

**UNIVERSITY OF GHANA
COLLEGE OF HUMANITIES**

**FINANCIAL SECTOR DEVELOPMENT AND ECONOMIC GROWTH IN
SSA: INSIGHTS WITH NEW DATA**

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**A THESIS SUBMITTED TO THE DEPARTMENT OF FINANCE,
UNIVERSITY OF GHANA BUSINESS SCHOOL, UNIVERSITY OF
GHANA, LEGON IN PARTIAL FULFILLMENT OF THE
REQUIREMENT FOR THE AWARD OF A MASTER OF PHILOSOPHY
IN FINANCE DEGREE**

DEPARTMENT OF FINANCE

JULY, 2018

Declaration

I do hereby declare that this work is the result of my own research and has not been presented by anyone for any academic award in this or any other university. All references used in the work have been fully acknowledged.

I bear sole responsibility for any shortcomings.

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Certification

I hereby certify that this thesis was supervised in accordance with procedures laid down by the University.

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Dedication

This work is dedicated to the Almighty God, my family, mentors and friends

Acknowledgements

I offer my sincere appreciation to my supervisors, Prof. A. Q. Q. Aboagye and Prof. K. A. Osei, for their suggestions and insightful feedback. I am also grateful to the lecturers in the Department of Finance of the University of Ghana Business School for their constructive criticisms and contributions during the seminar series.

Abstract

This study investigates the empirical relationship between five financial development indicators and economic growth in 25 Sub-Saharan Africa countries from 1980 to 2015 using the broad-based financial development indices of the Global Financial Development Database. The full sample was subsequently divided into three groups: low-income, and lower-middle-income, and high and upper-middle-income SSA countries in order to explore if the level of income influences the impact of finance on growth. The analyses include several panel data econometric techniques that take heterogeneity into account. The Dumitrescu-Hurlin (2012) causality test reveals a short-run bidirectional relationship between the depth of financial institutions and economic growth for the full sample (all) countries. The findings reveal that high and upper-middle-income countries support the supply-leading hypothesis while the low-income and lower-middle-income both follow the demand-following hypothesis. The Westerlund (2005) and Pedroni (1997, 1999, 2004) cointegration tests establish a long-run relationship between financial development and economic growth. The panel Fully Modified OLS and panel Dynamic OLS estimates indicate that financial sector development positively impacts economic growth for all sub-sample groups except for the high and upper-middle-income panel of countries which show negative estimates. Given the importance of financial development, it is recommended that policymakers should urge financial intermediaries to promote access to financial products and services. Also, the regulators of the financial sector must ensure that financial institutions and markets comply with the regulations and guidelines to ensure financial stability.

Keywords: Financial development, Economic growth, Sub-Saharan Africa

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List of Acronyms/Abbreviations

ATM	Automated Teller Machines
CIPS	Cross-sectionally augmented Im-Pesaran-Shin
CPI	Consumer Price Index
DOLS	Dynamic Ordinary Least Squares
FDI	Foreign Direct Investment
FMOLS	Fully Modified Ordinary Least Squares
GDP	Gross Domestic Product
GMM	General Method of Moments
GNI	Gross National Income
IMF	International Monetary Fund
MFI	Microfinance Institutions
SSA	Sub-Saharan Africa
VAR	Vector Autoregressive
VECM	Vector Error Correction Model

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CHAPTER ONE: INTRODUCTION

1.1 Background of the study

The debate about the significance of the financial sector to economic growth has been on-going for decades. In recent times, the interlinkages between financial sector development, poverty alleviation and economic growth provide compelling reasons why the financial sector is essential to developing countries especially those in sub - Saharan Africa. Mu, Phelps and Stosky (2013) found that deeper financial markets are beneficial to growth as the development of these markets improve financial intermediation and enable economic stability in the sub-region. Furthermore, the increase in funds and an improvement in the efficiency of the financial sector in SSA is reported as good for sustainable growth (Mlachila, Cui, Jidoud, Newaik, Radzewicz-Bak, Takebe, Ye & Zhang, 2016).

Inasmuch as there is extant literature documenting the relationship between the financial sector and economic growth, it is crucial to revisit the nexus because the widely used proxies to measure financial sector development either use the depth of a financial sub-sector or monetary aggregates. Due to unavailability of data, previous studies have used measures that represent a component of the financial system (Levine, 2003). The financial depth variables include liquid liabilities to gross domestic product, domestic credit to the private sector and stock market capitalisation while the monetary aggregates include broad and narrow money.

The problem is that these proxies do not reflect the financial intermediary role of financial institutions and markets which is the essential feature of the finance-growth nexus debate (De Gregorio & Guidotti, 1995) and may not provide a holistic picture of the financial sector. Von

Furstenberg and Fratianni (1996) argued that there is no consensus on the type of indicators for financial development. Cihak, Demirguc-Kunt, Feyen and Levine (2013) also pointed out that the empirical measurement of the financial sector development is quite challenging thus the use of the different dimensions as the basis of reporting on the level of financial development. This argument thus provides an insight into the need for a proxy that encapsulates all financial institutions and markets.

Svirydzienka (2016) introduced financial development indices that capture the depth, access and efficiency dimensions of the financial sector which this study adopts. First, it is essential to clarify that financial development is used synonymously with financial sector development in this study. The concept is also based on the definition of Sahay et al. (2015) which referred to financial development as a "combination of depth, access, and efficiency". Conceptually, this definition reflects the multidimensionality of financial intermediaries.

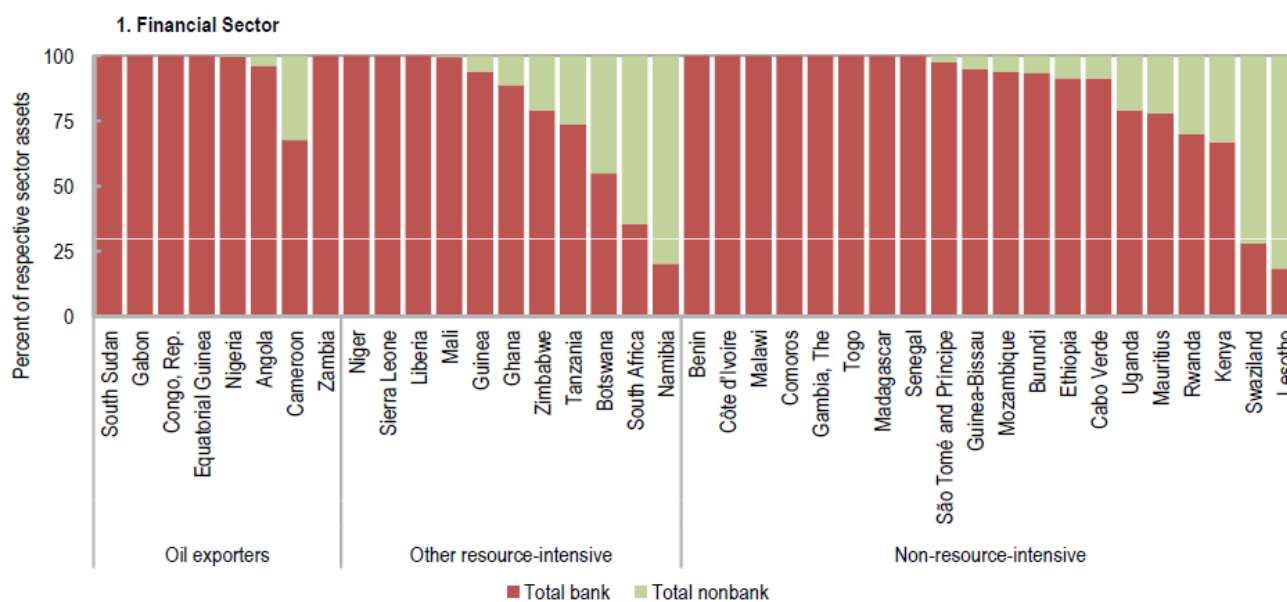
Financial sector development is vital to the sustainable development discourse because an inclusive finance sector which is a by-product of a well-developed financial sector is instrumental to poverty reduction (Imboden, 2005). A higher degree of financial development reduces the barriers that affect access to external capital and lessens the financial constraint faced by enterprises (Caballero & Krishnamurty, 2001).

Mukhopadhyay, Arizala, Haines, Newiak, Pani and Willems (2016) argued that an improvement in financial development will stimulate an additional annual economic growth by about 1 and a half percentage points. Consequently, the volatility associated with growth will be mitigated as financial sector development improves. Thus, the development of the financial sector can propel

SSA countries to attain the level of economic growth similar to developing countries with similar structural and macroeconomic fundamentals.

Both theoretical and empirical studies have concluded that the development of both institutions and markets contribute to and predict economic growth. The financial market of which the capital market is a significant component cannot be understated as it promotes the mobilisation of savings from spending units and information sharing, manages risk and facilitates the diversification of portfolios (Rajan & Zingales, 1998). Osei (1998) confirmed the benefit of stock market development to the operations of a capital market. A sound environment where the various financial intermediaries can function efficiently and effectively is desired, and that should be the aim of regulators and policymakers. The financing needs of infrastructure, housing, climate adaptation and mitigation are staggering. The funding gap in these areas can be filled in the capital market.

Figure 1.1: Comparison of Bank and non-bank sector assets in Sub-Saharan Africa, 2012



Source: Mlachila et al. (2016)/ IMF Regional Economic Outlook (2016)

Figure 1.1 shows the sectoral distribution of financial sector assets between bank and non-bank intermediaries in SSA. The diagram shows that the majority of the Sub-Saharan Africa economies hold relatively more assets in the banking sector than in the non-bank sector which is predominantly financial markets. This trend is similar across oil exporting, other resource-intensive and non-resource-intensive economies in the sub-region. This also suggests that it may be problematic for SSA countries to concentrate on the banking sector which may not yield the expected growth as the implementation of the Basel accords have not been carried through in most of their economies. Moreover, it seems that credit allocation is inefficient as banks predominantly finance government budget deficits, lend to politically affiliated groups instead of gearing funds towards entrepreneurial ventures (Allen et al., 2011).

The financial market complements the banks in the provision of funds in most economies. Demetriades and James (2011) have described the markets in SSA as dysfunctional. Stiglitz (2016) argued that the mismatch between the funds needed by long-term investment projects and the funds supplied in developing countries demonstrates their shortsightedness. Allen et al. (2009) stated that the financial development indicators used to describe SSA stock markets are low in comparison to the other developing countries. Most of the financial markets of SSA are in their formative stages except for South Africa (Mlachila et al., 2016a). The capital market has a comparative advantage in the mobilisation of funds for longer terms for investment. However, as demonstrated in Figure 1.1 this segment of the financial sector has not been fully exploited in the sub-region. This is the underlying reason why this thesis distinguishes the impact of financial institutions from that of the financial markets on economic growth.

Even though the level of financial sector development is generally low in SSA, its relationship with economic growth must be investigated because of volatility in external financing. Amusa, Monkam and Vieg (2016) stated that the volatility in aid and foreign direct investment flows to SSA serve as cause to improve upon domestic financial institutions and markets. Besides, the inadequate funds of the domestic banking sector and underdeveloped financial system of most developing economies inhibit their capacity to respond to the financial demand of enterprises which are their engine of growth (Letiche, 2010; Stiglitz, 2016). Lastly, Mukhopadyay et al. (2016) stated that the exports of natural resources that have contributed to the robust growth of SSA countries have been affected by fluctuating commodity prices which have slowed economic growth.

1.2 Statement of the problem

The research problem centers on the observation that most empirical papers refer to banks and stock markets as the conduits of financial intermediation than the broad spectrum of financial institutions and markets. This is because the data available do not adequately reflect the multidimensional nature of the financial sector. Studies as Levine (2003), Senbet and Otchere (2010) as well as Cihak et al. (2013) argued that the most prominent data problem that plagues the financial development-growth literature are the empirical proxies of financial development used in studies. Economists have used principal component analysis to overcome this challenge. However, the composition of variables may significantly differ with each study. This points to a critical problem in the finance-growth discourse which is the pursuit of an adequate empirical measure of financial development.

Several attempts have been made since Gelbard and Leite (1999) set out to quantify financial development using publicly available and accessible data. The creation and publication of such data ensure consistency in the results of studies that seek to examine financial development. The latest development is the nine indices created to measure the level of development of financial sector based on their depth, access and efficiency created by Svirydzenka (2016) and documented in Global Financial Development Database of the IMF. This implies that data is now available and its use may help improve the quantitative analysis of the financial sector especially for Sub-Saharan Africa countries.

This study addresses the shortcomings of previous studies which used a single indicator or a section of the financial sector as the measure of the overall financial sector. The dataset used includes five of the nine indices in a panel data of 25 Sub-Saharan Africa countries from 1980 to 2015. Panel cointegration, estimation and causality econometric techniques that allow for heterogeneity are employed to investigate whether the choice of proxies affects the relationship between financial development and economic growth in Sub-Saharan Africa.

1.3 Objectives of the study

This study seeks to address a methodological gap by using the latest dataset which is a comprehensive measure of financial sectors which has been a limitation cited by the authors of previous studies. This primary objective can be decomposed into three sub-objectives:

1. To establish the direction of causality between financial development and economic growth among the different income level of SSA countries.

2. To determine if there exists a long-run relationship between the financial sector development indicators and economic growth among the different income level of SSA countries.
3. To investigate the extent to which financial markets and financial institutions in Sub-Saharan Africa contribute to economic growth respectively among the different income level of SSA countries.

1.4 Research questions

The central question of this research is to re-investigate the relationship between financial sector development and economic growth using a new dataset which comprehensively measures the financial sector.

1. What is the direction of causality between financial sector development and economic growth among the different income level of SSA countries?
2. Does a long-run equilibrium relationship exist between financial sector development and economic growth among the different income level of SSA countries?
3. How does the level of development of the financial institutions and markets in SSA contribute to economic growth respectively?

1.5 Hypotheses of the study

1. H_0 : Financial sector development causes economic growth in SSA countries.
 H_1 : Financial sector development does not cause economic growth in SSA countries.
2. H_0 : Economic growth causes financial sector development in SSA countries.
 H_1 : Economic growth does not cause financial sector development in SSA countries.

3. H_0 : The level of development of financial institutions and markets in SSA contribute to economic growth.

H_1 : The level of development of financial institutions and markets in SSA does not contribute to economic growth.

4. H_0 : A long-run relationship between financial sector development and economic growth in SSA exists.

H_1 : A long-run relationship between financial sector development and economic growth in SSA does not exist.

1.6 Significance of the study

This study contributes to literature on the finance-growth nexus in two ways. The central contribution of this work is to address a methodological gap where many studies compute their financial development indices which may result in inconsistent results. The broad-based financial development indices are used to analyse the nature of the relationship between financial sector development and economic growth of the 25 SSA countries.

Empirical literature shows that studies use different econometric techniques to assess financial sector-economic growth nexus. The second contribution of this study is its use of advanced panel econometric techniques that allow for considerable heterogeneity to determine the impact and causal relationship between financial sector development and economic growth. This methodological contribution should provide a better understanding of the relationship.

Concerning policy formulation, the findings of the study should inform regulators of the financial sector on the degree of urgency needed to fast-track the implementation of policy reforms that promote financial sector development. Good institutional and regulatory frameworks serve as catalysts for financial stability and development. Low and middle-income economies which are focused on in this study are described as developing economies; thus this study is relevant for development.

1.7 Limitations of the study

The choice of the selected countries is solely based on the data available for the key variables and the sample period of the study from 1980 to 2015. Therefore, the sample size includes 25 countries from sub-Saharan Africa. There is not much data on the access and efficiency dimensions of the financial sector covering a long enough period to be analysed independently in this study. In cognisance of this, an index that captures all dimensions including the depth of both financial institutions and markets is used as an indicator of the overall financial sector development.

1.8 Organization of the study

This thesis comprises of five chapters. Chapter one dealt with the general introduction of the study which covers the background, problem statement, research questions, objectives, hypothesis, and limitations of the study. The rest of the thesis is structured as follows: Chapter two presents the review of the literature on the finance-growth nexus and the discussion of findings of related studies. Chapter three describes the data, the sample selection criteria, its sources and the methodology used to achieve the research objectives. Chapter four presents the empirical results

of the analysis and discussion of the findings. Finally, Chapter five outlines the summary, conclusions, policy recommendations and areas to note for further research into the subject matter.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents a brief outline of the four different finance-growth hypotheses and empirical review of studies that focused on the relationship between finance and growth. The role of the financial sector in the growth process, the determinants of the financial sector development, and the proxies used to measure financial development are presented in this chapter. An overview of the financial sector in SSA is also highlighted.

2.2 Theoretical review: Finance-growth nexus

The theoretical literature explains the relationship between finance and economic growth. This study presents the literature which pertains to the direction of causality. Four finance-growth hypotheses expound the direction of causality between finance and growth. They are the supply-leading hypothesis, demand-following hypothesis, the feedback hypothesis and no causality hypotheses. The supply-leading and demand-following hypotheses are unidirectional as causality runs from either finance or growth to the other. The feedback hypothesis implies a bidirectional relationship between finance and growth.

Most studies confirm the supply-leading hypothesis. Economic growth caused by the development in the financial sector is explained by the supply-leading hypothesis. The financial sector provides financial services and products that serve as a productive input to economic growth. The mobilisation of savings translates into capital accumulation which leads to productive investment and growth (McKinnon, 1973).

The demand-following hypothesis suggests that financial development dependent on the growth of the economy. Real economic growth causes an upsurge in the demand for financial services such as savings which results in the introduction of better financial instruments and services (Robinson, 1952). Patrick (1966) suggests that the contribution of finance is passive and enabling the growth of the real sector.

The bidirectional relationship between financial development and economic growth show that the development of the financial sector is both a factor of and an outcome of economic growth (Patrick, 1966). This relationship is also referred to as the feedback hypothesis illustrates how as both the growth of the financial sector and the real economy help the other. As the real economy grows, the demand for financial services also increase, and the effective intermediary of the financial sector would cause funds to be channelled to profitable ventures which would yield more output.

When the financial development and economic growth are independent of each other, the relationship is one of no causality. The Neutrality Hypothesis suggests that there is no significant causal relationship between the financial sector and the real economy (Lucas, 1988).

2.3 The role of the financial sector

Several studies have disputed the claim made by Lucas (1988) that finance is not relevant to economic growth. Such studies reveal a positive contribution of finance to economic growth date back to Schumpeter (1911). Schumpeter (1911) acknowledged the role of finance in technical innovation and entrepreneurship. The financial sector contributes to the economy through its functions. Merton (1995) and Levine (2005) outlined the core functions of the financial system as

the provision of a payments system, savings mobilisation, economic resource allocation, risk management, provision of price information and a mechanism for dealing with asymmetric-information and incentive problems.

Given the functions of finance, its contribution to economic growth can be said to be grounded in financial intermediation. Financial intermediation is concerned with the transformation of savings into investment. Financial intermediaries are beneficial as they provide services of information production, liquidity transformation and diversification. The availability of an array of financial assets gives households and intermediaries options of holding diversified portfolios. The financial sector is subsequently expected to invest in productive ventures which should foster economic growth.

Developing the financial markets and their intermediaries enhance the supply of long-term capital which is needed to finance entrepreneurial, housing, infrastructure and other development projects. The capital supplied by the money market is short-term in nature and do not match the financial needs of the projects that can accelerate economic growth. Therefore, the economic growth in developing countries may be restricted due to the prominence of the money market. In good times, the focus is shifted to the financial markets. The shift occurs because of the symbiotic relationship between financial markets and financial intermediaries (Allen & Santomero, 2001).

A strong capital market combined with macroeconomic stability to attract potential investors. Thus, financial development encourages both domestic and foreign capital investment. The

absence of a developed domestic financial system is detrimental to an economy as it encourages capital flight (Collier, Hoeffler, & Pattillo, 2000).

Levine (2002) settled the financial structure argument when he found no evidence to support either financial intermediaries or markets even though the empirical evidence supports the role of the financial sector in economic development. The market-based school of thought tends to stress how to fix the problems of the bank-based financial system. Even though banks have been found to outperform markets at the early stages of development, this study does not seek to promote any of the two divides of the financial sector. Ray and Chakraborty (2006) opine that the essential requirement for growth is the availability and supply of funds measured through financial depth. This is in line with the "financial services" school of thought (Levine, 2002; Beck & Honohan, 2008). Demircuc-Kunt, Feyen and Levine (2011) concluded that financial markets tend to be more developed comparatively than banks as economies develop.

Beck, Miambo, Faye and Triki (2011) propose the low level of financial development may have contributed to Africa's poor economic performance. The low level of savings translates into a low level of financial intermediation thus there is a need to look at the other sectors of the financial system with funds that can be used to invest in entrepreneurial ventures. Rousseau and Sylla (2003) state that an independent central bank developed securities markets and banking sector and stable monetary arrangements are vital to achieving this goal. The components of the financial system of developing countries especially those in SSA need to be improved.

First, sufficient capital must be available to be channelled to productive sectors in order for the growth of the economy to be sustained (Agbetsiafa, 1998). The quantity and composition of the financial assets in an economy can induce economic growth. Financial intermediation generates a higher return on investment and thus promotes growth. The growth of income also plays a role in the demand for financial services. The relationship between real economic activity and financial development was discussed by Gurley and Shaw (1995) as financial intermediation, and capital formation plays a key role in facilitating economic development. Rewilak (2017) suggested that financial development in terms of financial deepening and greater physical access is beneficial for poverty reduction. Ultimately, as suggested by Rodrik and Subramanian (2009), an improved domestic financial sector will attract and sustain the yields of financial liberalisation which has been the focus of SSA countries since the 1980s.

2.4 Determinants of financial development

Given the impact that the financial sector has on economic growth, it is prudent to highlight some of the factors that enable the growth and development of the sector. The growth led finance hypothesis which is also described as the demand-following hypothesis suggests that the level of economic growth contributes to the growth of the financial sector. The expansion of the real sector and its consequent increase in real income and employment will create a demand for financial services which is good for the sector (Patrick, 1966).

In addition to economic growth, other factors facilitate the development of the financial sector. Voghouei, Azali and Jamali (2011) reviewed the literature on the sources of financial development and concluded that trade and financial liberalisation policies, macroeconomic factors, institutions,

legal and regulatory framework and political economy factors are among the factors that lead to the growth of the financial sector. Aluko and Ajayi (2017) investigated the determinants of banking sector development of 25 SSA countries using GMM dynamic panel estimator on data averaged over three year periods from 1997 to 2014. The findings of this study suggest that trade openness, institutional quality, population density had positive effects on the depth of the banking sector while inflation, financial liberalisation and economic growth negatively affected the stability of the banking sector.

In order to understand the factors that promote financial development, the main sources will be highlighted. First, the liberalisation policies are a significant determinant of the level of the financial sector. The Structural Adjustment Programmes of the 1980s were implemented in to expand both the financial industry and economy. Liberalisation reduces the controls on cross-border capital flows and interest rate controls and other financial repressive measures put in place by governments. Von Furstenberg and Fratianni (1996) suggested that when revenue mobilisation through taxes are inadequate, governments will be compelled to repress the financial sector in order to divert funds to certain sectors. This does not help economies grow as the private sector may not be adequately financed to be immensely profitable. Liberalisation increases financial depth as real interest rates increase and as such encourage savings and investment (Shaw, 1973; McKinnon, 1973). These policies could also lead to financial crises if not implemented and managed well (Ghosh, 2005).

Institutions serve as checks and balances in the supervision of all financial intermediaries to ensure that they perform their approved functions as outlined by law. Huang (2010) stated that the supply

side of financial sector development is enabled by the institutions in the economy. The quality of these institutions is shown in their independence from political influences. Basically, institutions should boost investor confidence and implement measures to prevent or mitigate the effects of the failures of financial institutions. Weak institutional quality reflects in the underdeveloped nature of the financial sector which leads to low economic growth (Anayiotos & Toyoran, 2009; Allen et al., 2014; Ahmed & Mmolainyane, 2014). The endowment theory (Acemoglu, Johnson, & Robinson, 2005) and settler mortality theory (Beck, Demirguc-Kunt, & Levine, 2003) detail how institutions impact financial development.

When the rule of law is present and upheld in countries, it could lead to the development of the financial sector. This can be attributed to the enforcement of legal rights and contracts, investor, creditor and property rights protection (La Porta, Lopes-de-Silanes, Shleifer, & Vishny, 1998). The origins of the legal system tradition and its quality thereof determine the extent to which it could promote or inhibit the functions of the financial sector as propounded by (La Porta, Lopes-de-Silanes, Shleifer, & Vishny, 1997, 1998). Beck et al. (2003) also observed that economies that observe British common law tradition have better developed financial sectors than those that follow the French civil law tradition. Asongu (2012), however found that the economies that adopt the French civil law tradition are more efficient in the provision of financial services.

The increase in exports is said to lead to economic growth through capital formation, technological development and employment creation (Feder, 1983). Trade openness and financial development also have a positive relationship in the long-run (Kim, Lin, & Suen, 2010; Wolde-Rufael, 2009; Keho, 2017). Rajan and Zingales (2003) proposed the simultaneous openness hypothesis which

suggests that both trade and financial openness can promote financial sector development. This hypothesis states that an economy open to both trade and capital flows can increase the depth of the financial sector. Studies such as Law (2007, 2009) supported the simultaneous openness hypothesis. Trade liberalisation goes hand in hand with financial liberalisation because of financial flows aid in trade transactions. La Porta, Lopes-de-Silanes, Shleifer and Vishny (1998) suggested that trade liberalisation boosts financial liberalisation. The growth in credit to the private sector has been linked to the rise in private capital flows and commodity prices as SSA exports its goods. Takyi and Obeng (2013) used data from 1988 to 2010 found that per capita income and trade openness contribute to financial development in Ghana.

Other factors such as monetary policy, political climate and remittances are reported to contribute to the growth of the financial sector (Sanfilippo-Azofra, Torre-Olmo, Cantero-Saiz, & López-Gutiérrez, 2018; Fromentin, 2017).

2.5 Empirical review

Literature suggests that the choice of financial development variable of a study is dependent on the section of the financial system the study is interested in (Hermes & Lensink, 2003). Adu, Marbuah, & Mensah (2013) also stated that the measure of financial development is a source of dispute in the finance-growth nexus literature. The various methodological and aggregation levels used to estimate the relationship between financial development and economic growth differ from simple correlation to dynamic panel regressions. It is important to note that cross-country analysis is sensitive to estimation methods, countries data frequency and the proxy measures used in a study

(Yu, Hassan, & Sanchez, 2012). The empirical review is sub-divided into the findings of studies concerning markets, banks and financial development and economic growth.

2.5.1 Financial market-growth nexus

A number of studies have examined the relationship between the financial market and economic growth and the results of these studies vary. The financial market offer services different from the traditional financial services offered by banks (Levine & Zervos, 1996). This would have a different impact on economic growth. Capital markets channel funds to projects that are either too long-term or too risky. Financial markets are an integral part of economic growth and development. The financial market promotes corporate governance, foreign portfolio investment, domestic risk diversification, efficient allocation of financial resources and liquidity of financial assets and the monitoring of investment are a by-product of financial development (Agarwal, 2001; Levine & Zervos, 1996; Adjasi & Biekpe, 2006). Financial markets also affect capital flows. Agbloyor, Abor, Adjasi and Yawson (2014) suggest that established domestic financial markets are the necessary condition to ensure that private capital flows to Africa. This finding is consistent with that of Alfaro et al. (2004) and Alfaro, Chanda, Kalemli-Ozcan, & Sayek (2004) which suggests that strong financial markets are important for foreign direct investment to have a positive impact on economic growth. The state of an economy's stock market could forecast the level of that country's growth as it also fosters bank finance (Demirgüç-Kunt & Levine, 1996).

Using Augmented Mean Group (AMG) and Common-Correlated Effects (CCE) on yearly data from 1989 to 2011, Durusu-Ciftci, Ispir, and Yetkiner (2017) found that both debts from credit markets and equity from stock market have a positive long-run effect on the steady-state level of GDP per capita for 40 countries. A study on the capital market of Turkey estimated the effects of

capital market sub-components on GDP and found out a long run cointegrating relationship (Coskun, Seven, Ertugrul, & Ulussever, 2017). The findings show that the constructed aggregated capital market index has a positive effect on economic growth. Using stock market indicators for 9 African countries, Agarwal (2001) found a positive relationship between stock market development and economic growth from 1992 to 1997.

Economic growth preceding financial development has been evident in several studies. These findings support the demand following hypothesis. El-Wassal (2005) investigated the stock market development in 40 emerging economies and found that economic growth and financial liberalisation policies facilitated the development of the stock markets. A similar finding was found by Masoud and Hardaker (2012) who examined the relationship between economic growth and stock market development for 42 emerging countries. The results of their study indicate a bi-directional causal relationship between stock market and economic growth. The banking sector and the stock market both have positive effects on growth.

2.5.2 Bank-growth nexus

The positive effects of the banking sector to growth has been documented by several studies. De Gregorio and Guidotti (1995) analysed the relationship between bank credit to the private sector and GDP and economic growth using data from 98 countries and found that efficiency was the channel through which financial development influenced growth. Christopoulos and Tsionas (2004) found a unidirectional relationship from bank development to economic growth using financial depth data from 10 developing countries and panel cointegration approach.

Yartey and Adjasi (2007) stated that financial intermediary development promotes that of the capital market. In the early stages of development, the banking sector and the capital market complement each other. Fufa and Kim (2018) applied dynamic panel GMM on data of 64 countries from 1989 to 2012 found that the relationship between financial development and economic growth depends on the stage of economic development of the country. They also found that the measures of the banking sector were statistically significant compared to the measures of the stock market.

Using evidence from 16 developing countries, Demetriades and Hussein (1996) found bidirectional causality between economic growth and banking sector development. Demetriades and James (2011) found that economic growth stimulates banking sector development in Africa. The banking sector together with the insurance sector was found to impact the economic growth of the G-20 countries using the Johansen test on data from 1980 to 2014 (Pradhan, Arvin, Nair, Hall, & Gupta, 2017). The insurance industry is another integral part of the financial sector. This industry provides financial services that help households and businesses manage risks. Studies such as Alhassan and Biekpe (2016) and Alhassan and Fiador (2014) found a positive impact of insurance sector development on economic growth.

Most of the literature on the bank-growth nexus has been intertwined with the literature on the impact of financial development and economic growth in general because of the use of the proxy, domestic credit to the private sector.

2.5.3 Financial development-growth nexus

Financial development first impacts capital formation which is channelled to the private sector through investment; then it is translated into economic growth (Misati & Nyamongo, 2011). The positive effects of financial development include allocation of funds to productive ventures and risk management (Levine, 1997), and reduction of information asymmetries. Mlachila et al. (2016a) observed that both theoretical and empirical literature that financial development is good for promoting strong and stable economic growth. Theoretically, financial development aids in saving mobilisation, supported efficient allocation, risk management and diversification and reduction of information asymmetries. Financial sector development as implied by this study includes improved quality and quantity of financial services.

Goldsmith (1969) documented a positive correlation between financial development and economic growth among 35 countries. King and Levine (1993) and Levine (1997, 2005) found a strong positive effect of financial development on economic growth. Comparatively, developing countries that are less reliant on foreign capital flows have improved economic growth rates.

To literature, according to growth is less volatile in the early stages of financial development. As the financial sector develops, the growth gets highly volatile and gradually returns to less volatility as the financial sector matures (Ibrahim & Alagidede, 2017). This finding is similar to that of Levine, Loayza and Beck (2000) who found that the higher the level of financial development, the lower its effect on economic growth studying 74 countries from 1960 to 1995.

The structure of the financial sector of an economy differs across countries and changes as countries improve their economic development (Dermiguc-Kunt & Levine, 1996). In light of this,

Ahmed and Wahid (2011) examined the link between financial structure and economic growth of seven African countries using panel cointegration estimation tools. Their findings show that the market-based financial sector explains economic growth while a highly developed banking sector is positively related to economic growth.

Rehman, Ali and Nasir (2015) examined the relationship between trade openness, financial development and economic growth using cointegration, Granger causality and Vector Error Correction Model (VECM) on data from 1971 to 2012. The findings show that economic growth causes financial development and that trade openness cause economic growth. Another study that found a unidirectional causality from economic growth to financial development is Odhiambo (2008) who found this direction of causality in Kenya. Rousseau and D' Onofrio (2013) found unidirectional causality from financial development to growth in 14 countries using monetary aggregates. They also found using VECM that monetisation may cause growth in 22 African countries. Bist (2018) found that financial development impacts economic growth in 16 low-income countries using FMOLS and DOLS on data from 1995 to 2014. The results of the Dumitrescu-Hurlin causality test support the demand-following hypotheses.

Many studies have found a complementary causal relationship between financial development and economic growth. For instance, Yu, Hassan and Sanchez (2012) found a bi-directional causality between finance and growth for most developing countries and a one-way causality from growth to finance for the poorest countries. However, they found no long-run relationship between financial development and economic growth. Ghirmay (2004) investigated the causal link in

thirteen SSA countries using cointegration analysis found bi-directional causality in six of the countries.

Levine, Loayza and Beck (2000) found that well-developed financial intermediaries have a great impact on economic growth using instrumental variable and dynamic panel techniques on data gathered from 74 countries for a period spanning from 1960 to 1995. Loayza and Rancière (2004) found a positive long-run relationship between financial intermediation and output growth using PMG estimator on data on 75 countries from 1960 to 2000. The short-run relationship was however found to be negative.

Studies that have found a positive effect of both stock markets and banks include Ngongang (2015) and Beck and Levine (2004). Ngongang (2015) found a positive link between financial development and economic growth using the dynamic panel GMM technique on data from 2000 to 2014 on 21 Sub-Saharan Africa countries. Stock market capitalisation relative to GDP and banking credit to the private sector relative to GDP were used as the financial development indicators.

Another group of studies suggest a non-linear relationship between finance and economic growth. Rioja and Valey (2004) used panel data from 1961 to 1995 on 74 developed and developing countries found the relationship between finance and economic growth to be non-linear and inverted U-shaped depicting the turning point in the effect of financial development. Samargandi, Fidrmuc and Ghosh (2015) also found an inverted U-shaped long-run relationship between finance and growth using pooled mean group estimations on data of 52 middle-income countries from

1980 to 2008. The short-run relationship is insignificant. Too much finance can negatively impact growth. The findings by Ruiz (2018) suggested that countries below the finance threshold exhibited slower growth as compared those above the finance threshold. He also found a positive effect of institutional investors on economic growth using a dynamic panel threshold technique on 116 economies from 1991 to 2014. Luintel, Khan, Leon-Gonzalez and Li (2016) suggested that financial structure is irrelevant for economic growth using data of 69 countries from 1989 to 2011 in a Bayesian framework.

2.6 Concept and proxies of financial development

An overview of the financial sector of developed economies seems to suggest that financial institutions are not essential after financial market imperfections such as information asymmetries and transaction costs are reduced to the barest minimum (Allen & Santomero, 1997). This study views the components of the financial sector as complements. At best, it is assumed that bank and nonbank financial intermediaries are complements in the provision of financial products and services. This assumption is in line with the study by Scholtens and van Wensveen (2000). They suggest that the static perfect financial market should not be the standard for economies. Instead, both the financial market and institutions should offer financial products that transform “financial risk, term, scale location and liquidity”. Limiting the concept of financial development to the reduction in market imperfection does adequately capture the various dimensions and the intermediary role of the sector (Cihak et al., 2013).

Table 2.1 presents a brief list of studies cited in this study and the proxies for financial development adopted in these studies. It can be inferred from the table that the majority of the

proxies of financial development used are either related to financial depth or monetary aggregates.

These proxies may not adequately capture the multifaceted nature of the financial sector.

Table 2.1: Proxies for financial development

Study	Proxies for financial development
Adu et al. (2013)	Private sector credit , private-sector credit/total domestic credit, broad money, narrow money/broad money, currency/broad money, currency, domestic credit, bank deposit liabilities, deposit interest rate
Agbloyor et al. (2014)	Stock market capitalization, stock market turnover, bank credit, private credit and broad money
Akinlo and Egbetunde, (2010)	Bank credit, credit to the private sector, liquid liabilities, broad money, interest rate spread
Alfaro et al. (2009)	Liquid liabilities, commercial-central bank assets, credit to the private sector
Al-Yousif (2002)	Currency to narrow money, broad money
Ang and McKibbin (2007)	Liquid liabilities, domestic credit to private sector, commercial bank assets plus central bank
Baltagi et al. (2009); Demirguc-Kunt et al. (2011)	Private credit, stock market capitalization
Beck and Levine, (2004)	Bank credit to the private sector, turnover ratio
Coskun et al. (2017)	Stock market capitalization, stock market traded value, corporate bond market capitalization, and total market value of mutual funds and pension funds
Coulibaly (2015)	Broad money, domestic credit to private sector
Durusu-Ciftci et al. (2017)	Domestic credit to private sector, value traded
Ferreira (2008)	Domestic credit, foreign liabilities, sum of the bonds and money market instruments, bank assets/bank liabilities, domestic credit/bank deposits.
Fromentin (2017)	liquid liabilities, bank credit to private sector

Fufa and Kim (2018)	Turnover ratio, value traded, market capitalization, bank credit, private credit, and liquid liabilities
Hassan et al. (2011)	Bank credit, domestic credit to the private sector, liquid liabilities, gross domestic savings
Hermes and Lensink (2003)	Credit to the private sector
Ibrahim and Alagidede (2017)	Private credit and domestic credit
Jedidia et al. (2014)	Domestic credit to private sector, value traded ratio, issued bank securities
Law and Singh (2014)	Private sector credit, liquid liabilities, domestic credit
Levine et al. (2000)	Liquid liabilities, ratio of commercial bank assets to the sum of commercial bank assets and central bank assets, private credit
Misati and Nyamongo (2011)	Credit to private sector, stock market turnover
Ngare et al. (2014)	Market capitalization, broad money, domestic credit to private sector, gross private investment
Odhiambo (2008)	Broad money
Quartey and Prah (2008)	Broad money, domestic credit, private credit, private credit to domestic credit ratio
Rewilak (2017)	Credit to private sector, broad money, ATMs per 1000km ² , number of bank branches per 1000km ²
Rioja and Valey (2004)	Private credit, liquid liabilities, commercial-central bank assets
Ruiz (2018)	Bank private credit, and domestic credit to the private sector
Samargandi, Fidrmuc and Ghosh (2015)	Liquid liabilities, ratio of commercial bank assets to the sum of commercial bank assets and central bank assets and bank credit to the private sector

2.7 Overview of Sub-Saharan Africa

Figure 2.1 compares the values of economic growth rates of Sub-Saharan Africa to that of the world from 2004 to 2015. The growth rates of the economies of Sub-Saharan Africa have consistently been higher than the average world economic growth rates. As mentioned earlier, the

financial sector which acts as one of the factors that foster economic growth is relatively underdeveloped (Beck, Fuchs, & Uy, 2009; World Bank, 2012).

Mlachila et al. (2016b) documented that the level of financial development in Sub-Saharan Africa has improved over the years. Therefore, promoting the development of the financial sector should have a great impact on the sub-region's growth. Sahay et al. (2015) predicted that financial development is expected to yield as much as one and a half percentage point of additional growth on average for countries in SSA. Allen, Otchere and Senbet (2011) detailed an overview of the financial sector of the various sub-regions in Africa. They document that the infiltration of foreign banks has facilitated the development of the banking industry. This has been accommodated by the implementation of the financial sector reforms. That

Figure 2.1: Comparison of economic growth rates from 2004 - 2015: SSA vs World

	2004–08	2009	2010	2011	2012	2013	2014	2015
Sub-Saharan Africa	6.8	4.0	6.6	5.0	4.3	5.2	5.1	3.4
<i>Of which:</i>								
Oil-exporting countries	9.2	7.0	8.5	4.6	3.8	5.7	5.9	2.6
Of which: Nigeria	8.6	9.0	10.0	4.9	4.3	5.4	6.3	2.7
Middle-income countries	6.9	3.8	6.5	4.5	4.2	4.6	4.6	2.6
Of which: South Africa	4.8	-1.5	3.0	3.2	2.2	2.2	1.5	1.3
Low-income countries ¹	7.7	6.3	7.6	7.6	6.2	7.0	7.2	7.2
Fragile states	3.5	3.3	5.6	3.1	3.4	7.2	6.1	3.9
<i>Memorandum:</i>								
World economic growth	4.9	0.0	5.4	4.2	3.5	3.3	3.4	3.1
Sub-Saharan Africa resource-intensive countries ²	7.0	3.9	6.7	4.9	3.9	5.0	4.7	2.6
Sub-Saharan Africa frontier and emerging market economies ³	7.1	4.4	6.8	5.0	4.5	5.1	5.0	3.5

Source: Mukhopadhyay et al. (2016)/ IMF Regional Economic Outlook (2016)

countries with relatively developed banking industries are Nigeria, South Africa, Malawi, Seychelles and Botswana. Countries such as Lesotho, Namibia, South Africa and Swaziland have more than half of their financial sector assets in the non-bank financial assets. Studies conclude that the banking sector dominates in most sub-Saharan African countries. Microfinance and mobile phone banking have become prevalent in SSA, and they both help in promoting financial inclusion.

Inefficient credit allocation to the private sector act as one of the principal constraints of private sector development in selected countries of sub-Saharan Africa (Adelegan & Radzewicz-Bak, 2008) and this can be attributed to disintermediation as most banks in the sub-region prefer to lend to the government. Stiglitz (2016) stated that financial intermediaries in Africa tend to be dysfunctional as they buy government securities at the detriment of the private sector which gets inadequate funds channelled. The huge gap between the deposit and lending rates have made banking expensive to the saver. Another problem is the over-reliance on banks for funding when financial markets are a better option for projects that require long-term maturities.

Domestic financial markets complement bank financing. Most empirical literature agrees that a well-developed financial sector promotes economic growth positively. The financial markets in SSA have been described as shallow and illiquid. These financial markets are afflicted with the concentration of trades in a few stocks which affects its liquidity. Osei (1998) stated that the level of listing on an economy's stock exchange reflects an extent of the growth of its capital market. Observing the listing of firms on SSA financial markets shows that how underdeveloped the sector. The limited number of companies listed on SSA stock exchanges limit the choice of equity investment and inhibit domestic participation to some extent. However, the privatisation of public

enterprises helps improve the number of firms listed on stock exchanges. Mukhopadyay et al. (2016) documented that the depth of the financial market and institutional development of the middle-income SSA countries have made progress even though it is lower than that of other developing regions.

The extensive financial sector reforms such interest rate liberalisation, removal of credit ceilings, and privatisation of state-owned banks undertaken by African countries have helped promote financial development (Senbet & Otchere, 2008). Improved macroeconomic conditions have also played a role in the development of the financial sector in SSA. Governance, poverty and unemployment are factors also responsible for the slow economic growth (Letiche, 2010). Stiglitz (2016) reiterated the concerns raised by Letiche (2010) that there is also the low investment in infrastructure in sectors such as transportation, education and health which are conduits to economic transformation.

2.8 Summary of literature review

The finance-led growth hypothesis is prevalent in the existing literature. The emphasis on financial development as a catalyst in boosting economic growth is attributed to the functions and role of the sector. The general determinants of financial sector development were discussed to provide a background to factors that facilitate the growth of the sector. The empirical review shows that finance usually has a positive impact on economic growth in developing countries except in a few instances where too much finance has an adverse effect on growth. The directional of causality documented for developing countries is either unidirectional or bidirectional. An overview of the state of the SSA's financial sector was also presented to explore and provide a context of its underdeveloped state.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter introduces the empirical strategy to serve as the roadmap in an attempt to address the objectives of the study. The research design, population and sample size, descriptive statistics and sources of the data are outlined. The choice of the cross-section dependence test, panel unit root test, panel cointegration and estimation and panel causality tests of the various panel econometric methodology employed are discussed in detail.

3.2 Research design

This paper investigates the relationship between financial sector development and economic growth in the following order: cross-sectional dependence test, panel unit root tests, panel causality tests, panel cointegration test and estimation tests. The econometric techniques employed allow for heterogeneity which is to cater for the differences in the economic development of the individual countries of the panel. Studies that use a similar approach include Abdullah, Siddiqua, and Huque (2017), Salahuddin, Alam, and Ozturk (2016) and Bist (2018).

3.3 Population and sample

Out of 49 SSA countries, the dataset used comprises an unbalanced panel of 25 countries observed from 1980 to 2015. Eberhardt and Teal (2011) stated that an important factor to consider in understanding the growth process is heterogeneity. Therefore, the sample is grouped into four based on their income classification to explore how the peculiarities of how the level of income affects the impact of financial sector development on growth.

The selection of countries is determined by the availability of data on the chosen variables for financial development. The sample includes ten low-income (LIC), nine lower middle-income (LMIC) and six high income and upper-middle income countries (HUMC) as listed in Table 3.1. Countries with GNI per capita in constant 2010 above \$12,235 are classified as high income. Upper-middle-income countries have GNI per capita between \$3,956 and \$12,235. Countries are classified as lower-middle-income when their GNI per capita is from \$1,006 to \$3,955 and those with GNI per capita below \$1,005 are categorised as low-income countries.

Table 3.1: List of Sub-Saharan Africa countries and their categorization

High and Upper-middle-income	Lower-middle-income	Low income
Botswana Equatorial Guinea Gabon Mauritius Seychelles* South Africa	Cabo Verde Cameroon Cote d'Ivoire Ghana Kenya Nigeria Sudan Swaziland Zambia	Burkina Faso Burundi Central African Republic Chad Gambia, The Madagascar Malawi Niger Senegal Togo

Note: * denotes high-income country.

3.4 Variables

3.4.1 Economic growth

The dependent variable for this study is economic growth proxied by the first difference of the log of the gross domestic product (GDP) per capita. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in

the value of the products. The values used are constant 2010 U.S. dollars. The data are obtained from the World Development Indicators. Existing economic literature has shown that GDP growth is a reliable growth measure compared to capital accumulation and productivity growth (Jedidia, Boujelbène, & Helali, 2014). Thus, we use real GDP per capita to reflect the developmental stage of an economy.

3.4.2 Financial sector development variables

The independent variables are five measures of financial development. These variables to be investigated are the depth of the financial market (FDMD), depth of financial institutions (FDID), financial institutions index (FDFI), financial market index (FDMI) and financial development index (FDIX). The depth of the financial intermediaries and markets are important because the private sector needs an appreciable amount of funds in order to churn out a sustained level of growth in economies. Gurley and Shaw (1955) lamented that economic development is inhibited if financial intermediaries are not growing. For this reason, this study focuses on depth as it connotes the availability of funds to be channelled into productive sectors.

The proxy variables and their respective data sources for the financial development indicators used in the composition and computation of the indices are listed in Appendix 1. The broad-based index of financial development computes data from the World Bank FinStats, the Financial Access Survey of the International Monetary Fund, the debt securities database of the Bank of International Settlements and Dealogic corporate debt database.

The empirical investigation uses a data set constructed from the Global Financial Development Database developed by Svirydzenka (2016). This database is important because the previous empirical literature on financial development had challenges with the measure of financial sector development which partially captured various aspects of the financial system. A standard three-step approach was used in the computation of the overall financial development index. The procedure involves the normalisation of the variables and the aggregation of the normalised variables into sub-indices for financial institutions and markets. The sub-indices are also aggregated into the final index. Principal component analysis (hereafter, PCA) is used to build the Financial Development Index (hereafter, FDIX) so the database generated is based on the statistical dimensions of the data. The composite indicator (FDIX) accounts for the highest possible variation in the set of indicators using the least variables. PCA retains most of the information in a dataset while reducing its multidimensionality. The index created from PCA is parsimonious. All the indices are re-normalised to range between 0 and 1. The trends of the key variables are also presented in Appendix 2.

The financial development index is computed from both the financial institutions index and financial market index. This index fills the gap in measuring the financial sector better than the proxies used.

The control variables included the analysis to strengthen the empirical results are inflation and trade openness. They serve as controls also because they are potential determinants of economic growth. These variables are obtained from the World Development Indicators.

3.4.3 Inflation

Inflation is proxied by the first difference of the log of the consumer price index. Consumer price index reflects the changes in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals. Inflation is used as a proxy for macroeconomic stability (Boyd, Levine, & Smith, 2000; Alhassan & Fiador, 2014).

3.4.4 Trade openness

The sum of exports and imports of goods and services measured as a share of gross domestic product is often used as the proxy for trade openness. Trade as a percentage of GDP is used to reduce the bias caused by the size of the economy (Alhassan & Fiador, 2014).

3.5 Cross-section dependence tests

Cross-section dependence occurs when a panel of countries is examined, and the unobserved factors that are common across them are correlated. Even though heterogeneity may be accounted for in the analysis, there is the possibility that some factors common to the countries in the panel are omitted. The omitted and unobserved factors create error terms which cause inconsistent and biased estimates. The cross-sectional dependence (CD) test by Pesaran (2004) is applied in this study. The test statistic is as follows:

$$CD = \sqrt{\frac{2}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^N \sqrt{T_{ij} \hat{p}_{ij}} \right)$$

where $\hat{p}_{ij}$ is the sample estimate of the pairwise correlation of the residuals, N and T are the cross-section and time dimensions of the panel respectively.

3.6 Panel unit root test

The order of integration of the variables is important in order to avoid model misspecification, wrong inference and spurious results. The order of integration in setting up econometric models is important. Panel unit root tests are employed to test for the presence of unit roots which occurs when the variables are integrated of the order one. The popular panel unit root tests such as the Levin, Lin and Chu test (2002) and Im, Pesaran and Shin test (2003) cannot be applied because they do not account for cross-sectional dependence.

The presence of cross-dependence calls for a unit root that does not assume cross-section independence. This study employs the cross-sectionally augmented IPS (CIPS) introduced by Pesaran (2007). This test augments the standard augmented Dickey-Fuller regressions with cross-section averages of lagged levels and first-differences of the individual series. The rejection of the null hypothesis does not suggest that the unit root null is rejected for all i . The CIPS test:

$$CIPS = \frac{1}{N} \sum_{i=1}^N CADF_i,$$

where cross-sectionally augmented Dickey-Fuller (CADF) regression is represented by:

$$\Delta y_{i,t} = \alpha_i + b_i y_{i,t-1} + c_i \bar{y}_{i,t-1} + d_i \Delta \bar{y}_t + \epsilon_{i,t}$$

$CADF_i$ is the t-ratio of b_i in the CADF regression.

$$H_0: \delta_i = 1$$

$$H_1 \begin{cases} \delta_i < 1 \text{ for } i = 1, 2, \dots, N \\ \delta_i = 1 \text{ for } i = N + 1, N + 2, \dots, N \end{cases}$$

where y represents the variables, $\alpha_i = (1 - \delta_{it})\epsilon_i$, b_i is the OLS estimate, c_i and d_i are the coefficients of the cross-sectional averages $\bar{y}_t$ and $\Delta\bar{y}_t$ respectively, $\Delta y_{it} = y_{it} - y_{it-1}$, $\bar{y}_t = \frac{1}{N} \sum_{i=1}^N y_{i,t}$, $\Delta\bar{y}_t = \frac{1}{N} \sum_{i=1}^N \Delta y_{i,t}$, $\epsilon_{i,t}$ is the error term.

3.7 Panel causality test

Estimating the causality of a relationship is important as the implication of the result informs policy formulation and implementation. The Granger causality was proposed in 1969 as an econometric method of examining the causal relationships between time series. The concept of causality suggests that “if past values of x are significant predictors of the current value of y even when past values of y have been included in the model, then x exerts a causal influence on y ”.

For heterogeneous data models, Dumitrescu and Hurlin (2012) introduced the Granger non-causality test. There are four kinds of the test which are Homogeneous Non - Causality (HNC), Homogeneous Causality (HC), Heterogeneous Causality (HEC) and Heterogeneous Non - Causality (HENC) hypotheses. This study will concentrate on the Homogeneous Non -Causality (HNC) which is a fixed coefficient model with fixed individual effects.

The linear model for this test is as follows:

$$GDPCG_{i,t} = \alpha_i + \sum_{k=1}^K \gamma_i^{(k)} GDPCG_{i,t-k} + \sum_{k=1}^K \beta_i^{(k)} FD_{i,t-k} + \epsilon_{i,t}$$

The variables FD_{it} and $GDPCG_{it}$ are stationary over time $t=1, \dots, T$ for $i=1, \dots, N$ individuals. The autoregressive parameters $\gamma_i^{(k)}$ and the regression coefficients $\beta_i^{(k)}$ are allowed to vary across cross-sections. However, the individual effects α_i is fixed, and the lag order (K) are identical for all cross-sections.

$$H_0: \gamma_k = \dots = \gamma_K = 0 \quad \forall i = 1, \dots, N$$

$$H_1: \gamma_{i1} = \dots = \gamma_{iK} = 0 \quad \forall i = 1, \dots, N_1$$

Causality is said to exist for all individual cross-sections if $N_1 = 0$. The null hypothesis is one of no causality for any of the cross-sections of the panel.

The test statistic based on individual Wald statistics averaged across the cross-section of the panel is expressed as:

$$\bar{W} = \frac{1}{N} \sum_{i=1}^N W_{i,T}$$

The standardised Z bar statistic computed is expressed as:

$$\bar{Z} = \sqrt{\frac{N}{2K}} (\bar{W} - K) \rightarrow N(0, 1)$$

3.8 Panel cointegration test

We employ the Westerlund and Pedroni cointegration to determine whether there exists a long-run relationship between financial development, its components and economic growth. Cointegration demonstrates that there is at least one long-run equilibrium relationship between the variables. Cointegration occurs if the linear combination of two non-stationary variables with the same order of integration has a lower order of integration (Engle & Granger, 1987).

The Pedroni Residual Cointegration test extends the traditional Engle-Granger (1987) two-step residual-based cointegration method for a panel framework with multiple regressors. Pedroni (1997, 1999, 2004) proposed 7 test statistics categorised into two groups. The within-dimension (panel) based statistics pool the autoregressive coefficients across the cross-sections to be homogenous. Similarly, the between-dimension (group) based statistics allow the autoregressive

coefficients to be heterogeneous. The null hypothesis of the Pedroni (1997, 1999, 2004) tests is of no cointegration for both categories. The statistics are also distributed asymptotically.

The cointegration regression of Pedroni (1997, 1999, 2004) is specified as follows:

$$GDPCG_{it} = \alpha_i + \delta_{it} + \beta_i FD_{it} + u_{it}$$

For the processes:

$$GDPCG_{it} = GDPCG_{it-1} + v_{it}$$

$$FD_{it} = FD_{it-1} + \epsilon_{it}$$

where $i = 1, \dots, N$ represents each cross-section (country), and $t = 1, \dots, T$ refers to the period, α_i are the individual constant terms, β is the slope parameter for the cross-section i of the panel, u_{it} are stationary disturbance terms. α_i and δ_{it} allow for the possibility of country-specific effects and deterministic trend effects respectively. u_{it} and v_{it} are the estimated residual deviations from the long-run relationship. FD_{it} and $GDPCG_{it}$ represents the measures of financial development and economic growth respectively.

Within-dimension (panel) based statistics:

Panel v statistic:

$$Z_v = \left(\sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11}^{-2} \hat{e}_{it-1}^2 \right)^{-1}$$

Panel ρ statistic:

$$Z_p = \left(\sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11}^{-2} \hat{e}_{it-1}^2 \right)^{-1} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11}^{-2} \hat{e}_{it-1}^2 (\hat{e}_{it-1}^2 \Delta \hat{e}_{it}^2 - \hat{\lambda}_i)$$

Panel pp statistic:

$$Z_t = \left(\hat{\sigma}^2 \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11}^{-2} \hat{e}_{it-1}^2 \right)^{-\frac{1}{2}} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11}^{-2} \hat{e}_{it-1}^2 (\hat{e}_{it-1}^2 \Delta \hat{e}_{it}^2 - \hat{\lambda}_i)$$

Panel ADF statistic:

$$Z_t = \left(\hat{S}^2 \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11}^{-2} \hat{e}_{it-1}^2 \right)^{-\frac{1}{2}} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11}^{-2} \hat{e}_{it-1}^2 (\hat{e}_{it-1}^2 \Delta \hat{e}_{it}^2)$$

$$H_0: \phi = 1$$

$$H_1: \phi < 1$$

Between-dimension (group) based statistics:

Group p statistic:

$$\tilde{Z}_p = \sum_{i=1}^N \left(\sum_{t=1}^T \hat{e}_{it-1}^2 \right)^{-1} \sum_{t=1}^T \hat{e}_{it-1}^2 (\hat{e}_{it-1}^2 \Delta \hat{e}_{it}^2 - \hat{\lambda}_i)$$

Group PP statistic:

$$\tilde{Z}_t = \sum_{i=1}^N \left(\hat{\sigma}^2 \sum_{t=1}^T \hat{e}_{it-1}^2 \right)^{-\frac{1}{2}} \sum_{t=1}^T \hat{e}_{it-1}^2 (\hat{e}_{it-1}^2 \Delta \hat{e}_{it}^2 - \hat{\lambda}_i)$$

Group ADF statistic:

$$\tilde{Z}_t^* = \sum_{i=1}^N \left(\sum_{t=1}^T \hat{S}^2 \hat{e}_{it-1}^2 \right)^{-\frac{1}{2}} \sum_{t=1}^T \hat{e}_{it-1}^2 (\hat{e}_{it-1}^2 \Delta \hat{e}_{it}^2)$$

$$H_0: \phi_i = 1$$

$$H_1: \phi_i < 1$$

This test assumes cross-sectional independence among the units and allows for heterogeneity in the slope coefficients and deterministic trends.

The Westurland (2005) tests the alternative hypothesis that at least one cross-section of the panel is cointegrated or all panels are cointegrated. It also accounts for both heterogeneity and cross-sectional dependence.

The cointegration regression of Westurland (2005) is specified as follows:

$$\Delta GDPCG = \delta'_i d_t + \alpha_i (GDPCG_{it-1} - \beta'_i FD_{it-j}) + \sum_{j=1}^{p_i} \alpha_{ij} \Delta GDPCG_{it-j} + \sum_{j=-qi}^{p_i} \gamma_{ij} \Delta FD_{it-j} + e_{it}$$

$$H_0: \alpha_i = 0 \text{ for all } i.$$

$$H_1: \alpha_i < 0 \text{ for all } i \text{ or at least some } i.$$

where $i = 1, \dots, N$ represents each cross-section (country), and $t = 1, \dots, T$ refers to the period, β is the slope parameter for the cross-section i of the panel, e_{it} is the stationary disturbance term. α_i and $\delta'_i d_t$ allow for the possibility of country-specific effects and deterministic trend effects respectively. u_{it} and v_{it} are the estimated residual deviations from the long-run relationship. FD_{it} and $GDPCG_{it}$ represents the measures of financial development and economic growth respectively.

3.9 Panel cointegration estimation

Given that the Westurland and Pedroni cointegration only tests for the presence of a long-run relationship between variables. Thus, there is a need for long-run relationships to be estimated.

This study will consider the fully modified OLS (FMOLS) as the main estimator of long-run relationship for this panel dataset. The dynamic OLS (DOLS) is the robustness check estimator. These two estimators correct the standard OLS for endogeneity and serial correlation. Endogeneity is said to arise when there are omitted variables, measurement error or simultaneity bias.

The alternatives to the estimation methods used in this study are the Engle-Granger (1987) and the Johansen (1988) methods. Johansen method includes lags in its estimation to overcome the omitted lagged variable bias that undermines the Engle-Granger method. However, the optimal number of lags included in the Johansen test could affect the sensitivity of the results. The existence of more than one cointegrating vectors could affect the interpretation of each implied economic relationship. Also, the reliance on the test on asymptotic properties causes it to be sensitive to specification errors in limited samples.

The problem with the Engle and Granger (1987) method is that it can lead to contradictory results as any error that is produced from the OLS regression used in the first step on the Engle-Granger test is carried onto the second step. The error if it exists could affect the estimator and cause bias because of the omission dynamics. The Engle-Granger method thus suffers from the omitted lagged variable bias.

The validity of both the Engle-Granger and Johansen methods are criticised because they cannot be employed if the variables are a mixture of variables integrated of order one and stationary variables.

The estimation of long-run relationships is essential in economics. Chudik, Mohaddes, Pesaran and Raissi (2013) raised the concern that the issue of slope heterogeneity must be taken into account when modelling the relationship between the dependent variable and the regressors. This informed the selection of an estimation method which estimates the long-run relationship using tests based on the pooled, pooled weighted and the grouped mean dimensions. The pooled estimation removes the deterministic components from both the dependent and independent variables before performing either the FMOLS or DOLS. The pooled weighted estimation, on the other hand, accounts for heterogeneity while performing the FMOLS or DOLS estimator. Grouped mean estimation uses the average of the FMOLS or DOLS estimates of the cross-sections.

The FMOLS estimator for heterogeneous panels allows for heterogeneity across each cross-section of the panel (Pedroni, 2000). FMOLS is a non-parametric estimation that addresses serial correlation while the DOLS is an extension of Stock and Watson (1993) which generates unbiased long-run estimates by including leads and lags in the static parametric regression. As stated earlier, the panel DOLS will also serve as the robustness check estimator. The estimators are asymptotically unbiased, and inferences can be made about the long run relationships irrespective of the short run heterogeneity.

Kao and Chiang (2000) found that the DOLS is best suited for panels that are either homogenous or heterogeneous while the FMOLS is biased towards heterogeneous panels.

$$GDPCG_{it} = \alpha_i + \beta FD_{it} + \varepsilon_{it}$$

where $i = 1, \dots, N$ represents the panel member (country), $t = 1, \dots, T$ refers the period, α_i are the individual constant terms, β is the slope, ε_{it} are stationary disturbance terms. FD_{it} and $GDPCG_{it}$ represents the measures of financial development and economic growth respectively.

The coefficient of the FMOLS estimator is expressed as:

$$\hat{\beta}_{FMOLS} = \left[\sum_{i=1}^N \sum_{t=1}^T (FD_{it} - \overline{FD}_{it})^2 \right]^{-1} \left[\sum_{i=1}^N \sum_{t=1}^T (FD_{it} - \overline{FD}_{it}) GDPCG_{it} + T \widehat{GDPCG}_t \right]$$

where y_{it} is the serial correlation and y_{it}^+ eliminates the endogeneity problem.

The coefficient of the DOLS estimator is expressed as:

$$\hat{\beta}_{DOLS} = \left[\sum_{i=1}^N \sum_{t=1}^T z_{it} z_{it}' \right]^{-1} \left[\sum_{i=1}^N \sum_{t=1}^T (FD_{it} - \overline{FD}_{it}) GDPCG_{it} + \widehat{z}_{it} \right]$$

where $\widehat{z}_{it} = (FD_{it} - \overline{FD}_{it})$ and $z_{it} = 2(K+1) \times 1$

3.10 Summary of methodology

The central panel econometric techniques applied in this study are discussed. The cross-section dependence test informs the choice of panel unit root test. The Dumitrescu-Hurlin panel causality test is for testing the direction of short-run causality between finance and growth in heterogeneous panels. The Pedroni and Westerlund cointegration tests establish a long-run relationship between financial development indicators and economic growth. Finally, the two estimation methods, the FMOLS and DOLS have been found to produce estimators that are asymptotically normally distributed and consistent estimates robust to serial correlation and endogeneity.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

In the previous chapter, the key variables and the various panel econometric methodologies employed in this study was outlined. In this chapter, the results of the diagnostic tests and that of the estimations of the panel Pedroni and Westerlund cointegration and Dumitrescu-Hurlin causality tests are presented. This is followed by a discussion and interpretation of the results for the sub-sample groups.

4.2 Descriptive statistics

Tables 4.1 to 4.4 report the descriptive statistics for the variables used in the study for the 4 sample groups consisting of all countries, high and upper-middle-income countries, lower -middle-income countries and low -income countries.

Table 4.1: Descriptive statistics for all SSA countries

	GDP	GDPCG	FDIX	FDFI	FDID	FDMI	FDMD	CPI	TRD
Mean	2462.81	0.02	0.14	0.24	0.11	0.06	0.08	58.51	75.70
Median	966.11	0.01	0.11	0.20	0.07	0.02	0.03	53.32	64.15
Maximum	20333.94	1.41	0.61	0.74	0.90	0.49	0.78	348.99	531.74
Minimum	219.19	-0.37	0.04	0.07	0.01	0.00	0.00	0.01	6.32
Std. Dev.	3352.33	0.08	0.09	0.12	0.13	0.09	0.12	40.70	49.75
Observations	894	894	894	894	894	719	719	883	878

Note: Gross Domestic Product (GDP), Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD), Consumer Price Index (CPI), Trade (TRD), Standard Deviation (Std. Dev.).

Table 4.2: Descriptive statistics for high and upper-middle-income SSA countries

	GDP	GDPCG	FDIX	FDFI	FDID	FDMI	FDMD	CPI	TRD
Mean	7317.29	0.04	0.23	0.35	0.20	0.11	0.14	58.75	116.27
Median	6598.60	0.03	0.20	0.35	0.10	0.04	0.05	53.24	99.53
Maximum	20333.94	1.41	0.61	0.74	0.90	0.49	0.79	132.88	531.74
Minimum	486.99	-0.19	0.06	0.11	0.01	0.004	0.01	5.96	37.49
Std. Dev.	3881.85	0.13	0.14	0.16	0.23	0.14	0.19	33.26	74.00
Observations	211	211	211	211	211	181	181	211	210

Note: Gross Domestic Product (GDP), Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD), Consumer Price Index (CPI), Trade (TRD), Standard Deviation (Std. Dev.).

Table 4.3: Descriptive statistics for lower-middle-income SSA countries

	GDP	GDPCG	FDIX	FDFI	FDID	FDMI	FDMD	CPI	TRD
Mean	1487.34	0.02	0.14	0.22	0.10	0.05	0.07	53.93	68.79
Median	1264.22	0.02	0.13	0.21	0.09	0.02	0.04	45.09	62.00
Maximum	3980.77	0.30	0.29	0.51	0.25	0.34	0.37	348.99	188.65
Minimum	701.53	-0.16	0.04	0.07	0.01	0.00	0.00	0.01	6.32
Std. Dev.	751.98	0.05	0.05	0.08	0.06	0.07	0.09	47.74	35.23
Observations	323	323	323	323	323	288	2880	315	308

Note: Gross Domestic Product (GDP), Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD), Consumer Price Index (CPI), Trade (TRD), Standard Deviation (Std. Dev.).

Table 4.4: Descriptive statistics for low-income SSA countries

	GDP	GDPCG	FDIX	FDFI	FDID	FDMI	FDMD	CPI	TRD
Mean	492.76	0.00	0.10	0.18	0.06	0.02	0.05	62.40	57.94
Median	465.62	0.01	0.10	0.18	0.06	0.01	0.03	58.23	53.47
Maximum	1052.96	0.29	0.17	0.26	0.16	0.09	0.23	250.62	131.49
Minimum	219.19	-0.37	0.05	0.09	0.01	0.00	0.00	0.47	20.06
Std. Dev.	184.18	0.05	0.02	0.04	0.03	0.02	0.06	37.50	21.85
Observations	360	360	360	360	360	253	253	357	360

Note: Gross Domestic Product (GDP), Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD), Consumer Price Index (CPI), Trade (TRD), Standard Deviation (Std. Dev.).

The financial development variables are normalised from 0 to 1; thus the closer the value is to 1, the more developed the sector the variable is representing is. The average value of the financial institutions index is 0.23 followed by financial development index (0.142), depth of financial institutions (0.107), financial market index (0.051) and depth of financial market (0.0702). The data corroborates with the findings of other studies which lament on how underdeveloped the financial sector is in SSA.

The South African economy has the most developed financial sector for all five financial development indicators: financial development index (0.610), financial institutions index (0.738), financial market index (0.487), depth of financial institutions (0.895) and depth of financial markets (0.785). The only high -income country in the study, Seychelles, has a fairly developed financial sector compared to the average values. Financial development index (0.30), financial institutions index (0.58), financial market index (0.02), depth of financial institutions (0.16) and depth of financial markets (0.06). Nigeria and Chad have the highest value for the financial

development index for the lower middle-income and low-income countries sample groups respectively.

The average growth of GDP per capita for all countries is 0.15% compared to the 0.37%, 0.15% 0.001% of high and upper-middle-income, lower middle income and low -income countries respectively. The highest growth recorded is 140.5% attributable to Equatorial Guinea in 1997. The lowest growth is -36.8% for the Central African Republic in 2013. Equatorial Guinea also records the most trade to GDP (531.7) in 1998 with the least trade to GDP (6.32) attributable to Ghana in 1982. Sudan has both the highest and least value of the Consumer Price Index valued at 348.992 in 2015 and 0.009 in 1980 respectively.

4.3 Pairwise correlation matrices

Tables 4.5 to 4.8 provide an insight into the pairwise correlations among the variables of the four sample groups used in this study. The association of any two pairs of variables is revealed by correlation. However, correlation does not presume causality. The direction of causality between financial development and economic growth will be analysed using the Dumitrescu-Hurlin panel causality tests. The majority of correlation coefficients of the 4 sample groups show a significant association between the variables. All the correlation coefficients for all countries sample are positive. The real gross domestic product per capita and the financial development variables are negatively correlated for the high and upper-middle-income countries. The correlation coefficients between the financial development variables and the real gross domestic product per capita which are negative are also insignificant for both the lower-middle and low-income countries sample groups.

Table 4.5: Pairwise correlation matrix for all SSA countries

	GDP	FDIX	FDID	FDFI	FDMD	FDMI	CPI	TRD
GDP	1							
FDIX	0.41*	1						
FDID	0.30*	0.86*	1					
FDFI	0.47*	0.93*	0.76*	1				
FDMD	0.20*	0.74*	0.78*	0.54*	1			
FDMI	0.24*	0.86*	0.79*	0.60*	0.83*	1		
CPI	0.17*	0.09*	0.07*	0.08*	0.16*	0.12*	1	
TRD	0.37*	0.15*	0.01	0.22*	0.05	0.004	0.04	1

Note: Gross Domestic Product (GDP), Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD), Consumer Price Index (CPI), Trade (TRD), * show the level of significance at 10%.

Table 4.6: Pairwise correlation matrix for high and upper-middle-income SSA countries

	GDP	FDIX	FDID	FDFI	FDMD	FDMI	CPI	TRD
GDP	1							
FDIX	-0.16*	1						
FDID	-0.12	0.91*	1					
FDFI	-0.11	0.94*	0.76*	1				
FDMD	-0.06	0.85*	0.96*	0.69*	1			
FDMI	-0.16*	0.92*	0.93*	0.72*	0.90*	1		
CPI	0.61*	0.20*	0.20*	0.19*	0.26*	0.24*	1	
TRD	-0.12	-0.31*	-0.38*	-0.27*	-0.35*	-0.31*	0.01	1

Note: Gross Domestic Product (GDP), Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD), Consumer Price Index (CPI), Trade (TRD), * show the level of significance at 10%.

Table 4.7: Pairwise correlation matrix for lower-middle-income SSA countries

		GDP	FDIX	FDID	FDFI	FDMD	FDMI	CPI	TRD
GDP		1							
FDIX		0.37*	1						
FDID		0.24*	0.53*	1					
FDFI		0.40*	0.77*	0.59*	1				
FDMD		-0.09	0.41*	0.24*	0.03	1			
FDMI		0.10	0.64*	0.13*	0.00	0.60*	1		
CPI		0.39*	0.16*	0.05	0.13*	0.16*	0.14*	1	
TRD		0.57*	0.30*	0.28*	0.36*	0.08	0.03	0.05	1

Note: Gross Domestic Product (GDP), Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD), Consumer Price Index (CPI), Trade (TRD), ***, **, * show the level of significance at 1%, 5% and 10% respectively.

Table 4.8: Pairwise correlation matrix for low-income SSA countries

	GDP	FDIX	FDID	FDFI	FDMD	FDMI	CPI	TRD
GDP	1							
FDIX	0.26*	1						
FDID	0.25*	0.33*	1					
FDFI	0.37*	0.87*	0.43*	1				
FDMD	-0.05	0.61*	-0.24*	0.11	1			
FDMI	-0.10	0.59*	-0.18*	0.07	0.99*	1		
CPI	0.21*	0.11*	0.04	0.08	0.14*	0.12*	1	
TRD	0.43*	0.17*	0.31*	0.24*	-0.04	-0.02	0.16*	1

Note: Gross Domestic Product (GDP), Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD), Consumer Price Index (CPI), Trade (TRD), ***, **, * show the level of significance at 10%.

4.4 Results of cross-section dependence test

The analyses start with the empirical investigation which tests for the presence of correlation in the errors of the cross-sections. The results of the cross-section dependence test applied to the individual variables employed in this study are reported in Table 4.9. The results indicate that the null hypothesis of no cross-sectional dependence (correlation) is rejected at 1% significance level for all the variables. This implies that the residuals of the panel regression are correlated. This informs the choice of panel unit root test.

Table 4.9: Results of Pesaran cross-section dependence test

Variables	Test Statistic	P-value
GDPCG	8.30***	0.00
FDIX	19.93***	0.00
FDFI	23.57***	0.00
FDID	21.79***	0.00
FDMI	13.89***	0.00
FDMD	12.40***	0.00
CPI	95.77***	0.00
TRD	8.42***	0.00

Note: Gross Domestic Product (GDP), Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD), Consumer Price Index (CPI), Trade (TRD), *** show the level of significance at 1%.

4.5 Results of panel unit root test

The null hypothesis of no cross-sectional dependence was rejected at 1% for the variables used in the study. This informs the choice of the panel unit root test. The cross-sectional augmented Im-Pesaran-Shin (CIPS) test assumes cross-sectional dependence. The results reported in Table 4.10

demonstrate that the variables are the first-difference stationary. Pesaran (2012) states that the rejection of the null unit root hypothesis means that statistically, the majority of the units of the panel are stationary.

Table 4.10: Results of the cross-section dependence (CIPS) test

Variables	Level		First difference	
	Intercept	Intercept + Trend	Intercept	Intercept + Trend
FDIX	-1.13 (0.13)	1.11 (0.87)	-8.98*** (0.00)	-7.08*** (0.00)
FDFI	-3.03 (0.00)	-1.05 (0.15)	-8.73*** (0.00)	-6.05*** (0.00)
FDMI	0.67 (0.75)	2.83 (1.00)	-5.71*** (0.00)	-4.08*** (0.00)
FDID	-1.06 (0.15)	-0.33 (0.37)	-8.25*** (0.00)	-6.37*** (0.00)
FDMD	0.76 (0.78)	3.81 (1.00)	-5.51*** (0.00)	-4.19*** (0.00)
GDP	1.32 (0.91)	1.29 (0.90)	-5.85*** (0.00)	-4.46*** (0.00)
CPI	-2.90 (0.00)	0.04 (0.52)	-6.01*** (0.00)	-6.20*** (0.00)
TRD	0.51 (0.69)	3.39 (1.00)	-7.44*** (0.00)	-5.46*** (0.00)

Note: Gross Domestic Product (GDP), Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD), Consumer Price Index (CPI), Trade (TRD), ***, **, * show the level of significance at 1%, 5% and 10% respectively.

4.6 Results of the pairwise panel causality tests

This panel causality test requires that the variables are stationary. The first-differencing of the variables leads to the loss of their long-run properties; thus the use of stationary variables without an error-correction model shows the results of the existence or non-existence of short-run causality between the financial development variables and economic growth. The results of the estimated short-run panel causality tests are reported in Table 4.11 to 4.14.

Table 4.11: Results of Dumitrescu-Hurlin panel causality test for all SSA countries

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
FDIX does not homogeneously cause GDPCG	1.55	1.49	0.143
GDPCG does not homogeneously cause FDIX	1.10	0.09	0.93
FDFI does not homogeneously cause GDPCG	1.74**	2.10**	0.04
GDPCG does not homogeneously cause FDFI	1.12	0.16	0.87
FDID does not homogeneously cause GDPCG	1.67*	1.87*	0.06
GDPCG does not homogeneously cause FDID	2.72***	5.16***	0.00
FDMI does not homogeneously cause GDPCG	1.06	-0.02	0.98
GDPCG does not homogeneously cause FDMI	0.72	-0.97	0.33
FDMD does not homogeneously cause GDPCG	1.30	0.65	0.51
GDPCG does not homogeneously cause FDMD	0.75	-0.90	0.37

Note: Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD).

Table 4.12: Results of Dumitrescu-Hurlin panel causality test for high and upper-middle-income SSA countries

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
FDIX does not homogeneously cause GDPCG	2.76***	2.59***	0.01
GDPCG does not homogeneously cause FDIX	0.76	-0.48	0.63
FDFI does not homogeneously cause GDPCG	3.62***	3.91***	0.00
GDPCG does not homogeneously cause FDFI	0.54	-0.82	0.41
FDID does not homogeneously cause GDPCG	2.58**	2.31**	0.02
GDPCG does not homogeneously cause FDID	0.43	-0.98	0.33
FDMI does not homogeneously cause GDPCG	1.25	0.26	0.80
GDPCG does not homogeneously cause FDMI	0.51	-0.79	0.43
FDMD does not homogeneously cause GDPCG	1.68	0.86	0.39
GDPCG does not homogeneously cause FDMD	0.63	-0.61	0.54

Note: Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD).

Table 4.13: Results of Dumitrescu-Hurlin panel causality test for lower-middle-income SSA countries

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
FDIX does not homogeneously cause GDPCG	0.89	-0.34	0.74
GDPCG does not homogeneously cause FDIX	1.76	1.30	0.20
FDFI does not homogeneously cause GDPCG	0.85	-0.42	0.68
GDPCG does not homogeneously cause FDFI	1.91	1.57	0.12
FDID does not homogeneously cause GDPCG	1.94	1.64	0.10
GDPCG does not homogeneously cause FDID	2.43**	2.55**	0.01
FDMI does not homogeneously cause GDPCG	0.33	-1.32	0.19
GDPCG does not homogeneously cause FDMI	1.01	-0.10	0.92
FDMD does not homogeneously cause GDPCG	0.55	-0.92	0.36
GDPCG does not homogeneously cause FDMD	1.01	-0.10	0.92

Note: Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD).

Table 4.14: Results of Dumitrescu-Hurlin panel causality test for low-income SSA countries

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
FDIX does not homogeneously cause GDPCG	1.40	0.66	0.51
GDPCG does not homogeneously cause FDIX	0.71	-0.72	0.47
FDFI does not homogeneously cause GDPCG	1.42	0.69	0.49
GDPCG does not homogeneously cause FDFI	0.76	-0.61	0.54
FDID does not homogeneously cause GDPCG	0.87	-0.39	0.70
GDPCG does not homogeneously cause FDID	4.35***	6.51***	0.00
FDMI does not homogeneously cause GDPCG	1.77	1.16	0.25
GDPCG does not homogeneously cause FDMI	0.55	-0.87	0.39
FDMD does not homogeneously cause GDPCG	1.88	1.35	0.18
GDPCG does not homogeneously cause FDMD	0.53	-0.90	0.37

Note: Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD).

For the panel for all countries, the null hypothesis that financial institutions index and depth of financial institutions does not cause economic growth is rejected at 5% and 10% respectively. Economic growth also causes the depth of financial institutions at the significance level of 1%.

The causality test indicates that there is a short-run bidirectional relationship between the depth of financial institutions and economic growth.

According to the results, the null hypothesis that financial development index, financial institutions index, depth of financial institutions does not cause economic growth is rejected at the significance level of 1%, 1% and 5% respectively for high and upper-middle-income countries. This shows a unidirectional causality running from financial development index, financial institutions index, depth of financial institutions to economic growth.

For both lower-middle income and low-income countries, the null hypothesis that economic growth does not homogeneously cause the depth of financial institutions is rejected at 5% and 1% significance level. The depth of financial institutions causes economic growth in both lower-middle income and low-income countries.

4.7 Panel cointegration test results

Using the first-difference of the log of gross domestic product (GDPCG) as the dependent variable, the Westerlund and Pedroni Residual Cointegration (1997, 1999, 2004) of the 4 sample groups are performed with the lag length selected by Schwarz Bayesian Information Criterion. The lags varied from 1 to 8 for each of the financial development variables. The cointegration test is carried out for alternatively for financial development index (FDIX), financial institutions index (FDFI), financial market index (FDMI), and depth of financial institutions (FDID) and depth of financial markets (FDMD) for the four sample groups. The results of the Pedroni cointegration test for each of the financial development indicator are reported in Tables 4.11 to 4.15. The results of the

Westerlund cointegration test is presented in Table 4.16. The estimations are based on two models, one with no trend assumption and the other which assumes trend. On average, the null hypothesis of no cointegration is rejected at 1 % for both the Westerlund and Pedroni cointegration test. A majority of the eleven statistics of the test are statistically significant for most of 5 financial development variables for each panel with or without the assumption of a trend.

The results of both the Westerlund and Pedroni Residual Cointegration tests imply that there is a long-run equilibrium relationship between economic growth and financial development index, financial institutions index, financial market index, the depth of financial institutions and financial markets respectively for all the sub-samples.

Table 4.15: Results of Pedroni cointegration test - Financial Development Index (FDIX)

		Intercept				Intercept + Trend			
		All countries	High-Upper-Middle income countries	Lower Middle income countries	Low income countries	All countries	High-Upper-Middle income countries	Lower Middle income countries	Low income countries
Pooled estimation	1	-0.29 (0.61)	-1.14 (0.87)	1.74 (0.04)	1.96 (0.03)	-3.33 (1.00)	-2.56 (1.0)	-0.30 (0.62)	-0.00 (0.50)
	2	-7.25 (0.00)	-1.93 (0.03)	-6.15 (0.00)	-7.83 (0.00)	-5.01 (0.00)	-0.83 (0.20)	-4.58 (0.00)	-6.64 (0.00)
	3	-22.74 (0.00)	-16.91 (0.00)	-9.48 (0.00)	-14.06 (0.00)	-25.04 (0.00)	-19.13 (0.00)	-9.73 (0.00)	-15.65 (0.00)
	4	-17.91 (0.00)	-8.46 (0.00)	-9.07 (0.00)	-13.13 (0.00)	-18.98 (0.00)	-8.86 (0.00)	-9.26 (0.00)	-14.52 (0.00)
Pooled weighted estimation	1	0.21 (0.42)	0.001 (0.50)	-0.12 (0.54)	0.48 (0.31)	-2.87 (1.00)	-1.56 (0.94)	-1.96 (0.98)	-1.41 (0.92)
	2	-8.88 (0.00)	-3.75 (0.00)	-3.92 (0.00)	-7.56 (0.00)	-6.738 (0.00)	-2.41 (0.01)	-2.69 (0.00)	-6.44 (0.00)
	3	-17.63 (0.00)	-8.83 (0.00)	-7.94 (0.00)	-13.71 (0.00)	-20.37 (0.00)	-9.79 (0.00)	-8.81 (0.00)	-16.73 (0.00)
	4	-16.13 (0.00)	-8.03 (0.00)	-7.23 (0.00)	-12.52 (0.00)	-18.14 (0.00)	-8.73 (0.00)	-7.82 (0.00)	-14.77 (0.00)
Grouped estimation	5	-8.71 (0.00)	-2.73 (0.00)	-4.57 (0.00)	-7.32 (0.00)	-5.61 (0.00)	-1.30 (0.1)	-2.65 (0.00)	-5.34 (0.00)
	6	-25.37 (0.00)	-12.96 (0.00)	-11.99 (0.00)	-18.71 (0.00)	-30.10 (0.00)	-12.53 (0.00)	-11.51 (0.00)	-26.97 (0.00)
	7	-20.42 (0.00)	-9.67 (0.00)	-9.64 (0.00)	-15.64 (0.00)	-19.84 (0.00)	-9.14 (0.00)	-8.80 (0.00)	-15.94 (0.00)

1- Panel v-Statistic, 2- Panel rho-Statistic, 3- Panel PP-Statistic, 4- Panel ADF-Statistic, 5- Group rho-Statistic, 6- Group

PP-Statistic, 7- Group ADF-Statistic. The p-value is in parentheses.

Table 4.16: Results of Pedroni cointegration test - Financial Institutions Index (FDFI)

		Intercept				Intercept + Trend			
		All countries	High-Upper-Middle income countries	Lower Middle income countries	Low income countries	All countries	High-Upper-Middle income countries	Lower Middle income countries	Low income countries
Pooled estimation	1	-0.33 (0.63)	-1.14 (0.87)	1.59 (0.06)	1.94 (0.03)	-3.38 (1.00)	-2.57 (1.00)	-0.41 (0.66)	-0.01 (0.50)
	2	-7.19 (0.00)	-1.90 (0.03)	-6.02 (0.00)	-7.86 (0.00)	-4.88 (0.00)	-0.75 (0.23)	-4.45 (0.00)	-6.66 (0.00)
	3	-22.85 (0.00)	-17.24 (0.00)	-9.46 (0.00)	-14.07 (0.00)	-25.22 (0.00)	-19.06 (0.00)	-9.95 (0.00)	-15.79 (0.00)
	4	-17.91 (0.00)	-8.45 (0.00)	-9.06 (0.00)	-13.15 (0.00)	-18.91 (0.00)	-8.73 (0.00)	-9.47 (0.00)	-14.62 (0.00)
Pooled weighted estimation	1	0.06 (0.48)	-0.08 (0.53)	-0.21 (0.58)	0.40 (0.35)	-3.00 (1.00)	-1.61 (0.95)	-2.04 (0.98)	-1.49 (0.93)
	2	-8.96 (0.00)	-3.72 (0.01)	-4.00 (0.00)	-7.67 (0.00)	-6.81 (0.00)	-2.41 (0.01)	-2.7503 (0.00)	-6.53 (0.00)
	3	-17.74 (0.00)	-8.85 (0.00)	-8.08 (0.00)	-13.75 (0.00)	-20.66 (0.00)	-9.56 (0.00)	-9.26 (0.00)	-16.84 (0.00)
	4	-16.31 (0.00)	-8.16 (0.00)	-7.38 (0.00)	-12.59 (0.00)	-18.37 (0.00)	-8.60 (0.00)	-8.19 (0.00)	-14.90 (0.00)
Grouped estimation	5	-8.67 (0.00)	-2.76 (0.00)	-4.45 (0.00)	-7.36 (0.00)	-5.59 (0.00)	-1.34 (0.09)	-2.57 (0.01)	-5.37 (0.00)
	6	-25.70 (0.00)	-13.59 (0.00)	-12.00 (0.00)	-18.73 (0.00)	-30.50 (0.00)	-12.68 (0.00)	-11.90 (0.00)	-27.11 (0.00)
	7	-20.67 (0.00)	-10.09 (0.00)	-9.69 (0.00)	-15.68 (0.00)	-20.0189 (0.00)	-9.11 (0.00)	-9.01 (0.00)	-16.05 (0.00)

1- Panel v-Statistic, 2- Panel rho-Statistic, 3- Panel PP-Statistic, 4- Panel ADF-Statistic, 5- Group rho-Statistic, 6- Group PP-

Statistic, 7- Group ADF-Statistic. The p-value is in parentheses.

Table 4.17: Results of Pedroni cointegration test - Financial Market Index (FDMI)

		Intercept				Intercept + Trend			
		All countries	High-Upper-Middle income countries	Lower Middle income countries	Low income countries	All countries	High-Upper-Middle income countries	Lower Middle income countries	Low income countries
Pooled estimation	1	2.55 (0.01)	0.63 (0.26)	1.84 (0.03)	1.70 (0.05)	-0.24 (0.59)	-0.83 (0.80)	-0.04 (0.51)	0.16 (0.44)
	2	-9.13 (0.00)	-2.69 (0.00)	-5.73 (0.00)	-6.42 (0.00)	-7.55 (0.00)	-1.56 (0.06)	-4.61 (0.00)	-5.82 (0.00)
	3	-16.01 (0.00)	-7.47 (0.00)	-8.27 (0.00)	-11.24 (0.00)	-16.79 (0.00)	-7.53 (0.00)	-8.6 (0.00)	-12.02 (0.00)
	4	-15.62 (0.00)	-7.14 (0.00)	-8.04 (0.00)	-10.68 (0.00)	-16.79 (0.00)	-8.06 (0.00)	-8.34 (0.00)	-11.60 (0.00)
Pooled weighted estimation	1	-0.51 (0.6942)	-0.66 (0.75)	0.14 (0.44)	-0.32 (0.62)	-3.23 (1.00)	-2.03 (0.98)	-1.62 (0.95)	-1.89 (0.97)
	2	-8.32 (0.00)	-3.65 (0.00)	-4.08 (0.00)	-6.48 (0.00)	-6.64 (0.00)	-2.32 (0.01)	-3.31 (0.00)	-5.77 (0.00)
	3	-14.53 (0.00)	-7.76 (0.00)	-6.12 (0.00)	-11.19 (0.00)	-15.97 (0.00)	-8.35 (0.00)	-6.45 (0.00)	-13.10 (0.00)
	4	-14.16 (0.00)	-7.40 (0.00)	-5.96 (0.00)	-10.63 (0.00)	-15.62 (0.00)	-8.02 (0.00)	-6.16 (0.00)	-12.30 (0.00)
Grouped estimation	5	-7.70 (0.00)	-2.41 (0.01)	-4.37 (0.00)	-6.31 (0.00)	-5.30 (0.00)	-1.04 (0.15)	-2.78 (0.00)	-5.11 (0.00)
	6	-18.25 (0.00)	-8.77 (0.00)	-8.59 (0.00)	-14.26 (0.00)	-17.56 (0.00)	-7.72 (0.00)	-7.79 (0.00)	-14.83 (0.00)
	7	-17.24 (0.00)	-8.78 (0.00)	-8.40 (0.00)	-12.74 (0.00)	-16.52 (0.00)	-8.43 (0.00)	-7.55 (0.00)	-12.73 (0.00)

1- Panel v-Statistic, 2- Panel rho-Statistic, 3- Panel PP-Statistic, 4- Panel ADF-Statistic, 5- Group rho-Statistic, 6- Group PP-

Statistic, 7- Group ADF-Statistic. The p-value is in parentheses.

Table 4.18: Results of Pedroni cointegration test - Depth of Financial Institutions (FDID)

		Intercept				Intercept + Trend			
		All countries	High-Upper-Middle income countries	Lower Middle income countries	Low income countries	All countries	High-Upper-Middle income countries	Lower Middle income countries	Low income countries
Pooled estimation	1	0.37 (0.36)	-0.56 (0.71)	1.36 (0.09)	2.11 (0.02)	-2.84 (1.00)	-2.10 (0.98)	-0.58 (0.72)	0.16 (0.44)
	2	-7.68 (0.00)	-2.46 (0.01)	-5.45 (0.00)	-7.98 (0.00)	-5.41 (0.00)	-1.29 (0.10)	-4.33 (0.00)	-6.80 (0.00)
	3	-23.55 (0.00)	-16.79 (0.00)	-8.75 (0.00)	-14.16 (0.00)	-26.18 (0.00)	-18.86 (0.00)	-9.19 (0.00)	-16.10 (0.00)
	4	-14.93 (0.00)	-6.45 (0.00)	-8.41 (0.00)	-13.27 (0.00)	-15.57 (0.00)	-6.42 (0.00)	-9.02 (0.00)	-14.90 (0.00)
Pooled weighted estimation	1	1.10 (0.14)	1.07 (0.14)	-0.32 (0.62)	1.72 (0.04)	-2.07 (0.98)	-0.50 (0.69)	-2.16 (0.98)	-0.33 (0.63)
	2	-8.68 (0.00)	-3.37 (0.00)	-3.85 (0.00)	-8.08 (0.00)	-6.72 (0.00)	-1.95 (0.03)	-2.90 (0.00)	-6.89 (0.00)
	3	-16.51 (0.00)	-8.72 (0.00)	-7.16 (0.00)	-13.96 (0.00)	-18.38 (0.00)	-11.10 (0.00)	-7.33 (0.00)	-16.53 (0.00)
	4	-14.80 (0.00)	-6.11 (0.00)	-6.66 (0.00)	-12.97 (0.00)	-16.58 (0.00)	-7.21 (0.00)	-7.09 (0.00)	-14.98 (0.00)
Grouped estimation	5	-8.87 (0.00)	-3.28 (0.00)	-4.04 (0.00)	-7.64 (0.00)	-5.84 (0.00)	-1.66 (0.05)	-2.49 (0.01)	-5.59 (0.00)
	6	-24.59 (0.00)	-12.24 (0.00)	-11.80 (0.00)	-18.22 (0.00)	-25.48 (0.00)	-12.15 (0.00)	-10.06 (0.00)	-21.32 (0.00)
	7	-20.28 (0.00)	-9.37 (0.00)	-9.54 (0.00)	-15.76 (0.00)	-20.07 (0.00)	-9.05 (0.00)	-9.13 (0.00)	-16.07 (0.00)

1- Panel v-Statistic, 2- Panel rho-Statistic, 3- Panel PP-Statistic, 4- Panel ADF-Statistic, 5- Group rho-Statistic, 6- Group PP-Statistic, 7- Group ADF-Statistic. The p-value is in parentheses.

Table 4.19: Results of Pedroni cointegration test - Depth of Financial Markets (FDMD)

		Intercept				Intercept + Trend			
		All countries	High-Upper-Middle income countries	Lower Middle income countries	Low income countries	All countries	High-Upper-Middle income countries	Lower Middle income countries	Low income countries
Pooled estimation	1	2.67 (0.00)	0.71 (0.24)	1.82 (0.03)	1.81 (0.04)	-0.13 (0.55)	-0.78 (0.78)	-0.01 (0.50)	0.27 (0.39)
	2	-9.27 (0.00)	-2.92 (0.00)	-5.86 (0.00)	-6.41 (0.00)	-7.73 (0.00)	-1.83 (0.03)	-4.78 (0.00)	-5.81 (0.00)
	3	-16.02 (0.00)	-7.31 (0.00)	-8.36 (0.00)	-11.24 (0.00)	-16.95 (0.00)	-7.47 (0.00)	-8.90 (0.00)	-12.00 (0.00)
	4	-15.62 (0.00)	-7.14 (0.00)	-8.01 (0.00)	-10.67 (0.00)	-16.95 (0.00)	-8.12 (0.00)	-8.60 (0.00)	-11.59 (0.00)
Pooled weighted estimation	1	-0.44 (0.67)	-0.67 (0.75)	0.22 (0.41)	-0.27 (0.61)	-3.18 (1.00)	-2.05 (0.98)	-1.52 (0.94)	-1.84 (0.97)
	2	-8.50 (0.00)	-3.78 (0.00)	-4.30 (0.00)	-6.46 (0.00)	-6.83 (0.00)	-2.49 (0.01)	-3.51 (0.00)	-5.75 (0.00)
	3	-14.66 (0.00)	-7.63 (0.00)	-6.46 (0.00)	-11.18 (0.00)	-16.21 (0.00)	-8.16 (0.00)	-6.89 (0.00)	-13.10 (0.00)
	4	-14.26 (0.00)	-7.34 (0.00)	-6.16 (0.00)	-10.62 (0.00)	-15.84 (0.00)	-7.96 (0.00)	-6.60 (0.00)	-12.29 (0.00)
Grouped estimation	5	-7.86 (0.00)	-2.73 (0.00)	-4.37 (0.00)	-6.31 (0.00)	-5.56 (0.00)	-1.42 (0.08)	-2.88 (0.00)	-5.11 (0.00)
	6	-18.22 (0.00)	-8.59 (0.00)	-8.68 (0.00)	-14.25 (0.00)	-17.79 (0.00)	-7.75 (0.00)	-8.14 (0.00)	-14.82 (0.00)
	7	-17.02 (0.00)	-8.79 (0.00)	-8.05 (0.00)	-12.73 (0.00)	-16.79 (0.00)	-8.60 (0.00)	-7.86 (0.00)	-12.72 (0.00)

1- Panel v-Statistic, 2- Panel rho-Statistic, 3- Panel PP-Statistic, 4- Panel ADF-Statistic, 5- Group rho-Statistic, 6- Group PP-

Statistic, 7- Group ADF-Statistic. The p-value is in parentheses

Table 4.20: Results of Westerlund cointegration test

Variables	Specific autoregressive parameter	Common autoregressive parameter	Specific autoregressive parameter	Common autoregressive parameter
	Intercept		Intercept + Trend	
All countries				
FDIX	-4. 57*** (0.00)	-2. 68*** (0.00)	-5. 82*** (0.00)	-4.74*** (0.00)
FDFI	-4. 62*** (0.00)	-2.70*** (0.00)	-5.77*** (0.00)	-4.74*** (0.00)
FDMI	-4.12*** (0.00)	-2.54*** (0.01)	-5.06*** (0.00)	-4.59*** (0.00)
FDID	-4.55 *** (0.00)	-2.71*** (0.00)	-5.38*** (0.00)	-4.96*** (0.00)
FDMD	-4.18*** (0.00)	-2.60*** (0.00)	-4.84*** (0.00)	-4.63*** (0.00)
High and upper-middle-income counties				
FDIX	-2.21** (0.01)	-1.32* (0.09)	-2.84*** (0.00)	-2.44*** (0.01)
FDFI	-2.22** (0.01)	-1.32* (0.09)	-2.74*** (0.00)	-2.42*** (0.01)
FDMI	-2.19** (0.01)	-1.34* (0.09)	-2.91*** (0.00)	-2.48*** (0.01)
FDID	-2.27** (0.01)	-1.34* (0.09)	-2.82*** (0.00)	-2.51*** (0.01)
FDMD	-2.23** (0.01)	-1.34* (0.09)	-2.73*** (0.00)	-2.44*** (0.01)
Lower-middle-income counties				
FDIX	-2.72*** (0.00)	-1.5772* (0.0574)	-2.93*** (0.00)	-2.51*** (0.01)
FDFI	-2.67*** (0.00)	-1.5666* (0.0586)	-2.88*** (0.00)	-2.47*** (0.01)
FDMI	-2.59*** (0.00)	-1.5560* (0.0599)	-2.57*** (0.01)	-2.38*** (0.01)
FDID	-2.61*** (0.00)	-1.5598* (0.0594)	-2.81*** (0.00)	-2.47*** (0.01)
FDMD	-2.54*** (0.01)	-1.5299* (0.0630)	-2.37*** (0.01)	-2.28** (0.01)

Note: Gross Domestic Product (GDP), Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD)

***, **, * show the level of significance at 1%, 5% and 10% respectively. The p-value is in parentheses.

Results of the Westerlund cointegration test (continued)

Variables	Specific autoregressive parameter	Common autoregressive parameter	Specific autoregressive parameter	Common autoregressive parameter
	Intercept		Intercept + Trend	
Low income counties				
FDIX	-3.12*** (0.00)	-1.74** (0.04)	-3.94*** (0.00)	-3.109*** (0.00)
FDFI	-3.10*** (0.00)	-1.72** (0.04)	-3.954*** (0.00)	-3.10*** (0.00)
FDMI	-2.54*** (0.01)	-1.47* (0.07)	-3.48*** (0.00)	-2.69*** (0.00)
FDID	-3.15*** (0.00)	-1.75** (0.04)	-4.05*** (0.00)	-3.16*** (0.00)
FDMD	-2.55*** (0.01)	-1.47* (0.07)	-3.49** (0.00)	-2.69*** (0.00)

Note: Gross Domestic Product (GDP), Economic Growth (GDPCG), Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD) ***, **, * show the level of significance at 1%, 5% and 10% respectively. The p-value is in parentheses.

4.8 Panel cointegration estimates

The panel FMOLS and DOLS are used to estimate the long-run estimates of the measures of financial development. The test is done for all four sample groups, and the results are reported in Tables 4.17 to 4.20.

On average, the results for both the panel FMOLS and DOLS are comparable in terms of magnitude.

Table 4.21: Results of panel FMOLS and DOLS for all SSA countries

	Intercept			Intercept + Trend		
	1	2	3	1	2	3
Fully Modified OLS						
FDIX	1.31*** (0.00)	0.97*** (0.00)	2.31*** (0.00)	0.56 (0.11)	0.81*** (0.00)	0.03 (0.95)
FDFI	1.20*** (0.00)	0.83*** (0.00)	1.14*** (0.00)	0.25 (0.10)	0.48*** (0.00)	0.33 (0.18)
FDMI	0.60*** (0.0021)	2.76*** (0.00)	4.67 (0.29)	0.33 (0.15)	10.28*** (0.00)	9.29** (0.02)
FDID	1.31*** (0.00)	4.03*** (0.00)	2.38*** (0.00)	0.11 (0.75)	1.80*** (0.00)	0.41 (0.30)
FDMD	0.31*** (0.0008)	0.92*** (0.00)	2.01 (0.22)	0.18 (0.40)	3.89*** (0.00)	3.55** (0.02)
Dynamic OLS						
FDIX	1.44** (0.03)	1.78*** (0.00)	2.26 (0.13)	0.27 (0.44)	0.55** (0.05)	0.14 (0.80)
FDFI	0.92** (0.04)	1.42*** (0.00)	1.14*** (0.00)	0.12 (0.54)	0.31** (0.01)	0.29 (0.16)
FDMI	1.02** (0.04)	0.56* (0.07)	-4.51 (0.42)	0.27 (0.34)	0.09 (0.59)	-2.62 (0.57)
FDID	2.86*** (0.00)	3.21*** (0.00)	2.11*** (0.00)	0.11 (0.75)	0.44* (0.08)	0.80* (0.01)
FDMD	0.49 (0.27)	0.49*** (0.01)	1.64** (0.01)	0.04 (0.89)	0.15 (0.35)	2.02* (0.06)

Note: ***, **, * show the level of significance at 1%, 5% and 10% respectively. The number in parentheses indicate the p-value.

Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD). 1-Pooled estimation, 2- Pooled weighted estimation and 3- Grouped estimation.

Table 4.22: Results of panel FMOLS and DOLS for high and upper-middle-income SSA countries

	Intercept			Intercept + Trend		
	1	2	3	1	2	3
Fully Modified OLS						
FDIX	-5.72*** (0.00)	-3.43*** (0.00)	-0.28 (0.84)	-0.57 (0.48)	-1.75*** (0.00)	-6.31*** (0.00)
FDFI	-3.92*** (0.00)	-2.08*** (0.00)	-0.57 (0.39)	-0.42 (0.35)	-1.06*** (0.00)	-3.35*** (0.00)
FDMI	-0.88*** (0.00)	-0.68*** (0.00)	-1.14 (0.53)	-0.05 (0.83)	0.73*** (0.00)	1.20 (0.47)
FDID	-2.80*** (0.00)	0.23*** (0.00)	-3.25*** (0.00)	-1.52*** (0.00)	-3.18*** (0.00)	-4.23*** (0.00)
FDMD	-0.62*** (0.00)	-1.17*** (0.00)	-0.12 (0.87)	-0.12 (0.57)	-0.13** (0.03)	0.41 (0.52)
Dynamic OLS						
FDIX	-6.99*** (0.00)	-0.97 (0.48)	-1.22 (0.62)	-1.10 (0.20)	-0.77** (0.02)	-6.59** (0.02)
FDFI	-3.76*** (0.01)	-0.88 (0.34)	0.96 (0.44)	-0.60** (0.03)	-0.41** (0.04)	-3.34*** (0.00)
FDMI	1.17* (0.06)	0.30 (0.63)	-0.23 (0.96)	-0.03 (0.93)	0.03 (0.94)	3.24* (0.07)
FDID	-0.64 (0.46)	0.71 (0.30)	-4.66*** (0.00)	-1.78*** (0.00)	-1.66*** (0.00)	-5.68*** (0.00)
FDMD	0.52 (0.29)	-0.28 (0.55)	0.08 (0.96)	-0.45 (0.22)	-0.29 (0.42)	1.14* (0.10)

Note: ***, **, * show the level of significance at 1%, 5% and 10% respectively. The number in parentheses indicate the p-value. Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD). 1-Pooled estimation, 2- Pooled weighted estimation and 3- Grouped estimation.

Table 4.23: Results of panel FMOLS and DOLS for lower-middle-income SSA countries

	Intercept			Intercept + Trend		
	1	2	3	1	2	3
Fully Modified OLS						
FDIX	3.91*** (0.00)	3.73*** (0.00)	4.14*** (0.00)	1.03** (0.02)	2.04*** (0.00)	2.20*** (0.00)
FDFI	3.48*** (0.00)	2.49*** (0.00)	2.26*** (0.00)	0.6282*** (0.00)	1.29*** (0.00)	1.39*** (0.00)
FDMI	-0.07 (0.85)	13.47*** (0.00)	9.39 (0.38)	0.69* (0.06)	30.55*** (0.00)	19.69** (0.04)
FDID	4.96*** (0.00)	7.46*** (0.00)	5.37*** (0.00)	1.44*** (0.00)	3.11*** (0.00)	2.52*** (0.00)
FDMD	-0.71 (0.24)	5.66*** (0.00)	3.65 (0.37)	1.18*** (0.01)	12.72*** (0.00)	7.57** (0.04)
Dynamic OLS						
FDIX	2.64*** (0.00)	2.82*** (0.00)	4.99*** (0.00)	0.72 (0.14)	1.22*** (0.00)	2.23*** (0.00)
FDFI	2.64*** (0.00)	3.04*** (0.00)	2.75*** (0.00)	0.43 (0.24)	0.96*** (0.00)	1.69*** (0.00)
FDMI	-0.06 (0.87)	-0.13 (0.72)	-13.96 (0.30)	0.48 (0.19)	0.38 (0.29)	1.60*** (0.00)
FDID	4.60*** (0.00)	4.08*** (0.00)	5.48*** (0.00)	1.03 (0.15)	1.21** (0.01)	2.92*** (0.00)
FDMD	-0.84 (0.29)	-0.54 (0.52)	-4.53 (0.37)	1.36*** (0.01)	1.04*** (0.00)	1.20 (0.34)

Note: ***, **, * show the level of significance at 1%, 5% and 10% respectively. The number in parentheses indicate the p-value.

Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD). 1-Pooled estimation, 2- Pooled weighted estimation and 3- Grouped estimation.

Table 4.24: Results of panel FMOLS and DOLS for low-income SSA countries

	Intercept			Intercept + Trend		
	1	2	3	1	2	3
Fully Modified OLS						
FDIX	-0.33 (0.42)	1.94*** (0.00)	2.23*** (0.00)	2.13*** (0.00)	1.79*** (0.00)	1.89*** (0.00)
FDFI	0.70*** (0.00)	1.33*** (0.00)	1.05*** (0.00)	1.15*** (0.00)	0.97*** (0.00)	0.96*** (0.00)
FDMI	-3.98*** (0.00)	0.31*** (0.00)	3.42* (0.09)	0.01 (0.99)	5.05*** (0.00)	3.17** (0.04)
FDID	0.75** (0.04)	3.06*** (0.00)	2.70*** (0.00)	1.70*** (0.00)	2.69*** (0.00)	2.35*** (0.00)
FDMD	-1.51*** (0.00)	0.25*** (0.00)	1.66** (0.03)	-0.00 (1.00)	1.93*** (0.00)	1.20** (0.04)
Dynamic OLS						
FDIX	-0.85 (0.28)	0.50 (0.49)	1.87*** (0.00)	1.87*** (0.00)	1.83*** (0.00)	2.30*** (0.00)
FDFI	0.17 (0.72)	1.09*** (0.00)	0.96*** (0.00)	1.12*** (0.00)	1.03*** (0.00)	1.20*** (0.00)
FDMI	-3.69*** (0.00)	-4.31*** (0.00)	3.23 (0.21)	-2.10 (0.15)	-1.20 (0.48)	1.75 (0.58)
FDID	0.44 (0.55)	1.78*** (0.00)	3.14*** (0.00)	2.01*** (0.00)	2.45*** (0.00)	2.78*** (0.00)
FDMD	-1.29*** (0.00)	-1.65*** (0.00)	1.28 (0.18)	-0.23 (0.61)	0.27 (0.55)	0.61 (0.61)

Note: ***, **, * show the level of significance at 1%, 5% and 10% respectively. The number in parentheses indicate the p-value.

Financial Development Index (FDIX), Financial Institutions Index (FDFI), Financial Market Index (FDMI), Depth of financial institutions (FDID) and Depth of financial markets (FDMD). 1-Pooled estimation, 2- Pooled weighted estimation and 3- Grouped estimation.

4.9 Discussion

This study set out to achieve the following objectives:

1. To establish the direction of causality between financial development and economic growth among the different income level of SSA countries.
2. To determine if there exists a long-run relationship between the financial sector development indicators and economic growth among the different income level of SSA countries.
3. To investigate the extent to which financial markets and financial institutions in Sub-Saharan Africa contribute to economic growth respectively among the different income level of SSA countries.

The findings of this study with regards to the research objectives reiterated in this section is discussed along with the income groups of the countries.

4.9.1 All SSA countries

The results of the panel cointegration estimations indicate positive estimated coefficients for all the financial development variables except for the grouped mean DOLS estimator for the financial market index. The majority of the estimates are statistically significant at 1%. The panel DOLS reports similar estimated coefficients but no statistical significance. The results show that a 1% increase in the financial development variables stimulates economic growth between 0.03% and 4% for the all countries sample. There is a bi-directional causal relationship from economic growth to the depth of financial institutions. This finding supports the feedback hypothesis. The financial institutions index is also found to foster economic growth. The short-run causality running from the financial development index, financial market index and the depth of the financial market to

economic growth is statistically insignificant. According to Singh and Weisse (1998), developing countries should boost the banking sector first because the capital markets require financial infrastructure which developing countries may not possess. Ray and Chakraborty (2006) suggested that banks outperform the markets when economies are developing. This finding shows how the development of the banking sector especially promotes economic growth.

4.9.2 High and upper-middle income SSA countries

The financial development variables are negatively related to economic growth with the majority of the estimates being statistically significant. As mentioned earlier, some of the panel DOLS estimator presents results similar to the panel FMOLS but show no statistical significance especially for the depth of the financial markets. The negative estimate coefficients are unexpected as we expect that all the financial development variables would positively influence economic growth. A 1% increase in the financial development variables stimulate economic growth between -7% and 4% in the high and upper-middle-income countries.

The negative relationship between the financial development variables and economic growth may suggest that that component of the financial sector is not adequately developed to have a positive and significant impact on the economy. The access and efficiency dimensions of the financial sector of the high and upper-middle-income countries are underdeveloped in comparison to depth (size) of the financial industry thus limiting the positive impact on the economies. According to Beck, Degryse and Kneer (2014), there are chances of disintermediation of financial resources in situations where the depth of the financial sector does not grow with access and efficiency. This phenomenon would not lead to economic growth. The negative estimates may also suggest that

there is a substantial amount of non-performing assets and disintermediation as a result of financial resources not being channelled to productive and profitable ventures to boost economic growth. Arcand, Berkes and Panizza (2012) supported this evidence as their study found a negative impact of financial depth on growth when it is above a certain threshold which means that there is a bell-shaped relationship. Another reason postulated by Cecchetti and Kharroubi (2012) concluded that when human capital gets concentrated in the financial sector as it develops, it becomes detrimental to the growth of the real sector because of the shift in the workforce. The results from the causality tests support the supply-leading hypothesis as the study reveals that the overall financial development index, the financial index and the depth of financial institutions cause economic growth.

4.9.3 Lower-middle income SSA countries

The estimates of both the panel FMOLS and DOLS indicate a significant and positive impact of financial development index, financial institutions index and the depth of financial institutions. Both the panel FMOLS and DOLS estimates show that the grouped mean estimation of the financial market index is positive and significant. The depth of the financial market is statistically significant for only the FMOLS estimations. The results show that a 1% increase in the financial development variables stimulates economic growth between 1.1% and 12.8%.

The causality tests indicate that economic growth causes the depth of financial institutions for lower-middle income countries. Therefore, the results are consistent with the demand-following hypothesis. The study did not find short-run causality running from financial development index,

financial institutions index, financial market index and depth of financial market to economic growth.

4.9.4 Low-income SSA countries

On average, the panel FMOLS and DOLS estimates for financial development index, financial institutions index and depth of financial institutions are positive and statistically significant. The underdeveloped nature of the financial market in low -income countries may account for the mix of positive and insignificant estimates for the measures of the financial market. The results show that for low -income countries, a 1% increase in the financial development variables stimulates economic growth between -4.3% and 5.1%. The findings of the panel of low -income countries are similar to that of the lower middle-income countries. There is a short run unidirectional relationship running from economic growth to the depth of financial institutions which is line with the demand-following hypothesis. There is no short-run causality running from financial development index, financial institutions index, financial market index and depth of financial market to economic growth.

To sum up the findings of the three income groups, the results of this paper suggests that there is finance has an impact on growth which may be dependent on a certain threshold and how well-developed the other dimensions apart from depth are promoted.

4.10 Summary of findings

The analyses of the data reveal a significant long-run equilibrium relationship between the five financial development variables and economic growth using Westurland and Pedroni cointegration

tests. The panel FMOLS and DOLS long-run estimates reveal that for the all countries sample, the five financial development variables positively impact on economic growth. A disaggregation of the main sample into income groups show that the high and upper-middle income panel of countries have negative long-run estimates while the lower middle income and low -income panel of countries have positive long-run estimates.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The preceding chapters covered the background of the study, literature review, methodology, results and discussion of the findings. In this final chapter of the study, the summary of the key findings and results are presented. The conclusions, recommendations and areas for further studies to policymakers and researchers arrived at as a result of the implications of findings are also outlined.

5.2 Summary of key findings

This study re-examined the long-run relationship between 5 measures of financial development and economic growth using an unbalanced panel of 25 SSA countries compiled from Global Financial Development Database from 1980 to 2015. The study reveals the following key results:

- The Dumitrescu-Hurlin panel causality test results reveal that the direction of causality varies with each sample group depending on the financial development variable and the income level of the sample of countries involved. There is a short-run bidirectional relationship between the depth of financial institutions and economic growth for the all countries group. For high and upper-middle-income countries, there is short-run unidirectional causality running from financial development index, financial institutions index, depth of financial institutions to economic growth. The depth of financial institutions causes economic growth in the short-run for both lower-middle income and low -income countries.

- There is a long-run equilibrium relationship between financial development index, financial institutions index, financial market index, depth of financial institutions and depth of financial markets and economic growth respectively using both Pedroni and Westerlund cointegration tests.
- On average, all five financial development variables have positive and statistically significant FMOLS, and DOLS long-run estimates for all the income groups except for high and upper-middle-income countries group. The long-run estimates show that finance negatively impacts growth for high and upper-middle-income countries. The panel FMOLS and DOLS estimations address both heterogeneity and endogeneity issues.

5.3 Conclusions of the study

The results of this study indicate that financing development impacts on economic growth depending on the level of development of a country's financial sector and income level. There is a long-run relationship between financial development and economic growth for the selected 25 SSA countries. In general, the evidence from the FMOLS and DOLS estimates point to a positive impact of financial development on economic growth with the exception for the high and upper-middle income countries where the results suggest that increased financial development adversely affects growth. The direction of causality between financial development and economic growth is also dependent on the income group of the panel of countries involved.

5.4 Recommendations

This study provides an evidence-based proposition for Sub-Saharan Africa countries. The findings of the study should inform the formulation of policies that will drive growth in the financial sector and economy. The recommendations based on the findings of this study is as follows:

Firstly, the bi-directional relationship between the depth of financial institutions and economic growth in SSA affirms that there is a need for both growth-enhancing policies and financial sector reforms in the region (Calderon & Liu, 2003). This is in line with the recommendations of other studies such as Stiglitz (2016) and Mlachila et al. (2016a). They suggest the availability of funds is the first step in the strategy to promote sustainable growth. Accordingly, measures must be put in place to encourage saving in the domestic financial sector.

The second point is that financial intermediaries should provide financial products and services to serve the needs of the different households and businesses in an economy. This recommendation is based on the observation that the values associated with access to financial institutions and markets captured in the overall financial development index are very low. A diversified financial system that promotes financial inclusion is expected to improve financial access and usage and consequently promote financial development. This is where microfinance and mobile banking transactions should be taken seriously and quantified for proper regulation and research on how to improve on the service and harness their potential to foster an inclusive financial sector.

The third recommendation is to create and improve the investment climate in Sub-Saharan Africa. This means that factors such as investor and creditor rights, improved financial infrastructure, the

rule of law and favourable macroeconomic conditions that boost the development of the financial sector should be improved.

The fourth point proposes that the regulators of both bank and non-bank financial institutions and markets must be stringent in their supervisory role in order to reduce the event of bank-runs and financial crises. The stability of financial institutions and markets is crucial as the availability of funds needs to be sustainable for the other productive sectors of an economy to benefit in the long-run.

The fifth recommendation is to initiate and execute more policies that will boost the activity and trading volume of stocks on the financial markets. The listing of companies is not adequate to spur growth in the firms, markets and the overall economy.

For further research, data on microfinance institutions and other institutions that provide financial services to the financially excluded must be inculcated into the dataset in order to gauge the inclusiveness of the financial sector. Microfinance institutions are a critical component of the financial sector of developing nations providing services to a large section of the population who are financially excluded.

The last recommendation is for further studies to consider the use of estimation methods that resolve both heterogeneity and cross-sectional dependence issues. Even though the estimation methods catered for heterogeneity, the issue of cross-section dependence was not addressed which may bring new perspectives to the analysis of the finance-growth nexus.

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Appendix 1 : Data sources of the financial sector development indicators

Category	Indicator	Data Source
Financial Institutions		
Depth	Private-sector credit to GDP	FinStats 2015
	Pension fund assets to GDP	FinStats 2015
	Mutual fund assets to GDP	FinStats 2015
	Insurance premiums, life and non-life to GDP	FinStats 2015
Access	Bank branches per 100,000 adults	FinStats 2015
	ATMs per 100,000 adults	IMF Financial Access Survey
Efficiency	Net interest margin	FinStats 2015
	Lending-deposits spread	FinStats 2015
	Non-interest income to total income	FinStats 2015
	Overhead costs to total assets	FinStats 2015
	Return on assets	FinStats 2015
	Return on equity	FinStats 2015
Financial Markets		
Depth	Stock market capitalization to GDP	FinStats 2015
	Stocks traded to GDP	FinStats 2015
	International debt securities of government to GDP	Bank for International Settlement debt securities database
	Total debt securities of financial corporations to GD	Dealogic corporate debt database
	Total debt securities of nonfinancial corporations to GDP	Dealogic corporate debt database
Access	Percent of market capitalization outside of top 10 largest companies	FinStats 2015
	Total number of issuers of debt (domestic and external, nonfinancial and financial corporations)	FinStats 2015
Efficiency	Stock market turnover ratio (stocks traded to capitalization)	FinStats 2015

Source: Sviryzdenka (2016)/ IMF Staff Estimates

Appendix 2: Trends of the key variables

