICT penetration through the rollout of mobile phones has great benefits. In fact, mobile phone rollout is seen as the key element in ICT diffusion (Mushtaq and Bruneau, 2019). According to these authors, mobile phone usage increases financial product availability (supply side) and at the same time boosts demand for financial products (demand side). According to Sy et al. (2019), mobile money has led to a sweeping change in financial services delivery in sub-Saharan Africa. Consequently, Sub-Saharan Africa has emerged as the global leader in mobile money innovations, approval, and use, with about 40 out of 45 sub-Saharan African nations aggressively utilizing this innovative financial technology (FinTech). Financial Technology has emerged as a driver of growth and a technological factor that enhances inclusion in finance and development in the financial sector.

2.6. Empirical Strategy

2.6.1. Data and Data Sources

This study investigates the influence of financial inclusion on financial development using regression models. We specify a baseline model where financial development depends on financial inclusion index and other control variables which include real GDP per capita, human capital development, political stability and inflation (CPI) as shown in equation (1) below:

$$FD_{it} = f(FI_I_{I\,it}, GDPPC_{it}, TO_{it}, HCD_{it},\ PSTAB_{it}, CPI_{it}) \quad (1)$$

where i = 1, 2, 3, ..., N is the cross-sectional dimension of countries; t = 1, 2, 3,....., T represents time; FI_I_{it} is computed using the principal component analysis. FD_{it} represents financial development index for country *i*, at time *t*. FI_I_{it} is financial inclusion for country *I*, at time *t*. $GDPPC_{it}$ is GDP per capita for country *i* at time *t* and is used as a measure of economic growth. TO_{it} is trade openness for country *i*, at time *t*. HCD_{it} is human capital development for country *i*,

at time *t*. HCD is measured using gross secondary school enrollment as a ratio of total population. $PSTAB_{it}$ is political stability for country i, at time *t*. CPI_{it} is inflation, proxied by the consumer price index, in country i, at time *t*. These variables are selected in line with the empirical and theoretical literature on financial sector development and economic growth. Economic growth (Zaidi et al., 2019), trade openness (Ibrahim and Sare, 2018), human capital development (Ibrahim and Sare, 2018; Zaidi et al., 2019), political stability (Khan et al., 2020) and inflation (Ayadi et al., 2015) have usually being used in literature as control variables.

Theoretically, these factors may influence financial sector development in various ways. For instance, consistent with the demand–following hypothesis, increases in the level of income heightens agents' demand for better financial services leading to improved financial markets (Ibrahim and Sare, 2018). The depth and size of the financial sector may increase as a result. Similar to this, openness of an economy to trade increases the size and depth of the financial sector as a country's financial sector becomes integrated with other markets. Higher trade openness generates new demand for external finance as firms require credit to surmount cash constraints leading to higher financial sector development (Svaleryd and Vlachos, 2002).

Also, an increase in human capital development, in terms of education for instance, increases the ability of individuals to participate in the financial system. Individuals are more likely to understand the financial system and participate in it as they become more educated. Human capital accumulation may suggest that well educated people have better access to quality of information and hence more probable to behave in a less risk averse matter (Outrivelle, 1999). And as noted by Ibrahim (2018), as human capital is deepened through quality educational attainment, individuals become more aware of risk analysis and may invariably increase their risk-taking capacity. In addition, higher education can also be associated with higher savings. Indeed, both

cases demand provision of better and quality financial services thus moving the domestic financial sector to a well–developed one because education stimulates more banking patronage and financial intermediation.

A politically stable economy is more likely to attract investments into its financial system due to stability and certainty in the political environment. This could help to increase the depth and size of the financial system. Higher price levels influence consumption and savings in an economy. economies with episodes of macroeconomic instability are more probable to have underdeveloped financial systems relative to those economies with more stable macroeconomy particularly of low inflation rates. The inflation-financial development link is consistent with the theoretical proposition that higher inflation is associated with macroeconomic instability and therefore dampens financial institutions appetite to provide credit to the private sector. Rousseau and Wachtel (2001) present evidence to suggest that in countries with high inflationary periods, confidence in money as a store of value is challenged in addition to destabilizing efficient financial intermediation and discouraging the purchase of financial assets.

2.6.2. Data Sources

We obtain data for this study from the International Financial Statistics, Global Financial Development, World Development Indicators and the World Governance Indicators databases where appropriate. For instance, data on economic growth, human capital development, trade openness and inflation are taken from the World Development Indicators database. Institutional data on political stability is sourced from the World Governance Indicators whereas data on financial development index is taken from the Global Financial Development database. Variables on the various dimensions of financial inclusion are gathered from the International Financial Statistics database and the World Development Indicators. The data gathered for the study covers

22 African countries[1] over a 12-year period, from 2007-2018. The period and number of countries used in the study are conveniently selected based on the availability of data in order to reduce the number of missing values in the calculation for our financial inclusion index. Countries with less than half of the observations for the financial inclusion components are excluded. Based on this criterion, the study arrives at 22 countries with enough observations to construct an efficient index for financial inclusion.

2.6.3. Principal Component Analysis (PCA)

The index for financial inclusion is calculated using Principal Component Analysis (PCA), which involves four (4) selected measures covering usage and access dimensions of financial inclusion. According to the PCA method, the jth factor index may be specified as;

$$\text{FI_I}_{j} = W_{J1}X_{P1} + W_{J2}X_{P2} + W_{J3}X_{P3} + W_{J4}X_{P4}$$

where FI_I_j is the Index for Financial Inclusion; Wj is the weight of the parameter of the factor score; X is the initial value of the individual components; whereas P is the quantity of variables present in the equation. The composite index for financial inclusion is created using two financial inclusion dimensions where every dimension is made up of two factors. Supply-side factors from the first dimension, which includes; number of commercial bank branches per one hundred thousand 100,000 adults (CBBA) and number of ATMs per one 100,000 adults (ATMA). Demand-side factors also form the second dimension, and they include; the number of borrowers from commercial banks per one thousand (1000) adults (BCBA) and the number of commercial bank

[1] The countries are Burundi, Botswana, Cameroon, Congo, Comoros, Cabo Verde, Djibouti, Egypt, Ghana, Guinea, Equatorial Guinea, Lesotho, Madagascar, Namibia, Nigeria, Rwanda, Eswatini, Seychelles, Tunisia, Uganda, Zambia, Zimbabwe.

depositors per one thousand (1000) adults (DECB). Thus, four indicators make up the financial inclusion index. The index is specified as follows:

$$FI_I = f(CBBA, ATMA, BCBA, DECB).$$

2.6.4. Estimation Procedure

We include the lag of the dependent variable (financial development) as one of the regressors which may potentially result in a high correlation between our explanatory variables and the error term. To account for endogeneity, which is usually prevalent in studies examining the association between financial inclusion and financial development, we rely on a system GMM to estimate a dynamic baseline equation where financial development depends on its initial lag, financial inclusion, GDP per capita, human capital development, inflation and economic growth. This is shown in equation (3) below:

$$FD_{it} = \delta_o FD_{it-1} + \delta_1 FI_I_{it} + \delta_2 GDPPC_{it} + \delta_4 TO_{it} + \delta_3 HCD_{it} + \delta_4 PSTAB_{it} + \delta_5 CPI_{it} + \alpha_i + \gamma_t + \mu_{it} \quad \ldots\ldots\ldots\

transform the equation by differencing to eliminate country-specific effects. This is shown in equation in below (3)

$$\Delta FD_{it} = \delta_o \Delta FD_{it-1} + \delta_1 \Delta FI_I_{it} + \delta_2 \Delta\, GDPPC_{it} + \delta_3 \Delta TO_{it} + \delta_3 \Delta HCD_{it} + \delta_4 \Delta PSTAB_{it} + \delta_5 \Delta CPI_{it} + \Delta\gamma_t + \Delta\mu_{it} \quad (3)$$

Arellano and Bond (1991) recommended the use of lagged levels of the explanatory variables as instruments. This is effective for the moment restrictions under the assumption of uncorrected error terms and weak exogeneity of the various regressors variables. These moment restrictions are specified in equations (4) - (8) as follows:

$E[GDPPC_{it-s}(\Delta\mu_{it})] = 0$ such that $s \geq 2$, and $t = 3, \ldots\ldots\ldots\ldots, T$ (4)

$E[TO_{it-s}(\Delta\mu_{it})] = 0$ such that $s \geq 2$, and $t = 3, \ldots\ldots\ldots\ldots, T$ (5)

$E[HCD_{it-s}(\Delta\mu_{it})] = 0$ such that $s \geq 2$, and $t = 3, \ldots\ldots\ldots\ldots, T$ (6)

$E[PSTAB_{it-s}(\Delta\mu_{it})] = 0$ such that $s \geq 2$, and $t = 3, \ldots\ldots\ldots\ldots, T$ (7)

$E[CPI_{it-s}(\Delta\mu_{it})] = 0$ such that $s \geq 2$, and $t = 3, \ldots\ldots\ldots\ldots, T$ (8)

Nevertheless, Blundell and Bond (1998) argued that the lagged levels of the independent variables are not strong instruments for the first difference equation when the series over time are persistent and time dimension is short. Arellano and Bover (1995) proposed the use of the combination of the level and differenced equations. Blundell and Bond (1998) showed that the use of these equations increase efficiency by reducing biases and inaccuracy connected with the difference GMM. Thus, the system GMM is the proper method that is capable of producing consistent and unbiased estimates which is grounded on the putting together of the system regression in difference

form with level regression (Arellano and Bover, 1995; Blundell and Bond, 1998). Blundell and Bond (1998) show further that the difference GMM is inferior to the system GMM estimator because the instruments that form part of the levels equation continue to be good estimates for the endogenous variables even when highly persistent variables such as inflation and output are present. To facilitate the calculations of the system GMM, Blundell and Bond (1998) suggest the use of additional moment conditions that are based on the property of stationarity of the variables. It is also critical to point out that the extra conditions implemented by the system GMM may demand deviations from averages in the long run not to be correlated with the fixed-effects. Arellano and Bover (1995) and Blundell and Bond (1998) proposed the system GMM tool and additional moment conditions specified as follows:

$$E[\Delta FD_{it-1}(\alpha_i + \mu_{it})] = 0 \qquad \text{for } t = 3,\ldots,T \qquad (9)$$

$$E[\Delta FI_I_{it-1}(\alpha_i + \mu_{it})] = 0 \qquad \text{for } t = 3,\ldots,T \qquad (10)$$

$$E[\Delta GDPPC_{it-1}(\alpha_i + \mu_{it})] = 0 \qquad \text{for } t = 3,\ldots,T \qquad (11)$$

$$E[\Delta HCD_{it-1}(\alpha_i + \mu_{it})] = 0 \qquad \text{for } t = 3,\ldots,T \qquad (12)$$

$$E[\Delta TO_{it-1}(\alpha_i + \mu_{it})] = 0 \qquad \text{for } t = 3,\ldots,T \qquad (13)$$

$$E[\Delta PSTAB_{it-1}(\alpha_i + \mu_{it})] = 0 \qquad \text{for } t = 3,\ldots,T \qquad (14)$$

$$E[\Delta CPI_{it-1}(\alpha_i + \mu_{it})] = 0 \qquad \text{for } t = 3,\ldots,T \qquad (15)$$

Thus, based on the moment conditions in equations and employing the GMM technique yield reliable and accurate estimates which are always dependent on the instruments' validity. We address issues of instruments validity with the use of two formal diagnostic tests: serial correlation test and Sargan/Hansen test for over–identifying restrictions. Whereas the serial correlation tests

the null hypothesis that the error term of the model is serially uncorrelated (whether first, AR (1) or second-order, AR (2)), the Sargan/Hansen test is used to examine the exogeneity of the instruments under the null hypothesis that over–identifying restrictions are valid.

The study argues that, using an index of financial development provides a more accurate measure as financial development has many dimensions which may not be effectively captured with the use of a single variable measure. As a result, and consistent with the literature (Ayadi et al., 2015; Bist, 2018; Guru & Yadav, 2019, Osei et al., 2019, Anarfo et al., 2019), the study estimates two dynamic models where single measures of financial development are used as dependent variables. This approach allows the validation of our assertion that using an index of financial development provides a more comprehensive and effective measure of financial development. The alternative models estimated are;

$$DCPS_{it} = \delta_o DCPS_{it-1} + \delta_1 FI_I_{it} + \delta_2 GDPPC_{it} + \delta_4 TO_{it} + \delta_3 HCD_{it} + \delta_4 PSTAB_{it} + \delta_5 CPI_{it} + \alpha_i + \gamma_t + \mu_{it} \quad (16)$$

$$DCB_{it} = \delta_o DCB_{it-1} + \delta_1 FI_I_{it} + \delta_2 GDPPC_{it} + \delta_4 TO_{it} + \delta_3 HCD_{it} + \delta_4 PSTAB_{it} + \delta_5 CPI_{it} + \alpha_i + \gamma_t + \mu_{it} \quad (17)$$

Where $DCPS_{it}$ is domestic credit to the private sector for country *i,* at time, *t* and DCB_{it} is domestic credit provided by banks for country *i.* at time, *t.* $DCPS_{it-1}$ and DCB_{it-1} are the initial lag of domestic credit to the private sector and domestic credit provided by banks respectively; $\alpha_i$is unobserved country-specific effects; γ_t is the time-specific effects; μ_{it} is the random error term. Other variables in the model denote their meanings as previously defined.

2.6.5. Robustness Check

The study uses static panel regression techniques to check for the robustness of the findings from the dynamic models. As a result, a static panel model is estimated with the same control variables as in the dynamic model. The static model is specified generally as;

$$FD_{it} = f(FI_I_{I_{it}}, GDPPC_{it}, TO_{it}, HCD_{it}, \ PSTAB_{it}, CPI_{it}) \quad (18)$$

Where FD takes the form of financial development index, domestic credit provided to the private sector and domestic credit provided by banks in separate models. As part of diagnostic tests, multicollinearity, heteroscedasticity and autocorrelation tests are performed to ensure the models are adequate to provide reliable and valid results. Where appropriate, robust standard errors have been used to ensure heterogeneity and other problems associated with static models are efficiently dealt with.

2.7. Empirical Results

We regress financial development on its initial value and other control variables that have been selected in line with theoretical and empirical literature. Initially, three models are estimated using system GMM. To check for the robustness of the findings, panel OLS regression techniques are employed. Before the regression results, descriptive statistics and correlation analysis are estimated as part of preliminary tests.

2.7.1 Descriptive and Summary Statistics

Table 2. 2. Descriptive Statistics

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
FD_I	240	0.1687	0.0940	0.04	5
FI_I	233	0.0032	1.0009	-0.8894	3.6849
GDPPC	256	1.7977	4.4289	-18.4911	18.0660
TO	258	86.7723	51.1819	20.7225	347.9965
HD	151	57.8489	21.1959	15.0849	96.6594
PSTAB	264	-0.3350	0.8349	-2.4002	1.2002
INF	255	6.7837	5.6180	-4.2949	36.9648
DCPS	242	22.1474	17.6421	2.1700	86.5607
DCB	259	21.7355	15.9999	2.1700	68.5556

FD_I = Financial Development Index, FI_I = Financial Inclusion Index, GDPPC = Real GDP Per Capita, TO = Trade Openness, HD = Human Development, PSTAB = Political Stability, INF = Inflation, DCPS = Domestic Credit Provided to the Private Sector and DCB = Domestic Credit Provided by Banks.

Table 1 presents the descriptive statistics of the data. From the Table, the mean financial development and financial inclusion are 0.1687 and 0.0032 respectively. The mean financial inclusion value suggests a rather low level of financial inclusion in Africa. As per the index for financial inclusion, Seychelles (3.6849) is observed to have the most inclusive financial sector whereas inclusion is lowest in Burundi (-0.8894). On the average, real GDP per capita growth rate among African countries is 1.7977%. Compared to the evidence of Silajdzic and Mehic (2018), real GDP per capita growth is relatively lower in Africa than in transition economies (3.64). Given the average trade openness of 86.77%, our evidence suggests that transition economies are more open to trade (108.18) on average, than African countries according to the finding of Silajdzic and Mehic (2018). The averages for human development and political stability are 57.85 and -0.34 respectively. The average inflation, domestic credit to private sector and domestic credit provided

by banks are 6.78%, 22.15% and 21.74% respectively. The average inflation suggests that consumer prices among the African countries are quite low.

2.7.2. Correlation Matrix

Table 2. 3. Pairwise Correlation Matrix

VARIABLE	FD_I	FI_I	GDPPC	TO	HD	PSTAB	INF	DCPS	DCB
FD_I	1								
FI_I	0.8236*	1							
GDPPC	0.0578	0.0074	1						
TO	0.2416*	0.4194*	0.0525	1					
HD	0.6929*	0.7289*	-0.0385	0.2944*	1				
PSTAB	0.3109*	0.5571*	0.1171	0.4527*	0.4304*	1			
INF	0.0469	-0.1502*	0.0493	-0.1785*	-0.1385	-0.2375*	1		
DCPS	0.6335*	0.5890*	-0.0206	0.1454*	0.7099*	0.3102*	-0.1790*	1	
DCB	0.7018*	0.6504*	-0.0163	0.1873*	0.7208*	0.3730*	-0.1832*	0.9878*	1

* denotes significance at the 5% significance level. FD_I = Financial Development Index, FI_I = Financial Inclusion Index, GDPPC = Real GDP Per Capita, TO = Trade Openness, HD = Human Development, PSTAB = Political Stability, INF = Inflation, DCPS = Domestic Credit Provided to the Private Sector and DCB = Domestic Credit Provided by Banks.

The correlation matrix of the variables of the study are presented in Table 2. According to Kennedy (2008), multicollinearity exists when the correlation between two independent variables is equal to or greater than 0.80. Using this benchmark, the problem of multicollinearity has no effect on this study. The Table indicates a strong and positive correlation (0.8236) between financial inclusion and financial development. This implies that, a rise in financial inclusion may be connected with a rise in financial development. Additionally, the Table shows a strong positive correlation between trade openness and financial development. This evidence suggests that, trade liberalization and less restrictions in trade may help drive financial development positively in Africa. Also, the correlation between human development (0.6929) and financial development is positive and significant (0.6929). Political stability (0.3109) and financial development are also positively correlated. It is inferred that, increasing human development and political stability may cause an improvement in the financial system of Africa.

The Table further shows that, trade openness (0.4194), human development (0.7289) and political stability (0.5571) are positively correlated with financial inclusion. This suggests that, favorable movements in trade openness, human development and political stability may cause financial inclusion to increase. Nonetheless, the correlation between inflation and financial inclusion is negative, suggesting that an increase in inflation might cause financial inclusion to decline. There is a significant and positive correlation between domestic credit to private sector, domestic credit provided by banks and financial inclusion. This evidence suggests that development of the financial system may enhance financial inclusion in Africa. From Table 2, there is no strong correlation between any two independent variables used in the study. As a result, there is no presence of multicollinearity and that the effect of multicollinearity is reduced in this study.

2.7.3. Financial Inclusion and Financial Development in Africa

Table 2. 4. Financial Inclusion and Financial Development in Africa

	1	2	3
Lagged financial development	0.7633***	0.8653***	0.8945***
	(0.0937)	(0.1241)	(0.0973)
	[0.000]	[0.000]	[0.000]
Financial inclusion	0.0099**	1.4543	0.8636
	(0.0048)	(1.7866)	(1.1733)
	[0.040]	[0.416]	[0.462]
Real GDP per capita	0.0012***	0.0458	0.0536
	(0.0003)	(0.1792)	(0.1495)
	[0.000]	[0.798]	[0.720]
Trade openness	0.0000	-0.0056	-0.0030
	(0.0000)	(0.0079)	(0.0069)
	[0.171]	[0.482]	[0.661]
Human development	0.0005**	0.0928*	0.0740*
	(0.0002)	(0.0505)	(0.0416)
	[0.019]	[0.066]	[0.075]
Political Stability	-0.0103*	-1.3644	-0.9440
	(0.0056	(1.2906)	(0.9197)
	[0.067]	[0.290]	[0.305]
Inflation		-0.3020**	-0.2670**
	-	(0.1453)	(0.1064)
		[0.038]	[0.012]
Diagnostics			
Wald χ 2	127110.92	35873.19	15070.25
[p-value]	[0.000]	[0.000]	[0.000]
Hansen test	11.69	6.59	5.96
[p-value]	[0.111]	[0.253]	[0.310]
AR (2)	-0.38	0.96	1.01
[p-value]	[0.708]	[0.339]	[0.312]
No. of groups	15	17	17

*, **, and *** denote 10%, 5%, and 1% significance levels, respectively. Values in ( ) and [ ] are standard errors and p-values respectively.

The findings of the study are presented in Table 3. Specifically, we estimate three models. in order, by presenting some set of control variables which are chosen based on the theoretical and prior

empirical studies. The study argues that a comprehensive index of financial inclusion and financial index are better measures of financial inclusion and financial development respectively as compared to single measures mostly used in literature (Rasheed et al., 2016; Moyo, 2018; Bist, 2018; Guru & Yadav, 2019, Osei et al., 2019, Anarfo et al., 2019). As a result, three regression models are estimated; first using financial inclusion index as a dependent variable on financial development index (column 1 of Table 3), then two single measures of financial development also as separate dependent variables in column 2 and column 3 of Table 3. Results from the system GMM are shown in Table 3. Financial development index is the outcome variable in column 1, domestic credit to the private sector is the outcome variable in column 2 and domestic credit by banks is the outcome variable in column 3. The dependent variables in columns 2 and 3 are used to check the robustness of the findings in column 1.

Regarding the post estimation tests to check for the validity of the models, the p-values of the Wald Chi-square statistic show that at the 1% level of significance, the explanatory variables in all the models are jointly significant. The Hansen test of over-identification restriction suggests the instruments are valid and therefore we do not reject the null hypotheses of instruments validity. The p-values for [AR (2)] show that there is no second-order autocorrelation. In sum, the diagnostic tests indicate that the estimates are valid and the models, well-specified.

Evidence from columns 1, 2 and 3 in Table 3 show that the coefficient of lagged financial development is positive and statistically significant regardless of the dependent variable or model indicating that present financial development is contingent on the past figures of financial development. Higher financial development in past periods positively affects current financial development. This suggests that, countries with highly developed financial sectors continue to experience improved financial development in current periods. Regarding the effect of financial

inclusion on financial development, the result indicates a positive and significant influence of financial inclusion on Africa's financial sector development when financial development is proxied by the financial development index.

Conversely, when financial development is measured with a single variable; that is, either domestic credit to the private sector or domestic credit by banks, the effect is insignificant. This suggests that, financial inclusion affects wider dimensions of financial development which may not be captured by a single measure. For instance, using private credit and domestic credit as measures for financial sector development, Osei et al (2019) find that the financial development coefficient alternates signs, depending on the proxy for financial development.

Our results show that, since there are different aspects of financial development which occur concurrently, financial inclusion may not necessarily affect a single aspect but has a composite influence on financial development as a whole. The employment of an index of financial development shows this significant effect. This problem associated with the use of a single measure of financial development may partly account for the different findings in the financial inclusion-financial development literature since the measure used significantly influences the nature of the effect.

Consistent with the studies of Rasheed et al (2016), Hlophe (2018) and Anarfo et al (2019), this study finds that a rise in financial inclusion leads to an improvement in the financial system of African countries. This evidence is also in line with Allen et al (2014) and Otchere, (2016) who also find financial inclusion to positively influence financial development. Specifically, this study finds that, at the 5% significance level, a 1% rise in financial inclusion results in a 0.99% increase in financial development. By implication, an increase in financial inclusion ensures that financial services reach out to the marginalized and the usually excluded parts of the population. Extending

loans, ATM services, increasing bank branches and using deposit gathering strategies through mobile technology helps to extend financial services to areas that would otherwise be excluded.

This helps to develop the level of financial development as financial services usage and supply becomes available easily and conveniently throughout a country. When financial institutions become larger, they necessarily strive to reach out to as many clients as possible (more inclusive) to support their growth agenda. At the same time, as more people get involved in the financial system, financial institutions develop capacity to meet the growing numbers and the associated needs, thereby enhancing financial sector development. Overall financial inclusion is observed to be a significant determinant of financial sector development in Africa.

The study further finds that, economic growth, proxied with real GDP per capita growth has a significantly positive influence on the level of financial develop in Africa. In consistency with the empirical findings of Zaidi et al (2019), this suggests that, the financial system in Africa develops as economic growth increases. More specifically, a 1% surge in economic growth leads to a 0.12% rise in financial development at the 1% significance level. Again, this effect is significantly captured only when financial development is measured with the financial development index.

This confirms the earlier argument that the financial development index allows all the components of financial development to be captured which helps to better determine the influence of external factors. It can be inferred from this evidence that financial institutions are able to perform better during periods of economic boom. In periods of high economic growth, financial institutions are able to operate at high efficiency by providing financial services at lower costs with sustainable revenues. Also, they are well able to extend their services and become more accessible as individuals and companies become better placed to access financial services such as loans due to the high economic growth. This results in a surge in the depth, size and efficiency of financial

institutions and consequently enhances the development of the financial system. Thus, in general, higher growth of the African economy promotes the development of the financial system through increased depth, access and efficiency of financial services.

On Human development, this study finds a positive and statistically significant link with financial development irrespective of the measure of financial development. This evidence is consistent with Zaidi et al (2019) showing that, human development is key to the development of the financial system of Africa. It is found that, a 1% rise in human development may result in a 0.05% increase in financial development, at the 5% significance level when financial development is proxied by an index. Similarly, using the single measures of financial development, human development remains positive and statistically significant at the 10% significance level.

This suggests that, human development which may be reflected in secondary school education and beyond, helps to improve financial development in Africa. Indeed, the study finds evidence that, higher literacy rate in Africa can help to improve the financial system. As individuals become educated, even at the secondary school level and beyond, they tend to better understand and participate in the financial markets which may help to increase the size, depth and liquidity of the markets. Increased participation in the financial markets will then consequently reflect in a development of the financial system. Again, human development helps individuals to better access financial services such as ATMs and credit facilities by financial institutions. All these factors, through human development help to enhance the financial system. Overall, human capital development in Africa significantly drives the development of the African financial system.

With regards to political stability as a measure of institutional quality, the study finds the coefficient of political stability to be negative and significant. This evidence is contrary to Khan et al. (2020) who find political stability to positively influence financial development.

Conversely, a politically stable environment and an expectation of further stability reduces total systemic risk and encourages participation in the financial markets which positively influences the development of the financial system. Statistically, a 1% increase in political stability may result in a -1.03% change in financial development. Political stability, therefore, specifically in Africa, is essential for the development of the African financial system. Political stability positively influences financial development by reducing capital flight, encouraging investment in the African markets. This promotes depth, ensures liquidity and stimulates financial sector development.

Again, similar to the evidence for economic growth and financial inclusion, the influence of political stability on financial development is only observed when an index of financial development is employed as the dependent variable. Using single measures of financial development, political stability exerts no significant effect on the individual proxies. In explaining this we argue that, the effect of political stability may not necessarily be on the domestic credit to the private sector or domestic credit by banks. Instead, political instability reduces the confidence people have in the financial system and affects the size, depth and efficiency of the financial system which are not captured by these single measures. Moreover, in columns 2 and 3, inflation is found to exert a negative and significant influence on financial development. This is in line with Ayadi et al (2015) who also measured financial development with a single variable. It is inferred from this evidence that; inflationary pressures undermine the growth of the financial system in Africa. Higher inflationary pressures may affect the size, liquidity and access of financial services as participation in the financial markets may likely reduce as a result of inflation which negatively affects the size and liquidity of funds and consequently the financial system as a whole.

2.7.4 Robustness Check

Table 2. 5. Financial Inclusion and Financial Development in Africa: Alternative Approaches

	Random-Effects		
	1	2	3
Financial inclusion	0.0228***	3.8616***	3.6719***
	(0.0055)	(1.1744)	(1.0864)
	[0.000]	[0.001]	[0.001]
Real GDP per capita	0.0000	-0.2016	-0.1883
	(0.0004)	(0.1244)	(0.1150)
	[0.905]	[0.105]	[0.102]
Trade openness	-0.0000	0.0259	0.0211
	(0.0000)	(0.0278)	(0.0257)
	[0.850]	[0.352]	[0.412]
Human development	0.0007*	0.1201*	0.1237**
	(0.0004)	(0.0637)	(0.0589)
	[0.071]	[0.059]	[0.036]
Political Stability	0.0040	-2.5595*	-1.3113
	(0.0081)	(1.3497)	(1.2403)
	[0.618]	[0.058]	[0.290]
Inflation		-0.0216	-0.0140
	-	(0.0741)	(0.0685)
		[0.771]	[0.839]
Diagnostics			
F-Statistic	0.0000	0.0000	0.0000
Adjusted R-Squared	0.3700	0.2614	0.2568
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	-	-	-
Hausman Test	0.1124	0.5614	0.3041
No. of observations	120	124	125

*, **, and *** denote 10%, 5%, and 1% significance levels respectively

Table 4 presents findings from the random-effects model after the Hausman Specification Test showed the appropriateness of this model. This is done to check for the robustness of the findings

from Table 3 using alternative panel regression techniques. Specifically, random-effects models are estimated. Financial development index, domestic credit provided to the private sector and domestic credit by banks are used as the dependents variables in columns 1, 2 and 3 respectively.

Regarding post estimation diagnostics to check for the validity of the models, the p-values of the F-Statistic are significant at the 1% significant level for all models suggesting that at the 1% significance level, the explanatory variables in each of the models are jointly significant. In the Random effects models, 37.00%, 26.14% and 25.68% of the variations in financial development index (column 1), domestic credit to the private sector (column 2) and domestic credit by banks (column 3) can be explained by the explanatory variables employed in the models. Due to the problem of heteroscedasticity and autocorrelation, the models are estimated with robust standard errors which caters for this problem and ensures the validity and reliability of the results presented.

From Table 4, financial inclusion is again found to be significant and positively linked to financial development. This confirms the finding in Table 3 where a different estimation technique is applied. The statistically significant link between financial inclusion and financial development is more pronounced when financial development index is used as the dependent variable (columns 1) as the random-effects model provide consistently significant and positive relations. This again confirms the earlier argument that using an index of financial development helps to effectively capture the total effect of financial inclusion. Real GDP per capita, a measure of economic growth, is found to be positive and significantly related to financial development when financial development is proxied with an index. However, when financial development is measured with the use of single variables, economic growth exerts a statistically significant negative influence. It is evident, again, that the choice of proxy affects the behavior of financial development.

More robust evidence is found for human development as it is observed to exert a statistically significant and positive influence on financial development across the various techniques and models. This is consistent with the finding from Table 3 and confirms that development of human capital is a key driver of financial development in Africa.

Consistent with the findings from Table 3, political stability and inflation are found to be significant and negatively related to financial development. The political stability evidence suggests that financial development is negatively affected, as people perceive the occurrence of a politically related violence whereas the perception of political stability stimulates financial development. Similarly, the inflation evidence confirms the earlier evidence, which suggests that inflationary pressures undermine financial development.

2.8. Policy Implications and Recommendation

Financial development keeps performing an important function in Africa because it is gradually becoming the main source of funding and has consequences on financial inclusion, macroeconomic policies and stability. Relying on the results from our empirical analysis and considering the general focus of this objective, we emphasize the inferences and implications of our study to help policy makers. Our study provides evidence of a significant positive influence of financial inclusion on financial development in Africa. Nevertheless, the extent of accessibility and usage of mainstream financial services is still on the low in Africa. Since financial inclusion positively drives financial development, it is necessary for policy makers to critically reflect on the extent of access and use of formal financial services in a bid to improve the financial system of Africa.

The positive relation between financial inclusion and financial development implies that, financial inclusion enhances financial development in Africa. As an implication, central banks and

governments must leverage this positive association to develop the financial sector by embarking on financial inclusion as a key policy objective in the quest to develop Africa's financial system. In order to develop the financial system, governments should provide an environment where financial institutions can extend access to financial services through increased bank branches and agencies whiles encouraging usage of formal financial services in individual and corporate settings. The central banks and financial institutions in Africa must devise strategies to help provide access to financial access to everyone who can use them in a convenient way, and at affordable prices. By this, these financial institutions will be contributing to the development of the African financial system as a whole.

Policy initiatives such as the facilitation of low-cost bank accounts for people who are financially excluded could help to enhance banking penetration and financial development as a whole. Advancements in other dimensions of financial inclusion such as accessibility and usage through improvements in physical banking infrastructure can help to improve financial development among African economies. Also, to improve the African financial system, there is the need for an increased attention to the financially excluded. The financial system of Africa can improve by including the unbanked in the society; that is, by granting access to the financially excluded to increase financial inclusion. The size, depth and liquidity of the financial system can be greatly improved as more people are included.

Policies must be targeted at improving digital accessibility to finance and financial services, sustaining the delivery of financial services to rural areas and using socially fit models to increase the financial abilities of people with traditional or language hindrances and illiteracy. In enhancing digital access to finance and financial services, governments in Africa must provide the right conditions for providers to implement and encourage the use of financial services through mobile

phones. This initiative can help to increase accessibility and use of financial services by people in the remote areas also whiles ensuring that they are financially included. Due to the increasing usage of mobile phones, this policy initiate can help to conveniently provide financial services to everyone and ensure financial development in the end. African countries that have not accepted and promoted the use of 'mobile money' and other mobile technologies to provide financial services must do so to improve their financial system. We therefore, recommend that government policy to improve financial development must target financial inclusion as it is a key driver of financial sector development.

Also, the financial industry must help to meet the unattended needs of micro-credit, micro-businesses and provide 'safe' options for savings. Most enterprises in Africa are not included in the mainstream financial system because of their relatively smaller sizes. However, designing policies to provide micro-credit to micro-enterprises could greatly help to include these enterprises in the financial system which will indisputably ensure inclusive finance and the improvement of the African financial system.

Lastly, our study finds that financial development in Africa can be achieved only in a politically stable environment. This study finds that, the perception of political instability and politically-related violence negatively affects financial sector development in Africa. The risk and uncertainty associated with a politically unstable environment deters people from participating in the financial system. Local and foreign investment in the financial sector will likely stall or reduce when individuals and corporations perceive political violence as the risk of loss and other risks heighten in such environments. African governments and all stakeholders of the African economy must ensure that politically-related violence is reduced whiles shaping the perception of both foreign and local investors and participants to be rather positive. People will then be committed to the

improvement of the financial sector by participating in the financial markets and helping to increase the size and depth of the financial system.

2.9. Conclusion

The financial sector's importance to the African economy cannot be overemphasized. With the increasing developments in financial technology and mobile phone use in Africa, it is imperative to assess how the issue of financial inclusion influences financial development. The concept of financial inclusion and financial development in Africa is interesting given the region's interest in promoting and developing its financial system. Though a few studies (Hlophe, 2018 and Anarfo et al, 2019) have considered this relationship, the issue of measurement and method are a measure concern in the literature with most studies adopting single measures of financial development and financial inclusion. This study set out to investigate how financial inclusion influences financial development. These two main factors in this study are measured using indexes as the study argues that using indexes to measure these factors provide a more comprehensive measure of these concepts and help to effectively capture their multidimensional aspects. The study relies on data from 22 African countries over a 12-year period, from 2007 to 2018. We investigate this relationship using the Generalized Method of Moments (GMM) approach to panel data. Static panel data models are also used to provide robustness checks to the estimates from the GMM estimation.

We find financial inclusion, proxied by the index of financial inclusion, to be significant and positively connected to financial sector development, measured with the financial development index. Again, we find financial inclusion to positively and significantly affect financial inclusion index in all of the static models too, providing more robust evidence. However, employing single measures of financial development as dependent variables, we find financial inclusion to exert an

insignificant effect on financial development. In our static models, financial inclusion was found to be positively related to the single measures of financial development, but in an inconsistent manner. We provide further evidence that, real GDP per capita growth, human development and political stability are key drivers of financial development in Africa.

Our findings suggest that, using a single measure of financial development does not serve as a comprehensive proxy as other key aspects of financial development may not be captured. In conclusion, using indexes to measure financial inclusion and financial development provide a more comprehensive measure which provides robust findings that can effectively assist policy makers in designing initiatives and strategies. To ensure financial development in Africa, we recommend that African governments stabilize the political environment of their respective countries. Again, we recommend that government policy on financial inclusion affect two main areas; policies concerned with industry or providers to ensure the creation and delivery of appropriate financial services and products that can help include the financially excluded in the African financial system and policies geared at enhancing the education and awareness of financial services and their benefits.

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CHAPTER 3

FINANCIAL DEVELOPMENT, FINANCIAL INCLUSION AND INCOME INEQUALITY

3.1. Introduction

Financial development has long been identified as a tool for bridging the gap between the poor and the rich as it provides the avenue for the needy and the marginalized to get financially included, get access to credit and engage in meaningful economic activities that help to narrow the income disparity (Bittencourt et al, 2019; Altunbas and Thornton, 2019; and Jung and Vijverberg, 2019). Income inequality has become prominent as it has exacerbated the economic stability of both developed and developing nations over the past few decades (Kavya and Shijin, 2020). Many African countries have liberalized their financial systems during the last three decades, reorganizing the bulk of state-owned commercial banks and allowing domestic financial businesses to acquire international assets (Moyo et al., 2014). Although the African financial system has witnessed some of these reforms to improve its ability to support economic activities, decrease poverty and reduce income inequality, Africa is still the poorest region and ranked second in terms of the most unequal regions on the globe after Latin America (Tita and Aziakpono, 2016).

Fuentes-Nieva and Galasso (2014) aver that, a quick rise in income inequality is a threat to social cohesion in Africa and is harmful to economic growth and efforts to decrease poverty. Income inequality can also exert a multiplier effect on other kinds of inequalities such as gender inequality, thus, inequality among men and women. Higher inequality can also exert an adverse influence on equal representation in politics. For instance, when the affluent use their wealth to capture decision making in government policies, the rules are decided to favor them at the cost of everyone else. This could result in erosion of democratic governance, disintegration of social cohesion and rising

unrest in social settings (Kumar, 2014). The nature and degree of the influence of financial development on inequality in income, however, is not very clear, both from theoretical and empirical angles.

There are three perspectives in the theoretical literature on the link between financial development and income inequality (Baiardi and Morana, 2018). However, these three theoretical perspectives are complemented to an extent by the intensive and extensive margins of financial inclusion identified by Bittencourt et al (2019). The extensive margin influences the amount of people who use financial services, adding people from the lower end of the income distribution, that is, raising financial inclusion (Greenwood and Jovanovic, 1990). The intensive margin has to do with the improvements in the quality and number of financial services. There is no broadening of access to financial products and services with the intensive margin. An increase in financial inclusion on the extensive margin, for instance, can help to reduce income inequality by allowing the poor and marginalized to access financial services.

One of these theories, following the works of Becker and Tomes (1979), Banerjee and Newman (1993) and Galor and Zeira (2004), hypothesizes that when there is increased financial development, income inequality reduces as more people gain access to the financial system and obtain credit for business and other economic activities. In the US for instance, Bittencourt et. al (2019) note that low-income earners experience greater difficulties in gaining access to financial and credit markets, and these imperfections in the market can affect the occupational results of low-income persons. According to this hypothesis therefore, increased finance can assist in bridging the gap in income and reduce inequality.

The second theoretical perspective, following the works of Haber (2004) and Lamoreaux (1995), hypothesizes that increased financial development rather worsens income inequality. The

argument is that when financial development increases, services provided to those who already have access to the financial system is rather enhanced as opposed to the extension of financial services to new clients. As a consequence, the inequality gap only widens further. The third theoretical perspective, following the work of Greenwood and Jovanovic (1990), hypothesizes that the interrelation between financial development and income inequality is rather an inverted u-shaped. This hypothesis argues that, at the initial stages of financial development, only the privileged gain access to credit and so the inequality situation worsens but as the economy experiences higher growth, more and more individuals get included and they can also access credit which helps to narrow the inequality in income (Baiardi and Morana, 2018; and Jung and Vijverberg, 2019).

Thus, Greenwood and Jovanovic's (1990) model predicts an inverted u-shaped relationship between income inequality and financial sector development, with income inequality first increasing, then stabilizing and eventually decreasing as more individuals participate in the financial system. Expectedly, the empirical evidence on the nexus between financial development and inequality is far from conclusive (Zhang and Naceur, 2019). Review of literature (see, e.g., Demirguc-Kunt-Kunt and Levine, 2009; de Haan and Sturm, 2016, 2017; Baiardi and Morana, 2018; Altunbas and Thornton, 2019; Kavya and Shijin, 2020) affirm that the empirical evidence on the connection between finance and income inequality is not conclusive.

What is clear in the theoretical and empirical literature, however, is the fact that financial development impacts inequality through the inclusion of the poor and the marginalized in the formal financial system (Zhang and Naceur, 2019). Indeed, Zhang and Naceur (2019) argue that the effect of financial development on income inequality is necessarily indirect through financial inclusion. According to Zhang and Naceur (2019), when financial development improves the

overall income of a country, the distribution of that income inevitably evolves over time. This counts as an indirect means through which financial development can affect income inequality.

In Africa for instance, Tita and Aziakpono (2016) credit the insistent poverty and broadening income differences to exclusion in finance in the region where only 22% of businesses have access to credit or line of credit as compared to 43% in other developing nations outside Africa. Expectedly, empirical studies including Zhang and Naceur (2019) have considered the financial development-inequality nexus in a direct fashion and taken for granted the intermediary role of inclusion. Such direct approach is not only far from theoretical stipulations but also counter intuitive and potentially the source of the inconclusiveness in the empirical literature. Intuitively, financial development can only be meaningful to the poor and reduce inequality when the poor get included in the financial system.

We therefore consider an indirect approach, for the first time in the empirical literature, to the best of our knowledge, to the study of the financial development-inequality relationship in line with the theoretical underpinnings in the context of Africa. Africa is home to not just high poverty levels and significant income disparities, but also a sub region with relatively less developed financial systems and high levels of financial exclusion. We use the three stage least square approach by specifying a system of simultaneous equations that consider the effect of financial development on financial inclusion and the eventual effect on inequality. Given the possible reverse causality between financial development and financial inclusion with consequential endogeneity problem, our chosen estimation approach is capable of surmounting such endogeneity issues.

This study contributes to the extant literature in various ways. First, in contrast to most studies that use the ratio to GDP of bank credit or broad money supply as measures of financial development, we employ the index of financial development produced by the IMF, which captures better the

depth, access, and efficiency characteristics of financial development (Svirydzenka, 2016). Although studies such as Batuo and Mlambo (2010) Kavya and Shijin (2020) Bolarinwa and Akinlo (2021) have used an index of financial development, none of these studies have used it together with a financial inclusion index. Second, whereas a reasonably robust connection has been documented between financial development and economic growth, policymakers are also concerned about how the benefits from higher growth in the economy are distributed. This study provides meaningful insights on how financial development affects income distribution. Given public interests on income distribution, policymakers should be interested in knowing how policies affect both economic growth and income distribution. Finally, this study provides a context through which finance can be used as an instrument to affect income inequality, which has largely been ignored in the literature. Financial inclusion is used in this study to provide a context through which financial development can be used as a tool to reduce income inequality. Insights from this study will guide policymakers concerning the policies to implement in order to reduce the widening income gap in Africa.

The rest of this chapter is organized as follows: the next section provides a theoretical and empirical review of the finance-inequality literature; Section 3.3 provides stylized facts about income inequality in the African region. 3.4 provides information on data and the empirical strategy employed for this study whiles Section 3.5 presents and discusses the findings. Section 3.6 presents the policy implications and recommendations whiles Section 3.7 concludes the chapter.

3.2. Literature Review

The role financial development plays in development of economies have been well documented in literature and in policy environments. A well-developed financial market and institutions provide

financing opportunities to all members and parts of society. Financial development assists in the reduction of income inequality by providing platforms for the needy and those on the margins of society to get their hands on to loans and engage in productive economic activities (Bittencourt et al, 2019; Altunbas and Thornton, 2019; Jung & Vijverberg, 2019). The funds extended as a result of higher accessibility to finance can be used for productive purposes (starting businesses, gaining higher education, and to enable the attainment of one's aspirations), and to improve economic growth (Ahmed and Masih, 2017). Financial development helps in bridging the disparity between the rich and the poor by enabling the extension of financial services to the needy thereby helping them to participate in profitable economic ventures (Bittencourt et al, 2019; Altunbas and Thornton, 2019; Jung and Vijverberg, 2019).

There have been mixed findings in the empirical literature on the nature and degree of the influence of development in the financial sector on income inequality, which reflects the conflicting theoretical and empirical views. The nature and degree of the influence of development in the financial system on income inequality is far from obvious. Theories in relation to the effects of financial sector development on income inequality offer unclear predictions on this connection. Similarly, results from empirical studies have also been mixed and contrasting. Three economic theories have been propounded to predict how financial development affects inequality in income- the inequality-narrowing perspective (Braun et al, 2019; Galor and Zeira, 2004; Banjeree and Newman, 1993; Becker and Tomes, 1979), the inequality-widening perspective (Haber, 2004; Lamoreaux;1995) and the inverted U-shaped perspective (Jung and Vijverberg, 2019; Baiardi and Morana, 2018; Greenwood and Janovic, 1990).

The first theoretical perspective – the finance-inequality narrowing hypothesis, follows the works of Becker and Tomes (1979), Banerjee and Newmann (1993), Galor and Zeira (1993) and Galor

and Moav (2004). These authors suggest that the imperfections in the market and information asymmetry hinder the poor from gaining access to loans in order to make investments in human and physical capital, suggesting that financial development helps to reduce income inequality. A key assumption from this theoretical perspective is that individuals inherit different amounts of wealth and those with considerable wealth make investments in education which helps them to take up skilled work, whereas those with relatively lower initial wealth must borrow to make human and physical capital investment. Nevertheless, in financial markets that are underdeveloped, high costs of borrowing hinder poor people from accessing affordable credit and so they most likely remain unskilled. As financial markets improve as a result of expansion in the economy, the consequent availability of financial products provides an opportunity to needy people to borrow and invest in human and physical capital. Subsequently, inequality decreases as the welfare of the poor is enhanced.

The inequality-narrowing perspective further posit that, when financial systems experience increased development, income inequality decreases as more individuals get access to financial services and gain loans for their businesses and other economic ventures. Galor and Zeira (1993) examine the importance of wealth distribution in macroeconomics through human capital investments and conclude that imperfections in the capital markets such as the presence of information asymmetry and transaction costs prevent effective screening and monitoring of investments and risk sharing. Banjeree and Newmann (1993), Becker and Tommes (1979), are of the view that, imperfections in financial markets impede accessibility to schooling and accumulation of capital for children from less well-off households; hence, an increase in access to finance for such households will enable them to make human capital investments such as schooling, improve their welfare and reduce inequality in income.

The models of Galor and Zeira (1993) and Banerjee and Newman (1993) imply that convergence in the levels of income of the rich and the poor in the long run may not take place in the existence of imperfections in the capital markets and indivisibilities in investments in human or physical capital; rather, there may be a persistence of income inequality, which depends on the initial distribution of wealth. In their model, an economy that has imperfections in its capital market and an initial unequal wealth distribution will continue to be unequal and achieve a relatively slower growth than an economy that is similar but has a decent level of equity in its initial wealth distribution.

More current contributions by Galor and Moav (2004) allows the finance-inequality connection to change with the level of development in the economy. Therefore, at the initial stages of development, inequality spurs growth, because, as a result of imperfections in the credit market, only rich people with a higher propensity to save are able to gain access to formal financial resources. This is in favor of the physical capital accumulation over that of human capital, together with its relatively higher rate of return. However, credit challenges become harmful to growth at later stages of financial development, where the return to accumulation of human capital becomes more than the return to accumulation of physical capital. A higher accumulation of human capital and a higher egalitarian distribution of income become critical for economic growth.

Banerjee and Newman (1993) create a three-sector model in which two of the technologies need indivisible investments but where the existence of imperfections in the capital market mean that only rich people can access sufficient credit to pursue the indivisible (higher-return) technologies. The models suggest that income inequality should be higher for nations with larger imperfections in the capital market (i.e., more difficulties in obtaining funds to finance higher return investments) and that a negative association should be observed between financial development and inequality

in income. This model therefore suggests a linear association which predicts that finance can decrease inequality and poverty.

The second theoretical perspective, "inequality-widening hypothesis", following the works of Haber (2004) and Lamoreaux (1995) hypothesizes that an increase in financial development rather leads to a worsening of income inequality. This hypothesis argues that, when there is an increase in financial development, it only increases the services provided to people who are already able to access formal financial services as against extending services to new customers. This view states that, as a result of weakened financial institutions and weak financial regulation, development in the financial system happens on the intensive margin and enhances the extension of financial services to individuals who already use them, instead of directing resources to new customers.

Under conditions such as these, the wealthy and the politically connected primarily benefit from development in the financial system, which puts upward pressure on income inequality and worsens welfare (Baiardi and Morana, 2018). van der Weide and Milanovic (2014) argue that, at higher levels of income inequality, the growth of income for the poor and needy is reduced, and this results in a boost to the growth of income for the wealthy. Additionally, de Haan and Sturm (2016, 2017) show that development in the financial system supports the inequality-raising effects of financial liberalization.

The third theoretical perspective, following the work of Greenwood and Jovanovic (1990) hypothesizes that the connection between financial development and income inequality is rather an inverted U-shaped. The argument is that at the initial stages of financial development, only the rich and privileged have access to loans and so the inequality condition becomes worse but as the economy progresses, more individuals get financially included and so they are able to access financial services and this helps to reduce the income disparity between the rich and the poor

(Biardi and Morana,2018 and Jung and Vijverberg, 2019). It is argued that increasing financial intermediation is costly, but boosts economic growth and economic growth, in turn, helps to improve financial development and income equality by reducing the costs of intermediation and raising accessibility to formal financial services. Therefore, the linkage between growth and income inequality is highly dependent on the degree of financial development. At the initial stages of development in the economy, where there is low growth and inequality, accessibility to financial services is very expensive and only a few individuals join intermediaries. As development increases, more individuals benefit from financial intermediation, which results in higher and quick growth, yet also to higher income equality.

Immediately an important threshold for financial development is ultimately passed, and financial services are then spread to more people in the populace, income inequality then decreases, i.e., increased financial development (reduced cost of financial intermediation) results in an equilibrium with growth increase and decreased income inequality, although transitional dynamics may not be monotonic (Townsend and Ueda, 2006). Hence, the financial sector requires a minimum size before financial development can contribute to a more egalitarian distribution of income: below the threshold, development in finance only works on the intensive margin, by channeling more resources to individuals who already have accessibility to financial markets; as the financial and economic development level increases and a vital threshold is achieved, financial inclusion then works also on the extensive margin, channeling resources to people who were previously not included in the formal financial sector.

In Greenwood and Jovanovic's model, economic agents work the more productive and riskier of two technologies when they are in a position to diversify risks by investing in financial intermediary unions. However, the fixed costs that are associated with coalitions prevent poor

people from taking part. Assuming that needy people save less and gather wealth more slowly, income disparities between members of intermediary groups and outsiders will broaden, leading to a rise in income inequality. However, since costs of coalition are constant in the model, all agents ultimately join the groups, which results in an ultimate reversal in the trend of income inequality.

The theoretical perspective of Greenwood and Jovanovic (1990) makes the following conclusion. In the initial stages of economic development, the financial sector is mostly not organized, and there is a slow growth process. As the level of income improves, the financial system becomes more prevalent, there is higher economic growth rate, and income inequality between the wealthy and the needy increases. When the development of the financial system reaches a mature stage, however, the economy experiences a high rate of growth with a wholly developed financial structure, and thus distribution of income across agents become stable which helps to narrow inequality.

Bolarinwa and Akinlo (2021) examine the nonlinear relationship between financial development and inequality using 40 African countries selected from high-income, middle-income and lower-income countries. The study uses a dynamic panel threshold model to test the new financial development indicator. The results confirm the existence of threshold levels of financial development that addresses income inequality in Africa. Aggregately, financial development tends to promote inequality in high-income countries and reduces the same in low and middle-income countries.

Kavya and Shijin (2020) examine the nexus between economic development, financial development and income inequality using an unbalanced panel of 85 countries consisting of 28 high-income, 41 middle-income, and 16 low-income countries for the period ranging from 1984

to 2014. The study uses unbalanced dynamic panel GMM estimation models and finds no clear-cut evidence to support the proposition of economic development along with financial growth, which would reduce the problem of income inequality. Moreover, most advanced or highly developed high-income countries do not enjoy the benefits of financial development.

In a similar way, Younsi and Bechtini (2020) investigate the existence of the Kuznets' curve using economic growth, financial development and income inequality in BRICS countries. The study uses annual panel data covering the period 1990–2015. The findings of the study support the existence of Kuznets' inverted U-shaped relationship between financial development and income inequality. Further, the Granger causality test results confirm a unidirectional causality running from all financial development proxies to income inequality.

Using a trivariate cointegration regression involving Gini coefficient, financial development and real GDP per capita, Thornton and Di Tommaso (2019) examine the long run relation between financial development and income inequality in a panel of 119 countries from 1980 to 2015 using panel cointegration. The authors find that financial development, as measured by the index of financial development developed by the IMF, reduces income inequality in the long run.

Altunbas and Thornton (2019) examine the relationship between financial development and income inequality in a panel of 121 countries for the period 1980 to 2015. Using the IMF's financial development index and the quantile regression technique, the authors conclude that the impact of financial development changes with a country's level of income. Thus, financial development promotes income equality in upper-middle countries and inequality in low and high-income countries. The study further finds that the impact of financial development is generally higher in high-income countries.

Zhang and Naceur (2019) examine the relationship between financial development, income inequality, and poverty by employing instrumental variables in their regression. The study features a multidimensional investigation unlike the existing literature, which mainly studies the effects of financial deepening. Financial access, depth, efficiency, stability, and liberalization are considered. The study finds that four out of five dimensions of financial development (access, depth, efficiency, and stability) can significantly reduce inequality and poverty. Also, financial liberalizations tend to exacerbate inequality and poverty.

Jung and Vijverberg (2019) investigate the link between financial development and income inequality in China over the period 1998 to 2014. Using spatial dependence modeling techniques and a panel dataset of 29 administrative units in China, they find that financial development reduces income inequality.

Similarly, Baiardi and Morana (2018) examine the relationship between financial development and income inequality in the European Monetary Union (Euro Area). The authors find evidence of the presence of the Kuznets curve, that is, a long-term inverse U-shaped linkage between financial development and income inequality. In a related study, Zhang and Naceur (2019) explored the linkages between financial development, inequality and poverty using a sample of 143 countries from the period 1961 to 2011.

In measuring financial development, the study covered five dimensions of financial sector development – (access, depth, efficiency, stability and liberalization) and used 10 variables from the Global Financial Development Database – (bank account per 1000 adults, value traded of the top 10 trading companies to total value traded, banks private credit to GDP, stock market total value traded to GDP, net interest margin, stock market turnover, volatility of stock price index, ratio of regulatory capital to risk weighted assets, domestic liberalization and external

liberalization). The authors find that out of the five dimensions of financial development used in the study, financial access, depth, efficiency and stability can help reduce income inequality and poverty. The study further reveals that financial liberalization tends to have a negative effect on inequality and poverty.

In the same vein, Haan and Sturm (2017) investigate how financial development, financial liberalization, and banking crises are associated with income disparities based on a panel fixed effects model for a cross country dataset of 121 countries between 1975 and 2005. The authors argued that financial development and liberalization might be associated with financial crises, which may impact income inequality since financial crises related to financial development and liberalization harm low-income people more if the crises are accompanied by an economic slowdown. Their main finding was that financial development, financial liberalization, and banking crises increase the income inequality.

Seven and Coskun (2016) examine whether bank and stock market development contribute to reducing income inequality and poverty in emerging economies. Using dynamic panel data methods with an updated dataset for the period 1987-2011, the authors assess the finance inequality nexus by taking the separate and simultaneous impacts of banks and stock markets into account. Their findings suggest that although financial development promotes economic growth, this does not necessarily benefit those on low-incomes in emerging countries. For the finance-poverty link, we find that neither banks nor stock markets play a significant role in poverty reduction.

Jauch and Watzka (2015) analyzed the link between financial development and income inequality for a broad unbalanced dataset of up to 138 developed and developing countries over the years 1960–2008. Using credit to GDP as a measure of financial development, the authors reject

theoretical models that predict a negative influence of financial development on income inequality measured by the Gini coefficient. Controlling for country fixed effects, possible endogeneity problems, GDP per capita and other control variables, the study finds that financial development increases income inequality.

Shahbaz et al (2015) investigate the relationship between financial development and income inequality in the case of Iran. In doing so, the authors apply the ARDL bounds testing approach to examine the long-run relationship in the presence of structural break in the series. The VECM Granger causality approach is used to detect the direction of the causal relationship between financial development and income inequality. Moreover, Greenwood–Jovanovich (GJ) hypothesis is tested. The results confirm the long run relationship between the variables. Furthermore, financial development reduces income inequality. Economic growth worsens income inequality, but inflation and globalization improve income distribution. The authors find evidence in support of the Greenwood and Jovanovic hypothesis.

Law et al (2014) examine whether the relationship between financial development and income inequality varies with levels of institutional quality. The empirical evidence based on the threshold regression approach shows that there indeed exists an institutional quality threshold effect in the relationship between financial development and income inequality. Financial development tends to reduce income inequality only after a certain threshold level of institutional quality has been achieved. Until then, the effect of financial development on income inequality is nonexistent. This finding suggests that institutional quality affects the link between financial development and income inequality, reflecting the notion that better quality finance results in more equal income distribution.

Kim and Lin (2011) analyze the relationship between income-inequality and financial development using a panel of 72 countries from 1960 to 2005. An instrumental variable threshold regression approach is employed to analyze the data. The study finds that, the relationship crucially depends on the stages of development, suggesting that, a threshold level of financial development is necessary for achieving reduction in income inequality through financial development.

Batuo and Mlambo (2010) investigate how financial development is related to income distribution in a panel data set covering 22 African countries for the period between 1990 to 2004. A dynamic panel estimation technique (GMM) is employed and the findings indicate that income inequality decrease as economies develop their financial sector, which is consistent with the bulk of theoretical and empirical research. The result also confirm that educational attainment plays a significant role in making income distribution more equal. They also find no evidence supporting the Greenwood-Jovanovic hypothesis of an inverted-U- shaped relationship between financial sector development and inequality.

Law and Tan (2009) examine the role of financial development in influencing income inequality in Malaysia over the period of 1980-2000. The empirical results based on ARDL bounds test indicate that financial market development is, at best, very weak and statistically insignificant in reducing income inequality in Malaysia. The evidence is valid for a variety of financial indicators, including the banking sector, the stock market and financial aggregate variables.

In line with the model of Greenwood and Janovic (1990), De Haan and Sturm (2016) find that financial development increases inequality. Using private sector credit to GDP as a proxy for financial development, the authors use data on banking regulatory practices covering 91 countries over the period 1973 to 2005.

It is evident from the foregoing that financial development affects inequality through the increased provision of financial services to the poor and marginalized. These studies, however, assumed that the effect of financial development on income inequality is direct even though theory prescribes the opposite. The empirical literature has tended to ignore the intermediary role of access to financial services and considered a more direct financial development-income inequality nexus, an approach that is not only far from theoretical stipulations but also a potential source of the inconclusive results obtained in the literature. We therefore consider an indirect approach, for the first time in the empirical literature, to the study of the financial development-inequality relationship in line with the theoretical underpinnings in the context Africa.

3.3. Stylized Facts about Inequality in Africa

Income inequality is still relatively high and insistent in the African region (Kunawotor et al, 2020). Countries in Africa are among the poorest nations on the globe, with countries in Africa known to be amongst the most unequal countries in the world. Notably, six out of the ten most unequal countries in the world in 2010 were from Africa (AfDB, 2012). The African continent is only behind Latin America and the Caribbean in the world income inequality distribution (United Nations Department of Economic and Social Affairs, 2019). Aside having the least mean per capita income as compared to other parts of the world, Sub-Saharan Africa (SSA) has the highest ratio for headcount poverty. The ratio for headcount poverty which was 56.75 percent in 1990 has fallen by only 13.85 percent over two decades to 42.65 percent in 2012. In the opposite, East Asia, Pacific and South Asian regions that had headcount poverty ratios above 50 percent in 1990 experienced a substantial decrease to 7.21 percent and 18.75 percent respectively by 2012.

Even though Africa has wholly seen a robust growth in GDP for about two decades, standards of living of Africans have not been significantly enhanced in consistency with the GDP growth (Tita

and Aziakpono, 2016). Interestingly, SSA again shows a low level of GDP per capita growth, which suggests that the higher economic growth witnessed over the past years have not been high enough to significantly reduce income inequality. It could also be, that the high economic growth has being concentrated in the formal sectors whiles great unexploited productive resources in the informal sectors are left excluded, thus prolonging income inequality in the region (Tita and Aziakpono, 2016). Also, some of the most unequal nations in the world are from the SSA region. Among these SSA nations are; South Africa, Botswana, Lesotho, Angola, Comoros, Namibia, Swaziland and Central Africa Republic. This list is confirmed by the United Nations Development Programme (2017) who also affirm that 10 out of the 19 most unequal nations worldwide are based in Sub-Saharan Africa.

Despite the high growth rate, could the comparatively high inequality in income and poverty rate in Africa be ascribed to the state of Africa's financial system? In the previous three decades, many nations in SSA have adopted many reforms in the financial sector which place emphasis on policies that are market oriented. For instance, in the 1980s and 1990s, a lot of African nations adopted a structural adjustment program which stressed the opening and liberalization of the financial systems as against government-controlled periods that characterized the past. A careful look at factors of financial development in the region show that although Africa has witnessed some development in the financial sector, the sector is mainly underdeveloped and remains among the least advanced in the world. The degree of exclusion in finance also remains very high, with just 35 percent of the adults having accessibility to the formal banking sector and other financial institutions (Global Findex, 2014).

Odusola et al (2017) posit that, policies that are geared towards reduction of poverty are not automatically the same as those intended to help decrease income inequality. For example, quality

education and higher productivity are powerful tools for reducing poverty, yet if they are not accompanied by progressive taxation and well-designed social protection, they could enhance disparities in income. Promoting harmonizing policies that assist in addressing poverty and income inequality are important to help shift the existing trends of diverging inequality into converging trends of decreasing inequality across the African region.

3.4. Empirical Strategy

3.4.1. Data

This study employs a quantitative methodology using secondary data from relevant sources. Data on the variables used in this study are obtained from the International Financial Statistics, Global Financial Development, World Development Indicators and the World Governance Indicators databases where appropriate. Specifically, data on economic growth, human capital development, Inequality and inflation are obtained from the World Development Indicators database. Data on financial development is obtained from the Global Financial Development database. Variables on the various dimensions of financial inclusion are obtained from the International Financial Statistics database and the World Development Indicators. The study employs data from 22 countries[2] covering a period that spans from 2004 to 2015. The period and number of countries used in the study are conveniently selected based on the availability of data. The period and number of countries used in the study are conveniently selected based on the availability of data. Countries with less than half of the observations for the financial inclusion components are excluded. Based on this criterion, the study arrives at 22 countries with enough observations to construct an efficient

[2] The countries are Burundi, Botswana, Cameroon, Congo, Comoros, Cabo Verde, Djibouti, Egypt, Ghana, Guinea, Equatorial Guinea, Lesotho, Madagascar, Namibia, Nigeria, Rwanda, Eswatini, Seychelles, Tunisia, Uganda, Zambia, Zimbabwe.

index for financial inclusion. Especially, data for income inequality (GINI) was available only up to the end period used in this study. This influenced the choice of the period of the study.

3.4.2. Principal Component Analysis

The financial inclusion index is calculated using Principal Component Analysis (PCA), which involves four (4) selected measures covering usage and access dimensions of financial inclusion. The use of the PCA helps to sufficiently deal with the problem of multicollinearity and over-parameterization as a single measure of financial inclusion (Ahamed and Mallick, 2019). This approach is consistent with studies such as Lenka and Barik (2018), Anarfo et al. (2019), Ahamed and Mallick (2019) and Singh and Stakic (2020), who also compute an index for financial inclusion using PCA. According to the PCA technique, the jth factor index can be specified as;

$$\text{FI_I}_{j} = W_{J1}X_{P1} + W_{J2}X_{P2} + W_{J3}X_{P3} + W_{J4}X_{P4} \dots\dots Equation\ 1$$

where FI_I_j is the Financial Inclusion Index; Wj is the weight of the parameter of the factor score; X is the original figure of the respective components; while P is the number of variables in the equation. The financial inclusion composite index is constructed by two dimensions of financial inclusion where each dimension consists of two factors. The first dimension is the supply side factors which include; number of commercial bank branches per one hundred thousand (100,000) adults (CBBA) and number of ATMs per one hundred thousand (100,000) adults (ATMA). The second-dimension factors are the demand side factors which include; number of borrowers from commercial banks per one thousand (1000) adults (BCBA) and number of depositors with commercial banks per one thousand (1000) adults (DECB). The financial inclusion index is made up of four factors. The index is specified as follows:

$$\text{FI_I} = f(\text{CBBA,ATMA, BCBA, DECB}).$$

3.4.3. Empirical Procedure

The independent variables employed may not be strictly exogenous as inequality (dependent variable) may affect the level of financial inclusion (independent variable). To avoid any possible endogeneity between the dependent variable and the independent variables, 3 Stage Least Squares (3SLS) modelling is used as the main analytical method. According to Zellner and Theil (1962), this method combines two-stage least squares regression and multivariate seemingly unrelated regression (SUR) estimation, and takes into account the covariances across equation disturbances. The 3sls technique produces estimates that are superior to the 2sls because although consistency is maintained by both of them, the 3sls produces estimates that are asymptotically efficient and uses information that are inherent in the correlations between the errors in the specified structural equations (Nosier and El-Karamani, 2018).

The three stage least square set up involves three steps (Iddrisu and Alagidede, 2020). The first step concerns the estimation of the coefficients in the reduced form specification. The second step involves the use of two stage least squares in the respective structural equations to estimate the structural coefficients. In the last step, generalized least squares technique is used to estimate the structural coefficients of the entire system using the covariance matrix of the errors in the structural equation obtained from the residuals in the 2sls. Unlike the OLS, the generalized least squares technique relaxes the homoscedasticity assumption. A key advantage of the three stage least squares is that, it has the complement of full information which enhances efficiency and also considers restrictions in parameters in the different structural equations being used (Zellner and Theil, 1962).

Given the objective of considering an indirect effect of financial development on income inequality through financial inclusion, we specify our model in a three stage least square set up as follows:

$$INQ_{it} = \partial_0 + \partial_1 FI_{it} + \partial_2 UNE_{it} + \partial_3 HCD_{it} + u_{it} \ \ldots\ldots Equation\ 2$$

$$FI_{it} = \vartheta_0 + \vartheta_1 FD_{it} + \vartheta_2 CPI_{it} + \vartheta_3 HCD_{it} + \vartheta_4 GRW_{it} + u_{it} \ \ldots\ldots Equation\ 3$$

Such that INQ_{it} represents inequality measure for country *i* at time *t*. FI_{it} is financial inclusion for country *i* at time *t*. UNE_{it} is unemployment rate for country *i* at time *t*. HCD_{it} is human capital development for country *i* at time *t*. FD_{it} is financial development for country *i* at time *t*. CPI_{it} is inflation in country *i* at time *t*. GRW_{it} is economic growth for country *i* at time *t* and u_{it} represents the error terms. Equations 2 and 3 are set up as simultaneous equations and ran simultaneously using STATA to determine the indirect effect of financial development on income inequality in Africa. Income inequality (GINI coefficient) and financial inclusion (financial inclusion index) are treated as endogenous variables whiles all the other variables in equations 2 and 3 are treated as exogenous variables.

In equation 2, we estimate the effect of financial inclusion and other control variables (GDP per capita, unemployment and human capital development) on income inequality. In equation 3, we estimate the effect of financial development and other control variables (GDP per capital, consumer price index, human capital development and economic growth) on financial inclusion. The theoretical expectation is that, an increase in financial development in equation (3) should exert a positive influence on financial inclusion as the development of the financial sector could enhance the extension of financial services to the unbanked. This positive influence is captured in equation (3) by ϑ_1.

An increase in financial inclusion is then expected to improve the livelihoods of the previously unbanked through increased accessibility to credit and other financial services which would improve their incomes and reduce income inequality. Financial inclusion is therefore expected to reduce income inequality in equation (2) and is captured by ∂_1. The indirect impact of financial

development on income inequality is then obtained by the product of ϑ_1 and ∂_1 in line with studies such as Nosier and El-Karamani (2018) and Iddrisu and Alagidede (2020). We then use the delta method by Oehlert, (1992) to calculate the error term for the product of ϑ_1 and ∂_1 to know the statistical significance. The statistical significance of the product is determined by the t-statistic, which is found by dividing the coefficient by the standard error. In the delta method, we assume that the covariance between $\hat{\gamma}$ and $\hat{\beta}$ is zero, the standard errors of the indirect effect of financial development on income inequality can be calculated as in Equation 4;

$$\mathrm{SE}(\hat{\delta}_i) = \sqrt{\hat{\gamma}_i^2\,\mathrm{SE}(\hat{\beta}_{1i}^2) + \hat{\beta}_{1i}^2\,\mathrm{SE}(\hat{\gamma}_i^2)} \ldots\ldots\ldots\ldots Equation\ 4$$

where $\hat{\delta}_i$ is the calculated indirect effect of financial development on inequality via financial inclusion, i denotes the channel variable, financial inclusion. $\hat{\gamma}_{\mathrm{i}}$ is the estimated coefficient of the channel variable, $\hat{\beta}_{1i}$ is the estimated coefficient of financial development. SE is the standard errors of the estimated coefficients.

In line with literature, income inequality (Zhang and Naceur, 2019) in this study is measured with the GINI coefficient. Following Svirydzenka (2016), financial development is proxied by the financial development index whereas financial inclusion is proxied by the financial inclusion index which is computed using principal component analysis. The use of the financial inclusion index is consistent with studies such as Lenka and Barik (2018), Anarfo et al. (2019), Ahamed and Mallick (2019) and Singh and Stakic (2020). Inflation, economic growth and unemployment are proxied by the consumer price index, annual real GDP growth rate and the unemployment rate respectively. Human capital development is proxied by secondary school enrolment whereas GDP per capita represents the annual GDP per capita growth rate.

3.5. Empirical Results

This section presents the empirical findings of the study. Specifically, the three stage least square regression approach is employed to examine the indirect relationship between financial inclusion, financial development and income inequality in Africa. The theoretical expectation is that, an increase in financial development should exert a positive influence on financial inclusion as the development of the financial sector could enhance the extension of financial services to the unbanked. An increase in financial inclusion is then expected to improve the livelihoods of the previously unbanked through increased accessibility to credit and other financial services which would improve their incomes and reduce income inequality. Financial development is therefore expected to reduce income inequality through financial inclusion. Also, before the three stage least square results are presented, we first present a descriptive and correlation analysis of our variables.

3.5.1. Descriptive Statistics

Table 3. 1. Descriptive Statistics

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
GINI	217	0.5826	0.0402	0.4408	0.6720
FIIND	209	0.0000	1.0000	-0.8689	3.7512
FD	240	0.1612	0.0948	0.04	0.5
UNE	75	10.3993	7.4536	0.5986	35.46
SCE	168	53.2253	22.8723	11.9686	96.6594
INF	255	7.1880	5.8354	-4.2949	36.9648
GDPG	253	4.8095	4.8214	-17.6689	37.9987

GINI = Income inequality, FIIND = Financial Inclusion index, FD = Financial Development, UNE = Unemployment rate, SCE = Human Capital Development, INF = Inflation rate, GDPG = Annual GDP growth rate.

Table 3.1 presents the descriptive statistics of the variables used in this study. The mean value of GINI (Gini coefficient) is 0.5826 with a standard deviation of 0.0402. Since the Gini coefficient lies between 0 and 1, the average value suggests that, there is a moderate level of income equality in Africa, on average. The relatively small standard deviation of 0.0402 suggests that, there is less variation of Gini coefficient among countries in Africa which is reflected in the minimum and maximum values of 0.4408 and 0.6720 respectively.

On the average, financial inclusion is very low in Africa with high variations across countries. Some countries have very low (negative) financial inclusion whiles others have very high inclusion rates. The minimum financial inclusion is -0.8689 whiles the maximum financial inclusion is 3.7512. Financial development has an average of 0.1612 with minimum and maximum values of 0.04 and 0.5 respectively. The relatively low standard deviation indicates less cross-country variation in the level of financial development across Africa.

Unemployment (UNE) and human capital development (SCE) have averages of 10.3993 and 53.2253 respectively. The relatively high standard deviation for human capital development indicates significant difference in the level of human capital development across Africa. Whereas some countries have a very highly developed human capital, many others also have very low development in human capital. The standard deviation (7.4536), minimum (0.5986) and maximum (35.46) values for unemployment indicate a highly variable rate of unemployment across Africa.

The average values for inflation (INF) and annual gross domestic product (GDPG) are 7.1880 and 4.8095 respectively. This suggests that, on the average, the rate of inflation across Africa is about 7.12% whiles the average rate of growth for African economies is about 4.8095%. The minimum

and maximum values for inflation are -4.2949 and 36.9648 respectively while GDPG is highest at 37.9987 and lowest at -17.6689.

3.5.2. Correlation Matrix

Table 3. 2. Correlation Matrix

VARIABLE	GINI	FIIND	FD	UNE	SCE	INF	GDPPC
GINI	1						
FIIND	-0.2609*	1					
FD	-0.2636*	0.5988*	1				
UNE	0.1642	0.2680*	0.3290*	1			
SCE	-0.0650	0.7427*	0.6907*	0.4352*	1		
INF	-0.1675*	-0.2324*	-0.0236	-0.1317	-0.2199*	1	
GDPG	0.0782	-0.0490	-0.0553	0.0184	-0.1867*	-0.0190	1

* Denote significance at the 5% significance level. GINI = Income inequality, FIIND = Financial Inclusion index, FD = Financial Development, UNE = Unemployment rate, SCE = Human Capital Development, INF = Inflation rate, GDPG = Annual GDP growth rate.

Table 3.2 presents the correlations between the variables used in this study. From the Table, financial inclusion index (FIIND) is observed to have a significant negative correlation (-0.2609) with income inequality (GINI coefficient). This relationship suggests that, an increase in financial inclusion may be associated with an increase in income equality in Africa. Again, there is a negative correlation (-0.2636) between financial development (FD) and income inequality (GINI). This correlation also suggests that, development in the financial sector is associated with a decrease in income inequality. These correlations suggest that, an increase in financial inclusion and

development in the financial sector in Africa have the likelihood of reducing income inequality on the continent.

From the Table, unemployment rate (UNE) is observed to be positive (0.3483) and significantly correlated with income inequality (GINI), suggesting that, an increase in the rate of unemployment may be associated with an increase in income inequality in Africa. High unemployment in a country may widen the income gap and an associated increase in inequality in income. Annual Gross domestic product (GDPG) is observed to be positively correlated with income inequality (GINI). This suggests that, an increase in economic growth may be associated with a reduction in income equality, thus, an increase in income inequality.

Table 3.2 again shows that, financial sector development (0.5988) and human capital development (0.7427) are positively correlated with financial inclusion, suggesting that, development in the financial sector may be associated with an increase in financial inclusion. In the same way, the positive correlation between human capital development and financial inclusion suggests that, an increase in financial inclusion may be associated with an increase in human capital development. A financially inclusive economy may help to improve the human capital of individuals. There is also a significant negative correlation (-0.2324) between financial inclusion and inflation, suggesting that, an increase in financial inclusion may be associated with a reduction in inflationary pressures in an economy. Unemployment rate (0.3290) and human capital development (0.6907) are observed to be significant and positively correlated with development in the financial sector. This suggests that, development in the financial sector may be associated with higher development in human capital. However, there may also be an associated increase in the rate of unemployment as the financial sector improves.

3.5.3. Regression Results

Table 3. 3. Regression Results

	Inequality Equation (1)	Inclusion Equation (2)
FIIND	0.0200**	
	(0.0082)	
UNE	0.0991***	
	(0.0379)	
SCE	0.0480	
	(0.0846)	
FD		-5.9638***
		(1.3402)
INF		-0.4208***
		(0.0887)
SCE		-4.7066***
		(1.4785)
GDPG		-0.8398
		(0.5320)
Constant	-1.0301***	14.1406**
	(0.3061)	(6.7910)
R-squared	0.5652	0.6078
Chi2	28.61	31.37
Prob>chi2	0.0000	0.0000
Eventual Effect of FD on GINI	-0.1193***	
	(0.0558)	

Notes: *, **, and *** denote 10%, 5%, and 1% significance levels, respectively. FIIND = Financial Inclusion index, FD = Financial Development, UNE = Unemployment rate, SCE = Human Capital Development, INF = Inflation rate, GDPG = Annual GDP growth rate.
The GINI coefficient is the dependent variable in column one. In column 2, financial inclusion is the dependent variable. Standard errors are in brackets.

Table 3.3 presents the results of our three stage least square (3SLS) simultaneous equation model.

Results from the two equations estimated in this study are presented. The first equation (Column 1) includes UNE (unemployment rate) which is excluded in the second equation (Column 2). Again, INF (inflation) and economic growth (GDPG) are included in the second equation but

excluded from the first equation. The inequality equation has an R-squared of 0.5652 which means that, about 56.52% of the variations in income inequality can be explained by the independent variables employed in the inequality equation in column 1.

Also, the F-statistic of the inequality equation is observed to be significant at the 1% significance level, suggesting that, the model is jointly significant and that the independent variables used are jointly significant in explaining changes in income inequality. The coefficient of determination for the financial inclusion equation is 0.6078. This means that, about 60.78% of the changes in financial inclusion can be explained by the independent variables in the inclusion equation. There is joint significance in the inclusion model at the 1% significance level, which indicates that, the model adopted is significant in explaining variations in financial inclusion.

We set out to examine the indirect effect of financial inclusion on the relationship between financial development and income inequality in Africa. From column 1 in Table 3.3, we find that financial inclusion is positively related to income inequality and the relationship is significant at the 5% significance level. Accordingly, income inequality increases by 2% following a 1% increase in financial inclusion. In column 2 of Table 3.3, we again find financial sector development to be significant and negatively related to financial inclusion, in a relationship that is significant at the 1% significant level. This also suggests that, an increase in financial development will result in a decrease in financial inclusion. Development of the financial sector may benefit current players in the financial sector initially and increase the level of exclusion in the system.

We examine the indirect effect of financial development on income inequality by multiplying the coefficients of financial inclusion and financial development. The eventual coefficient is -0.1193, and statistically significant at the 5% significance level. Statistically, income inequality falls by

about 11.93% with an increase in financial development. The significant negative coefficient suggests that, financial development significantly affects income inequality in Africa through financial inclusion. This means that, financial development helps to significantly reduce income inequality in Africa. This finding is consistent with the findings of Younsi and Bechtini (2020), Baiardi and Morana (2018) and Thornton and Di Tommaso (2019) but contradicts the findings of Jauch and Watzka (2015). Whereas financial inclusion positively affects income inequality, we find financial development to simultaneously influence financial inclusion negatively.

Our finding suggests that, an increase in financial development propels the provision and extension of financial services on the extensive margin in Africa. This eventually results in a decrease in income inequality as poor households gain increased access to the financial sector, taking advantage of the developments in the financial sector. The findings suggests that, an increase in financial inclusion without a simultaneous increase in financial development may not necessarily reduce income inequality. This is because, without development in the financial system as a whole, an increase in financial inclusion may likely benefit current users of financial services and rather result in a widening of the income gap. Financial development increases the capacity of financial service providers to extend services and products to poor and marginalized individuals, resulting in a reduction in the income gap.

This evidence supports the extensive margin (Bittencourt et al., 2019) of financial inclusion which argues that, as the level of economic and financial development increase, financial inclusion then works on the extensive margin, channeling resources to people who were previously not included in the formal financial sector. The extensive margin of financial inclusion influences the amount of people who use financial services, adding people from the lower end of the income distribution, that is, raising financial inclusion (Greenwood and Jovanovic, 1990). As an economy progresses

and society becomes increasingly urbanized, formerly poor migrants are able to select their levels of education and business activities as loans become relatively more accessible in a mature financial system, which reduces income inequality (Jung and Vijverberg, 2019). Thus, the effects of the extensive margin reduce inequality by assisting low-income families to accumulate human capital, decrease liquidity challenges, increase investment opportunities, and manage risks.

Our findings support the finance-inequality narrowing hypothesis which follows the works of Becker and Tomes (1979), Banerjee and Newmann (1993), Galor and Zeira (1993) and Galor and Moav (2004). From this hypothesis, the imperfections in the market and information asymmetry hinder the poor from gaining access to loans in order to make investments in human and physical capital, suggesting that financial development helps to reduce income inequality. In financial markets that are underdeveloped, high costs of borrowing hinder poor people from accessing affordable credit and so they most likely remain unskilled. As financial markets improve as a result of expansion in the economy, the consequent availability of financial products provides an opportunity to needy people to borrow and invest in human and physical capital. Subsequently, inequality decreases as the welfare of the poor is enhanced.

Additionally, the indirect relationship observed in this study can be explained with the hypothesis of Greenwood and Jovanovic (1990). The authors posit that, at the initial stages of financial development, only the rich and privileged have accessibility to loans and so the inequality condition becomes worse. This assertion is reflected in the negative influence of financial development on financial inclusion observed in Table 3.3. However, as the economy progresses, more individuals get financially included and so they are able to access financial services and this helps to reduce the income disparity between the rich and the poor (Biardi and Morana,2018 and Jung and Vijverberg, 2019). Empirical studies by Kim and Lin (2011) and Shahbaz et al (2015)

also support our findings and the hypothesis of Greenwood and Jovanovic. Kim and Lin (2011) for instance find that, the relationship between financial development and income inequality crucially depends on the stages of financial development, which suggests that, a threshold level of financial development is necessary for achieving reduction in income inequality through financial development. This means that, initial development may not necessarily reduce income inequality.

From column 1 in Table 3.3, we further find that, unemployment (UNE) is significant and positively related to income inequality, with the relationship being significant at the 1% significance level. Statistically, income inequality increases by 0.3884 units following a 1 unit increase in unemployment. This evidence suggests that, high unemployment in a country increases the income gap between the poor and the rich. Unemployed individuals receive no or very little income whiles the employed enjoy huge incomes. This phenomenon increases income inequality. It is inferred from this evidence, therefore, that, income inequality is high in countries where the unemployment rate is very high. On the other hand, inequality in income will be lower for countries with lower unemployment rates or in countries where the unemployment rate is falling.

In column 2 of Table 3.3, inflation is observed to exert a significant negative influence on financial inclusion. This finding suggests that, higher inflation in an economy reduces the ability of financial institutions to increase the provision of financial services, either to existing customers or to the poor. Also, we find human capital development to be significant and negatively related to financial inclusion, suggesting that, development of the human capital of individuals is related with a decrease in financial inclusion. This suggests that, secondary school enrolment in Africa may not necessarily result in an increase financial inclusion.

3.5.4. Robustness Check

Table 3. 4. Robustness Check

	Inequality Equation (A)	Inclusion Equation (B)
FIIND2	0.0578***(0.0158)	
UNE	0.0032*(0.0019)	
SCE	-0.2180***(0.0527)	
FD		-5.3717***(1.6819)
INF		-0.0349(0.0271)
SCE		0.0625***(0.0069)
GDPG		-0.0462(0.0448)
Constant	0.2439(0.2081)	-2.0193***(0.4941)
R-squared	0.0336	0.7392
Prob>chi2	20.15 0.0002	118.54 0.0000
Eventual Effect of FD on GINI	-0.3105**(0.1291)	

*, **, and *** denote 10%, 5%, and 1% significance levels, respectively. The GINI coefficient is the dependent variable in column one. In column 2, financial inclusion is the dependent variable. Standard errors are in brackets.

In Table 3.4, we test the robustness of the findings presented in Table 3.3 by employing an alternative measure of financial inclusion index developed by Van et al (2020). The authors create an index of financial inclusion using three indicators which are; number of commercial bank branches per one hundred thousand (100,000) adults, number of ATMs per one hundred thousand (100,000) adults and the ratio of bank credit to the private sector as a percentage of GDP.

Consistent with the model employed in Table 3.3, The inequality equation includes UNE (unemployment rate) but is excluded in the inclusion equation Again, INF (inflation) and economic growth (GDPG) are included in the inclusion equation but excluded from the inequality equation. This is done to ensure that the conditions of a well-specified 3SLS equation are satisfied.

The inequality equation has an R-squared of 0.0336 suggesting that, about 3.36% of the changes in income inequality can be explained by the explanatory variables used in the inequality equation in column A of table 3.4. Likewise, the F-statistic of the inequality equation is shown to be significant at the 1% significance level, indicating that, there is joint significance in the inequality model and that the explanatory variables employed are together significant in explaining variations in income inequality. The coefficient of determination (R-squared) for the financial inclusion equation is 0.7392. This suggests that, about 73.92% of the variations in financial inclusion can be explained by the explanatory variables in the inclusion equation. The financial inclusion equation is jointly significant at the 1% significance level, which indicates that, the model adopted is significant in explaining variations in financial inclusion.

Consistent with the earlier finding presented in Table 3.3, we find financial inclusion to exert a significant positive influence on financial inclusion (column A), an influence that is significant at the 1% significance level. This means that financial inclusion, individually, increases the gap in income among individuals in Africa. Statistically, a 1% increase in financial inclusion results in a 5.78% increase in income inequality. An increase in financial inclusion in Africa therefore increases the income gap. Again, consistent with the evidence presented in Table 3.3, we find from column B in Table 3.4 that, financial development is negatively related to financial inclusion at the 1% significance level. Development of the financial sector reduces the provision and extension of financial services in Africa.

The indirect effect of financial development on income inequality is captured by multiplying the coefficients of financial development and financial inclusion. The coefficient for this interaction is negative and significant at the 5% significance level. The coefficient of -0.3105 suggests that, a 1% increase in financial development may result in a 31.05% decrease in income inequality, through financial inclusion. Consistent with the evidence from Table 3.3, this finding supports the finance-inequality narrowing hypothesis that follows the works of Becker and Tomes (1979), Banerjee and Newmann (1993), Galor and Zeira (1993) and Galor and Moav (2004). As financial markets improve as a result of expansion in the economy, the consequent availability of financial products provide an opportunity to needy people to borrow and invest in human and physical capital. Subsequently, inequality decreases as the welfare of the poor is enhanced.

At the initial stages of financial development, only the rich and privileged have accessibility to loans and so the inequality condition becomes worse (Greenwood and Jovanovic (1990). This explains the negative relation observed between financial development and financial inclusion in Column B of Table 3.4. Provision of financial services may not be extended to the poor and marginalized in the early stages of financial development as current users of financial services are more likely to benefit from new innovations and developments, resulting in a decrease in the use of financial services by the poor. As the economy and financial sector develops further, financial services are extended to the poor and marginalized as providers develop the capacity to include the underprivileged population. More individuals get financially included and so they are able to access financial services and this helps to reduce the income disparity between the rich and the poor (Jung and Vijverberg, 2019).

We further find the coefficients of unemployment and human capital development to be consistent with the findings observed in Table 3.3. Similar to the evidence in Table 3.3, unemployment is

found to be positive and significantly related to income inequality at the 1% significance level. This suggests that, an increase in unemployment results in an increase in the income gap between the rich and the poor. In the same way, a reduction in the unemployment rate may lead to a reduction in income inequality. Employment helps poor individuals who do not receive any income to improve their income situation by earning salaries. Employed individuals who earn salaries can also improve their skill set through education in order to earn higher income and reduce income inequality.

The human capital evidence also suggests that, as poor individuals become more educated, healthy and highly skilled, they become well-positioned to earn higher incomes and probably have multiple income sources. Over time, the income gap reduces as more poor people develop their human capital and achieve higher incomes. This finding is consistent with Batuo and Mlambo (2010). Additionally, human capital is observed in column B to exert a significant positive effect on financial inclusion, indicating that, development in human capital enhances the ability of individuals to access formal financial services in Africa. This evidence suggests that, education is important in increasing the demand and accessibility of financial services in Africa. As individuals become more healthy, highly skilled and educated, the level of financial inclusion increases as these individuals become better placed to access loans and use other financial services.

3.6. Policy Implications and Recommendations

Financial inclusion can bring many welfare benefits to individuals. The rising income inequality in Africa portrays more than a story of poverty in Africa. Even though there seem to be an improvement in the financial sector and the provision of financial services, the income gap seems to be widening. Based on the findings from this study, we provide suggestions and recommendations to guide policy making in order to take advantage of the development of the

financial sector and the increasing provision of financial services in Africa. We find evidence of an indirect relationship between financial development and income inequality, with financial inclusion significantly affecting this nexus.

The significant negative effect of financial development on income inequality through financial inclusion suggests that, development of the financial sector actually reduces the income gap between the rich and the poor. Our evidence suggests that financial inclusion, which is a result of development in the financial sector, occurs both on the intensive margin and the extensive margin. In order to reduce the income gap and ensure income inequality, policy makers and financial institutions must put in place measures to ensure that financial services are extended to the poor and marginalized. Policy makers and regulators should provide incentives to motivate financial institutions to extend their reach to the poor, even at the initial stages of financial development.

In terms of policy making for instance, policies that are geared towards reducing income inequality may require mainstream financial services to keep a certain number of accounts from areas that are considered as less developed. Also, such policies may require formal providers of financial services to report on their activities, not just corporate social responsibility acts, but their banking activities with individuals in rural areas. This will help to ensure that, a minimum number of rural dwellers, if not all, are able to gain accessibility to financial services from mainstream financial service providers. As per the extensive margin of financial inclusion, extending financial services to individuals in rural communities, as a result of development in the financial sector, can help to increase their income and contribute to the reduction of income inequality in Africa. As part of policy making, also, policies targeted at improving financial sector development must be accompanied with financial inclusion policies. However, policy makers must ensure that financial

services are extended to the poor and marginalized, otherwise, development of the financial sector will only widen the income gap in Africa.

Our findings suggests that, increased financial development reduces financial inclusion as development in the financial sector only increases the provision of financial services to the rich and the already banked population in the early stages of development. As a result, there is no broadening or extension of financial services to the marginalized. In order to move from the intensive margin to the extensive margin and reduce income inequality, financial institutions must design products and services for the poor and low-income groups at all stages of development. A conscious effort must be made by banks to extend tailor-made financial services to rural areas and the unbanked population, whiles taking care of their urban and existing customers.

This will ensure that the poor are not left out but also provided with opportunities to take advantage of the development of the financial system. As the poor access financial services designed for them, they will be able to benefit from the income opportunities provided through investment activities to increase their income which will eventually help to reduce the income gap. As banks extend financial services to the unbanked and marginalized, poor people can take advantage of the presence of group loans for instance, to improve their trading and expand their businesses. This will go a long way to improving their incomes and lead to a reduction in income inequality.

Also, financial institutions may use the services of agencies to increase their reach to rural dwellers. In areas where it may not be economically prudent to build a branch, mainstream financial service providers may employ the services of agents to act on their behalf in the provision of financial services to individuals in such areas. Through the use of agents and agencies, banks and other financial institutions can empower the poor in their businesses and economic activities.

By enhancing their businesses and economic activities, the livelihoods of poor people can be improved through increased income. Income inequality can be reduced by the use of agency services to reach rural communities.

Additionally, we find human capital development to have a negative influence on income inequality, that is, human capital development contributes to the reduction of income inequality in Africa. This calls for governments and policy makers in Africa to implement policies that will help to improve the human capital of the citizenry. Policies on health and education, for instance, must be actively and seriously pursued. Education increases the income of individuals by positioning the poor to take up lucrative jobs and opportunities and attain higher incomes. Investment in education and human capital, using current generations' resources, will bear fruit in the next generation. For instance, giving children good education will equip them to succeed and achieve higher incomes. As poor individuals become more educated also, their understanding of the financial system and financial services will be improved. Such educated individuals will be able to take advantage of financial sector development and the availability of profitable investment and financial services provided in the financial system to improve their incomes and reduce the income gap in the society.

Unemployment is also found in this study to significantly increase income inequality in Africa. High unemployment rate implies that a higher number of the population are not actively engaged in active employment. As a result, they may earn very little or no income which increases income inequality. African governments and policy makers must implement policies that will lead to job creation in their countries. More jobs and employment will reduce the unemployment rate and effectively reduce income inequality in Africa. Again, governments in Africa must create

conducive economic environments which will attract foreign investors to venture into their countries and create more job opportunities for their citizens.

3.7. Conclusion

The effect of financial development on income inequality in Africa has not been extensively examined in the literature. The few studies that have considered this relationship have also failed to provide the channel through which financial development affects income inequality. Issues of measurement have also been of major concern in the literature. Most studies have studied financial development using single measures as the proxy. However, due to the multidimensional nature of financial development and other key factors such as financial inclusion, it is pertinent to study these factors with more comprehensive measures that capture all of their dimensions. The interaction between financial development, financial inclusion and income inequality is important as African governments, in collaboration with international bodies, seek to reduce poverty and the high-income inequality that is characteristic of the continent.

This study set out to examine the indirect effect of financial inclusion in the relationship between financial development and income inequality in Africa using the three-stage least squares (3SLS) approach. To do away with the issue of measurement where single measures are used as proxies for financial development and financial inclusion, we proxy both financial development and financial inclusion with indexes that capture the multidimensional nature of these two factors. The study uses data that covers a 12-year period, from 2004 to 2015. The 3SLS estimation technique is adopted for this study as it provides more robust estimates that are asymptotically efficient and uses information that are inherent in the correlations between the errors in the specified structural equations (Nosier and El-Karamani, 2018). We test the robustness of our initial findings by employing an alternative index of financial inclusion used by Van et al (2020).

The expectation at the beginning of this study was that, financial development should lead to a reduction in income inequality, through financial inclusion. Our expectation is supported. We find financial development to indirectly exert a negative effect on income inequality in Africa, meaning that, development in the financial sector reduces the income gap between the poor and the rich. Financial development eventually reduces income inequality as financial services are extended to the marginalized as the sector further develops. This finding is robust to alternative measures of financial inclusion.

Additionally, we find unemployment rate to be significant and positively related to income inequality in Africa. This indicates that, an increase in the rate of unemployment in Africa hinders the achievement of income equality in the society. Also, we find human capital development to be negative and significantly related to income inequality, implying that, development of the human capital of the African populace is essential to achieving income equality. The income of the poor can increase greatly as they become more educated and positioned to take up high-income positions and roles.

Based on these findings, we suggest that policy makers and financial institutions make efforts to move financial inclusion in Africa from the intensive margin to the extensive margin in order to reduce income inequality. Financial institutions must design products and services for the poor and low-income groups. A conscious effort must be made by banks to extend tailor-made financial services to rural areas and the unbanked population. Financial institutions should use the services of agents and agencies to reach poor and rural communities where building permanent branches may not be economically prudent. Policy makers and governments in Africa must implement policies targeted at reducing the unemployment rate whiles providing the necessary investments

and opportunities for individuals to develop their human capital. These will go a long way to contribute to the reduction of income inequality in Africa.

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CHAPTER 4

FINANCIAL INCLUSION AND BANKING STABILITY IN AFRICA

4.1. Introduction

Financial inclusion has gained global attention and has now become a significant public policy priority in the aftershock of the recent global economic downturn. For instance, after the crisis, leaders of the G20 recognized the importance of promoting and implementing policies aimed at achieving financial inclusion, stability and consumer protection. Globally, policy makers have recognized financial exclusion as a key impediment to development; hence, the expansion of financial access to all has now been prioritized by governments (Demirgüc-Kunt et al., 2015). In the last decade, central banks in developing and advanced countries have designed policies in collaboration with multilateral institutions such as the World Bank, International Monetary Fund (IMF), G20, the Alliance for Financial Inclusion (AFI) and the Consultative Group to Assist the Poor (CGAP) to promote financial access.

The developmental goal of financial inclusion, however, could have consequences on the soundness of banks. On one side, financial inclusion through the extension of bank credits to a lot of people and companies may reduce loan portfolio quality and weaken the stability of the banking sector in situations where the supervision of banks is weak (Sahay et al. 2015). On another side, financial inclusion may promote banking sector stability by diversifying risks; that is, making loans to more individuals and companies (Morgan and Pontines 2014). Possible risks arising from advancing loans to low-income borrowers is a major concern because the participation of the poor in the financial sector results in increased cost of information and transaction. This is because, the poor are not easily accessible and there is relatively more difficulty in gathering information on the poor. Additionally, financial instability may be increased when low-income borrowers have a

credit history that is poor (Van et al, 2020). In fact, Ahamed & Mallick (2019) posit that, safety and soundness concerns are part of the main reasons why banks hesitate from providing banking services to underprivileged areas in the society. Authorities in the Asian region have particularly showed their worries about macroeconomic instability that results from increased financial inclusion (Van et al, 2020). Overlooking the interaction between financial inclusion and stability may result in financial exclusion, which is the inaccessibility to formal financial services, systemic crises (Cihak et al, 2016).

Recently, due to the development of innovative technologies, mainstream financial providers are increasingly looking for fresh avenues and markets; recognizing the advantages of micro-finance style of operations (Ahamed & Mallick, 2019). By exploiting larger scale in skill and technology, banks can extend financial products to more customers possibly at reduced costs, whilst helping to reduce risk by using more non-wholesale funding. Indeed, the role of financial inclusion in increasing savings, decreasing poverty and increasing income equality is well documented in the literature and development circles (Mushtaq & Bruneau, 2019; Neaime & Gaysett, 2019; Li, 2018; Allen et al, 2016; Demirgüc-Kunt & Levine, 2007). However, substantial literature has been dedicated to the positive role played by financial inclusion in promoting economic growth (Singh & Stakic, 2021; Ali et al, 2020; Kim et al, 2018) and welfare of households (Ofori Abebrese & Baidoo, 2020; Neaime & Gaysett, 2018; Baiardi & Morana, 2018), whereas little consideration has been given to investigating the influence of increased financial access on the stability of banks. the few studies on this subject have also yielded inconclusive findings, making it necessary for further research to be done to establish the relationship.

Even though empirical literature on the inclusion-stability nexus is growing, the results remain inconclusive. Whiles a greater number of these studies find that increased levels of financial

inclusion enhance bank level stability (Danisman & Tarazi, 2020; Ahamed & Mallick, 2019; Neaime & Gaysett, 2018; Morgan & Pontines, 2014; Cull et al 2012; Hannig & Jansen, 2010), other studies find a negative relationship (Sahay et al, 2015; Amatus & Alirez, 2015; Mehrotra & Yetman, 2015). We argue that a fundamental flaw in the measurement of financial inclusion is at the heart of the inconclusiveness. Whereas some authors use the number of bank accounts per 1,000 adults, number of SME borrowers to gross borrowers and proportion of outstanding SME loans to total loans which relate to usage (Siddik & Kabiraj, 2018; Morgan & Pontines, 2014), others use the number of bank branches or ATMs per 1,000 adults which relates to access (Neaime & Gaysett, 2018; Evans, 2016; Mbutor & Uba, 2013).

Meanwhile, financial inclusion encompasses usage and access. To measure the concept of financial inclusion as either usage or access is to wrongly capture the multidimensionality of the concept. Indeed, even each of the usage and access sub dimensions have different measures and existing literature has largely dwelled on single measures of either of these sub dimensions. Meanwhile, getting the measurement right is critical for policy purposes. We therefore use an index of different measures of financial inclusion across the usage-access divide. The use of this comprehensive measure helps to provide more robust evidence and sets the course for the use of comprehensive indexes in further research. Although few authors have used similar indices (Anarfo et al, 2020; Anarfo et al, 2019; Lenka & Bairwa, 2016), they are in the context of financial inclusion-financial regulation and financial inclusion-monetary policy nexus. The only study in the context of financial inclusion-stability nexus that has used an index, to the very best of our knowledge, is the study of Ahamed and Mallick (2019) but they used a single proxy for inclusion from the dimension of access (number of bank branches per 100 square kilometres) and a single

measure of inclusion from the dimension of usage (number of ATMs per 100,000 people), a limitation the authors concede in their work.

Additionally, the empirical literature on the inclusion-stability nexus on Africa is substantially limited. To the best of our knowledge, the only studies in the African region are Ahmad (2018); Siddik & Kabiraj (2018); Ackah & Asiamah (2016); Amatus & Alireza (2015); Aduda & Kalunda (2012). These studies, like their counterparts on the advanced economies, suffer the measurement problems. Importantly, the limited literature on Africa is puzzling given that it is the sub region where financial exclusion is more pronounced.

With regards to account penetration, the number of individuals aged 15 and over who hold a bank account in Sub-Sahara Africa is an average of 24% compared to 89% in high-income countries, 55% in Pacific and East Asia, 45% in Central Asia and Europe, 39% in Caribbean and Latin America, and 33% in Southern Asia (Allen et al, 2016). Importantly, it is also in Sub-Sahara Africa where financial institutions and markets are relatively less developed with the banking system as the key source of funding for firms and individuals. Bank stability in African nations therefore is even more critical relative to the advanced economies where alternative financing sources exist.

We therefore focus on financial inclusion and bank stability in an African context where financial exclusion is more pronounced and where the banking system is the main lifeline of the financial systems of these countries. In doing so, we use the quantile regression technique to capture inherent asymmetry in the measure for bank stability. The bank z-score has been commonly employed in literature to measure bank stability (Anarfo et al, 2020; Siddik & Kabiraj, 2018; Dwumfour, 2017; Čihák, Mare & Melecky, 2016; Morgan & Pontines, 2014). A key component of the measure of the bank z-score is return on assets. Returns necessarily exhibit tail dynamics as they swing

between extreme losses and extreme profitability during crisis and boom periods respectively. To use approaches based on the mean, as in the literature (with the exception of Ahamed and Mallick, 2019), is to ignore these tail dynamics which have the greatest effect on bank stability.

This study contributes severally to the inclusion-stability literature. First, this study contributes by employing an index of financial inclusion which captures the multifaceted nature of financial inclusion, unlike many previous studies that employ single measures (Evans, 2016; Mbutor & Uba, 2013). Again, the estimation method employed helps to capture the influence of inclusion at various quantile levels of stability in Africa. The use of the quantile regression technique provides an avenue for tailored policies across the African region. Most studies on stability in Africa provide general recommendations for all economies, ignoring the different stability levels among countries. A clear insight in this nexus is of great managerial and economic relevance in achieving inclusive development in finance and growth. Policies can then be made with reference to the level of stability in a country. Lastly, this study contributes to the extant literature on the factors that determine banks' stability, concentrating solely on the African region where evidence on the influence of financial inclusion on stability has been scanty and inconclusive.

4.2. Contextualizing Financial Inclusion and Bank Stability

Strategically, banks are involved in various intermediation services and choose a mix of assets and funding combinations to attain their corporate objectives (Roengpitya et al., 2014). Using a worldwide sample of 222 banks, Roengpitya et al. (2014) find three different business models for banks by assessing their combination of assets and plans for funding: retail-funded, wholesale-funded, and capital market-oriented. For retail-funded, these are banks that depend on huge stable sources of funds which include deposits and have a high share of loans in their books; for wholesale-funded banks, these are banks that possess a large part of loan liabilities in their books

(which includes interbank borrowings); and lastly, capital market-oriented banks, those that have 50 percent of assets in tradable securities and are typically financed in wholesale markets. Studies also indicate that the selection of a business model, that is, a combination of assets and financing strategies, affect banks' risk and return (Demirgüc¸-Kunt and Huizinga, 2010; Ayadi and De Groen, 2014; Roengpitya et al., 2014).

Banks that use the retail-funded model of business can decrease distress comparatively more (Calomiris and Kahn, 1991; Song and Thakor, 2007). In a financial system that is inclusive, institutions may have more avenues to gather inexpensive retail deposits, and thus decrease additional costs of providing banking services. Inclusion may assist banks to reduce information asymmetry problems by developing more personal relationships with customers (Petersen and Rajan, 1995), and may be more efficient in an atmosphere that has stronger institutions which strengthens creditor rights. It is contended that retail deposits are insensitive to risks and serve as a stable inexpensive source of long-term finance (see e.g., Song and Thakor, 2007) contrasted with wholesale financing which is enormously volatile and usually costly (e.g., see Huang and Ratnovski, 2011; Poghosyan and Cihak, 2011).

Financial inclusion has positive consequences on bank stability by decreasing procyclicality risk (Ozili, 2018). A significant rise in the number of small savers through increased financial inclusion would raise both the scope and stability of banks' deposit base which decreases the dependence of banks on "non-core" funding, which is usually more volatile in crisis periods (Khan, 2011), thus enhancing stability in the banking system. Also, low-income earners are less responsive to changes in economic cycles, therefore adding them to the financial system reduces volatility and enhances the stability of deposit and loan bases in the financial sector. Hannig and Jansen (2010) show that financial providers that cater for poor individuals tend to thrive through macro-crises and this helps

to sustain economic activity locally. Nonetheless, financial inclusion can possibly have adverse influences on stability. Negative externalities come mainly from the provision of loans to people without adequate supervision. A rise in borrowings may deteriorate lending standards and result in lower quality in loan portfolios. Cihak et al (2016) observe that, whereas enhanced financial inclusion improves stability in nations where processes are adequately supervised, it reduces stability in poorly supervised economies.

Hannig and Jansen (2010) contend that in the recent credit crisis when there was a dry up of wholesale funding, the diversified retail deposit base served as a cushion for financial institutions. In a financial system that is inclusive, banks are able to garner large retail deposits, which are mostly cheaper than wholesale funds. Collins et al. (2009) find that households that are poor are thorough users of savings avenues, whereas Allen et al. (2016) argue that savings opportunities provide more flexibility to homes for both payments and savings, and therefore opportunities for savings are more probable to be needed by unbanked or underbanked individuals compared to loan services. Therefore, in a financial system that is inclusive, banks that have large retail deposit funding must be able to decrease costs of funding and risks, and thus achieve more stability.

Further review of literature shows that the gap between financial providers and customers reduces the efficiency of financial services by intensifying information asymmetry problems (Hauswald and Marquez, 2006; Deng and Elyasiani, 2008). Hauswald and Marquez (2006) show that financial service providers get accurate signals about the quality of customers when the geographical distance between them is decreased. By reducing the distance, banks are able to develop good relationships, and hence make internal the advantages of supporting informationally opaque individuals. Using access to better information as a competitive advantage, banks can make thoughtful lending decisions, and set prices properly while reducing adverse selection and moral

hazard problems (Buch et al., 2012). Banks can take advantage of scale economies and decrease additional costs to gain higher power in the market. Because market power is the distance between price and additional costs shown as a percentage of price, increased power in the market would show whether banks are capable of minimizing marginal costs. Arguing on this line, Petersen and Rajan (1995) and Di Patti and Dell'Ariccia (2004) show that banks advance more loans to small companies when their market power is higher. As a result, in a financial system that is inclusive, banks with low marginal costs should be capable of reducing extreme risk-taking, and thus become increasingly stable.

The proportion of people who are outside the mainstream financial sector is reduced through higher financial inclusion, which leads to a more efficient implementation of monetary policy and promotes stability in the financial sector (Danisman and Tarazi, 2020). Employment increases when banks extend loans to SMEs, which are normally more labor-intensive. Prasad (2010) states that savings decrease the reliance on foreign nations, promote the funding of domestic investments and enhances stability. Another possible explanation is that financial inclusion provides benefits to people in financial emergencies and enables them to manage their financial risks, which also promotes banks' stability (Demirguc-Kunt et al, 2017; Karlan et al, 2014). Particularly, by moving from cash transactions to digital transfers, people create payment histories that can be examined when applications for credit are made. Absence of credit history can limit their chances of gaining access to credit and payment histories can be employed as alternative sources of information for evaluating credit risk.

In financial sectors that are inclusive, banks will likely have larger penetration of branches/ATMs across different regions and will have clients of all income levels and groups. This may have two disparate effects on banks stability (Ahamed & Mallick, 2019). With regards to the advantages

provided by higher financial inclusion, Ahamed & Mallick posit that when banks operate in financially inclusive sectors, they would be capable of attracting large (almost) risk-free inexpensive retail deposits and minimize their marginal costs. On another side, there may be offsetting effects of financially inclusive sectors associated with the loss of banking stability as a result of information asymmetries that come from working with poor families or small companies. It may also happen from a lack of technical and managerial know-how, and agency problems associated with complex organizational and product structure needed to serve a broad customer base in a financially inclusive sector. Therefore, inclusive finance may have stability enhancing or stability-reducing effects.

Several theoretical paradigms exist in the literature to explain the link between financial inclusion and banks' stability. First, financial inclusion leads to bank stability generally through mobilization of retail deposits. The transmission mechanism is such that when individuals who are financially excluded get involved in the financial system, banks get more customers and garner stable and cheaper retail deposits as opposed to wholesale funding sources, which is more volatile, especially during crisis period (Ahamed & Mallick 2019; Neaime & Gaysett 2018; Han & Melecky 2013; Hannig & Jansen, 2010). It is imperative to note that banks borrow from the wholesale sources in addition to the deposits but these wholesale funding sources dry up during financial crisis period with consequential effects on the liquidity and stability of these banks (Hannig & Jansen, 2010). To sum up, financial inclusion leads to mobilizing stable retail deposits which not only have effect on the stability of banks but also on the stability of the entire financial sector.

A second theoretical paradigm that explains the connection between financial inclusion and bank stability assumes that via financial inclusion banks are able to expand their clientele base and lower operational costs by spreading it over the large number of clientele base. This is more effective

when banks introduce technology in their financial delivery models to serve customers. By so doing, banks are able diversify their operations into many sectors of the economy which foster greater stability in the financial sector (see Beck et al 2011; Demirgüc-Kunt et al 2008).

At the household level, a theoretical association between financial inclusion and banking stability can also be explained. Importantly, individuals and households with more accessibility to financial risk-management tools can indirectly promote bank stability. A risk management tool such as insurance, for instance, can help maintain and improve the stability in the banking system by absorbing huge losses for both individuals and businesses. This helps to reduce the negative impact of losses which have the potential of collapsing businesses and destabilizing the banking system. This accessibility will not only promote the resilience and stability of the financial system but the economy as a whole (Cull et al., 2012).

Another theoretical paradigm assumes that at the macro level, more access to mainstream financial services can enhance efficiency of financial intermediation, by attracting huge amounts of local savings and consequently enhance soundness of investment financing and investment cycles. This will boost bank stability only if quality financial infrastructure and capable supervision are instituted (Prasad, 2010; Cull et al., 2012). On a whole, it is pertinent to note that this current study follows previous studies and explain the link between financial inclusion and bank stability based on the above theoretical underpinnings.

4.3. Financial Inclusion and Bank Stability: A Review of Literature

Theoretically, the current literature recognizes a number of avenues through which financial inclusion may affect the stability of banks. First by reaching out to more customers, banks are able to mobilize a lot of inexpensive and stable retail deposits, thereby reducing their reliance on more expensive and volatile wholesale deposits (Ahamed & Mallick, 2019; Neaime & Gaysett, 2018; Han & Melecky, 2013). Secondly, theory postulates that by increasing proximity with customers, banks are able to reduce information asymmetry and this strengthens the financial system. In addition, by increasing their customer base through financial inclusion, banks can reduce operational cost by spreading it over a large customer base. More importantly, there is the argument that, banks in addition to taking deposits, also borrow (wholesale funding sources) to on-lend. These wholesale sources dry up during financial crisis periods with its associated effect on liquidity and stability of banks (Hannig & Jansen, 2010).

Even though the empirical literature on the financial inclusion-stability nexus is growing, the findings remain inconclusive. While a greater number of these studies reveal that increase in the levels of financial access enhances the stability of banks, other studies find a negative relationship.

Using bank-level data, Vo et al (2020) examine financial inclusion and financial stability in the Asian region. The study uses a dataset of 3071 banks in the Asian region over the period from 2008 to 2017. Employing the GMM approach, the study finds that increased level of financial inclusion from providing accessibility to banking services contributes positively and significantly to stability, resulting in increased resilience in the banking sector. The authors posit that, financial inclusion enables banks to increase revenue, decrease cost, and grow their market share.

In a similar way, Danisman and Tarazi (2020) investigate how financial inclusion influences the stability in the European banking sector. The study uses a sample of 4,168 banks in 28 EU nations

from 2010–2017. Using the GMM technique, the authors find that higher financial inclusion through increased ownership of accounts and digital payments exert a stabilizing impact on the banking sector. The authors further show that the stabilizing influence of financial inclusion is mainly pushed by targeting underprivileged adults who are undereducated, not working, and who live in poor communities. Hence, along with the known positives to society as a whole, financial inclusion has the extra advantage of enhancing the stability of the financial sector.

Morgan and Pontines (2018) examine how greater financial inclusion influences the stability of SMEs. The authors employ the GMM estimation technique to analyze data from 2005 to 2011. The authors also use two proxies for financial stability; namely, bank Z-score and bank non-performing loans as a proportion of gross loans. The authors find evidence that an increased share of lending to SMEs aids financial stability by reducing non-performing loans (NPLs) and the probability of default by financial institutions.

Han and Melecky (2013) contend that in times of crisis, depositors of banks become anxious. This anxiety can result in a bank run and its consequential effect of withdrawal of huge deposits by bank customers. They argue that this phenomenon could be curtailed if banks are able to diversify their deposits by increasing their clientele base. Han and Melecky (2013) examine the link between access to bank deposits before the 2008 financial crisis and the deposit dynamics during the crisis. They use Honohan's (2008) index to measure access to deposits and Demirgüc-Kunt and Klapper's (2012) measure of actual use of deposits and Z-score as the measure of bank stability. Using GMM and OLS estimation techniques, the study focuses on deposit growth from 2006-2010 for banks in 173 countries and find that greater access to bank deposits as a result of the diversification of their funding base can make the deposit funding base of banks stronger in times of crisis. This means greater financial access enhances bank stability.

Morgan and Pontines (2014) examine the relationship between financial inclusion and financial stability using panel data for the period 2005-2011. They use bank Z-score and bank non-performing loans (NPLs) as proxies for bank stability. In measuring financial inclusion, the authors use loans granted to SMEs as a percentage of total loans granted by the commercial banks, and the number of SME borrowers as a proportion of total number of borrowers from commercial banks. Using the system GMM dynamic panel estimator of Blundell and Bond (1988), they find that greater lending to SME's reduces the probability of default by banks. The authors also find that increased access to formal financial services by SME's (financial inclusion) has a positive and significant effect on bank stability. This implies that having a greater number of SME borrowers leads to a lower probability of default by banks and reduces NPL's in the books of banks.

Neaime and Gaysett (2018) examine the impact of financial inclusion on income inequality, poverty and financial stability in Middle Eastern and Northern African (MENA) countries over the period 2002 -2015. Using GMM and OLS econometric models and a sample of 8 MENA countries, they find that while financial inclusion decreases income inequality, population size and inflation increases income inequality. They also find that financial inclusion also contributes positively to financial stability.

In a related study, Ahamed and Mallick (2019) investigate the effect of financial inclusion on bank stability. The authors use a sample of 2635 commercial banks in 86 countries whiles employing the Ordinary Least Squares (OLS), Generalized Method of Moments (GMM) and Quantile regression estimation techniques. In measuring financial inclusion, the authors focus on access indicators and use the following variables, which have been classified by the authors as demographic penetration variables, and geographic penetration variables; number of bank branches per 100,000 people, number of ATMs per 100,000 people, bank branches per 100square

kilometers and ATMs per 100 square kilometers. They find that higher levels of financial inclusion contribute to greater bank stability.

Some studies have however found a negative relationship between financial inclusion and financial stability. Khan (2011) investigates the effects of financial inclusion on financial stability. The results show that an attempt to increase the number of bank borrowers leads to a reduction in lending standards, which mainly contributed to the enormity of the United States sub-prime mortgage crisis. The study also found that the reputational risk of banks would increase when they reach out to smaller borrowers by outsourcing credit assessment functions.

Amatus and Alireza (2015) investigate the relationship between financial inclusion and financial stability of 35 countries in Sub-Saharan Africa over the period 2004 to 2011. The authors apply the GMM estimation technique and used bank-z score as a proxy for financial stability and measure financial inclusion with the outstanding loan and deposits of commercial banks with inflation, GDP per capita, and financial crisis as control variables. The authors find that outstanding deposits with commercial banks negatively affect financial stability.

Mehrotra and Yetman (2015) contend that increased financial access does not guarantee financial stability. They argue that greater financial inclusion through increase in access to credit could lead to financial excesses in the economy.

It is clear from the empirical review above that the relationship between financial inclusion and bank stability is inconclusive. Although studies such as Vo et al (2020), Danisman and Tarazi (2020) and Neaime and Gaysett (2018) have found greater financial inclusion to enhance stability, Amatus and Alireza (2015) and Mehrotra and Yetman (2015) also find greater financial inclusion to reduce stability. It is therefore pertinent to contribute to this discourse by examining how greater

financial inclusion affect banks at different levels of stability as the level of stability differs greatly across Africa. Although financial stability and bank stability are conceptually different, we review studies on financial stability as part of our empirical review as studies on financial stability have largely proxied this with bank Z-score and bank non-performing loans, proxies which are also used in the literature for banking stability (e.g., see Han and Melecky, 2013; Morgan and Pontines, 2018; Vo et al., 2020).

4.4. Bank Stability

Brunnermeier et al (2009) explain banking stability as instances where there is absence of banking crisis within the banking sector. Segoviano and Goodhart (2009) define bank stability as conditions that are stable within the banking sector which ensure smooth flow of operations and activities which are beneficial to the growth of the sector. They further argue that the banking stability will differ from country to country, when there is unanticipated fluctuation in economic cycles, and there is an effect of booms and recession. Schinasi (2004) also define banking stability in terms of its ability to manage risks, enable and improve economic processes, and absorb shocks.

Bank stability is said to be essentially founded on the confidence the people in a country have in the banking institutions and which postulates that the problems of one bank can effortlessly spread to other institutions. Banks have been established to be involved in almost everything in our everyday activities. Paying bills, building up savings, buying homes, drawing salaries, and loan taking are examples of transactions with banks. Organizations also depend on the banking sector for payment of their transactions and meeting additional financial needs. Banks also relate with each other in an international network to carry out financial services to their local customers and customers overseas. However, as they interact with each other and the public, the reputation they

develop and the confidence the populace gets to have of them as having the financial strength to survive for the foreseeable future is what determines their stability.

Thus, bank stability is tied to financial strength, systemic risk (Morgan and Pontines, 2018), minimizing financial distress, and reputation. Systemic risk is the risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy (Committee on the Global Financial System, 2010). According to the European Central Bank (2007), a bank is characterized as stable when the bank does not have excessive volatility, stress or crises. In other words, as defined by the same organization above, bank stability is when a bank "is able to withstand shocks and the unfolding of imbalances in finance, thereby alleviating the possibility of troubles in the process of financial intermediation which are tough enough to meaningfully weaken the distribution of savings to good investment avenues".

IMF (2003) expressed that, bank instability can be attributed to the idiosyncratic components associated with poor practices in banking unfavorably influencing a bank's solvency, from systematic parts originated by total shockwaves involving financial difficulties for the banking sector or both. This further highlight that poor banking corporate governance affect greatly the bank's solvency and in turn affect greatly the bank's stability.

According to World Bank (2013) banking stability in defined in many ways. Most of the definition on banking stability is about the lack of system-wide occurrences in which the bank is in crises. In stability, the bank is expected to absorb its shocks through a self-corrective mechanism. Banking stability is very important for economic development/growth because transactions in every economy is made through the banks (financial institutions). A major instability in the banking

sector can result in hyperinflation, stock market crash or bank run and this seriously shake trust in the economic and financial system.

The regulation and supervision of banks also explained the basis for banking instability. Weak regulation framework and ineffective supervision from the regulators can also cause banking instability. It is due to weak regulation that the United States Financial Crises Commission was commissioned in 2011 (US Financial Crisis Inquiry Commission, 2011) with the suggestion that effective supervisory tools are needed to have banking stability.

4.5. Estimation Strategy

4.5.1. Data

This study employs a quantitative methodology using secondary data from relevant sources. Country level data on the variables used in this study are obtained from the International Financial Statistics, Global Financial Development, World Development Indicators and the World Governance Indicators databases where appropriate. Specifically, data on economic growth, human capital development, Inequality and inflation are obtained from the World Development Indicators database. Data on financial development is obtained from the Global Financial Development database. Variables on the various dimensions of financial inclusion are obtained from the International Financial Statistics database and the World Development Indicators. The study employs data from 22 countries[3] covering a period that spans from 2004 to 2015. The period and number of countries used in the study are conveniently selected based on the availability of data in order to reduce the number of missing values in the calculation for our financial inclusion index. Countries with less than half of the observations for the financial inclusion components are

[3] The countries are Burundi, Botswana, Cameroon, Congo, Comoros, Cabo Verde, Djibouti, Egypt, Ghana, Guinea, Equatorial Guinea, Lesotho, Madagascar, Namibia, Nigeria, Rwanda, Eswatini, Seychelles, Tunisia, Uganda, Zambia, Zimbabwe.

excluded. Based on this criterion, the study arrives at 22 countries with enough observations to construct an efficient index for financial inclusion. Countries without enough observations for Z-score and the financial inclusion indicators were dropped from the study.

Financial inclusion is measured with an index of inclusion indicators that cover the usage and access dimensions of financial inclusion. Principal Component Analysis (PCA) is used in computing an index for financial inclusion. Bank z-score is employed as the proxy for stability in the banking system. The Z-score compares the buffer of a country's banking system (capitalization and returns) with the volatility of those returns. In order to obtain comprehensive insights into this relationship, previous empirical papers (Morgan and Pontines, 2018; Ahamed and Mallick, 2019; Vo et al., 2020) use the *Z*-score as a proxy for bank stability. The *Z*-score has been widely discussed and considered not only as a gauge of bank operational risk but also profitability and thus as an absolute gauge of bank's stability. Banks with the same *Z*-score value might engage in activities that optimize the compensation structure and still ensure functional consistency, whereas other banks carry out many risky projects to maximize returns. The Z-score is aggregated at the country level and calculated as follows;

$$\text{Bank } z \text{ score }_{it} = \frac{ROA + EQA}{sd(ROA)} \dots\dots\dots 1$$

Where ROA denotes the return on assets, EQA is defined as the ratio between total bank equity and total bank assets. Technically, the Z-score is commonly interpreted as the extent to which returns would have decreased before the bank equity was depleted. In other words, for every standard deviation of bank profitability, the Z-score represents the specified bank's ability to withstand risk. From the Global Financial Development Database, the Z-score is calculated for country-years with no less than 5 bank-level observations. ROA, equity, and assets

are country-level aggregate figures. It is calculated from underlying bank-by-bank unconsolidated data from Bankscope and Orbis. The higher the Z-score, the higher the level of stability.

Bank size, inflation, trade openness and economic growth are employed as control variables. Also, Vo et al (2020) argue empirically that profitability could influence the stability of banks. We therefore include return on assets as one of our regressors. Bank size is measured as the natural logarithm of the total assets of banks whiles loan portfolio risk is proxied with non-performing loan ratio. With regards to macroeconomic variables, inflation and trade openness are proxied with annual consumer price index and trade openness as a percentage of GDP respectively. Economic growth is proxied with the annual GDP growth rate.

4.5.2. Principal Component Analysis (PCA)

Principal component analysis (PCA) is a method that is often used to determine the link between data and common tests. The PCA approach considers the first component as the factor that might have the highest variation in explaining most of the fluctuations in the dataset. Successive components, in conjunction with the first component, form an orthonormal pattern and capture the remaining unexplained fluctuations. The financial inclusion index is calculated using Principal Component Analysis (PCA), which involves four (4) selected measures covering usage and access dimensions of financial inclusion. We compute a multidimensional index for financial inclusion as follows;

$$\text{Financial inclusion index } = \sum_{i=1}^{n} \omega_{ij} X_i \dots \dots Equation\ 2$$

where ω_{ij} are the component's loadings or weights; and X_i are the original variables. The financial inclusion composite index is constructed by using two dimensions of financial inclusion where

each dimension consists of two factors. The first dimension consists of the supply side factors, which include; number of commercial bank branches per one hundred thousand (100,000) adults (CBBA) and number of ATMs per one hundred thousand (100,000) adults (ATMA). The second-dimension which captures the demand side factors include; number of borrowers from commercial banks per one thousand (1000) adults (BCBA) and number of depositors with commercial banks per one thousand (1000) adults (DECB). The financial inclusion index is made up of four factors.

4.5.3. Estimation Procedure

Heterogeneity may be a cause of concern in our study as data is pooled across different countries in Africa. Therefore, we examine whether our measure of financial inclusion index has a homogeneous impact on bank stability while illustrating the relationship at different points in the conditional distribution of the dependent variable. To accomplish this, we use the quantile regression (hereafter, QR) approach, as introduced by Koenker and Bassett (1978). The QR approach provides several advantages over other estimators. For instance, while OLS estimators are sensitive to non-normal errors, QR results are robust to modest deviation from normality and outliers. QR also provides a comprehensive characterization of the sample, allowing us to examine the impact of financial inclusion on the entire distribution of Z-score. We assess the effect of financial inclusion on bank stability using the quantile regression technique as follows:

$$Q_{yit}(\varphi|X_{it}) = X'_{it}\mu_{\varphi} + \varepsilon_{it} \quad (3)$$

Where $Q_{yit}(\varphi|X_{it})$ indicate the conditional quantile of the bank z-score distribution and X_{it} as the vector of the regressors. The quantiles of interest are given by φ, μ_{φ} is the parameter vector to be determined and the errors are given by ε_{it}. The regressors in X_{it} include financial inclusion, bank size, loan portfolio risk, inflation, trade openness and economic growth.

To estimate μ_{φ}, we minimize the loss function below:

$$\min_{X'_{it}\mu_{\varphi}} \sum_{t=1}^{T} \pi_{\varphi}(Q_{yit} - X'_{it}\mu_{\varphi}) \quad (4)$$

The loss function in equation (4) is then simplified to be:

$$\pi_{\varphi}(\varepsilon) = \varepsilon(\varphi - I(\varepsilon < 0))$$

Where an indicator function, denoted by *I*, assumes the value of 1 if $\varepsilon < 0$ otherwise it takes the value of 0.

4.6. Empirical Results

In this section, we present the empirical findings from our estimations. We test the effect of financial inclusion on the stability of the banking sector in Africa using a quantile regression approach which allows us to examine the influence of financial inclusion at various distributions of the dependent variable, z-score. Descriptive statistics and correlations between the variables are also presented in this section.

4.6.1. Descriptive Statistics

Table 4. 1. Descriptive Statistics

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
ZSC	138	2.3770	0.5520	1.1319	3.5388
FIIND	209	0.0000	1.0000	-0.8689	3.7512
BKS	137	3.2922	0.8546	2.1185	7.6069
ROA	135	0.5361	0.8291	-4.9079	2.0644
INF	255	7.1880	5.8354	-4.2949	36.9648
TO	251	84.5627	47.3064	21.3327	347.997
GDP	253	4.8094	4.8214	-17.6689	37.9987

ZSC = Z-score, FIIND = Financial Inclusion Index, BKS = Bank size, ROA = Return on Assets, INF = Inflation, TO = Trade openness, GDP = Gross domestic product.

Table 4.1 presents the descriptive statistics of the variables employed in this study. Z-score has a mean of 2.3770 and a standard deviation of 0.5520, implying that, on average, return on assets would have to fall by 2.3770 times their standard deviation to wipe out the equity of banks. The minimum and maximum values for Z-score are 3.1015 and 34.4242 respectively, which also show the wide disparity in stability levels across Africa. On the average, financial inclusion is very low in Africa with high variations across countries. Some countries have very low (negative) financial inclusion whiles others have very high inclusion rates. The minimum financial inclusion is -0.8689 whiles the maximum financial inclusion is 3.7512. Bank size (BKS) has an average of 3.2922, a standard deviation of 0.8546 and minimum and maximum values of 2.1185 and 7.6069 respectively. The standard deviation, minimum and maximum values indicate very high variation in the size of banking sectors across Africa. The minimum and maximum values, for instance,

indicate the presence of very small and very large banking sectors, representing significant deviations from the mean of 60.9832.

The mean for return on assets (ROA) is 0.5361 with a relatively smaller standard deviation of 0.8291. This shows that, on the average, banks in Africa generate a return of about 0.5361% from their total assets. The lowest value for return on assets is -4.9079 whereas the maximum value for return on asset is 2.0644. Inflation and GDP growth have means of 7.1880 and 4.8094 respectively, with standard deviations of 5.8354 and 4.8214 respectively. The mean for inflation suggests that, countries in Africa experience an inflation of about 7.12% on average.

In a similar way, the economies of countries in Africa are observed to grow at an annual rate of 4.8094, on average. Lastly, trade openness (TO) has a mean of 84.5627 and a standard deviation of 47.3064. The African economy can be said to be fairly open to trade, on average. However, the fairly high standard deviation indicates significant cross-country variation in the level of trade openness among countries in Africa. Whereas some countries are highly open to trade, others are less open to trade. The minimum and maximum values for trade openness are 21.3327 and 347.997 respectively. The maximum trade openness was recorded for Djibouti in 2013. GDP growth is highest at 37.9987%, experienced by Equatorial Guinea in 2004.

4.6.2. Correlation Analysis

Table 4. 2. Correlation Matrix

VARIABLE	ZSC	FIIND	BKS	ROA	INF	TO	GDP
ZSC	1						
FIIND	0.6071*	1					
BKS	0.1704*	-0.0594	1				
ROA	-0.3910*	-0.2337*	0.0164	1			
INF	-0.2023*	-0.2324*	0.1356	0.1636	1		
TO	0.1935*	0.3675*	-0.0705	0.0462	-0.1536*	1	
GDP	-0.2965*	-0.0490	-0.0763	0.0840	-0.0190	-0.0445	1

* Denote significance at the 5% significance level. ZSC = Z-score, FIIND = Financial Inclusion Index, BKS = Bank size, ROA = Return on Assets, INF = Inflation, TO = Trade openness, GDP = Gross domestic product.

Table 4.2 presents the correlations between the variables used in this study. The study finds no presence of multicollinearity among the independent variables as no two independent variables have strong correlations (correlation higher than 0.8) with each other. The correlation between financial inclusion and stability (ZSC) is positive (0.6071) and significant, suggesting that, an increase in financial inclusion is associated with an increase in the stability of the banking system. Conversely, an increase in banking sector stability may also be positively associated with financial inclusion. A stable banking system may provide the necessary grounds to ensure an inclusive financial system. The size of the banking system (BKS) is observed to be positively correlated (0.1704) with banking sector stability. This relationship suggests that, an increase in the size of the

banking system may be associated with an increase in stability in the banking system. In the same way, an increase in the stability of the banking system may be associated with an increase in the size of the banking system as banks may be able to grow and increase their assets in a more stable banking system.

Table 4.2 shows a significant negative (-0.3910) correlation between return on assets (ROA) and stability (ZSC). Similarly, inflation (INF) is observed to be significant and negatively (-0.2023) correlated with stability in the banking sector. The correlation between ROA and ZSC suggests that, an increase in banking sector profitability may be associated with a decrease in stability in the banking sector, implying that, high profitability may cause banks to take excessive risks that may make the banking system unstable. This correlation also implies that, an increase in banking sector stability may be associated with lower profit levels for banks. The correlation between inflation and ZSC suggests that, inflationary pressures in a country may destabilize the banking system whereas increased stability in the banking sector may help to reduce inflationary pressures in a country.

The correlation between trade openness (TO) and stability (ZSC) is significant and positive (0.1935) whereas there is a significantly negative correlation (-0.2965) between economic growth (GDP) and stability (ZSC). The negative correlation between economic growth and stability suggests that, increased economic growth in Africa exposes the banking system to risks and may be associated with instability in the banking system. The attraction of a growing economy to foreign investors and companies may expose the banking system and increase vulnerability to instability in Africa. On the other hand, an increase in the stability of the banking sector may be associated with a decrease in economic growth in Africa. The positive correlation between trade openness and stability suggests that, an increase in trade liberalization may be associated with an

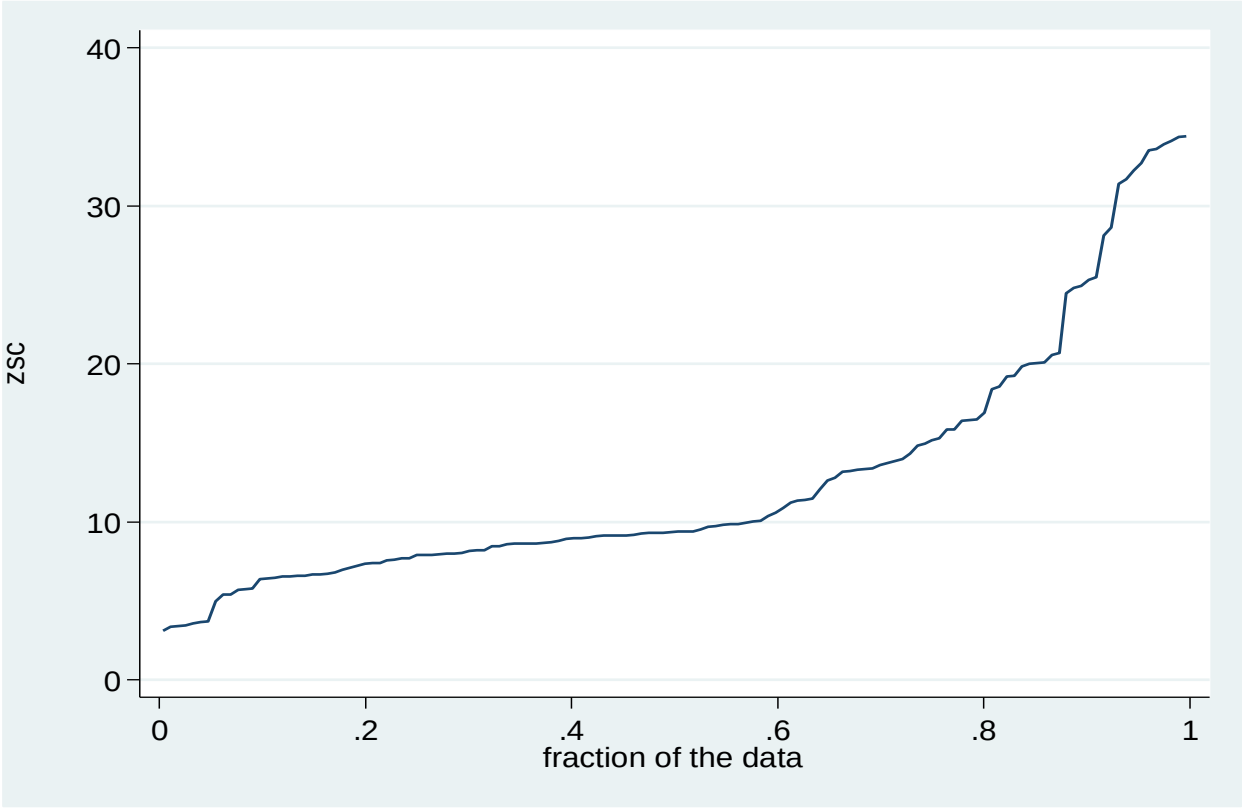
increase in stability in the banking system whiles an increase in stability may also be associated with an increase in trade openness in Africa. A highly stable banking system may increase the import and export of banking services and an associated increase in trade.

Return on assets (-0.2337) and inflation (-0.2324) are observed to significant and negatively correlated with financial inclusion. The relationship between return on asset and financial inclusion suggests that, high profitability may be associated with a decrease in financial inclusion whereas low profitability may be associated with higher financial inclusion. This may imply that highly profitable banks may not find the need to pursue financial inclusion as a way of improving their profit levels. However, low profitability may be associated with an increase in financial inclusion because relatively less profitable banks may find financial inclusion as an avenue to increase their profit levels, unlike their relatively more profitable counterparts.

The Table further shows a significant positive correlation (0.3675) between trade openness and financial inclusion, implying that, an increase in trade openness may be associated with an increase in financial inclusion whiles an increase in financial inclusion may also be associated with an increase in trade openness. Trade openness and inflation are also shown in the Table to be negatively correlated and significant. This correlation suggests that, an increase in inflation may be associated with a reduction in trade openness. In the same way, an increase in trade openness may be associated with a reduction in the rate of inflation.

4.6.3. Quantile Plot for Dependent Variable, ZSC

Figure 4. 1. Quantile Plot for ZSC



Source: Researcher's Computation (2021)

Figure 4.1 presents the quantile plot of the dependent variable, Z-score. The horizontal axis represents the quantiles of the dependent variable. The vertical axis represents the values of the dependent variable. Stability (Z-score) is observed to increase across quantiles, representing a seemingly positive slope. Although stability is higher at higher quantiles, stability is not too low even at lower quantile levels. Stability is observed to increase only marginally until the 60th percentile. However, there is a sharp increase in stability after the 60th percentile, representing a steeper slope.

4.6.4. Financial Inclusion and Bank Stability: Basic OLS

Table 4. 3. Basic OLS regression

Variable	Coefficient	Standard Errors
FIIND	4.4138***	0.6888
BKS	0.0067***	0.0008
ROA	-1.1781**	0.5477
INF	-0.1197	0.1145
TO	-0.0075	0.0246
GDP	-0.9639	0.7705
Constant	17.0801***	2.2608
R-squared	0.4908	
Prob > F	0.0000	
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	0.0000	
VIF	1.26	
Observations	103	

*, **, and *** denote 10%, 5%, and 1% significance levels, respectively. Z-score is the dependent variable. The standard errors are heteroscedasticity-consistent standard errors due to the presence of heteroscedasticity in the residuals. FIIND = Financial Inclusion Index, BKS = Bank size, ROA = Return on Assets, INF = Inflation, TO = Trade openness, GDP = Gross domestic product.

In Table 4.3, we estimate a basic OLS regression to provide justification for the use of the quantile regression technique. We test for heteroscedasticity with the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity. The Prob > chi2 of 0.0000 imply the rejection of the null hypothesis that there is constant variance in the residuals (homoscedasticity). We therefore find the presence of heteroscedasticity in the OLS which justifies the use of the quantile regression approach in this

study. While OLS estimators are sensitive to non-normal errors such as heteroscedasticity, quantile regression results are robust to modest deviation from normality and outliers. The quantile regression results provide heteroscedasticity-consistent estimates and therefore the presence of heteroscedasticity in the OLS regression provide strong justification for the use of the quantile regression technique in this study. Due to the presence of heteroscedasticity, the standard errors in Table 4.3 are robust standard errors which are heteroscedasticity-consistent. The R-squared of 0.4908 indicates that, the independent variables used in this study explain about 49.08% of the variations in bank stability (Z-score). Also, the model in Table 4.3 is statistically significant at the 1% significance level with a Prob > F of 0.0000, suggesting that, the independent variables employed are jointly significant in explaining variations in the dependent variable.

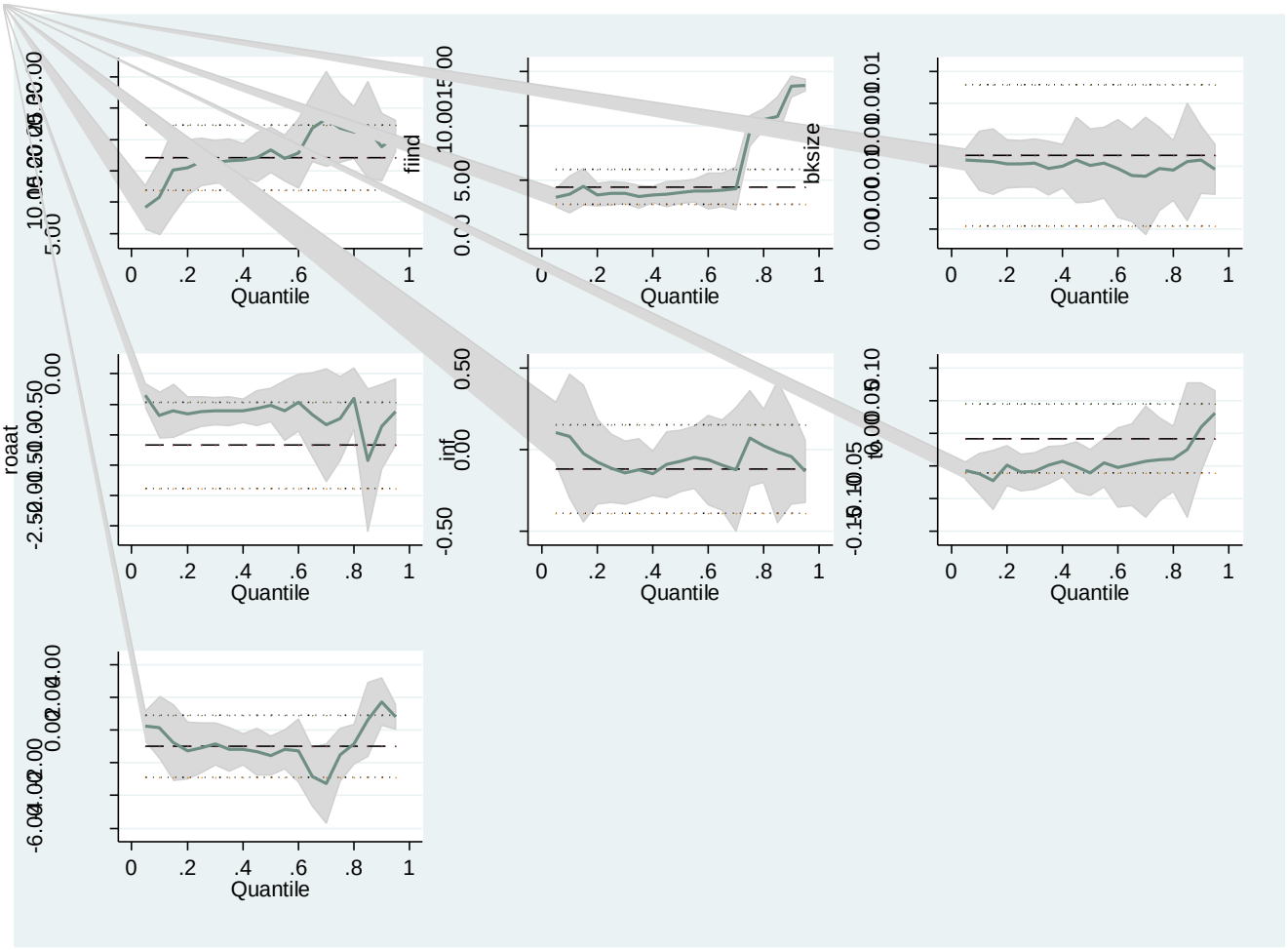
From the Table, financial inclusion is found to be significant and positively related to bank stability (ZSC). This suggests that, an increase in financial inclusion leads to an increase in bank stability whiles a decrease in financial inclusion also leads to a reduction in bank stability. At the 1% significance level, a 1 unit increase in financial inclusion may result in a 4.4138 increase in bank stability. In the same way, a 1 unit fall in financial inclusion results in a 4.4138 decrease in financial inclusion. It is inferred from this relationship that, financial inclusion augurs well for stability in the banking sector. Financial inclusion enhances soundness of individual banks. In particular, inclusive financial sector may enable banks to garner adequate cheap retail deposits from a large clientele base. Furthermore, it may also alleviate financing constraints of SMEs and also mitigate the post-lending moral hazard and asset substitutions problems. Therefore, with inclusive financial sector, banks enjoy greater stability.

Bank size is found to exert a significant positive effect on bank stability. This relationship also suggests that, an increase in the size of banks and the size of the banking sector as a whole enhance

the soundness of the banking system. Statistically, a 1 unit increase in the size of banks leads to a 0.0067 increase in bank stability, at the 1% significance level. Larger banks are able to operate efficiently and remain stable. This helps to ensure their stability and the stability of the banking system. The coefficient for return on assets (ROA) is found to be negative and significant at the 5% significance level, suggesting that, an increase in profitability results in a reduction in stability of banks. The source of bank profitability may expose banks to significant risks which may threaten their stability and the stability of the banking system. An increase in profitability through non-interest income generated from derivatives, for instance, may increase instability among banks.

4.6.5. Quantile Graphs

Figure 4. 2. Quantile graph



Source: Researcher's Computation (2021)

Figure 4.2 shows the quantile plots of the variables used in this study. In all, there are 7 graphs depicted in the Figure. The first graph represents the intercept whiles the second graph represents our variable of interest, the financial inclusion index. The third, fourth, fifth, sixth and seventh graphs represent our control variables which are bank size, return on assets, inflation, trade openness and economic growth respectively. The horizontal axis shows the quantile distributions of the dependent variable whiles the vertical axis shows the values of variables. Each of the graphs contain the coefficients of the OLS regression, the confidence intervals of the OLS regression, and

the coefficients of the quantile regression. The deep horizontal lines on the graphs represent the coefficients of the OLS regression. The coefficients of the OLS show a horizontal line because the coefficients are stable and do not change across quantiles. The dotted lines above and below the OLS coefficients are the confidence intervals for the OLS regression. The deep irregular lines that change across various quantiles represent the coefficients and confidence intervals for the quantile regression.

It is observed from the graphs that, the coefficients of the control variables are significantly different from the coefficients of the OLS regression. This is because, the coefficients of the control variables fall within the confidence intervals of the OLS confidence intervals. However, our variable of interest, that is financial inclusion index, shows different characteristics to the control variables. The quantile graph for the financial inclusion index is shown in the second graph. It is observed that, for low quantile levels of the dependent variable, the coefficients for the index of financial inclusion are not significantly different from the coefficients of the OLS regression. Until about the 60th quantile, the OLS regression coefficients are higher than the coefficients of the quantile regression.

The graph, however, considerably changes shape after about the 65th quantile where the coefficients of the quantile regression rise significantly above that of the OLS regression. At higher quantile levels (After the 65th quantile), the coefficients of the quantile regression are higher and significantly different from the coefficients of the OLS regression. This shows that, at higher quantile levels, financial inclusion exerts a bigger and significant impact on stability, an effect that cannot be captured by the OLS regression which is a mean regression.

4.6.3. Financial Inclusion and Stability: Quantile Regression Results

Table 4. 4. Quantile Regression Results

Variable	1	2	3	4	5	6	7	8	9
					Quantile				
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
FIIND	3.7029***	3.6927***	3.8246***	3.6980***	3.9033***	4.0083***	4.2624***	10.6029***	13.6124***
	[0.6592]	[0.6602]	[0.4493]	[0.4065]	[0.6494]	[1.1907]	[1.4473]	[1.9457]	[1.3297]
BKS	0.0063***	0.0061***	0.0062***	0.0060***	0.0061***	0.0059*	0.0054	0.0057	0.0064*
	[0.0018]	[0.0019]	[0.0013]	[0.0012]	[0.0018]	[0.0034]	[0.0041]	[0.0055]	[0.0038]
ROA	-0.6796**	-0.6579**	-0.6108***	-0.6097***	-0.5151*	-0.4724	-0.8444	-0.4091	-0.8680
	[0.2961]	[0.2965]	[0.2018]	[0.1826]	[0.2916]	[0.5348]	[0.6500]	[0.8739]	[0.5972]
INF	0.0829	-0.0734	-0.1402*	-0.1454**	-0.0697	-0.0637	-0.1229	0.0250	-0.0413
	[0.1132]	[0.1134]	[0.0772]	[0.0698]	[0.1115]	[0.2045]	[0.2486]	[0.3342]	[0.2284]
TO	-0.0614***	-0.0489**	-0.0574***	-0.0426***	-0.0598***	-0.0521	-0.0429	-0.0390	0.0095
	[0.0220]	[0.0220]	[0.0149]	[0.0135]	[0.0216]	[0.0397]	[0.0482]	[0.0648]	[0.0443]
GDP	0.1620	-1.2531	-0.8453	-1.1836**	-1.5671**	-1.2525	-3.2714*	-0.8631	1.7478
	[0.7979]	[0.7992]	[0.5440]	[0.4922]	[0.7861]	[1.4414]	[1.7520]	[2.3555]	[1.6097]
Constant	10.7906***	15.5373***	16.3991***	16.6881***	18.3130***	17.8286***	23.3109***	21.1708***	18.8011***
	[2.1735]	[2.1769]	[1.4816]	[1.3407]	[2.1412]	[3.9261]	[4.7721]	[6.4157]	[4.3843]
Pseudo	0.2472	0.2672	0.2889	0.3052	0.3216	0.3482	0.3704	0.4193	0.4767
R-squared									
Observations	103	103	103	103	103	103	103	103	103

*, **, and *** denote 10%, 5%, and 1% significance levels, respectively. The dependent variable is the Z-score. FIIND = Financial Inclusion Index, BKS = Bank size, ROA = Return on Assets, INF = Inflation, TO = Trade openness, GDP = Gross domestic product.

Results from the quantile regression are presented in Table 4.3. The table shows nine (9) conditional distributions (quantiles) of the dependent variable, Z-score. Column 1 shows the quantile regression at the 10th percentile through to column 9 which presents quantile estimates at the 90th percentile. Column 5 shows the median regression, which represents the least absolute deviation. Regression estimates at the lower quantiles represent low values (lower bank stability) of the dependent variable whereas estimates at higher quantiles represent higher values (higher bank stability) of the dependent variable. The Pseudo R-squared across quantiles ranges from 0.2472 to 0.4767. This suggests that, at the least value (10th percentile) of the dependent variable, the independent variables employed explain about 24.72% of the changes in stability whiles at the highest values of the dependent variable, about 47.67% of the variations in the dependent variable are explained by the same explanatory variables. It could be inferred from this that, the effect of the independent variables is more pronounced in highly stable banking sectors. In the median regression (i.e., 50th percentile), the explanatory variables used explain about 32.16% of the variations in bank stability.

From Table 4.3 we find that, as the Z-score changes across quantiles, the estimates of the financial inclusion index vary widely in magnitude but not in significance. In the first three quantiles, we find the coefficient of financial inclusion to fall in the 20th quantile and rise again in the 30th quantile. However, from the 40th quantile onwards, the magnitude of the financial inclusion coefficient increases throughout quantiles to the end. Across all conditional distributions of Z-score, the estimates of financial inclusion are found to be positive and significant at the 1% significance level. The positive relation between financial inclusion and bank stability suggests that, an increase in financial inclusion significantly improves bank stability in the African banking sector. More importantly, the increase in magnitude of the coefficients across different quantiles

imply that, inclusive finance enhances the stability of more stable banking systems. At higher distributions of Z-score where there is relatively higher stability, financial inclusion exerts a higher influence on bank stability. It could be inferred from this evidence that; financial inclusion helps to enhance the stability of more stable banking systems.

This notwithstanding, financial inclusion still exerts a positive influence on relatively less stable banking systems. The evidence shows that, financial inclusion is good for the stability and soundness of the banking system in Africa regardless of the level of stability. Even though there is some level of fluctuation in the degree of the influence of financial inclusion at lower quantiles, the coefficients still remain positive and significant, signifying that, financial inclusion extends positive effects on the banking system. As shown from Table 4.3, an increase in the level of financial inclusion for countries with relatively low stability can help to improve their stability. As the evidence shows, although the impact of financial inclusion on stability is more pronounced at higher distributions of stability, financial inclusion still exerts a positive influence at lower distributions of stability.

Our finding is different in some respects but at the same time similar to some of the findings of Ahamed and Mallick (2019). In providing international evidence, Ahamed and Mallick (2019) find the coefficients of financial inclusion to vary in size, magnitude and significance as Z-score varies across quantiles. The coefficients of financial inclusion become positive and significant at and beyond the 40th quantile for these authors. Financial inclusion is positive but insignificant at the 20th and 30th quantiles and insignificantly negative at the 10th percentile. In our study, however, we find financial inclusion to be consistently positive and significant across all quantiles. This suggests that, the banking sector in Africa is significantly different from the rest of the world, as the evidence of Ahamed and Mallick (2019) assert. Ahamed and Mallick (2019), however, show

that, financial inclusion enhances the soundness and stability of more stable banks, an observation that is consistent with our study.

The result of the least absolute deviation (50th percentile) is consistent with the OLS regression. In both the mean and median regressions, financial inclusion is found to be significant and positively related to bank stability at the 1% significance level. This suggests that, an increase in financial inclusion results in an increase in the stability of banks. For the OLS regression, a 1unit increase in financial inclusion may result in a 4.4138 increase in the stability of banks while in the least absolute deviation, a 1unit increase in financial inclusion results in a 3.9033 increase in stability. In effect, the findings from these two estimation techniques imply that, financial inclusion enhances the stability and soundness of banks.

It is clear from the results presented in Table 4.3 that more inclusive finance enhances the stability of banks and the effect of a more inclusive financial system is more pronounced for relatively more stable banking systems. This is shown by the positive and statistically significant coefficients of financial inclusion across the various quantile distributions of Z-score. The effect of financial inclusion on bank stability in Africa is economically important. In particular, an inclusive financial sector may enable banks to garner adequate cheap retail deposits from a large clientele base which can help to improve their profitability and ensure stability. Furthermore, it may also alleviate financing constraints of SMEs and also mitigate the post-lending moral hazard and asset substitutions problems. Therefore, with a more inclusive financial sector, banks enjoy greater stability. Ahamed and Mallick (2019), for instance, show that, greater bank branch outreach and a financial system with greater access to bank accounts per capita seem to increase bank stability.

Through the diversification of risks by lending to more individuals and businesses across the country, financial inclusion may help to foster stability in the banking system. By increasing the

clientele base through financial inclusion, banks can be able to decrease their operational costs by spreading costs over a large number of customers. The cost reduction is even more prominent when the banks adopt innovative and low-cost financial delivery models in today's technological world to serve a large clientele base. Significantly, by creating a larger clientele base, banks are able to diversify their operations and lending into different sectors of the economy. The extension of financial services to the poor and marginalized contributes to stability of the banking system as low-income groups are relatively more immune to fluctuations in the economic cycle (Ozili, 2018). As a result of this, including them in the financial sector improves the stability of the deposit and loan bases in the financial system.

Bank size (BKS), return on assets (ROA), inflation (INF), trade openness (TO) and economic growth (GDP) are used as control variables in this study. From Table 4.3, we find the coefficients of bank size to vary in magnitude and significance as Z-score changes across various quantiles. For instance, at the 1% significance level, we find that the coefficients of bank size are positive and significant from the 10th to the least absolute deviation (50th quantile). The coefficients are significant at the 10% significance level at the 60th and 90th quantiles and become insignificant at the 70th and 80th quantiles. This finding suggests that, bank size significantly improves the stability of less stable banks than more stable banks. At higher quantiles, where there is more stability, the size of banks exerts little to no effect on the stability of the banking system. At lower levels of Z-score, an increase in the total assets of banks fosters stability through high capitalization as a result of the increase in total assets. This makes individual banks stronger and more stable and ensures stability of the banking sector. At higher levels of Z-score, additional increments in the levels of assets and capital does not exert any meaningful effect on stability as the banking system is already

highly stable. Any increase in total assets exert only little or no effect on stability when the banking system is already highly stable.

Moreover, we find the coefficients of return on assets to vary in magnitude and significance across various conditional distributions of Z-score. The coefficients of ROA are negative and significant at the 5% significance level at the 10th and 20th quantiles. At the 30th and 40th quantiles, the coefficients become significant at the 1% significance level and again becomes significant at the 10% significance levels at the 50th percentile. Beyond the 50th percentile, the coefficients become insignificantly related to Z-score. This finding suggests that, increasing profitability reduces the level of stability in Africa when stability is relatively lower. It is inferred from this evidence that, banks that operate in less stable banking systems further cause the stability of the banking sector to reduce as they seek to increase their profit levels by increasing their risk exposures. For instance, banks become riskier as they generate non-interest income from derivatives and other non-traditional sources.

Inflation is largely insignificant across quantiles and only exerts a significant negative influence on bank stability at the 30th and 40th quantiles, suggesting that, at some lower levels of Z-score, an increase in inflation will be associated with a significant reduction in the level of stability of the banking system. Inflationary pressures may cause banks to operate at higher costs and lead to potential losses. Since losses are written off against the equity of banks, higher losses as a result of inflation may reduce the equity of banks and increase their riskiness, and thereby increase the riskiness of the whole banking sector.

From Table 4.3, we find the coefficients of trade openness to vary in sign, magnitude and significance at different conditional distributions of Z-score. For instance, from the 10th to 50th quantiles, the coefficients of trade openness are negative and significant at the 1% significance

levels except at the 20th quantile where the coefficients are negative and significant at the 5% significance level. The coefficients become insignificant beyond the 50th quantile. This finding implies that, higher liberalization and openness of trade can be detrimental to countries with banking systems that are not very stable. We find that, at lower quantile levels where stability is relatively low, an increase in trade openness exerts a significant negative effect on the stability of banks. This is because, an increase in trade openness exposes banks to significant competition and risks which they may not be positioned to deal with. This increases the total risk of individual banks and leads to a reduction in the level of stability in the banking sector.

4.6.4. Robustness Check

Table 4. 5. Alternative Measure of Financial Inclusion

Variable	1	2	3	4	5	6	7	8	9
					Quantiles				
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
FIIND2	1.1565*	1.7987***	2.1636***	3.3968***	3.6597***	4.1840***	5.3371***	7.2404***	7.9360***
	[0.6687]	[0.6296]	[0.6000]	[0.5761]	[0.6341]	[0.8278]	[0.8904]	[1.3828]	[1.2493]
BKS	0.0054**	0.0047**	0.0039*	0.0037*	0.0046**	0.0042	0.0039	0.0037	0.0039
	[0.0023]	[0.0022]	[0.0021]	[0.0020]	[0.0022]	[0.0028]	[0.0030]	[0.0047]	[0.0043]
ROA	-0.8464**	-0.6775**	-0.6090*	-0.5177*	-0.5777*	-0.7174*	-0.9162**	-0.4276	-1.9458***
	[0.3421]	[0.3221]	[0.3069]	[0.2947]	[0.3244]	[0.4235]	[0.4555]	[0.7074]	[0.6391]
INF	0.1036	0.0379	0.0380	0.0126	-0.0141	0.0778	0.0826	-0.0745	0.1445
	[0.1271]	[0.1196]	[0.1140]	[0.1095]	[0.1205]	[0.1573]	[0.1692]	[0.2627]	[0.2374]
TO	-0.0404	-0.0930***	-0.1067***	-0.1365***	-0.1371***	-0.1588***	-0.1777***	-0.1491**	-0.0692
	[0.0341]	[0.0321]	[0.0306]	[0.0294]	[0.0324]	[0.0422]	[0.0454]	[0.0706]	[0.0638]
GDP	-0.8802	-0.9116	-2.0772**	-1.8948**	-1.2923	-0.0943	0.9161	1.1048	1.7606
	[0.9444]	[0.8891]	[0.8472]	[0.8135]	[0.8955]	[1.1690]	[1.2574]	[1.9527]	[1.7642]
Constant	11.3535***	16.6154***	20.5987***	23.5244***	23.7596***	23.9626***	25.4956***	25.7629***	24.9746***
	[2.6122]	[2.4592]	[2.3436]	[2.2502]	[2.4770]	[3.2336]	[3.4780]	[5.4013]	[4.8798]
Pseudo	0.1585	0.1625	0.1822	0.2253	0.2787	0.3314	0.3559	0.4095	0.4500
R-squared									
Observations	125	125	125	125	125	125	125	125	125

*, **, and *** denote 10%, 5%, and 1% significance levels, respectively. The dependent variable is the Z-score. FIIND = Financial Inclusion Index, BKS = Bank size, ROA = Return on Assets, INF = Inflation, TO = Trade openness, GDP = Gross domestic product

To check for the robustness of the findings from Table 4.3, we employ an alternative measure of financial inclusion index used by Van et al (2020). Our main financial inclusion index is calculated using four dimensions of financial inclusion; two from the supply side and two from the demand side. However, Van et al (2020) calculate an index of financial inclusion using 3 dimensions of financial inclusion which includes domestic credit to private sector as a supply-side factor of financial inclusion. The results from the quantile regression using the alternative measure of financial inclusion are presented in Table 4.4. We show 9 conditional distributions (quantiles) of the dependent variable, Z-score, beginning from column 1 through to column 9. Column 1 shows the quantile regression at the 10th percentile whiles columns 2, 3, 4, 5, 6, 7, 8, and 9 shows the 20th, 30th, 40th, 50th, 60th, 70th, 80th and 90th percentile respectively. Column 5 shows the median regression (the least absolute deviation), of the quantile distribution.

Regression estimates at the lower quantiles represent low values (lower bank stability) of the dependent variable whereas estimates at higher quantiles represent higher values (higher bank stability) of the dependent variable. The Pseudo R-squared across quantiles ranges from 0.1585 to 0.4500. This suggests that, at the least value (10th percentile) of the dependent variable, the independent variables employed explain about 15.85% of the changes in stability whiles at the highest values (90th percentile) of the dependent variable, about 45.00% of the variations in the dependent variable are explained by the same explanatory variables. It could be inferred from this that, the effect of the independent variables is more pronounced in highly stable banking sectors. In the median regression (i.e., 50th percentile), the explanatory variables used explain about 32.16% of the variations in bank stability.

Consistent with the evidence from Table 4.3, we find the coefficients of financial inclusion index to be positive and consistent in sign and significance (except at the 10th quantile in column 1), varying only in magnitude as Z-score changes across various quantiles. Except at the 10th percentile, where the coefficient of financial inclusion is significant at the 10% significance level, we find the index of financial inclusion to be significant at the 1% significance level from the 20th to the 90th percentile. We find that, the coefficient of financial inclusion increases at increasing levels of Z-score. This observation in sign, magnitude and significance is consistent with the finding from Table 4.3, where an alternative measure of financial inclusion was employed. The positive association between financial inclusion and bank stability indicates that, an increase in financial inclusion significantly enhances bank stability in the African banking sector. By implication, the increase in magnitude of the coefficients across different quantiles show that, inclusive finance enhances the stability of more stable banking systems. At higher distributions of Z-score where there is relatively more stability, financial inclusion exerts a higher influence on bank stability. As mentioned earlier, the inference from this evidence is that, financial inclusion helps to improve the stability of more stable banking systems.

At lower conditional distributions of Z-score where there is relatively less stability in the banking system, financial inclusion still exerts a positive influence on the stability of banks. This evidence suggests that, financial inclusion is harmless to banks, regardless of the level of stability in the banking systems in which they operate. Instead, financial inclusion contributes to the stability of even less stable banking systems. As shown from Table 4.3, an increase in the level of financial inclusion for countries with relatively low stability can help to improve their stability. As the evidence shows, although the impact of financial inclusion on stability is more pronounced at

higher distributions of stability, financial inclusion still exerts a positive influence at lower distributions of stability.

The result of the least absolute deviation from Table 4.4 (50th percentile) is consistent with the OLS regression and the findings presented in Table 4.3. In both the mean (OLS regression) and median regressions (from Table 4.3 and Table 4.4), financial inclusion is found to be significant and positively related to bank stability at the 1% significance level. This suggests that, an increase in financial inclusion results in an increase in the stability of banks. For the OLS regression, a 1unit increase in financial inclusion may result in a 4.4138 increase in the stability of banks while in the least absolute deviation, a 1unit increase in financial inclusion results in a 3.9033 increase in stability in Table 4.3 and a 3.6597 increase in stability in Table 4.4. In effect, the findings from these two estimation techniques and the alternative measure imply that, financial inclusion enhances the stability and soundness of banks.

The findings for the control variables are also consistent with the results from Table 4.3. From Table 4.4, we find that, the coefficients of bank size vary in magnitude and significance as Z-score changes across quantiles. The coefficients are significant at and below the 50th quantile. This finding suggests that, bank size significantly improves the stability of less stable banks than more stable banks, similar to the evidence found in Table 4.3. At higher quantiles, where there is more stability, the size of banks exerts no significant effect on the stability of the banking system. At lower levels of Z-score, an increase in the total assets of banks fosters stability through high capitalization as a result of the increase in total assets. This makes individual banks stronger and more stable and ensures stability of the banking sector. At higher levels of Z-score, additional increments in the levels of assets and capital does not exert any meaningful effect on stability as the banking system is already highly stable.

Additionally, we find the coefficients of return on assets to vary in magnitude and levels of significance across various conditional distributions of Z-score. The coefficients of ROA are negative and significant at the 1% significance level at the 10th and 90th quantiles and becomes significant at the 5% significance level at the 20th and 70th quantiles. At the 30th, 40th and 50th quantiles, the coefficients become significant at the 5% significance level. This finding suggests that, increasing profitability reduces the level of stability in Africa at both lower and higher levels of stability. It is inferred from this evidence that, banks become less stable and destabilize the banking system when an increase in profitability is achieved through higher risk-taking activities. Although higher risk-taking may lead to an increase in profitability, the stability of the banking system reduces as profitability increases. For instance, banks become riskier as they generate non-interest income from derivatives and other non-traditional sources.

As shown in Table 4.3, we find the coefficients of trade openness to vary in magnitude and significance at different conditional distributions of Z-score. The coefficients of trade openness are significant at the 1% significance level from the 20th to the 70th percentiles. This finding implies that, higher liberalization and trade openness can be detrimental to the African banking system, even at different levels of stability. We find that, an increase in trade openness exerts a significant negative effect on the stability of banks. This is because, an increase in trade openness exposes banks to significant competition and risks which they may not be positioned to deal with. This increases the total riskiness of individual banks and decreases the stability level of banks and the banking system.

4.7. Policy Implications and Recommendations

In this section, we provide implications of our research findings and make recommendations to regulators and other stakeholders based on our findings. Beyond the welfare benefits of financial

inclusion are issues like profitability, growth, and stability of banking systems. Financial inclusion, as documented in the literature, improves economic wellbeing of individuals and SMEs. Yet, the effect of financial inclusion on the stability of banks in Africa has not received much attention. Using country-level data from Africa and employing the quantile regression approach, we provide comprehensive evidence that, financial inclusion is positively related to stability in Africa, regardless of the level of stability of a particular banking system. Our results suggest that banks perceive financial inclusion as a mechanism to garner ample cheap retail deposits, providing a significant leeway to reduce reliance on volatile and often costly money market funding. Increasing financial inclusion also act as an instrument to reduce marginal cost of producing outputs, which contributes to greater pricing power of banks and makes them more stable.

Above and beyond the welfare spectrum, financial inclusion is beneficial for the stability of the African banking sector. Moreover, the positive effect of financial inclusion on stability is found to be pronounced in more stable banking sectors. There are important policy implications to our results. The positive relation between financial inclusion and stability suggests that banking stability is strongly influenced by the degree to which households and SMEs have access to financial services, which indicates the importance of ensuring an inclusive financial sector for achieving stability in the banking system and inclusive growth. By broadening banking services to the unbanked and/or underbanked people, bank managers can not only take early advantage of exploiting the untapped potential of customers and create a 'lock-in' effect but also aid an inclusive development agenda while allocating resources in more productive areas. Our finding calls for policy makers, regulators and supervisory bodies in Africa to cooperate with the objective of increasing financial inclusion in Africa in order to enhance stability in the African banking system, which is a fundamental requirement for inclusive economic growth.

Further, based on the evidence of a positive relation between financial inclusion and stability, we recommend that governments and all relevant stakeholders actively pursue and implement strategies that will ensure the provision of financial services to a larger customer base. We aver that, the low level of financial inclusion in Africa is partly due to the reluctance of banks to extend financial services to the poor and marginalized as a result of a perceived high riskiness of this group. Our empirical evidence, however, suggests that, increasing the provision of financial services and products to the poor and marginalized contributes to the stability of banks and the stability of the banking system as a whole. Governments in Africa should therefore provide incentives for banks to extend the provision of financial services to the marginalized without the fear of jeopardizing their stability and the stability of the banking system.

Also, banks may use the services of agencies to increase their reach to rural dwellers. In areas where it may not be economically prudent to build branches, mainstream financial service providers may employ the services of agents to act on their behalf in the provision of financial services to individuals in such areas. Through the use of agents and agencies, banks may be able to garner cheap retail deposits from the marginalized in the society. Cheap retail deposits provide an important leeway which helps to reduce the extent to which banks rely on relatively more volatile money market funds. As a result of being able to gather cheap retail deposits from individuals by the use of agents and agencies, banks will become more stable and contribute positively to the stability of the banking system as a whole.

We find bank size to exert a significant positive impact on the stability of relatively less stable banking systems. For banking sectors that are relatively less stable, we recommend that policy makers and regulators should increase the capitalization of banks which will position banks in such banking systems to create more assets. As the asset size of banks increase, banks become bigger

and more stable in their activities which contributes positively to the stability of the banking system. Increasing the size of individual banks, through an increase in their asset size helps to enhance their stability and the stability of the banking system. Also, relying on the evidence from return on assets, regulators should ensure that banks do not seek to increase their profitability through excessive risk-taking which could lead to instability in the banking system. This is because, an increase in the profitability of banks through excessive risk-taking increases the riskiness of the banks, even though their profit levels may increase for a while.

We also make some suggestions to future research. Future studies on the relationship between financial inclusion and stability could explore the channels through which financial inclusion affects stability. Future research could examine factors such as institutional quality which could serve as channels through which financial inclusion affects economic growth. Again, although a lack of detailed data is common, future research could explore the form of financial inclusion that exerts a positive influence of financial inclusion in Africa since financial inclusion can be on the intensive margin or the extensive margin. A breakdown of the financial inclusion variable could provide a more detailed understanding on which form of financial inclusion influences stability positively.

4.8. Conclusion

Due to the poverty reduction potential of financial inclusion, governments and central banks have, in recent times, sought to implement initiatives and policies to improve financial inclusion in their various countries. This developmental goal, however, can have significant consequences on the safety and soundness of banks and the financial system. Africa is one of the regions with the lowest level of financial inclusion in the world. As a result, the quest to improve financial inclusion is a critical part of the development agenda of Africa, especially in its poverty reduction initiatives.

This notwithstanding, little is known about the influence of financial inclusion on the stability of banks in Africa, who are the major providers of financial services in Africa.

The few studies that have considered this association have also provided inconclusive findings. Another key issue in the literature is the measurement of financial inclusion. Most studies use single indicators as proxies for financial inclusion. We see this as an error in measurement as financial inclusion is multidimensional and should be measured with an index that captures its multidimensional nature. We overcome this flaw in literature by using an index of financial calculation with two indicators each from the demand and supply sides of financial inclusion. We also adopt an alternative measure of financial inclusion from Van et al (2020) to test for the robustness of our findings.

We set out to investigate the impact of financial inclusion on stability in the African banking system. We employ the quantile regression approach to examine this relationship. Our study covers 22-African countries over a 12-year period, from 2004 to 2015. We measure financial inclusion using an index created from the main dimensions of financial inclusion. The use of the index provides a more comprehensive measure of financial inclusion. We employ the quantile regression method as it helps to deal with potential endogeneity issues whiles allowing us to examine the influence of financial inclusion at various conditional distributions of the dependent variable, Z-score.

Using country level data, we provide comprehensive evidence that greater financial inclusion enhances the stability of the African banking system. Although financial inclusion enhances the stability of banks at all levels of stability, our finding shows that, the impact of financial inclusion on stability is more pronounced in highly stable banking systems. Nonetheless, financial inclusion also enhances the stability of banks in relatively less stable banking systems. Greater financial

inclusion helps to alleviate financing constraints of SMEs. Information asymmetry is reduced as banks get closer to their customers by opening more branches and this mitigates post-lending moral hazard and asset substitutions problems. Therefore, with a more inclusive financial sector, banks enjoy greater stability.

Further, we find bank size to be positive and significantly related to Z-score at lower quantile levels, suggesting that, bank size significantly improves the stability of less stable banks than more stable banks. At higher quantiles, where there is more stability, the size of banks exerts little to no effect on the stability of the banking system. At lower levels of Z-score, an increase in the total assets of banks fosters stability through high capitalization as a result of the increase in total assets. At higher quantile levels where the banking system is more stable, an increase in the size of banks does not significantly improve stability.

Moreover, we find return on assets and trade openness to exert significant negative effects on stability at and below the 50th quantile, suggesting that, at lower to mid-levels of stability, higher profitability and increased trade openness affect stability negatively. Higher profit levels induce banks to make more profits by increasing their risks which increases their riskiness and the riskiness of the banking system. Similarly, increased trade openness exposes banks to higher competition and new risks and increases the riskiness of the banking system.

Based on these findings, we call on policy makers, governments and regulators in Africa to collaborate and cooperate to increase the level of financial inclusion in Africa as an inclusive financial system should not only be an economic objective but also a priority of banks. Banks should prioritize financial inclusion as it is necessary for their stability. Banks should pursue financial inclusion by extending the provision of financial services to the marginalized and underprivileged in the society by using the services of agents and agents; where setting up branches

may not be economically prudent. For banking systems that are relatively less stable also, regulators should ensure high capitalization as this will strengthen banks and position them to increase their assets. An increase in the size of banks through a rise in asset size will increase the level of stability in the banking sector. We suggest again, that, future studies on financial inclusion and stability could consider the channels through which financial inclusion affects stability. This study resolves the issue of measurement in the financial inclusion literature and provides comprehensive evidence on the influence of greater financial inclusion on various levels of stability in Africa.

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CHAPTER FIVE

FINANCIAL INCLUSION, INVESTMENT AND ECONOMIC GROWTH

5.1. Introduction

It is increasingly becoming an axiom that Financial Inclusion (FI) fosters economic growth. Theoretically, FI impacts economic growth through investment. FI spurs on investment when the previously excluded individuals now get access to credit and embark on numerous economic activities. Integration of finance facilitates accessibility to resources in finance and quicker activity in the economy. The exclusion of certain groups from accessing financial resources may have unfavorable effects on various parts of the economy (Huang et al., 2021). Thus, as more people get included in finance, they are able to access financial services and products such as credit which encourages investment in real productive activities. This further translates into a higher level of output and subsequently leads to economic growth. Investment therefore performs a key function in the connection between FI and growth in economies.

FI is seen as an essential tool for improving growth in an economy (Claessens and Perotti, 2007). The economic and social advancement plan of the modern day is dependent on the general accessibility to services from the financial sector, across the globe, for two principal purposes (Beck and Torre, 2006): (i) a great literature, theoretical and empirical, indicating the significance of a seasoned financial sector for advancement of economies and easing of poverty (Beck et al., 2000; Honohan, 2004); and (ii) accessibility of financial services that may be viewed as a public product which enables the participation of individuals in the gains of a contemporary, market-based system, in a comparable manner as the accessibility to safe water, fundamental health care and basic education (Peachey and Roe, 2004).

Sethi and Archaya (2018) note that financial exclusion can hinder growth of an economy through inadequate supply of financial services. However, through the channel of poverty reduction, FI can increase the economic growth of a country. Earlier theoretical studies contend that individuals' accessibility to services from the financial sector can change their employment and production decisions and thereby help to alleviate poverty (Aghion and Bolton, 1997). Mehrotra et al. (2009) maintain that when individuals are able to access services from banks, it helps them to save their monies with mainstream financial institutions. Through multiplier effects, this leads to high economic growth and helps to improve per capita GDP (Ghosh, 2011).

Sethi and Archaya (2018) show further that, accessing financial products affordably helps to reduce vulnerability of the needy by enhancing their standards of living through organized production activities in rural communities which results in more output production. Again, widespread accessibility to deposit and insurance services by the marginalized in the society helps to raise funds in the financial market. Allocating these funds efficiently into capital investments leads to increased productivity and employment which also leads to improvements in the allocation of income, and consequently, economic growth.

Nanda and Kaur (2016) posit that, FI enhances economic growth by creating value from small businesses which spills over positively on human development factors such as health and education; contributing to a decrease in inequality and poverty. Nonetheless, Madichie et al (2014) posit that, output growth in an economy cannot be possible without the combined role of investment and human capital which are made possible through improved accessibility to financial products and services as per conventional wisdom. The roles played by human capital and investment in the development and growth of an economy cannot be underestimated, in research and in practice.

Levine (2005) provides a wide-ranging assessment of how financial systems with several roles affect savings and investment decisions to enhance economic growth. Five main functions are observed which include (i) providing ex-ante information about probable investments; (ii) investment control and the consequence of corporate governance; (iii) trading, diversification, and risks management; (iv) savings accumulation and pooling; and (v) exchange of goods and services. These roles enhance growth of the economy through an added effective and efficient resource allocation, a swift mobilization of physical and intellectual capital, and a quicker development of technology (Creane et al. 2004).

Surprisingly, literature on financial inclusion-growth nexus has ignored the mediation role of investment (for instance see; Hariharan and Marktanner, 2012; Sharma, 2016; Lenka and Sharma, 2017; Kim *et al*., 2018; Sethi and Acharya, 2018; Raza *et al*., 2019). Others have focused on gender dimensions and information and communication technology (ICT) as mediating variables (Andrianaivo and Kpodar, 2011; and Swamy 2014), to the neglect of the theoretically stipulated role of investment. Although some authors (Hajilee et al, 2017; and Inoue and Hamori, 2016) have controlled for investment as one of the regressors in line with standard neoclassical growth equation, the nature of the theoretical foundation in the context of inclusion-growth nexus necessarily makes investment a conduit through which inclusion impacts growth. To treat inclusion and investment as separate regressors in inclusion-growth nexus is to obscure the theoretically prescribed mediating role of investment, which necessarily runs counter with the theoretical foundation of the very relationship they seek to study.

We contend that the influence of financial inclusion on economic growth would not be complete without examining its relation with investment as per the theoretical stipulations. Such a neglect of the important role of investment as a connection between FI and economic growth may well be

the source of the conflicting findings in the literature. The findings from this study will to a larger extent resolve this conflict in the literature. This study makes a case for investment in the financial inclusion-growth link by examining the mediating role and the threshold level at which investment may influence the association between FI and economic growth in a study of SSA nations. The dire implications of financial exclusion leading to lower investment which further translates into lower economic growth warrants a study like this which provides a deep understanding of the linkage between FI, investment and growth. This has crucial implications for policy.

This paper makes several contributions to policymaking and to current empirical literature in the following ways. First, to policymakers, the threshold analysis is essential in determining the channel through which FI influences economic growth in Africa. Past studies such as Kim et al (2018) have alluded to a linear association between FI and economic growth even though the relationship may also be non-linear (Nizam et al., 2020). This study makes a contribution to literature by employing investment as a channel through which inclusion may influence economic growth. The presence of the threshold level provides vital implications for policy which requires authorities to formulate effective strategies to adjust the degree of investment and FI to enhance economic growth. By knowing the potential influence and the right investment threshold point, policymakers will be able to devise strategies that can ensure that financial inclusion benefits the economy.

Our study also contributes through a new measure of FI, by employing an index of financial inclusion. This index uses multidimensional factors of inclusion, that is, supply and demand-sides of financial inclusion. There are several weaknesses in the previous measures for financial inclusion. The non-parametric method which calculates the weights of the dimensions of the index results in possible biases (Camara & Tuesta, 2014). Also, the use of just the supply-side indicators

proves inadequate for measuring the actual level of financial inclusion across countries (Abd Rahman, 2016). Our study, therefore, uses the two sides of inclusion in the creation of a new FI index.

5.2. Linkages Between Financial Inclusion and Economic Growth

Development theories have shown that accessibility to fundamental financial services is part of the critical factors responsible for higher economic growth. Therefore, financial inclusion is seen as a pre-condition for enhancing economic growth and development. Several theoretical explanations have been advanced to link finance and economic growth. One of such explanations was espoused by Schumpeter (1911). He showed that financial sector through its services does not only stimulate capital formation but enhance efficiency, investment and innovation which further translate into output growth. King and Levine (1993) supported Schumpeter's approach and established that financial sector with its intermediary role supports long run growth and productivity through capital accumulation. Additionally, Goldsmith (1969) provided explanations which supported Schumpeter's approach of a positive connection between finance and economic growth.

A lot of theoretical models (Banerjee and Newman, 1993; Aghion and Bolton, 1997; Aghion et al., 2009; Bayoumi and Melander, 2008; Cecchetti and Kharroubi, 2012) claim that accessibility to bank accounts enhances growth in an economy. A savings account, for instance, assists financially excluded people – who are mostly deprived with low levels of literacy– to save and build transaction records. This aids them to obtain loans for investment in entrepreneurship. These entrepreneurial activities give them a chance to earn higher income likened to the alternative of being employed for a lower wage (Banerjee and Newman, 1993). Capital becomes increasingly available to this segment as credit norms and requirements are relaxed. This promotes efficiency in capital in the country and exerts a positive influence on total growth (Aghion and Bolton, 1997;

Aghion et al., 2009). Easy accessibility to savings accounts and loans also enables marginalized parts of the population to use the services of mainstream financial providers. Lenders are then able to develop a portfolio that is diversified, decrease risk, extend more credit and hence promote total growth in the economy (Bayoumi and Melander, 2008). The effectiveness of the interest rate as a policy mechanism in enhancing economic growth increases as the contribution of the mainstream sector in total lending rises (Cecchetti and Kharroubi, 2012).

Conceptually, Sethi and Acharya (2018) highlighted the theoretical link between FI and growth in an economy. The authors emphasized two broad avenues through which FI can stimulate economic growth. The first possible channel is when the poor and the vulnerable groups through the financial sector get access to low-cost credit to advance their productive activities. This accessibility potentially leads to more output and employment, increase standard of living through rising incomes, reduces poverty levels, and later heightens economic growth.

This suggests that financial inclusion through this channel can reduce poverty levels and stimulate economic growth. The second channel through which FI leads to economic growth, according to Sethi and Acharya (2018), is investment. When the financially excluded people get access to deposit and insurance services, it helps them to save their monies which generally raises funds in the financial market. The availability of these funds in the financial system encourages more investment. An increase in investment leads to more output and employment which further translates into economic growth. This clearly suggests that investment performs a mediating function in the FI-economic growth nexus.

5.3. Financial Inclusion and Economic Growth: A Theoretical Outlook

Previous theories of economic growth and development recognize labor, capital, institutions, among others, as the economic growth factors, whereas the important role of finance in growth of economies has been largely overlooked by prior economist theorists due to presence of the Modgillani–Miller theorem and the Efficient Market Hypothesis. All of these theories assume a perfect market and that there is no friction, thus, a perfect capital market. This assumption suggests that investors trade their securities easily in perfect capital market conditions with no costs of transaction. Also, the supposition that corporations and individuals who trade for themselves can obtain and extend credit at equal rates does not apply in practice. However, the previous economic development theories also believe that a seasoned and well-functioning financial sector is needed to absorb deposits and thereby transfer funds for the generation of a broad variety of business operations.

The link between finance and growth of the economy has started to receive increasing attention in the literature. Current development theories sturdily assert that financial system development is a necessity as it produces an empowering condition for economic growth which comes through ‘supply-leading’ (financial development leading to growth) or a ‘demand-following’ (growth generating financial services demand) (Mohan, 2006). Moreover, current theories of development also reveal that the limited accessibility to finance is a key factor that accounts for the insistent inequality in income and the slow economic growth rate. Further, a lot of empirical studies on finance shows that improving the financial system and facilitating accessibility to finance might spur growth in an economy together with a decrease in income inequality and reduction in poverty (Kakwani and Pernia, 2000).

Exclusion from finance is predominant in societies that are largely unequal as compared to those have high equality. Burgess and Pande (2004) find that the policy of expanding rural branches in India had substantially helped in reducing poverty in rural communities. Additionally, a financial sector that is developed permits a large accessibility to funds, whereas in less developed financial sectors, there is a restriction on funds accessibility and individuals are inhibited by the availability of personal funds and are forced to depend on expensive informal avenues like moneylenders.

In underdeveloped financial systems, where there is low availability of funds and higher cost of accessing funds, only few economic operations can be funded and therefore, economic growth is likely to be lower. The financial systems that are developed also face challenges in satisfying low-income people to finance their expenditure. The poor are mostly left out by mainstream financial institutions because of a lack of the needed collateral for such purpose (World Bank, 2002). Hence, as noted previously, they depend on expensive informal avenues like moneylenders, thus causing growth to be concentrated among people who already participate in the mainstream financial sector (RBI, 2008).

So, without a financial system that is inclusive, poor people and small businesses have to rely on personal accumulated funds and incomes to make educational investments and entrepreneurship in order to utilize opportunities for growth (World Bank, 2008). Hence, accessibility to safe, simple and cheap loans and many other financial products by the needy and underprivileged classes, particularly in undeveloped places and sectors that are behind, is viewed as a requirement for enhancing economic growth and achieving a decrease in income gaps and poverty (Kakwani, 2000; RBI, 2008).

For inclusive finance, a stable and even banking system is required because only mainstream users of credit are capable of meeting the requirements of credit demand for families at an acceptable

degree, in a convenient way and at lower costs (Chhikara and Kodan, 2011). Moreover, a financial sector that functions well creates the same opportunities for all; and permits socially and economically excluded individuals to better participate in the economy, and add actively to development and shield themselves from shocks in the economy (World Bank, 2008a; RBI, 2008). A working financial sector also adds to the equal supply of gains in the economy. The strong connection between rural and total country level financial market decreases periodic, industrial and regional volatilities in the probable demand and supply of loans for rural communities in order to assist them to partake in investments in the urban sector (Moll, 1989).

Accessibility to credit by rural dwellers might also inspire fresh investments and encourage innovative technologies. Universally, about two billion individuals are presently omitted from accessing financial products, and the condition is not good in a lot of Least Developed Countries (LDCs), where over 90% of individuals are restricted from accessing mainstream financial products. Thus, increasing accessibility to finance must be a primary goal of all countries across the globe in order to grasp the faster growth rate of the economy and equal distribution of the benefits from growth (UN, 2006).

A developed financial sector with well-functioning institutions also introduces techniques for evaluation and gathering of information and sharing devices, which enables them to fund even the peripheral operations of companies or people, thereby encouraging growth-enhancing productive ventures. The presence of outside sources of funds to possible businesspersons and small businesses helps new players to come into the market resulting in higher competition. This, then, encourages business growth and productivity. The higher industrial growth presently reflects the faster growth in bank loans recently around the globe. The mean growth in non-food loans from

1970 to 2000 was 16.9%, which was seen as a proof growth in industrialization led by finance (Bell and Rousseau, 2001).

Certainly, inclusiveness in finance, which includes convenient savings, properly tailored credit for needy and low-income families and for small-and-medium-sized businesses, and suitable insurance and payment facilities can aid to improve the incomes of people, help them obtain capital, manage risks and alleviate poverty (UN, 2006). It is noted that accessibility to financial resources enables the transfer and receipt of financial payments and also decreases transaction fees. The mean refinance cost ranges from 8% to 14%, owing to operating costs of about 10% to 14% for microfinance institutions (MFIs) as likened to 3% to 4% for banks servicing average borrowers.

5.4. The Concept of Economic Growth

Masoud (2014) defines economic growth as the growth in per capital of Gross Domestic Product (GDP). He posits that income distribution, the accessibility of healthcare and access to education are key components of economic growth. Kuznets (1967) argue that economic growth is multi-faceted. He further argues that economic growth does not only concern the increase in total output but also the basic revolution of economies which ranges from industrial structure to its demographic and geographic composition, and also to its institutional and social makeup. Economic growth, by its character, is about total and macro-results (Acemoglu, 2012). With the introduction of the endogenous growth model, focus is gradually shifting from the reliance on the unidentified external technological advances in the explanation of economic growth. For instance, Masoud (2014) suggests that fluctuations in endogenous variables such as interest rate and rates of inflation affect the wellbeing of both needy and wealthy homes in an economy.

Growth and development philosophers in micro and macroeconomics over time have been concerned with the activity of collection, that is, the national output level and its growth over a period. Maddison (1995) views performance of economic growth in the future to be a result of some key factors which lead to a rise in per capita product namely; progress in technology, physical capital accumulation, global economies integration through the trading of products and services, investment, entrepreneurial and intellectual interaction. Within the last factor, Maddison observes that there are other factors such as the size of the economy, structural changes, the relative profusion or scarcity of natural resources.

5.5. Theoretical Literature

According to (Masoud, 2014), the main focus of the theories of economic growth is to improve the wellbeing of people and therefore, control the growth in living standards of a country's population.

5.5.1. Endogenous Growth Theory

The history behind theories of economic output and income distribution between salaries and profits were given in the "Wealth of Nations" by Adam Smith in 1776. The greatest contribution was to bring up the idea of increasing profits, relying on the division of labor. The basic factors influencing economic policy development constitute one of the key contributions made by this theory. Barkai (1969) avers that the "Wealth of Nations" stressed that technology was very vital compared to other factors in explaining the nature and condition of the wealth of a country. This theory has been debated relative to the emergence of stocks as interlaced in his proposition is the view which relies on the gathering of capital to reflect market resources distribution and income.

Bowley (1975) commented on this by arguing that the emergence of stocks is of great relevance as the way of allocating resources. As the gathering of capital to stocks performs a part in the

process of economic growth in distributing, tailored capital was used to back industrious labor and in turn produced the necessary capital to help labor in the long-run. Smith indicate that the significance of economic growth had been regarded as vital for a long while for understanding political policies and social conditions through higher specialization and separation of labor and on the gathering of real capital.

5.5.2. The Harrod-Domar Growth Model

The current theory of growth began with a classic piece by British economists, Roy Harrod and Domar. The Harrod-Domar Growth Model was initially called "An Essay in Dynamic theory". The model describes the economic techniques that increased investment results in higher growth. Domar (1946) and Harrod (1939, 1948) observe that the industrial system is fundamentally unbalanced by the use of the production function. This meant two effects of investment, first on the total demand side such as corporations spending extra, and the second on the total supply side where additional investment raises the stock of capital and generates extra business.

According to this theory, the primary obstacle for developing countries is that in poor countries there is a comparatively low degree of new formation of capital. The capital limitation method to growth and progress became the reason in the period of politics in the cold war for the transfer of funds and technical help from the advanced to developing countries. The Harrod-Domar growth model posit that investment is not relevant for future growth. This theory has suffered great criticism from advocates of the 'new growth model'. The assumption and the proposition of the neoclassical growth theory considers how to appreciate the cause of growth employed in empirical works for both advanced and emerging nations.

5.5.3. Neoclassical Growth Theory

The neoclassical theory of growth was birthed from the Harrod-Domar model and the new theory of growth propounded from the neoclassical theory of growth. The neoclassical theory tries to get nearer to the Keynesian theory through the advancement of the expectation's hypothesis and of the real cycle of business, in which a lot of challenges may be encountered today. Problems involving both social and financial actions such as foreign exchange markets, money and banking, holding companies, organized securities, big companies, corporate associations, organized labor, among others. Neoclassical economics gave the context after its inception in the 1870s (Debraj, 1998), paying heed to the kind of behavior in the analysis of the statistical model's particular viewpoint of the quantitative response process, other than the descriptive ways found in technological revolutions. Yet, the technological mechanism has been altered since World War II. The transformations in technology changed instead of the static numerical model to raise factor inputs, calculated by an increase in the rate of economic growth (Brinkman and Brinkman, 2001).

In the 1960s, the theory of neoclassical growth was used and individuals mostly adopted its method of modelling long-term growth, which has largely been spurred by higher returns (Solow, 1956; Swan, 1956). This type of outline supposed that the neo-classical production model of consumption increases as a function of knowledge stock rising in constant returns to scale, which comes back to every input (labor and capital) and smooth elasticity of the substation among the inputs. The fundamental neoclassical model for growth was established by Solow-Swan. The model employed the total production function relying on 3 important assumptions. The first assumption is that the growth in the labor force is at a constant exogenous rate. The second assumption is that output is a function of labor and capital whiles the last assumption is that there is no independent investment.

5.5.4. New Endogenous Growth Model

The new endogenous growth model started with writers like Romer (1986, 1990), Rebelo (1991) and Lucas (1988) who used no decreasing returns to develop models for a broad group of capital products that included human capital. The new theorists for growth who follow the model of Lucas (1988) in terms of human capital have been treated in a different way from accountants of growth who consider education as an extension of labor quality, using comparative incomes of individuals and stated educational levels as weights. One key contribution was offered by Romer who published a lot of works on this subject in the middle of the 1980s as a vital part of the endogenous growth model derived from the growth models of the Solow type.

The endogenous growth theory gives up decreasing returns of individual functions and the assumptions of constant returns to scale and which suggests that, economies grow with no bounds and there is prediction of no convergence about various economies. Change in technology is endogenous; meaning it increases with total stock of capital by making some forms of capital externality. This suggests that there is an alteration in the capital input which directly influences productively and indirectly impacts on variations in technology. This point on, it is obvious that the endogenous model more effectively reflects the realities of economic policies as the activity of modern-day economic transfer of improved technological change and new insight.

Romer (1986) reasons that changes in technology ensures increasing capital accrual, in line with the Solow (1956) model with change in technology. Barro (1991) finds human capital to have a substantial influence on growth rate, but he leaves behind an important part of the weaker performance in his regression analysis, for instance, SSA and South American nations are left unexplained. Also, Mankiw et al. (1995) present the endogenous theory of growth by involving

the production equation, where constant returns to the gathered factor is included. That is, if capital output is doubled, the quantity of output is also doubled.

5.5.5. Shumpeter's Theory

Financial institutions assist greatly in the allocation of resources in a country. According to literature, this role of allocation was first recognized by Schumpeter (1912). He emphasized the function of the banking sector as a supporter of productive investments and thus an accelerator of economic growth. Schumpeter showed that banks assist in identifying entrepreneurs with decent prospects for growth and allocate funds to them. This theory therefore argues that banks contribute to reallocation of resources to their very productive use which enhances economic growth (Yu and Gan, 2010). Schumpeter's theory emphasizes credit allocation and states that innovations drive development, that is, "the different employment of existing services of land and labor".

The role of banks in this theory is to efficiently identify entrepreneurs who are capable of introducing innovations, and provide them with the purchasing power required to direct the means of production to them. This channel, according to Schumpeter helps to promote economic growth. This theory argues that better intermediaries contribute to reducing slack in the financial system. Graff and Karmann (2006) confirm the Schumpeterian hypothesis by pointing out that efficiency in banking is a channel through which real economic growth is affected. According to Schumpeter, the more efficient the banking system, the better the economy.

5.6. Empirical Review

The contribution of a competent financial system towards the promotion of economic growth cannot be underestimated. The provision of financial services such as deposit mobilization, provision of payment systems, facilitating transactions and management of risk requires a well-functioning and effective financial system (Demirgüc-Kunt & Klapper, 2013). Studies at both the individual and cross-country levels have largely shown that financial inclusion affects economic growth positively (Raza et al, 2019; Kim et al, 2018; Lenka and Sharma, 2016; Sharma, 2016). However, some studies have also found a negative or insignificant relation between financial inclusion and economic growth (Naceur and Samir, 2007; Natamba et al., 2013; Dahiya and Kumar, 2020). The difference in the findings may be a result of a non-linear association between financial inclusion and economic growth. The literature has, however, largely ignored this possibility of this non-linear association which may be a reason for the mixed results. We present a review of the empirical literature below.

5.6.1. Positive Effect for Panel and Cross-Section Studies

Singh and Stakic (2020) assess the link between FI and economic growth among eight South Asian Association for Regional Cooperation (SAARC) countries, using annual data spanning 2004-2017. The study adopts the Pedroni panel co-integration test and 2 types of co-integration techniques, the Fully Modified Ordinary Least Square (FMOLS) and the Dynamic Ordinary Least Square (DOLS) techniques. From the Pedroni panel co-integration test, the presence of a long-run association between FI and economic growth is confirmed among the SAARC nations. The FMOLS and DOLS coefficients show that the FI and some chosen control variables together promote economic growth. This study examines a direct association between financial inclusion and economic growth, ignoring the possible indirect relationship that may exist between them.

Nizam et al (2020) examines the influence of inclusiveness in finance on the growth of 63 selected advanced and developing economies from 2014 to 2017. The extent of FI for every nation is measured with the use of a new computation of the FI index. The importance of inclusive finance on economic growth is later assessed with the use of a cross-sectional threshold regression method. The results show the presence of a threshold effect on the FI and growth relationship, which suggests that FI shows a non-monotonic direct association with growth of the economy. At a high level, the positive influence is more noticeable than when inclusion is at a lower level. Although Nizam et al (2020) examine the threshold effects between inclusion and growth, the findings from this study may not be entirely applicable in the African context as the pool of data includes countries from the developed world.

Chinoda (2020) investigates the link between economic growth and FI, and between growth of the economy and trade openness in Africa with the use of a panel of thirty countries from 2004–2017. The research uses granger causality tests and cointegration methods to determine whether there is an equilibrium long-run association between all 3 variables. The study finds a unidirectional causal link from economic growth to FI. This study ignores the possible and theoretically stipulated indirect relationship between financial inclusion and economic growth, an effect this study seeks to examine.

Van et al (2019) provide international evidence of a direct association between FI and economic growth. According to the authors, a stronger link is observed for low-income economies and countries with lower levels of FI. The study by Kim et al. (2018) which uses the GMM method from 1990 to 2013 and a list of 55 OIC nations demonstrate a positive association between FI and economic growth for OIC nations. Further, the results conclude that the high degree of FI is a key factor for producing economic growth. In the same way, research by Sethi and Acharya (2018)

using dynamic OLS (DOLS) and fully modified OLS (FMOLS) to study the connection between FI on growth for 31 nations conclude that, FI spurs economic growth for the countries studied. Thomas et al (2017) examine the connection between accessibility of finance and growth in SAARC economies from 2007 to 2015 by using the GMM technique. Out of the eight indicators used, seven of them are significant, showing that, high accessibility of finance leads to higher income and increases growth in the economy. The study also confirms that progress in financial access variables have a higher influence on the growth of developing economies than in middle-income nations.

Van et al (2019), Kim et al (2018), Sethi and Acharya (2018) and Thomas et al (2017) have all focused only on the direct association between financial inclusion and economic growth to the neglect of the theoretically stipulated role of factors such as investment. Our study addresses this by examining the non-monotonic relationship between financial inclusion and economic growth using threshold analysis.

Kim et al. (2018) investigate the link between FI and growth in 55 member states of the Organization for Islamic Cooperation (OIC). The authors measured financial inclusion by bank branches per 100,000 adults, ATMs per 100,000 adults, borrowers from commercial banks per 1000 adults, deposit accounts with commercial banks per 1000 adults, and insurance premium volume to GDP. Using the panel VAR and GMM estimation techniques, they find that FI has a positive influence on economic growth. This study uses single measures of financial inclusion and does not consider the possible indirect association between inclusion and growth, a phenomenon this study seeks to examine.

Inoue and Hamori (2016) assess 37 SSA economies from 2004 to 2012. They find that “the commercial bank branches” as a measure of FI exerts a positive influence on growth for the

selected countries. Although Inoue and Hamori (2016) focus on SSA, their study uses a single measure of financial inclusion to examine the direct association between inclusion and growth. The single measure ignores other dimensions of financial inclusion. This study addresses this by using a comprehensive index of financial inclusion to further examine the indirect relationship between these two factors.

Sahay et al (2015) examines the linkages between FI and economic growth. They find that higher accessibility to finance by companies improves economic growth, but only to an extent, after which the advantages of extra inclusion start to fall or even get to be negative in many advanced economies. Andrianaivo and Kpodar (2011) use the GMM method to assess the role of FI in economic growth among 44 African nations. The findings confirm a direct and significant influence of inclusion on growth. Additionally, the evidence shows that a well-functioning financial system exert a positive influence on growth of economies. The studies by Sahay et al (2015) and Andrianaivo and Kpodar (2011) have also ignored the possible indirect relationship between financial inclusion and economic growth.

5.6.2. Positive Effect for Time Series and Individual Country Studies

Comparable to the cross-section works, the influence of FI on economic growth has also been examined at the single-country level. Sethi and Sethy (2018) assess the connection between FI and growth of the Indian economy using the Toda–Yamamoto Granger causality test. It is confirmed from the linear cointegration test that a long-run association between FI and economic growth exist in India. The advancement of both demand and supply-side financial products exerts a positive influence on growth of the economy.

Omojolaibi (2017) studying FI and growth of the Nigerian economy from 1980-2014 find that FI is a significant determinant in per capita GDP generation and reduction of poverty. Lenka and

Sharma (2017) investigate the long run association between FI and growth of economies employing both supply and demand-side indicators. They find that FI has a direct influence on growth of economies in the long-run. Similarly, Iqbal and Sami (2017) observe that when the number of bank branches and percentage of credit deposit in GDP are used to measure FI, FI exerts a positive effect on growth of economies. These studies have refused to consider any channels through which financial inclusion affects economic growth.

A descriptive questionnaire survey was used by Batram et al. (2016) to generate information on FI from key institutions such as banks, insurance companies, supervisory agencies, and telecommunication companies that provide households with accessibility to a number of innovative financial products. The authors find that FI has an influence on the development of the Nigerian economy. Babajide et al. (2015) in Nigeria, using the number of commercial bank branches per one thousand km2 or for every hundred thousand adults and deposits in commercial banks find a significant and positive impact of financial inclusion on total factor productivity. Aduda and Kalunda (2012) also confirm that, accessibility to finance for households has a strong direct and significant relationship with growth. However, the channels through which financial inclusion positively influences economic growth have not been explored by these studies (Aduda and Kalunda, 2012; Babajide et al., 2015)

Ghosh (2011) confirms that experiments in social banking have a direct effect on the economy of India. The results further show that, the use of financial products and services determines per capita growth as is major technological advancements. Mehrotra et al. (2009) highlight that, access to banking services by individuals enables them to put their monies in the mainstream financial institutions which also leads to a rise in economic growth through a multiplier effect. Similar to

most of the studies above, these studies have also not considered how financial inclusion positively influences growth.

Andrianaivo and Kpodar (2011) investigate whether FI through mobile phones and information and communication technology (ICT) influences economic growth in a direct manner. The number of deposits or loans per head compiled by Beck et al (2007) and the Consultative Group to Assist the Poor (CGAP, 2009) is used to measure FI. Using the system Generalized Method of Moments (GMM), the findings show that, ICT (including mobile phone development) contributes significantly to economic growth. They also show that part of the direct influence of mobile phone penetration on economic growth results from higher FI.

Hariharan and Marktanner (2012) examine how FI affects economic growth in a direct manner. The authors used account at a mainstream financial institution as a measure for FI and find that FI facilitates the process of matching between savers and investors, which measures total productivity. Using GDP per capita as the measure for economic growth, they applied Ordinary Least Squares (OLS) and conclude that financial inclusion significantly contributes to a country's economic growth.

Sharma (2016) explores the connection between FI and growth of the Indian economy. Financial inclusion was measured by bank accounts per 1000 adults, loan account per 1000 adults, bank branches per 1000km, bank branches per 0.1million adults, ATM's per 1000km, ATMs per 0.1million adults, outstanding loans to GDP and outstanding deposits to GDP. The study employs the Vector Auto Regressive (VAR) model and measured economic growth with GDP. The empirical results indicate that there is a direct link between economic growth and various aspects of FI precisely banking services availability, banking penetration and banking services usage in terms of deposits. Unlike Sharma (2016), we use a comprehensive index of financial inclusion to

examine the theoretically stipulated indirect relationship between financial inclusion and economic growth in Africa.

In a related study, Lenka and Sharma (2017) investigate the effect of FI on growth in India from 1980-2014. The authors measure FI by number of credit and deposit accounts from commercial banks per 1000 adults, and number of bank branches per 1000 adults. The study is one of the few that used Principal Component Analysis (PCA) to compute an index for financial inclusion. Using the Autoregressive Distributed Lag (ARDL) and Error Correction Model (ECM), the authors find a positive influence of FI on economic growth in both the long and short run. Raza et al (2019) examine the connection between financial inclusion and economic development in Pakistan using data over the period 2010-2015. The authors find a direct connection between FI and economic growth; consequently, a rise in financial inclusion results in an increase in economic growth. Lenka and Sharma (2017) and Raza et al (2019) have also not considered the theoretically stipulated indirect association between financial inclusion and economic growth.

5.6.3. Negative Effect of Financial Inclusion on Economic Growth and the Transmission Channel of Financial Inclusion.

Dahiya and Kumar (2020) assess the linkage between FI and India's economic growth. Using an index to measure FI, the study finds FI to exert an insignificant influence on economic growth. Naceur and Samir (2007) demonstrate that bank development index, credit to private sector by banks in MENA nations has a negative influence on growth of such economies. Similarly, Moore and Craigwell (2003) claim that, the providing minor financial services does not generate any higher return financially in relation to the operating cost of finance for providing them. The finding also relates to Natamba et al. (2013). Employing GMM dynamic panel methodology to examine whether FI and economic growth effects vary among countries and particularly in certain regions,

oil-dependent and low-income countries, Barajas (2016) find financial inclusion to negatively affect economic growth.

Although the empirical literature largely points to a positive influence of financial inclusion on economic growth, the findings from studies such as Dahiya and Kumar (2020), Barajas (2016), Natamba et al. (2013) and Naceur and Samir (2007) indicate that the effect of financial inclusion on economic growth is far from conclusive. The inconclusive findings may be a result of measurement issues regarding financial inclusion and the context within which the studies are conducted. This makes it pertinent for the examination of this relationship in Africa to establish the relationship between financial inclusion and economic growth and the channel through which inclusion affects growth.

Little is known on the factors that mediate the association between FI and economic growth. However, the few studies that have investigated this role demonstrate that some of the major mediating terms include mobile penetration and the growth enhancing effect of the gender dimension of financial inclusion. For example, Chatterjee (2020) examines FI, ICT diffusion, and economic growth using a fixed-effect model for 41 countries. The results show that both FI independently and when interacted with mobile and internet can enhance growth in per capita. Nonetheless, in developing nations, the function of ICT variables in improving financial inclusion and hence growth is discouraging. Andrianaivo and Kpodar (2011) find that, the mediating factor, mobile penetration, positively and significantly mediates the connection between FI and growth of 44 African economies. A similar result is found by Swamy (2014) for gender dimension and rate of growth. In all these studies, there is a suggestion that economic growth can be affected through these channels. To the best of our knowledge, no study has considered investment as a channel through which financial inclusion affects economic growth.

It is therefore evident from the foregoing that the extant literature on the nexus between FI and economic growth have largely disregarded the role of investment. Other studies have focused on the gender dimension and ICT as mediating variables. We argue that the influence of financial inclusion on economic growth would be incomplete without examining its linkages with investment. Therefore, this study makes a case for investment in the FI-growth nexus by examining the simultaneous effect of financial inclusion and investment on economic growth in Africa.

5.6.4. The Effect of Financial Inclusion on Investment

The formation of capital is a key variable to understand the relevance of financial inclusion as an important factor that enhances economic growth as the access to financial institutions and services expand the firm's ability to invest; which has a positive spill-over effect on economic growth. A few studies have examined the link between financial inclusion and the accumulation of capital (investment). Cama and Emara (2022) estimate and compare the effects of financial inclusion on the relative size of gross capital formation of low-tech sectors in the MENA region. Using four measures of financial inclusion, the authors find that, financial inclusion exerts a positive and statistically significant effect on the size of gross fixed capital formation in low R&D-intensity industries in the MENA region.

Similarly, Emara and Cama (2020) examine the influence of financial inclusion on gross fixed capital formation in a sectoral analysis of some selected MENA countries. The authors find financial inclusion to exert a significant positive effect on the size of gross capital formation on sectors such as textiles, leather related products, wood and products of wood and furniture industries. Ayoola and Omowunmi (2018) investigate the relationship between financial inclusion and investment in Nigeria. Using three indicators of financial inclusion, the authors find affordability and availability of financial services to be significant and positively related with gross

fixed capital formation. In contrast, the authors find accessibility to be negative and significantly related to investment.

5.7. Empirical Strategy

5.7.1. Data

This study employs a quantitative methodology using secondary data from relevant sources. Data on the variables used in this study are obtained from the International Financial Statistics, Global Financial Development, World Development Indicators and the World Governance Indicators databases where appropriate. Specifically, data on economic growth, human capital development, Inequality and inflation are obtained from the World Development Indicators database. Data on financial development is obtained from the Global Financial Development database. Variables on the various dimensions of financial inclusion are obtained from the International Financial Statistics database and the World Development Indicators. The study employs data from 22 [4]countries in Sub-Saharan Africa, covering a period that spans from 2007 to 2018. The period and number of countries used in the study are conveniently selected based on the availability of data in order to reduce the number of missing values in the calculation of our financial inclusion index. Countries with less than half of the observations for the financial inclusion components are excluded. Based on this criterion, the study arrives at 22 countries with enough observations to construct an efficient index for financial inclusion.

Financial inclusion is measured with an index of inclusion indicators that cover the usage and access dimensions of financial inclusion. Principal Component Analysis (PCA) is used in computing an index for financial inclusion. Investment is employed as the threshold variable.

[4] The countries are Burundi, Botswana, Cameroon, Congo, Comoros, Cabo Verde, Djibouti, Egypt, Ghana, Guinea, Equatorial Guinea, Lesotho, Madagascar, Namibia, Nigeria, Rwanda, Eswatini, Seychelles, Tunisia, Uganda, Zambia, Zimbabwe.

Inflation, trade openness, government expenditure and human capital development are used as control variables. Investment is proxied with gross fixed capital formation whiles human capital development is proxied with secondary school enrolment. Inflation and trade openness are proxied with annual consumer price index and trade openness as a percentage of GDP respectively. Government expenditure and economic growth are respectively proxied with gross national expenditure and annual GDP growth rate.

5.7.2. Principal Component Analysis (PCA)

Principal component analysis (PCA) is a method that is mostly used to determine the link between data and common tests. In the PCA method, the first component is considered as the factor that might exert the highest influence in explaining most of the variations in the dataset. Succeeding components, together with the initial component, form an orthonormal pattern and capture the other unexplained variations. The index of financial inclusion is computed using Principal Component Analysis (PCA), which involves four (4) selected measures covering usage and access dimensions of financial inclusion. We conduct a multidimensional index for financial inclusion as follows;

$$\text{Financial inclusion index } = \sum_{i=1}^{n} \omega_{ij} X_i \dots \dots Equation\ 1$$

where ω_{ij} are the component's loadings or weights; and X_i are the original variables. The financial inclusion composite index is constructed by using two dimensions of financial inclusion where each dimension consists of two factors. The first dimension consists of the supply side factors, which include; number of commercial bank branches per one hundred thousand (100,000) adults (CBBA) and number of ATMs per one hundred thousand (100,000) adults (ATMA). The second-dimension which captures the demand side factors include; number of borrowers from commercial

banks per one thousand (1000) adults (BCBA) and number of depositors with commercial banks per one thousand (1000) adults (DECB). The financial inclusion index is made up of four factors. The index is specified as follows:

$$FI_I = f(CBBA, ATMA, BCBA, DECB) \ldots \text{Equation 2}$$

5.7.3. Empirical Procedure

The earlier discussion conceals the variables that may moderate the link between finance and growth in a way that initiates severe discontinuities in the connection. Undeniably, the assumption that the finance-growth nexus is a linear one is a major deficiency in the literature (Ibrahim and Alagidede, 2018). We argue that, financial inclusion may not promote growth when the threshold variable is below a certain level and that the total influence is dependent on the extent of investment in a country. Indeed, many scholars (see for instance Adeniyi et al., 2015; Ductor and Grechyna, 2015) have added quadratic terms in assessing nonlinearities in the connection between finance and growth. Nevertheless, the exact threshold points are usually calculated through differentiation. As a result, the confidence intervals within which such inflection points fall are mostly unidentified.

To control for this, we modify a linear growth model and test for definite discontinuities in the nexus using the Hansen (1996, 2000) threshold model which relies on a data sorting process. Our selection of Hansen (1996, 2000) is because of its use of the asymptotic theory in estimating thresholds which makes it the most appropriate technique. The Hansen (1996, 2000) threshold method relies on the least square estimation of the regression parameters which is superior to the traditional regression tree and quadratic approaches because the form of nonlinearities of our chosen approach is not imposed and the confidence intervals of all the thresholds identified can empirically be verified. Hansen (1999) assume that the threshold variable q_{it} is not time invariant.

The error e_{it} is assumed to be independent and identically distributed (iid) with mean zero and finite variance δ^2. The iid assumption excludes lagged dependent variables from x_{it}. Further, we use the first-differenced generalized method of moments (GMM) estimators and the associated asymptotic variance estimator that are proposed by Seo and Shin (2016) as well as linearity testing for the presence of a threshold effect. We examine the nonlinear relationship between financial inclusion and economic growth using the following equation:

$$y_{it} = \alpha_i + X'_{it-1}\theta_1 I(\text{ investment }_{it-1} \leq \gamma) + X'_{it-1}\theta_2 I(\text{ investment }_{it-1} \succ \gamma) + \varepsilon_{it} \qquad (3)$$

Subscripts i and t denote the indexes for country and year. The dependent variable y is used as a proxy for economic growth, while investment is the threshold measure used to split the sample into two regimes when estimating the influence of financial inclusion on economic growth. X is a vector of macroeconomic variables that control for inflation, trade openness, government expenditure, and human development, while $\theta_1$and θ_2 are the vectors for the two respective regression slopes for each regime, assuming there are two regimes. I, is a binary function that has a value of 1 when the investment variable is less than or equal to a specific threshold value γ and 0 otherwise. We determine the existence of the threshold effect γ by endogenously adopting the panel threshold model developed by Hansen (1999, 2000) to estimate and examine the significance of the threshold parameter γ. Next, α_i represents the constant in the model. The marginal effects of the key variables on economic growth are determined by the level of investment as follows:

$$\frac{dy}{dx} = \theta_1 \text{ if investment } _{it-1} \leq \gamma$$

$$\frac{dy}{dx} = \theta_2 \text{ if investment } _{it-1} \succ \gamma \qquad (4)$$

Individual fixed effects are removed with the mean differencing model (1) using the within transformation. This implies:

$$y_{it}^{*} = X_{it-1}^{*}\theta_1 I(\text{ investment }_{it-1} \leq \gamma) + X_{it-1}^{*'}\theta_2 I(\text{ investment }_{it-1} \succ \gamma) + Z_t^{*^*}\delta + \varepsilon_{it}^{*} \quad (5)$$

Where $y_{it}^{*} = y_{it} - \bar{y}_i, X_{it-1}^{*} = [x_{kit-1} - \bar{x}_{ki}], \varepsilon_{it}^{*} = \varepsilon_{it} - \bar{\varepsilon}_i$ and $\bar{y}_i = \frac{1}{T-1}\sum_{t=2}^{T} y_{it}$ (6)

All the other factors are transformed accordingly.

After compiling all the individuals and time periods, the transformed model can be expressed in a more compact form as follows:

$$Y^{*} = X^{*}(\gamma)\theta + Z^{*}\delta + \varepsilon^{*} = W^{*}(\gamma)\lambda + \varepsilon^{*} \text{ where } W^{*} = [X^{*}(\gamma) \quad Z^{*}]\lambda = \begin{bmatrix}\theta \\ \delta\end{bmatrix} \quad (7)$$

The coefficients and residuals can be computed by applying OLS to the transformed model (7):

$$\hat{\lambda} = \left[W^{*^*}(\gamma)W^{*}(\gamma)\right]^{-1} W^{*^*}(\gamma)Y^{*} \text{ and } \hat{\varepsilon}^{*}(\gamma) = Y^{*} - W^{*}(\gamma)\hat{\lambda} \quad (8)$$

The sums of the squared residuals are then obtained as follows: $S_1(\gamma) = \hat{\varepsilon}^{*\prime}(\gamma)\hat{\varepsilon}^{*}(\gamma)$

The estimation of the threshold value γ is based on minimizing the sum of squared residuals, such that $\hat{\gamma} = \arg \min_{\gamma} S_1(\gamma)$. According to Hansen (1999, 2000), the critical value for estimating the 95% confidence interval of the threshold value can be provided through the following relationship:

$$\Gamma = \{\gamma : LR(\gamma) \leq C(\alpha)\} \quad (9)$$

Where $C(\alpha)\}$ designates the asymptotic distribution of the likelihood ratio $LR(\gamma)$.

5.8. Empirical Results

In this section, we present the empirical findings from our estimations. We test the non-linear effect of investment on the nexus between financial inclusion and economic growth in Africa using

Hansen's sample splitting approach. Descriptive statistics and correlations between the variables are also presented in this section.

5.8.1. Descriptive Statistics

Table 5.1 shows the descriptive statistics of the variables used in this study. The Table contains the descriptive statistics for the full sample of data employed and subsamples. The subsamples are obtained using the threshold value of investment (14.9048). Thus, regime 1 under the subsample describes the data when investment is less than the threshold of 14.9048 whereas regime 2 under the subsample shows a description of the data when investment is greater than the threshold value of 14.9048. From the full sample description in Table 5.1, annual GDP growth rate is observed to be 4.1517% on average in Africa, over the period of the study. The minimum annual GDP growth rate is observed to be -17.6690% whereas the maximum annual growth rate is 19.6753%. On average for countries in Africa, gross fixed capital formation (investment) is 24.6382%, with this variable being highest at 79.4618% and lowest at 3.2859%. The mean value of investment implies that, on average, countries in Africa have gross fixed capital formation above the threshold level. However, the relatively high standard deviation for investment (10.6429) implies that there is considerable cross-country variation in investment across Africa.

Table 5. 1. Descriptive Statistics

VARIABLE	OBS	MEAN	STD DEV.	MINIMUM	MAXIMUM
Full Sample					
GDP	264	4.1517	4.4086	-17.6690	19.6753
INV	264	24.6382	10.6429	3.2859	79.4618
FI	264	-0.0538	0.9713	-0.8894	3.6849
INF	264	6.5090	5.7472	-4.2949	36.9648
TO	264	92.7092	63.8844	20.7225	347.9965
GNE	264	110.8985	16.7864	50.2393	167.5437
SCE	264	54.4678	20.8637	15.0849	96.6594
Subsample Regime 1					
GDP	47	3.0292	5.2121	-17.6690	16.6654
INV	47	12.3023	2.5229	3.2859	14.8646
FI	47	-0.2230	0.6432	-0.8894	1.3345
INF	47	6.4504	7.1670	-4.2949	29.5066
TO	47	56.9459	24.6338	20.7225	109.5216
GNE	47	110.6759	10.1488	81.7822	128.4
SCE	47	56.8322	17.3808	15.0849	86.7145
Subsample Regime 2					
GDP	217	4.3949	4.1888	-10.1904	19.6753
INV	217	27.3100	9.8122	15.0835	79.4618
FI	217	-0.0171	1.0262	-0.8765	3.6849
INF	217	6.5217	5.4109	-4.2949	36.9648
TO	217	100.4552	67.0928	30.8852	347.9965
GNE	217	110.9468	17.9206	50.2393	167.5437
SCE	217	53.9557	21.5452	20.1248	96.6594

GDP = Annual GDP growth rate, INV = Investment, FI = Financial Inclusion, INF = Inflation, TO = Trade Openness, GNE = Gross National Expenditure, SCE = Secondary School Enrolment

Financial inclusion is observed to have a negative mean (-0.0538) in Africa, a suggestion of a low level of financial inclusion, on average. The minimum and maximum values of financial inclusion are -0.8894 and 3.6849 respectively. Inflation and trade openness have means of 6.5090% and 92.7092% respectively. The mean value for trade openness suggests that there is high openness to trade among African economies, on average. The relatively high standard deviation for trade openness suggests that there is substantial cross-country variation in trade openness across Africa. The minimum inflation rate over the study period is -4.2949% whiles the maximum rate of

inflation is 36.9648%. Similarly, the minimum and maximum values for trade openness are 20.7225% and 347.9965% respectively.

The average values for gross national expenditure and secondary school enrolment are 110.6759% and 54.4678 respectively. The average value for gross national expenditure indicates a very high government expenditure by countries in Africa, on average. The minimum and maximum values for gross national expenditure are 50.2393% and 167.5437% respectively. The relatively high standard deviation indicates significant variations in secondary school enrolment among African countries.

The descriptive statistics for the subsamples (regime 1 and regime 2) are also shown in the Table 5.1. It is clearly shown in the Table that most countries have higher investment (above the threshold value). On average, periods of higher investment (above the threshold value) are associated with relatively higher economic growth (4.3949%), higher financial inclusion (-0.0171), and higher trade openness (100.4552%) as compared to periods below the threshold value. This may indicate that, the level of gross fixed capital formation (investment) affects a country's level of economic growth and financial inclusion.

5.8.2. Correlation Matrix

Table 5. 2. Matrix of Correlations for the full sample

VARIABLE	GDP	INV	FI	INF	TO	GNE	SCE
GDP	1						
INV	-0.0285	1					
FI	-0.1173	0.2380*	1				
INF	0.0765	-0.1210*	-0.1092	1			
TO	0.0669	0.3557*	0.2339*	-0.1249*	1		
GNE	-0.0092	0.0232	0.0202	0.0294	0.1719*	1	
SCE	-0.1370*	0.1005	0.6438*	-0.1523*	0.1468*	0.0728	1

*Denote significance at the 5% significance level. GDP = Annual GDP growth rate, INV = Investment, FI = Financial Inclusion, INF = Inflation, TO = Trade Openness, GNE = Gross National Expenditure, SCE = Secondary School Enrolment. Correlations for sub-samples (below and above the threshold value of investment) have been provided in Appendix A and B.

Table 5.2 presents the correlations between the variables used in this study. The low correlations among the independent variables indicate that there is no problem of multicollinearity among the explanatory variables. Financial inclusion is observed to have a significant and positive (0.2380) correlation with investment, suggesting that, an increase in financial inclusion may be associated with an increase in gross fixed capital formation (investment) in Africa. This correlation indicates that, an inclusive financial sector has the potential to increase investment activities in the economy. Also, the correlation between inflation and investment is observed to be negative (-0.1210) and significant. This indicates that, there is an inverse relationship between inflation and investment in Africa. An increase in inflation may therefore be associated with a decrease in investment.

Inflationary pressures may reduce the ability of individuals to accumulate capital through investment activities.

Further, the correlation between secondary school enrolment and economic growth is negative (-0.1370) and significant. An increase in secondary school enrolment in Africa may be associated with a decrease in economic growth. From the Table, there is a positive (0.3557) and significant correlation between trade openness and investment in Africa. This correlation indicates that, an increase in trade openness tends to be associated with an increase in gross fixed capital formation (investment), probably as a result of an increase in the inflow of capital and foreign investment. The positive and significant correlation between financial inclusion and trade openness also suggests that, an inclusive financial sector may be associated with higher openness to trade in African economies.

There is a significant and positive (0.6438) correlation between secondary school enrolment and financial inclusion. This correlation shows that, higher enrolment in secondary schools may be associated with higher financial inclusion in Africa. According to this relationship, human capital development, in the form of increased enrolment in secondary schools, may help to foster inclusive finance in Africa. The Table further shows a negative (-0.1249) and significant correlation between inflation and trade openness. Similarly, the correlation between inflation and secondary school enrolment is negative (-0.1523) and significant. The negative correlation between inflation and trade openness suggests that, there may be an associated reduction in trade openness during periods of inflationary pressures.

In the same way, the negative correlation between inflation and secondary school enrolment indicates that, an increase in inflation may be associated with significant reduction in human

capital development (secondary school enrolment). Trade openness is shown in the Table to be significant and positively correlated with gross national expenditure (0.1719) and secondary school enrolment (0.1468). These correlations suggest that, an increase in trade openness in Africa may be significantly associated with increases in government expenditure and human capital development.

From the Table, economic growth is observed to be positively correlated with trade openness (0.0669) and negatively correlated with gross national expenditure (-0.0092). The direct correlation between economic growth and trade openness indicates that an increase in trade openness may be associated with an increase in economic growth in Africa. The inverse relationship between gross national expenditure and economic growth also shows that, there may be an associated decrease in economic growth as government expenditure increases. There is also a negative (-0.1092) correlation between inflation and financial inclusion which shows that, an increase in inflation may negatively influence the pursuit of an inclusive financial sector in Africa.

5.8.3. Findings on the Estimated Threshold Values and Inclusion-Growth Nexus

Table 5. 3. Threshold Regression Results

	Model 1	Model 2
Regime 1		
Financial Inclusion	-96.6892***	-95.3629***
	(26.0444)	(34.9339)
Inflation	-0.4334	-0.4838
	(0.4363)	(0.4605)
Trade Openness	-0.6804**	-0.6701***
	(0.2658)	(0.1266)
Government Expenditure	-0.5792	-0.6162
	(0.5159)	(0.6454)
Secondary School Enrolment	0.9055**	0.8693***
	(0.3563)	(0.3226)
Regime 2		
Financial Inclusion	87.2429***	85.8721**
	(24.6797)	(33.6160)
Inflation	0.4160	0.4496
	(0.4784)	(0.4940)
Trade Openness	0.7797***	0.7668***
	(0.2989)	(0.1557)
Gov. Expenditure	0.5568	0.6072
	(0.5770)	(0.7138)
Secondary School Enrolment	-0.8280***	-0.7942***
	(0.3159)	(0.2815)
Threshold Value	14.9048***	14.9048***
95% confidence interval	[10.832, 18.977]	[10.991, 18.819]
Bootstrap p-value for linearity test	0.0000	0.0000

Note: Annual GDP growth rate is used as the dependent variable in Model 1 whiles Model 2 uses GDP per capita as the dependent variable. *, **, and *** denote 10%, 5%, and 1% significance levels, respectively.

In order to test the moderating role of investment, we estimate equation (1) under two regimes to investigate how the threshold level of investment affects the relationship between financial inclusion and economic growth in Africa. The findings from the estimation are presented in Table 5.3. The lower part of the Table shows the estimated threshold value of the respective threshold variable (14.9048), the 95% confidence interval which shows the level of precision of the

estimated threshold value and its associated bootstrap p-values (0.0000). Since our estimations allow one threshold γ, γ is not identified under the null hypothesis of no threshold effect. We therefore bootstrap the p-values which are asymptotically correct (Hansen, 1996) in order to examine the relevance of the sample split. The significance of the p-value suggests the need for a sample split based on the threshold variable. It is imperative to note that Hansen (1996, 2000) identifies a single threshold that is significant at 10% or better. In regime 1, we present the results on the effect of financial inclusion on economic growth for countries below the threshold values. Regime 2, however, shows the relationship between financial inclusion and economic growth when countries exceed the identified threshold values of the threshold variable. In order to test the robustness of our findings, we use alternative measures of economic growth, presented in Model 1 and Model 2. The findings in model 1 are consistent with the findings in model 2.

On the mediating variable, as shown in Table 5.3, the threshold of investment is estimated at 14.9048% and lies within a confidence interval of 10.832 and 18.977 for model 1. Similarly, the threshold for investment in model 2 is estimated at 14.9048% and lies within a confidence interval of 10.991 and 18.819. In both models, we find about 17.80% of countries to fall within regime 1 whiles majority of countries, about 82.20% of countries fall within regime 2. It is clearly shown that, the threshold level for investment in the two models are the same. The threshold level for investment does not change when economic growth is proxied with different variables, indicating robustness of our findings.

In regime 1, we find that financial inclusion is significant and negatively related to economic growth in model 1. That is, below the threshold level of investment, financial inclusion exerts a significantly negative effect on economic growth in Africa. Also, in model 2, financial inclusion is found to be significant and negatively related to economic growth for countries with investment

below 14.9048% of GDP. This highlights the importance of capital formation in enhancing the growth effects of financial inclusion (See e.g., Cama and Emara, 2022). Cama and Emara (2022) identify investment as key to understanding the relevance of financial inclusion to economic growth.

We argue that, for countries with investment below the threshold level, inclusive finance does not improve economic growth as individuals with access to finance are not able to invest in productive ventures to improve the level of producers' investment in the economy. This may cause the level of expenditure in the country to fall and affects economic growth adversely. This means that, for countries with lower levels of investment, an increase in financial inclusion does not increase the level of investment expenditure in the country. Funds accessed through the financial system do not enhance productive investments in the country. However, the cost of transactions and other related costs of higher financial inclusion affect consumption and investment adversely and results in a negative impact on economic growth.

In regime 2 where we estimate the influence of investment above the threshold value, we find financial inclusion to be positive and significantly related to economic growth. That is, above the threshold level of investment, financial inclusion exerts a significantly positive effect on economic growth. Specifically, in model 1, we find that, economic growth increases by 87.2429% with a 1% increase in financial inclusion, when investment is above 14.9048% of GDP. Likewise, in model 2, we find economic growth to increase by 85.8721% with a 1% increase in financial inclusion. It is inferred from this evidence that, financial inclusion spurs economic growth especially when investment is above the threshold level of 14.9048%. The finding suggests that, at higher levels of financial inclusion, productive investment in the African economy is enhanced which spills over positively on economic growth.

Sethi and Archaya (2018) posit that, when financially excluded people get access to deposit and insurance products, it helps them to save their monies which generally raises funds in the financial market. The availability of these funds in the financial system encourages more investment. An increase in investment leads to more output and employment which further translates into economic growth. Our finding from regime 2 supports the theoretical assertion of Sethi and Archaya (2018). We, however, add that, this assertion holds when the level of investment in a country is above a certain threshold level, below which access to finance affects economic growth adversely. Interestingly, our findings suggest that an increase in financial inclusion may not be beneficial to the economic growth of countries in Africa whose level of investment are below a threshold level. At worse, an increase in financial inclusion for such countries results in a negative effect on economic growth. It is apparent, however, that, inclusive finance is more beneficial for countries with levels of investment above a threshold level.

In regime 1, we find trade openness to be significant and negatively related to economic growth in models 1 and 2, when the level of investment is below the threshold level of 14.9048% of GDP. This relationship is significant at the 5% level in model 1 and significant at the 1% level in model 2. Specifically, a 1% increase in trade openness results in -0.6804% change in economic growth for model 1 whereas economic growth falls by -0.6701% for a percentage change in trade openness in model 2. It is inferred from this evidence that, at lower levels of investment, below the threshold level, openness to trade affects economies negatively. At lower levels of investment in a country, an increase in trade openness through trade liberalizations harms the economy as there may not be enough productive investments to absorb the increase in trade in the country. The reduction in revenues through lower taxes and tariffs affects the economy negatively.

Nonetheless, the evidence from regime 2 shows that, trade openness is significant and positively related to economic growth when investment is above the threshold value of 14.9048% of GDP. Specifically, economic growth increases by 0.7797% with a 1% increase in trade openness when investment is above the threshold level in model 1. Correspondingly, a 1% increase in trade openness results in 0.7668% increase in economic growth in model 2. This suggests that, beyond the threshold level of investment, trade openness exerts a positive influence on economic growth in Africa. At higher levels of investment, an economy is well able to accommodate increases in trade and enjoy positive benefits from trade openness.

Additionally, we find secondary school enrolment (human capital development) to be positive and significantly related to economic growth in regime 1, when investment is below the threshold level of 14.9048% of GDP, for both model 1 and model 2. However, in regime 2, we find human capital development to be significant and negatively related to economic growth. In regime 1 model 1, the relationship is significant at the 5% significance level and economic growth increases by 0.9055% with a 1% increase in human capital development whiles economic growth increases by 0.8693% for a 1% increase in human capital development, with the relationship being significant at the 1% level of significance.

5.9. Policy Implications and Recommendations

In this section, we provide implications of our research findings and make recommendations to regulators and other stakeholders based on our findings. Issues like profitability and growth exist beyond the welfare benefits of financial inclusion. Financial inclusion, as documented in the literature, may improve economic wellbeing of individuals and SMEs. Yet, the effect of financial inclusion on economic growth may not be as direct. Using country-level data from Africa and employing Hansen's sample splitting approach, we provide comprehensive evidence that, there is

a non-linear relationship between financial inclusion and economic growth with the level of investment affecting this relationship.

Our results suggest that, although investment moderates the relationship between financial inclusion and economic growth, a certain threshold level of investment must be achieved for financial inclusion to positively influence economic growth. Our findings further suggest that, when investment is below the threshold level identified in our study, financial inclusion affects economic growth negatively. However, when the level of investment is at or above the threshold level of investment, financial inclusion exerts a positive and significant influence on economic growth. Based on this finding, we recommend that, governments in Africa make a consented effort to increase their levels of investment. In order not to compromise the growth of the African economy by pursuing financial inclusion, governments must ensure that the level of investment is relatively high, above a threshold level. This way, financial inclusion will not only produce welfare benefits to citizens in the country but will also contribute significantly to the growth of the African economy.

We recommend that policies geared towards creating a financially inclusive financial sector must concurrently take into consideration factors that can help to improve the level of investment in the local economy. Specific to each economy, however, factors such as facilitating the acquisition of produced assets through various avenues must be keenly considered. With this, easy accessibility to funds from the financial sector can be channeled towards entrepreneurial activities in the country which can boost production and increase economic growth. We therefore urge governments in Africa to actively seek to increase their level of investment whiles pursuing financial inclusion as a policy objective. This way, financial inclusion can produce positive spill-overs on economies in Africa.

We also find evidence of a negative influence of trade openness on economic growth when investment is below the threshold level identified. However, above the threshold level of investment, trade openness exerts a positive and significant influence on economic growth. Our evidence suggests that, the level of investment in a country influence how trade openness affects economic growth in Africa. For governments seeking to increase their level of openness to trade, the level of investment in the country must first be assessed to determine the best policy action at the moment. When investment is below the threshold level, we recommend that African governments work to improve their level of productive investments in the country in order to be able to absorb additional capital that comes from higher trade openness. The productive capacity of African economies must first be developed, through increased productive capital investment in the local economy. Above the threshold level of investment, governments can increase their level of trade openness to enjoy positive benefits.

Below the threshold level of investment, we find evidence to show that an increase in human capital development (secondary school enrolment) affects economic growth positively and significantly. Nevertheless, above the threshold level of investment, human capital development (secondary school enrolment) influences economic growth negatively and significantly. This evidence shows that, increases in economic growth can be achieved by increasing the level of human capital development when investment in a country is low (below the threshold). Our recommendation to governments during periods of low investment is to increase the level of human capital development in order to increase economic growth. It is apparent, also, that, above the threshold level of investment, an increase in human capital development may not be a prudent strategy to achieve higher economic growth.

5.10. Conclusion

In spite of the theoretically prescribed mediating role of investment in the link between financial inclusion and economic growth, literature has basically approached the nexus in a manner that ignores investment. Most studies have examined the inclusion-growth nexus in a linear form, ignoring the channels through which inclusion may influence growth. Amazingly, literature on financial inclusion-growth nexus has ignored the mediation role of investment. Others have focused on gender dimensions and information and communication technology (ICT) as mediating variables (Andrianaivo and Kpodar, 2011; and Swamy 2014), neglecting the theoretically stipulated role of investment.

Although some authors (Hajilee et al, 2017; and Inoue and Hamori, 2016) have controlled for investment as one of the regressors in line with standard neoclassical growth equation, the nature of the theoretical foundation in the context of inclusion-growth nexus necessarily makes investment a conduit through which inclusion impacts growth. To treat inclusion and investment as separate regressors in the inclusion-growth nexus obscures the theoretically prescribed mediating role of investment, which necessarily runs counter with the theoretical foundation of the very relationship they seek to study. We contend that the influence of financial inclusion on economic growth would be incomplete without examining its linkages with investment as per theoretical stipulations.

Another key issue in the literature is the measurement of financial inclusion. Most studies use single indicators as proxies for financial inclusion. We see this as an error in measurement as financial inclusion is multidimensional and should be measured with an index that captures its multidimensional nature. We overcome this flaw in literature by using an index of financial

inclusion calculated with two indicators each from the demand and supply sides of financial inclusion.

We set out to investigate the non-linear relationship between financial inclusion and economic growth in Africa, with investment as the mediating/threshold variable. We employ the Hansen's sample splitting approach to examine this relationship. This approach allows us to examine the influence of inclusion on growth below and above the threshold level of investment. Our study covers 22-African countries over a 15-year period, from 2004 to 2018. We measure financial inclusion using an index created from the main dimensions of financial inclusion. The use of the index provides a more comprehensive measure of financial inclusion.

We provide evidence that, investment does not only significantly influence the relationship between financial inclusion and economic growth, but also, the level of investment in the country is important in determining the sign and magnitude of this effect. Specifically, we find that, below the threshold level of investment, financial inclusion exerts a negative and significant influence on economic growth whereas above the threshold level of investment, financial inclusion affects economic growth positively and significantly. Our evidence suggests that, the level of investment in a country is a significant channel through which financial inclusion affects economic growth. This notwithstanding, the effect on economic growth can be negative when investment is below the threshold level identified in this study. For financial inclusion to affect economic growth positively, we find that, the level of investment in the country must be equal to or exceed the threshold level of investment identified in this study.

Moreover, we find trade openness to be negative and significantly related to economic growth when investment is below the threshold level. Also, trade openness is observed to be positive and significantly related to economic growth when investment is above the threshold level. This

evidence suggests that, at lower levels of investment, below the threshold value, an increase in trade openness affects economic growth adversely. When investment is above the threshold level, however, the influence on economic growth is positive and significant. According to our findings, the level of investment is also a significant determinant of how trade openness affects economic growth in the African economy.

Lastly, our findings show that, human capital development (secondary school enrolment) affects economic growth positively when the level of investment is below the threshold level found in this study. On the contrary, the effect of human capital development (secondary school enrolment) on economic growth is negative and significant when investment is above the threshold level. Again, we find that the level of investment significantly influences how human capital development affects economic growth in Africa. According to this evidence, an increase in human capital development, when investment is below the threshold level may be detrimental to the growth of the African economy. However, for a country with investment below the threshold level, an increase in human capital development results in positive and significant effects on the economy.

Based on these findings, we recommend that governments in Africa critically consider the level of investment in their countries in making policies regarding financial inclusion. In order to curb the potential negative effects of financial inclusion on economic growth, African governments must ensure that the level of investment in their country is above the threshold level identified in this study. Whiles pursuing financial inclusion, African governments must simultaneously seek to increase investment. This way, an increase in financial inclusion will result in positive benefits to their respective countries. Also, since the level of investment affects how trade openness and human capital development influence economic growth, the level of investment must again be considered when deciding on increasing or decreasing the level of trade openness and secondary

school enrolment. For instance, below the threshold level of investment, it is not recommended for African governments to increase trade openness as it is more likely to result in negative effects on economic growth. Above the threshold level of investment, governments may increase trade openness to achieve higher economic growth. Future studies may also consider other channels through which financial inclusion may influence the economic growth in Africa.

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CHAPTER SIX

SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1. Introduction

There are four sections in this final chapter. This first section introduces the chapter, while the second section summarizes and concludes the research. Section 3 offers key policy recommendations, while the final section identifies areas where more research is needed.

6.2. Summary and Conclusions

This study examined the concept of financial inclusion and its linkages with key macroeconomic factors in Africa. Specifically, the study took a new dimension in the literature by employing a comprehensive index of financial inclusion, contrary to a lot of empirical studies before this that employ single measures of financial inclusion. The study investigated the influence of financial inclusion on financial development by employing a new index of financial development, unlike many previous studies that use the ratio of domestic credit to private sector as a percentage of GDP and other single measures of financial development that do not fully capture the multidimensional nature of financial development.

The study also examines the indirect effect of financial inclusion on the relationship between financial development and income inequality. Beyond these, the study also investigates how financial inclusion influences the stability of banks in Africa. The study also examined whether the financial inclusion-growth nexus is influenced by investment as a threshold variable. This study thus focused on key gaps regarding financial inclusion that have not received much attention and clarity. Specifically, the study answers the following questions:

- What is the relationship between financial development and financial inclusion in Sub-Saharan Africa? Does the measurement of financial development and financial inclusion matter?
- Does financial inclusion matter in the financial development-income inequality nexus?
- How does financial inclusion influence the stability of banks at various quantile distributions of stability in Africa? Does the measurement of financial inclusion matter in the financial inclusion-financial stability nexus?
- Does investment matter in the relationship between financial inclusion and economic growth? Is there a threshold effect of investment in the nexus between financial inclusion and economic growth?

6.2.1. Financial Inclusion and Financial Sector Development

Using data from 22 African countries over a 12-year period, from 2007 to 2018, we investigate the relationship between financial inclusion and financial development by employing the Generalized Method of Moments (GMM) approach to panel data. Static panel data models are also used to provide robustness checks to the estimates from the GMM estimation. We find financial inclusion, measured with the financial inclusion index, to be significant and positively related to financial development, measured with the financial development index. Again, we find financial inclusion to positively and significantly influence financial development index in all of the static models too, providing more robust evidence. However, employing single measures of financial development as dependent variables, we find financial inclusion to exert an insignificant effect on financial development. In our static models, financial inclusion was found to be positively related to the single measures of financial development, but in an inconsistent manner. We provide further

evidence that, real GDP per capita growth, human development and political stability are key drivers of financial development in Africa.

Our findings suggest that, using a single measure of financial development does not serve as a comprehensive proxy as other key aspects of financial development may not be captured. Using indexes to measure financial inclusion and financial development provide a more comprehensive measure which provides robust findings that can effectively assist policy makers in designing initiatives and strategies.

6.2.2. Financial Development, Financial Inclusion and Income Inequality

By employing the three-stage least squares (3SLS) approach, we examine the indirect effect of financial inclusion on the relationship between financial development and income inequality in Africa from 2004 to 2015. We find financial development to indirectly exert a negative effect on income inequality in Africa, meaning that, development in the financial sector reduces the income gap between the poor and the rich. However, financial development eventually reduces income inequality as financial services are extended to the marginalized as the sector further develops. This finding is robust to alternative measures of financial inclusion.

Additionally, we find unemployment rate to be significant and positively related to income inequality in Africa. This indicates that, an increase in the rate of unemployment in Africa hinders the achievement of income equality in the society. Also, we find human capital development to be negative and significantly related to income inequality, implying that, development of the human capital of the African populace is essential to achieving income equality. The income of the poor can increase greatly as they become more educated and positioned to take up high-income positions and roles.

6.2.3. Financial Inclusion and Banking Stability in Africa

Investigating the implications of financial inclusion on the stability of banks in Africa, findings from the quantile regression shows that greater financial inclusion enhances the stability of the African banking system. Although financial inclusion enhances the stability of banks at all levels of stability, our finding shows that, the impact of financial inclusion on stability is more pronounced in highly stable banking systems. Nonetheless, financial inclusion also enhances the stability of banks in relatively less stable banking systems. Greater financial inclusion helps to alleviate financing constraints of SMEs. Information asymmetry is reduced as banks get closer to their customers by opening more branches and this mitigates post-lending moral hazard and asset substitutions problems. Therefore, with a more inclusive financial sector, banks enjoy greater stability.

Further, we find bank size to be positive and significantly related to Z-score at lower quantile levels, suggesting that, bank size significantly improves the stability of less stable banks than more stable banks. At higher quantiles, where there is more stability, the size of banks exerts little to no effect on the stability of the banking system. At lower levels of Z-score, an increase in the total assets of banks fosters stability through high capitalization as a result of the increase in total assets. At higher quantile levels where the banking system is more stable, an increase in the size of banks does not significantly improve stability. Moreover, we find return on assets and trade openness to exert significant negative effects on stability at and below the 50th quantile, suggesting that, at lower to mid-levels of stability, higher profitability and increased trade openness affect stability negatively. Higher profit levels induce banks to make more profits by increasing their risks which increases their riskiness and the riskiness of the banking system. Similarly, increased trade

openness exposes banks to higher competition and new risks and increases the riskiness of the banking system.

6.2.4. Financial Inclusion, Investment and Economic Growth in Africa

We investigate the non-linear relationship between financial inclusion and economic growth in Africa, with investment as the mediating/threshold variable. We employ the Hansen's sample splitting approach to examine this relationship. Findings from the sample splitting and threshold estimations show that investment does not only significantly influence the relationship between financial inclusion and economic growth, but also, the level of investment in the country is important in determining the sign and magnitude of this effect.

Specifically, we find that, below the threshold level of investment, financial inclusion exerts a negative and significant influence on economic growth whereas above the threshold level of investment, financial inclusion affects economic growth positively and significantly. Our evidence suggests that, the level of investment in a country is a significant channel through which financial inclusion affects economic growth. This notwithstanding, the effect on economic growth can be negative when investment is below the threshold level identified in this study. For financial inclusion to affect economic growth positively, we find that, the level of investment in the country must be equal to or exceed the threshold level of investment identified in this study.

Moreover, we find trade openness to be negative and significantly related to economic growth when investment is below the threshold level. Also, trade openness is observed to be positive and significantly related to economic growth when investment is above the threshold level. This evidence suggests that, at lower levels of investment, below the threshold value, an increase in trade openness affects economic growth adversely. When investment is above the threshold level, however, the influence on economic growth is positive and significant. Lastly, our findings show

that, human capital development (secondary school enrolment) affects economic growth positively when the level of investment is below the threshold level found in this study. On the contrary, the effect of human capital development (secondary school enrolment) on economic growth is negative and significant when investment is above the threshold level. Again, we find that the level of investment significantly influences how human capital development affects economic growth in Africa.

6.3. Policy Implications and Recommendations

Due to the importance of financial inclusion to the financial system, poverty alleviation, and economic growth, financial inclusion has recently become a major issue for policymakers and researchers. As a result, the findings from this study have crucial policy implications. To ensure financial development in Africa, we recommend that African governments stabilize the political environment of their respective countries. Again, we recommend that government policy on financial inclusion affect two main areas; policies concerned with industry or providers to ensure the design and delivery of appropriate financial services and products that can help include the financially excluded in the African financial system and policies geared at enhancing the education and awareness of financial services and their benefits.

The significant negative effect of financial development on income inequality through financial inclusion suggests that, development of the financial sector actually reduces the income gap between the rich and the poor. Our evidence suggests that financial inclusion, which is a result of development in the financial sector, occurs both on the intensive margin and the extensive margin. In order to reduce the income gap and ensure income inequality, policy makers and financial institutions must put in place measures to ensure that financial services are extended to the poor

and marginalized. Policy makers and regulators should provide incentives to motivate financial institutions to extend their reach to the poor, even at the initial stages of financial development.

In terms of policy making, policies that are geared towards reducing income inequality may require mainstream financial services to keep a certain number of accounts from areas that are considered as less developed. Also, such policies may require formal providers of financial services to report on their activities, not just corporate social responsibility acts, but their banking activities with individuals in rural areas. This will help to ensure that, a minimum number of rural dwellers, if not all, are able to gain accessibility to financial services from mainstream financial service providers. As per the extensive margin of financial inclusion, extending financial services to individuals in rural communities, as a result of development in the financial sector, can help to increase their income and contribute to the reduction of income inequality in Africa. As part of policy making, also, policies targeted at improving financial sector development must be accompanied with financial inclusion policies. However, policy makers must ensure that financial services are extended to the poor and marginalized, otherwise, development of the financial sector will only widen the income gap in Africa.

Also, financial institutions may use the services of agencies to increase their reach to rural dwellers. In areas where it may not be economically prudent to build a branch, mainstream financial service providers may employ the services of agents to act on their behalf in the provision of financial services to individuals in such areas. Through the use of agents and agencies, banks and other financial institutions can empower the poor in their businesses and economic activities. By enhancing their businesses and economic activities, the livelihoods of poor people can be improved through increased income. Income inequality can be reduced by the use of agency services to reach rural communities.

Based on the evidence of a positive relation between financial inclusion and stability, we recommend that governments and all relevant stakeholders actively pursue and implement strategies that will ensure the provision of financial services to a larger customer base. We aver that, the low level of financial inclusion in Africa is partly due to the reluctance of banks to extend financial services to the poor and marginalized as a result of a perceived high riskiness of this group. By broadening banking services to the unbanked and/or underbanked people, banks may not only take early advantage of exploiting the untapped potential of customers and create a 'lock-in' effect but also aid an inclusive development agenda while allocating resources in more productive areas. Our finding calls for policy makers, regulators and supervisory bodies in Africa to cooperate with the objective of increasing financial inclusion in Africa in order to enhance stability in the African banking system, which is a fundamental need for inclusive economic growth. Governments in Africa should therefore provide incentives for banks to extend the provision of financial services to the marginalized without the fear of jeopardizing their stability and the stability of the banking system.

Banks may use the services of agencies to increase their reach to rural dwellers. In areas where it may not be economically prudent to build branches, mainstream financial service providers may employ the services of agents to act on their behalf in the provision of financial services to individuals in such areas. Through the use of agents and agencies, banks may be able to garner cheap retail deposits from the marginalized in the society. Cheap retail deposits provide an important leeway which helps to reduce the extent to which banks rely on relatively more volatile money market funds. As a result of being able to gather cheap retail deposits from individuals by the use of agents and agencies, banks will become more stable and contribute positively to the stability of the banking system as a whole.

Governments in Africa should critically consider the level of investment in their countries in making policies regarding financial inclusion. In order to curb the potential negative effects of financial inclusion on economic growth, African governments must ensure that the level of investment in their country is above the threshold level identified in this study. Whiles pursuing financial inclusion, African governments must simultaneously seek to increase investment. This way, an increase in financial inclusion will result in positive benefits to their respective countries.

Also, since the level of investment affects how trade openness and human capital development influence economic growth, the level of investment must again be considered when deciding on increasing or decreasing the level of trade openness and secondary school enrolment. For instance, below the threshold level of investment, it is not recommended for African governments to increase trade openness as it is more likely to result in negative effects on economic growth. Above the threshold level of investment, governments may increase trade openness to achieve higher economic growth.

6.4. Areas Necessitating Further studies

We also make some suggestions to future research. Future studies on the relationship between financial inclusion and stability could explore the channels through which financial inclusion affects stability. Future research could examine factors such as institutional quality which could serve as channels through which financial inclusion affects economic growth. Again, although a lack of detailed data is common, future research could explore the form of financial inclusion that exerts a positive influence on financial inclusion in Africa since financial inclusion can be on the intensive margin or the extensive margin. A breakdown of the financial inclusion variable could provide a more detailed understanding on which form of financial inclusion influences stability

positively. Aside investment, future studies may also consider other channels through which financial inclusion may influence the economic growth in Africa.

Due to the rise of mobile money, particularly in Africa, future studies may create an innovative index of financial inclusion by including the usage of mobile money and the quality and cost of providing financial services, which are important components of financial inclusion. Also, future studies may employ alternative measures of stability such as CoVaR by Tobias & Brunnermeier (2016) and SRISK and Marginal Expected Shortfall by Brownlees & Engle (2017) to provide more comprehensive evidence on stability in the banking sector.

Appendix A

Correlation Matrix below the threshold value of investment

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) GDPG	1.000						
(2) INV	0.406*	1.000					
(3) FI	-0.087	0.183	1.000				
(4) INF	0.089	0.327*	0.103	1.000			
(5) TO	-0.060	-0.298*	0.465*	-0.212	1.000		
(6) GNE	0.180	-0.208	-0.548*	-0.093	-0.085	1.000	
(7) SCE	0.019	0.064	0.665*	-0.030	0.225	-0.360*	1.000

** p<0.05*

Appendix B

Correlation Matrix below the threshold value of investment

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) GDPG	1.000						
(2) INV	-0.156*	1.000					
(3) FI	-0.140*	0.236*	1.000				
(4) INF	0.072	-0.197*	-0.152*	1.000			
(5) TO	0.050	0.276*	0.211*	-0.133*	1.000		
(6) GNE	-0.039	0.031	0.063	0.050	0.189*	1.000	
(7) SCE	-0.166*	0.162*	0.651*	-0.183*	0.166*	0.116	1.000

** p<0.05*