



**Strathmore**  
UNIVERSITY

**PANEL ANALYSIS OF THE DYNAMIC RELATIONSHIP BETWEEN FINANCIAL  
DEVELOPMENT AND ECONOMIC GROWTH IN SUBSAHARAN AFRICA**

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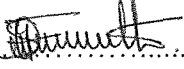
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## Abbreviation

SSA	Sub- Saharan Africa
GDP	Gross Domestic Product
M2	Broad Money
VAR	Vector Auto regression
BVAR	Bivariate Auto regression
MVAR	Multivariate Auto regression
MENA	Middle East and North Africa
OECD	Organization for Economic Co-operation and Development
GY	Growth rate of GDP per capita
IY	National investment to GDP
(DCP/GDP)	Ratio of bank claims on the private sector to nominal

## Abstract

Previous research on the relationship between financial development and economic growth has yielded mixed results. Whereas researchers agree on the presence of a positive relationship between finance and growth, they rarely agree on the direction of causality and the path the relationship takes. This study examines the direction of causality between financial development and economic growth in twenty countries in Sub-Saharan Africa and whether it changes over the course of development for the period 1963- 2013. The study employs dynamic panel analysis to account for the varying degrees of development and Pairwise Dumitrescu Hurlin Panel Causality Tests for testing multivariate causality between financial development and economic growth in SSA. Whereas the study establishes a positive relationship between economic growth and financial development, results suggest that the direction of causality does not change over the course of development. In most countries the direction of causality is bi-directional.

**Key words:** *Financial development, Economic growth, Sub Saharan Africa, Dynamic Panel Analysis*

## 1. Introduction

### 1.1 Background to the study

Literature is plentiful that affirms the significant role of financial development in economic growth. Researcher generally agree that the financial sector promotes economic growth through two ways (1) Improvement of total factor productivity and (2) inducing savings by increasing the rate of return on savings. For instance (Levine, 1997) argues that financial intermediaries, by facilitating risk management, identifying financially viable projects, monitoring management, and facilitating the exchange of goods and services, can promote efficient capital allocation which leads to improvement in the total factor productivity. (Greenwood & Jovanic, 1990), shows that financial intermediation provides a vehicle for diversifying and sharing risks, which can be achieved by inducing a capital allocation shift, towards risky but “high expected return” projects. This shift then spurs improved productivity and economic growth.

Empirical evaluation of the relationship between financial development and economic growth has taken three main strands. The first group of scholars argue that financial development leads to economic growth (supply leading response) examples are (Goldsmith, 1969), (King & Levine, 1993a) and (McKinnon, 1973) among others. The second group of scholars such as (Robinson, 1952), (Gurley & Shaw, 1967) and (Jung, 1986) maintains that it is economic growth which leads to the development of financial sector (demand-following response) whereas the third group contends that both financial development and economic growth granger cause one another (bi-directional causal relationship) – see (Greenwood & Jovanic, 1990), (Levine, 1997) and (Luintel & Khan, 1999).

The arguments of (Patrick, 1966), which have been famously coined as the “Patrick hypothesis” reasons that the direction of causality between financial development and economic growth changes over a country’s course of development. In Patrick’s view, financial development is able to induce real innovation for investment before sustained modern economic growth gets underway and, as modern economic growth occurs, the supply leading impulse gradually becomes less and less important as the demand-following financial response becomes dominant.

In Africa there is also no consensus regarding the direction of causality .For example (Ghirmay, 2004) , finds that financial development played a causal role in the economic growth of eight out of the thirteen countries sub- Saharan African countries he investigated. (Agbetsiafa, 2003), finds

mostly unidirectional causality running from financial development to economic growth in seven African countries thus lending support for the supply leading phenomena of the finance-growth nexus. In the case of Egypt, Morocco and Tunisia, different authors using four different indicators of financial development, find a bi-directional causality running between financial development and economic growth. In contrast, (Baliamoune-Lutz, 2008) finds mixed results for North African countries. Similarly, using three indicators of financial development, a weak causal relationship is found in almost all the twelve West African countries that were studied. (Odhiambo, 2004) , the author also finds conflicting results for three SSA countries where the demand following was supported in Kenya and South Africa while in Tanzania the supply-leading response was supported. The aim of the study was to test Patrick’s hypothesis in Sub-Saharan Africa (SSA). The empirically investigated the long-run causality between financial development and economic output for SSA for the period 1963- 2013. Dynamic panel analysis will be used to evaluate the relationship whereas multivariate time series model to get direction of causality.

## 1.2 Overview of financial sector and economic growth in Sub-Saharan Africa

GDP growth in sub-Saharan Africa increased by 5% in 2013 as well as per capita growth. However, M2 as a percentage of GDP growth decreased as well as private sector credit as a percentage of GDP. This indicates that as much as the financial development is growing it is growing at a decreasing rate.

*Table 1: Table indicating factors that affect economic growth and financial development*

Country	GDP growth rate	GDP growth per capita	M2as a % of GDP	Private sector credit as % GDP
Sub-Saharan	5%	4%	-5%	-6%

Most countries in SSA GDP growth rate has been increasing. Nigeria has the highest GDP among Sub-Saharan countries while Somali is the lowest

Africa enjoys certain key advantages that will enable the continent to equal or even surpass at least some of its emerging market counterparts in terms of financial sector development in the coming decade and beyond. Most African financial markets are open to new entrant including foreign players compared to other emerging market economies. The growing presence of subsidiaries of major global banks on the continent has undoubtedly improved the quality of financial services in recent years; the focus here has largely, but not exclusively, been on high margin corporate businesses as opposed to retail banking sector. The largest markets, Nigeria and South Africa according to (KPMG, 2013).

The table below indicates top 12 countries with the highest ratio commercial bank branches per 100,000 people in SSA. Having a high number of people access to banks indicates a high level of saving and borrowing which leads to economic growth.

*Table 2: Commercial bank branches (per 100,000 adults)*

<b>Country Name</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
Seychelles	42.04	39.86	40.31	39.84	46.21	45.84
Mauritius	17.84	17.92	18.19	18.45	18.99	20.44
Namibia	10.74	10.74	11.76	12.40	12.51	12.53
South Africa	4.74	7.10	7.34	5.99	7.84	9.28
Nigeria	4.66	4.15	3.75	5.16	6.21	6.43
Angola	2.16	2.67	4.04	4.64	5.60	6.30
Swaziland	5.87	5.91	5.93	5.78	5.77	5.62
Ghana	3.06	3.24	3.60	4.55	4.76	5.09
Rwanda	0.39	0.76	0.72	1.07	4.58	4.91
Zimbabwe	2.73	3.72	3.52	3.96	3.32	4.43

Country Name	2004	2005	2006	2007	2008	2009
Kenya	2.70	2.60	2.71	3.52	4.10	4.40

### 1.3 Problem statement

Research on the relationship between financial development and economic growth has yielded mixed results. Whereas researchers agree on the presence of a positive relationship between finance and growth they rarely agree on the direction of causality and the path the relationship takes. Patrick (1966) developed the idea that the relationship between finance and growth could vary over development phases of a country. In particular, at the initial stage of economic development, financial development will lead to economic growth; however as real growth takes place in the economy, this link becomes of lesser importance and growth will induce the demand for greater financial services.

Casual review of the growth and development indicators in Sub Saharan Africa reveals that data does not follow Patrick's hypothesis. Per capita growth rate has remained relatively constant over the years even with varying levels of financial development as measured by the ratio M2/GDP. As such one would conclude that over time finance and growth in SSA have not moved in synchrony as expected. It is therefore evident that there are some points of disconnect in the finance – growth transmission channel in SSA. Despite the apparent disconnect, researchers have devoted their efforts carrying out single country analysis and the rarely do they study the direction of causality taking into account the differences in economic development in the different SSA countries. The study aimed to address the issue using dynamic panel analysis to account for the varying degrees of development and employed Pairwise Dumitrescu Hurlin Panel Causality Tests methodology. To test multivariate causality between financial development and economic growth in SSA for the period 1960- 2013.

#### Research objectives

1. To model the varying relationship between financial development and economic growth in Sub Saharan Africa.
2. To identify the direction of causality between financial development and economic growth in Sub Saharan Africa.

#### **1.4 Research questions**

The research questions are derived from the research objectives above.

3. Does the relationship between financial development and economic growth vary with the level of development in Sub Saharan Africa?
4. What is the direction of causality between financial development and economic growth?

#### **1.5 Significance of study**

The linkage between financial intermediation and economic growth remains theoretically and empirically controversial. Providing evidence on this causal influence is crucial not only for economists but also for policymakers which are permanently looking for optimal reform decisions tending to promote financial intermediary development (Ghazi & Mohamed, 2004). A lot of research has been done on the finance growth nexus but for specific countries. The methods used were mainly time series methods for example VAR. Many did not put into consideration the use of cross-sectional data which will lead to the use of dynamic panel analysis.

#### **1.6 Scope of study**

The proposed research will investigate GDP and financial development to check for the direction of causality. The period will be from 1963- 2013. This is to cover most of the stages in Patrick's hypothesis. The study used 27 SSA countries are to be used, the criteria used to choose was the availability of data of the countries. These countries are Kenya, Rwanda, South Africa, Nigeria, Malawi, Madagascar, Lesotho, Swaziland, Benin, Senegal, Seychelles, Liberia, Burundi, Gabon, Zambia, Botswana and Cameroon. Data source is the World Development indicators of the World Bank.

## **2 Literature Review**

### **2.1 Introduction**

For a long time, it has been assumed that financial development is important for and leads to economic growth (supply leading phenomenon). Little has been discussed on the converse, where economic growth can also drive the development of the financial sector, i.e. demand-following effect. However, in practice, there is likely to be an interaction between supply-leading and demand-following phenomenon.

(Patrick, 1966), hypothesis argues that the direction of causality between financial development and economic growth changes over the course of development. In the authors view, financial development is able to induce real innovation for investment before sustained modern economic growth gets underway and, as modern economic growth occurs, the supply leading impetus gradually becomes less and less important as the demand-following financial response becomes dominant. As Patrick puts it, this sequential process is also likely to occur within and among specific industries or sectors. For instance, one industry may initially be encouraged financially on a supply-leading basis and as it develops, have its financing shift to demand-following, while another may remain in the supply-leading phase. This shift would be more related to the timing of the sequential development of industries, particularly in cases where the timing is determined more by government policy than by private demand forces (Patrick, 1966)

According to (Odhiambo, 2004) , the demand-following phenomenon, lack of financial growth is a manifestation of lack of demand for financial services. Therefore, as the real side of the economy develops, its demands for various new financial services materialize, and these are met rather passively from the financial side. In the second view, called the supply-leading phenomenon, the financial sector precedes and induces real growth by channeling scarce resources from small savers to large investors according to the relative rate of return.

#### **2.1.1 Finance – Growth transmission channel**

The first link is financial deepening which means an increase in the supply of financial assets in the economy. These leads to high interest rates which encourage savings which leads to capital accumulation. It occurs through financial intermediaries where many investors hand over their wealth. Financial institutions invest these funds in profitable ventures. According to (Kunt &

Levine, 2008) financial systems that are efficient at pooling the savings of individuals can strongly affect economic development. This happens by increasing savings, exploiting economies of scale and overcoming indivisibilities (Muchai, 2013) .

$$FD \uparrow \rightarrow R \uparrow \rightarrow S \uparrow \rightarrow K \uparrow \rightarrow Y \quad \text{Equation 1}$$

Where  $FD$  is financial deepening,  $R$  is interest rate,  $S$  is savings,  $K$  is capital stock and  $Y$  is national output. This transmission model will be employed in our study. Since we want to analyze the interrelationship between variables in the finance-growth channel, a VAR model is applicable. Two dynamic panel models will be employed in this study based on two measures of financial deepening whose data is available for the Sub-Saharan case. As (Ndebbio, 2004) , pointed out, financial deepening as an increase in the supply of financial assets in the economy. It is therefore important to develop some measures of the widest range of financial assets, including money.

### 2.1.2 Points of disconnect

According to Patrick the transmission channel involves an increase of financial deepening which leads to an increase in savings which translates to high interest rates then capital stock is increased and finally it leads to economic growth rate. Probably the funds are being diverted to non – productive activities. This can be due to micro-economic inefficiencies in the banking system. Lack of information in the banks have led them to finance low quality projects or finance short term projects

It could also be due to political interference in the banking system that may channel funds to unproductive systems. According to (Demetriades & Law, 2004) financial development may not cause increased growth because of corruption in the banking system .This diverts credit to unproductive or even wasteful activities. Loans taken could be used to fund recurrent expenditure for example paying salaries. As much this is reflected in the growth rate it is not productive in the same way it could have been when the funds would have been used to fund an expansion of a company or starting a company. This could have been reflected in various ways like creating employment, expanding the infrastructure and also in the near future could be used as exports.

## **2.2 Theories of causality between financial development and economic growth**

Of the possible factors contributing to economic growth, the role of financial sector has recently begun to receive more attention. The recognition of a significant relationship between financial development and economic growth dates back as least to the Theory of Economic Development by (Schumpeter, 1912) . However, the question of whether financial development preceded economic growth or vice versa has been debated in the historical literature on economic growth and finance. The pioneering studies in this area by (Goldsmith, 1969), and more recently by (McKinnon, 1973) documents a positive relationship between financial development and economic growth. (Robinson, 1952) , found that financial development follows economic growth. (Lucas, 1988) , argued that financial development and economic growth are independent and not causally related. Finally, (Demetriades & Khaled) and (Greenwood & Smith, 1997) claims that the two variables are mutually causal, they have a bidirectional causality.

### **2.2.1 Financial Development causing economic growth (supply leading hypothesis)**

(Bagehot, 1873), argues that the financial sector plays a critical role to the economic growth. Schumpeter notes that a well-developed financial system channels financial resources to the most productive use which leads to economic growth. They received further momentum from the Philosophers such as (McKinnon, 1973) , as well as from the World Bank and the International Monetary Fund. These scholars and institutions assert that a liberalized financial sector mobilizes greater volumes of financial saving and allocates capital to the more productive users, which enhances the productivity of physical capital. The effect of these factors is an increase in economic growth.

The stronger arguments though seem to be in favor of the fact that finance is important in facilitating economic growth as evident in the theories put forward in the various growth models - the classical, the neo-classical and the endogenous theory. For example, the (Ryuzo, 1964) (Harrod & Domar, 1946) classical growth model for a closed economy puts forth that the ratios of national savings and national capital-output stimulate the growth rate of gross national product (GNP). As such, the expansion of new capital stock through investment takes place only when these economies save a portion of their national income. This new investment generated through savings will lead to economic growth.

The Harrod- Domar growth model was extended to open economies by (Kennedy, 1966) , with savings having similar implications. Another popular classical work is that of (Schumpeter, 1912) which purports that financial intermediaries, in carrying out their financial services - such as mobilizing savings, evaluating projects, managing risks, monitoring managers and facilitating transactions - are essential for technological innovation and economic growth.

The second category of growth theories is that of the neo-classical which by considering productivity, capital accumulation, population growth and technological progress, sought to explain long-run economic growth. In (Solow, 1956) growth model, the importance of savings and capital investment in promoting economic growth is emphasized. His premise was that the capacity of the economy can be expanded if society saved part of their resources and used it to build into the future. Another contribution to the neo-classical growth theory is (Goldsmith, 1969) who focused on how to transform short-term financial instruments into long-term ones and how long-term financing can result in economic growth. The approach in this regard builds on the Harrod-Domar model. Goldsmith noted that liquidity can be generated in the financial system if there are surplus saver (persons who save more than they invest) and borrowers (who want to invest more than they save) so that the surplus is transferred to investors through financial instruments. Goldsmith alluded that the creation of liquidity is critical to the process of economic development.

(Woo, 1986) , investigates the international evidence on the causal relationship between financial development and economic growth using annual data from 56 countries. Using both simple and unidirectional concepts of causality, the author finds evidence of supply-leading pattern to be more frequent in less developed countries (LDCs) than demand-following pattern. According to the results of this study, LDCs are characterized by the causal direction running from financial development to economic growth, while developed countries are characterized by the reverse causal direction regardless of which causality concept is employed. Based on Uganda's experience, (Hyuha, 1982) found financial liberalization in Uganda to be both supply leading and demand-following, therefore conforming to a bi-directional causality pattern. (Kar & Pentecost, 2000) Examine the causal relationship between financial development and economic growth in Turkey.

(Calderon & Liu, 2002), study the direction of causality between financial development and economic growth using decomposition test on pooled data of 109 developing and industrial countries from 1960 to 1994 and adduce evidence that financial development generally leads to

economic growth. (Ghali, 1999) , reports from Tunisia that the persistence of high information and transaction costs coupled with lack of a competitive financial sector casts doubts on the existence of a positive impact of finance on economic growth in developing economies.

(Esso L. , 2010) , also examines the finance-growth connection with focus on Burkina Faso, Cape Verde, Cote d'Ivoire, Ghana, Liberia and Sierra Leone and establishes a long-run relationship between the two variables. The study shows that financial development precedes economic growth in Ghana and Mali, growth leads finance in Burkina Faso, Cote d'Ivoire and Sierra Leone, and finance and growth cause each other in Cape Verde and Liberia.

(Adusei, 2013) , the study produces evidence that there is mostly a unidirectional causality running from financial development to economic development in Ghana, Nigeria, Senegal, South Africa, Togo, and Zambia. Under different measures of financial development, the study reports a bi-directional causality in Kenya, Zambia, Zambia, South Africa, Nigeria, Ghana, and Togo.

### **2.2.2 Economic growth causing Financial development (demand following hypothesis)**

(Robinson, 1952) , explains that finance does not exert a causal impact on growth he instead states that the financial development follows economic growth as a result of higher demand for services. Patrick not only seconds the idea but also extends it and argues that the early phases of an economy is characterized by supply leading but when the economy matures it follows a demand following hypothesis. A number of researchers such as (Gurley & Shaw, 1967), (Goldsmith, 1969)and (Jung, 1986) realize causal direction from economic growth to financial development.

According to (Islam, Habib, & Khan, 2004) , there are reasons as to why a country can exhibit a demand following phenomena. The authors used five alternative proxies for financial development in order to see the impact of different aspects of financial development in Turkey. The Granger Causality Test was then applied in the context of a co-integration and vector error-correction mechanism. The empirical results of the study show that the direction of causality between financial development and economic growth is sensitive to the choice of measurement for financial development in Turkey. Although this study reveals that the strength of the causality between financial development and economic growth is much weaker than that between economic growth and financial development, the authors conclude that. It would be inconsistent with the results obtained to argue that for all intents and purposes in Turkey, economic growth leads financial development" (Kar & Pentecost, 2000)

The recent attempts based on cross-country and panel data partial correlation have to be accepted and interpreted with high levels of precaution whenever the causality issue is treated. (King & Levine, 1993a) , based on the (Barro, 1991) cross-sectional regressions, found that the initial level of the financial development indicators have a significant power of prediction of the growth indicators over the sub sequent years. The (King & Levine, 1993a) findings have to be treated with precaution since the different economies are not necessarily homogenous. Moreover, it is widely admitted that partial correlations reveal nothing about causation (Demetriades & Khaled) . Levine himself, in a departure from his original position recognized that "...cross country regressions do not resolve the issue of causality analysts should extend this research by examining the time series relationship" (Levine & Zervos, 1998).

The causal relationship between finance and economic growth is examined by (Waqabaca, 2004) in Fiji using time series data from 1970 to 2000 with the direction of causality running from economic growth to financial development. (Ndebbio, 2004), examines financial deepening, economic growth and development for Sub-Saharan African countries and finds that a developed financial sector spurs overall growth of an economy. Using three proxies of financial development (the ratio of M2 to GDP, the ratio of currency to narrow money and the ratio of bank claims on the private sector to GDP) with real GDP per capita as proxy for economic growth, (Odhiambo, 2004) examines the role of financial development on economic growth in South Africa and finds that economic growth leads financial development on economic growth in South Africa and finds that economic growth leads financial development. Employing ARDL-Bounds testing procedure, (Odhiambo, 2010) revisits the finance-growth nexus in South Africa by looking at the dynamic causal relationship between financial development, investment and economic growth and finds evidence that confirms demand-following hypothesis.

In Kenya, (Odhiambo, 2009) investigates the direction of causality between financial development and economic growth by examining the effect of inflation on the finance-growth nexus and reports that economic growth Granger-causes financial development in Kenya regardless of whether the causality is estimated in a bivariate framework or in a tri-variate setting. The paper argues that the financial sector development in Kenya to a very extent depends on the demand for, rather than the supply of, financial services

### 2.2.3 Feedback causality between financial development and economic growth

Also called ‘bidirectional causality’ This view states that finance and economic development is mutually causal, that is, they have bidirectional causality. In this hypothesis, it is asserted that a country with a well-developed financial system could promote a high economic expansion through technological changes, product and services innovation (Schumpeter, 1912). This in turn, will create a high demand of financial arrangements and services (Levine, 1997). As the banking institutions effectively respond to these demands, these changes will stimulate a higher economic achievement. Both financial and economic developments are therefore positively interdependent and their relationship could lead to bidirectional causality (Choong C, Yusop, Law, & Venus, 2003). Empirical support for this view can also be found, for example, in the works of (Greenwood & Smith, 1997) and (Luintel & Khan, 1999).

Despite the overwhelming arguments in favor of supply-leading a number of studies such as (Akinboade, 1998), (Wood, 1993), (Woo, 1986), (Hyuha, 1982) among others, have revealed that financial development and economic growth can granger cause one another. (Akinboade, 1998), for example, while examining the direction of causality between financial development and related growth in Botswana during the period 1972-1995, finds evidence of a bi-directional causality between financial development and per capita income. The author concludes that economic and financial development in Botswana appear to complement one another.

(Wood, 1993) , examines the causal relationship between financial development and economic growth in Barbados during 1946-1990 period. Using (Hsiao, 1979) test procedure, the author finds a bi-directional causal relationship between financial development and economic growth. The study however, finds no support for Patrick's hypothesis. (Calderon & Liu, 2002) , study not only finds evidence of supply leading but also using Granger it provides evidence of bidirectional causality. (Hondroyannis & Papapetrou, 2004) , show that in Greece there is a bi-directional causality between finance and growth in the long-run.

However, using time series and data ranging from 1965 to 2010 with domestic credit as a share of GDP and broad money supply as a share of GDP as measures of financial development with real per capita GDP as proxy for economic growth, (Adusei, 2012) reports that finance undermines growth in South Africa and that there is a unidirectional causal relationship that runs from financial development to economic growth. In Tanzania, (Odhiambo, 2005) investigates the finance-growth

connection and finds that there is a bi-directional causality between financial development and economic growth.

#### **2.2.4 Approaches to testing causality between financial development and economic growth**

One of the first attempt in testing the causality relationship is that of (Gupta, 1984), in which the author used the framework proposed by (Granger, 1988). The financial variable was approximated by the level of quasi-liquid liabilities (M2). The economic growth was measured by the industrial production with quarterly data. Gupta used this type of time frequency to overcome the shortage and the lack of regular annual data during a long time span in developing countries. (Ghazi & Mohamed, 2004) in Gupta's empirical analysis, although considered as an important step in causality nesting, is seen to study the money effects on industrial production more than financial aspects of economic growth. Moreover, the growth measure used seems to suffer from an approximation bias since the industrial production represents only a given part of total production.

(Jung, 1986), studies used a vector auto-regressive (VAR) framework to test causality between financial development and growth for a sample of 56 countries both developed and developing countries (DCs & LDCs) having at least 15 annual observations. He found that evidence from developing countries are in favor of a causal direction running from the financial sector to the real activity. By contrast, developed countries are characterized by a reverse causal direction: The financial services develop as the real activity expands. Nevertheless, although the usage of a vector auto-regressive (VAR) framework in testing Granger causality was original, the results are valid only in the case of stationary or co-integrated variables.

(Murinde & Eng, 1994) , initiates the studies using co-integration and unit root techniques within a bivariate VAR (BVAR) framework in testing the issue. The country sample used was Singapore with quarterly data spanning from 1979 to 1990. The evidence presented largely supports a unidirectional causality from financial development to economic growth. The authors consider that such a result is on line with the deliberate financial restructuring policy, implemented by the Government in the eighties. They concluded that causality patterns have tendency to vary with countries and more specifically with the outcomes of financial reforms implemented.

(Arestis & Demetriades, 1996) , tries to fill out the idea of causality patterns have the tendency to vary with outcomes of financial reforms implemented. They tried it by distinguishing "bank based" from "capital-market-based" financial systems in their causality tests. The authors divided their

twelve countries sample in two subsets of developed and developing countries. The range of the data differs from one country to another but the whole span ranges between 1949 and 1992. Co-integration and causality tests achieved tend to corroborate that the causal nature of the linkage is highly influenced by country specific financial sector features announced previously by (Demetriades & Khaled).

(Kul & Khan, 1999), carries out time series tests of the finance and growth relationship in a multivariate vector auto-regression (MVAR) framework with co-integration tests. They found that the long-run financial intermediation and growth ties are featured by a bi-directional causality for all the countries of the sample. Such outcomes were accounted for by the usage of new approaches and methods in testing this causality and the higher dimensional system. The outcomes of the different surveyed papers converge to the result that country specific features of the financial sector are likely to account for the differences between the achieved tests. Specifically, results on the causality pattern vary with the success of financial liberalization policies implemented in each country and with the development level of the financial sector generally.

(Kar & Pentecost, 2000) , examines the causal relationship between financial development and economic growth in Turkey. The authors used five alternative proxies for financial development in order to see the impact of different aspects of financial development in Turkey. The Granger Causality Test was then applied in the context of a co-integration and vector error-correction mechanism. The empirical results of the study show that the direction of causality between financial development and economic growth is sensitive to the choice of measurement for financial development in Turkey.

Panel data analysis, exploits time series and cross-sectional variations in data and avoids biases associated with cross-sectional regressions by taking the country specific fixed effect into account (Levine R. , 2005). Using a panel data error correction model, (Eslamloueyan & Sakhaei, 2001), investigate the short and long-run causality between financial development and economic growth in the Middle East. The authors' results suggest that there is bidirectional causality between financial development and economic growth in both the short- and long run.

(Mbarek & Rachdi, 2011), examines the direction of causality between finance and growth using panel data co-integration and GMM system approaches. Their study was based on a sample of 10 countries, 6 from the OECD region and 4 from the MENA (Middle East and North Africa) region

during 1990-2006. The authors report that panel data co-integration analysis confirms a long-term relationship between financial development and economic growth for the OECD and the MENA countries.

### **2.3 Conclusion**

Whereas researchers agree that there is a relationship between financial growth and economic growth, they find mixed results on the direction of causality. This lack of consensus could be probably attributed to the methodology used. Most researches have only used time series data and cross-sectional data which does not put into consideration the biasness of the indicators of financial development. According to (Beck, Demirgüç-, & Levine, 2000) , the estimates of financial development indicators can be biased for a variety of reasons, among them measurement error, reverse causation and omitted variable bias. Therefore, a suitable methodology that will take into account estimation method should be used in order to obtain unbiased, consistent and efficient estimates of this coefficient. To deal with these biases, researchers such as (Mbarek & Rachdi, 2011), (Hassana, Benito, & Jung-Suk, 2011) and (Eslamloueyan & Sakhaei, 2001) have utilized dynamic panel regressions with lagged values of the explanatory endogenous variables as instruments. This is what was used in this study

### **3 Methodology**

#### **3.1 Research Design**

The proposed research will involve an exploratory study to determine whether the direction of causality between financial development and economic growth changes over the course of development. The study seeks to explore whether Sub-Saharan Africa is demand following or supply leading. Patrick argues that relationship between finance and growth could vary over time. In particular, at the initial stage, financial development will lead economic growth; however as real growth takes place in the economy, this link becomes of lesser importance and growth will induce the demand for greater financial service. The transmission model will be employed in the study. A suitable estimation method should be used in order to obtain unbiased, consistent and efficient estimates of the coefficients. To deal with these biases, researchers have utilized dynamic panel regressions with lagged values of the explanatory endogenous variables as instruments. This is what will be employed in this study.

The steps of doing the method will be based on the research questions. The first research question was whether there is a relationship between economic growth and financial development. Panel regression will be used to establish if there is a relationship between the economic growth and financial development. Two models will be used, one where there is economic growth against all factors that cause economic growth without financial development. The other will be economic growth against all variables including financial development.

The second research question was to find the direction of causality between financial growth and economic growth. To determine this a multivariate time series will be used to determine the causality using employing Pairwise Dumitrescu Hurlin Panel Causality Tests methodology.

#### **3.2 Data and Measurement of variables**

The study will use data from 1960 to 2013, so that we can look at the development stages of SSA. The post-independence period and the developing period. The data will cover over four decades. Twenty-seven SSA countries are to be used, the criteria used to choose was the availability of data of the countries. Data sources are the World Development indicators of the World Bank and the International Financial Statistics (IFS) of the International Monetary Fund (IMF).

### 3.3 Model Specification

#### 3.3.1 Hausman test

Preliminary tests were mainly to decide whether to use random effects or fixed effects, researchers often rely on the (Hausman, 1978) specification test (Greene, 2008). The null hypothesis is that the preferred model is random effects vs. the alternative the fixed effects. It basically tests whether the unique errors ( $u_i$ ) are correlated with the regressors, the null hypothesis is they are not. This will be done by running a fixed effects model then the estimates are saved and running random effects model and also saving the estimates then performing the Hausman test

$$H = (\beta_{RE} - \beta_{FE})' [Var(\beta_{FE}) - Var(\beta_{RE})]^{-1} (\beta_{RE} - \beta_{FE}) \quad \text{Equation 2}$$

(Clark & Linzer, 2012) Under the null hypothesis, H is distributed with a chi-square with degrees of freedom equal to the number of regressors in the model. A finding that ( $p < 0.05$ ) is taken as evidence that, at conventional levels of significance, the two models are different enough to reject the null hypothesis, and hence to reject the random effects model in favor of the fixed effects model. If the Hausman test does not indicate a significant difference ( $p > 0.05$ ), then the null hypothesis is not rejected. This indicated that the random effect is preferred to fixed effect.

Panel diagnostic tests will be carried after the relationship has been established. The tests include the Wald's test and time effects test. The time effects test is to see if time effects are needed when running a fixed effects model.

#### 3.3.2 Direction of causality

This is to find out what causes the other between economic growth and financial development. The causality can be demand following, supplying leading, unidirectional and probably independent. According to (Sims, 1972), Granger has given a definition of a kind of causal ordering based on the notion that absence of correlation between past values of one of one variable X and that part of another variable Y which cannot be predicted from Y's own past implies absence of causal influence from X to Y.

According to (Rabiul, Wahidul, & UZ-Zaman, 2004), to get the relationship between the independent and dependent variables we need to use stationary data. The use of non-stationary may exhibit misleading interpretations leading to false regression. Weak stationarity requires that the mean (first moment) and variance/covariance (second moments) are independent of time. As

such, a natural starting point in identifying stationarity is an inspection of the economic series against time. If the plots for a full period (1963-2013) show that there is an upward trend in both the variables, it will indicate that over time, the mean is changing and the series are growing in a fairly systematic manner, indicating that all three variables are non-stationary.

By using an F-test to jointly test for the significance of the lags on the explanatory variables, this in effect tests for ‘Granger causality’ between these variables. It is possible to have causality running from variable financial development ( $X$ ) to economic growth ( $Y$ ), but not ( $Y$ ) to ( $X$ ); from economic growth ( $Y$ ), to financial development ( $X$ ), but not financial development ( $X$ ) to economic growth ( $Y$ ), and from both economic growth to financial development and vice versa.

$$Y_t = \beta_0 + \sum_{k=1}^k \beta_j Y_{t-j} + \sum_{k=1}^k \gamma_k X_{t-k} + u_t \quad \text{Equation 3}$$

$$X_t = \beta_0 + \sum_{k=1}^k \beta_j X_{t-j} + \sum_{k=1}^k \gamma_k Y_{t-k} + u_t \quad \text{Equation 4}$$

### 3.3.3 Economic growth measures

(King & Levine, 1993a), provides a set of four measures of growth that have a high indicative power of the quality and quantity of economic growth. One measure is retained from these indicators: the growth rate of real per capita GDP ( $GY$ ). We add to these standard measures another indicator of economic development: the real GDP per capita ( $y$ ), in accordance with (Murinde & Eng, 1994), (Demetriades & Khaled) and (Arestis & Demetriades, 1996). This study used GDP per capita as an economic indicator.

#### 3.3.3.1 Other factors causing economic growth

Financial development is not the only factor that causes economic growth within a country human capital. (Levine, 1997), suggested several possible indicators for economic growth: real per capita GDP growth, average per capita capital stock growth and productivity growth. Here we used real per capita GDP growth. Other variables influencing economic growth were introduced in our model, including per capita income, average education, political and stability indicators.

Indicators used to measure trade and government final consumption in this study are the ratio of trade to GDP (TRADE) and the ratio of general government final consumption expenditure to GDP (GOV), respectively (Guglielmo, Christophe, Robert, & Anamaria, 2009). They effectively measure the size of the real sector and the weight of fiscal policy. Inflation will be used as a

measure of the increase in the general price level and was selected as a control variable since it could impact money, credit as well as GDP.

#### **3.3.4 Financial Development Growth measures**

This study used two proxies of financial development. The first proxy for financial development is the ratio of broad money (M2). The monetization variable (M2) is designed to show the real size of the financial sector of a growing economy. The ratio of M2/GDP is therefore expected to increase over time if the financial sector develops faster than the real sector on the one hand, and decrease if the financial sector develops slower than the real sector, on the other hand.

The third indicator of financial development is represented by the ratio of bank claims on the private sector (PRVCRD). This ratio indicates the importance of the role played by the financial sector in financing the economy. It is assumed that credit provided to the private sector generates increases in investment and productivity to a much larger extent than do credits to the public sector. It is also assumed that loans to the private sector are given more stringently and that the improved quality of investment emanating from financial intermediaries' evaluation of project viability is more significant for private sector credit (Kar & Pentecost, 2000).

## 4 Data Analysis

### 4.1 Introduction

As stated in the methodology this study data analysis will be done in two steps according to the research questions. The dependent variable in our model is economic growth and it is defined as the logarithm of real per capita GDP (LGDPPC) (Adusei, 2013). We use two different indicators to measure financial development. The first measure of financial development is the logarithm of the ratio of broad definition of money, M2 denoted by LM2. This measure is used as a monetization variable (Eslamloueyan & Sakhaei, 2011). The second variable is credit to private sector GDP denoted as LPVRCR. The variable indicates the role of the financial intermediaries in transferring funds to the various sectors of the economy.

The researcher includes economic openness (LOPEN) and capital formation. (CFORM) as a share of GDP as control variables. Economic openness is defined as exports plus imports divided by GDP. Indeed, all variables are log-transformed (Levine, 1997).

### 4.2 Determining the relationship

Using the dynamic panel equation, to determine whether there is a relationship between economic growth and financial development

$$g_{i,t} = \alpha_i + \beta f_{i,t} + \gamma_1 C_{i,t} + \gamma_2 D_{i,t} + \delta y_{i,t-1} + \mu_i + \varepsilon_{i,t} \quad \text{Equation 5}$$

Where  $g$  is log percapita,  $\alpha$  is country specific coefficient,  $f_{i,t}$  financial indicators which are log of M2 and log of private sector credit,  $D_{i,t}$  indicates the control factors which are trade openness and log capital formation. The proxies for financial development indicate the size (M2) of financial sector and the depth (private sector credit) of the sector.

Table 3 presents summary statistics on the two financial indicators, growth, and the sources of growth. Each financial indicator is positively and significantly related with each growth indicator.

Table 3: Results of Dynamic panel Estimation. Dependent Variable: LGDPPC

Variable	Model 1
LOG(M2(-1))	0.14293*** (0.0309)
LOG(PRVCR(-1))	0.1066*** (0.0234)
OPENNESS	-0.0240** (0.0062)
LOG(FORMATION)	0.6844*** (0.0265)
R <sup>2</sup>	0.9927
Adjusted R <sup>2</sup>	0.9921
J-statistic	771.7315 (0.000)

\*\*\*, \*\* and \* shows significance at 1%, 5% and 10% levels of significance respectively.

$$g_{i,t} = \alpha_i + \beta f_{i,t} + \gamma_1 C_{i,t} + \gamma_2 D_{i,t} + \delta y_{i,t-1} + \mu_i + \varepsilon_{i,t} \quad \text{Equation 5}$$

The table above shows the results for the equation above. The model is for the whole of sub-Saharan countries relationship between log of percapita being equated to log M2, log private credit, trade openness and log of capital formation.

#### 4.3 Pairwise Dumitrescu Hurlin Panel Causality Tests

The current study investigates the direction of causality issue employing Pairwise Dumitrescu Hurlin Panel Causality Tests. The number of lags has been selected using Akaike Information criterion. The 27 countries have been divided into three depending in their GDP. Top nine

countries represent the countries with high GDP, from 10 to 18 have middle GDP and the last 9 countries with low GDP represent a country in its initial stages.

Evidence presented in Table 4 indicates a bi-directional causality between finance and economic growth in the study SSA countries.

*Table 4: Results for Pairwise Causality test SSA*

<b>Null Hypothesis</b>	<b>W-Stat.</b>
M2 does not homogeneously cause PRVCR	27.8391***
PRVCR does not homogeneously cause M2	12.9925****
PERCAPITA does not homogeneously cause PRVCR	14.8952***
PRVCR does not homogeneously cause PERCAPITA	16.1245***
PERCAPITA does not homogeneously cause M2	10.1391***
M2 does not homogeneously cause PERCAPITA	12.033***

\*\*\*, \*\* and \* shows significance at 1%, 5% and 10% levels of significance respectively.

The table above shows that there is a bidirectional causality. The p values are less than the significance level therefore we reject the null hypothesis. This confirms the few studies that have reported a bi-directional causality between finance and growth in Africa: (Akinboade, 1998), for example, while examining the direction of causality between financial development and related growth in Botswana during the period 1972-1995, finds evidence of a bi-directional causality between financial development and per capita income. Also (Agbetsiafa, 2003) in Kenya, Zambia, Zambia, South Africa, Nigeria, Ghana, and Togo.

*Table 5: Results for Pairwise Causality test High GDP countries*

<b>Null Hypothesis:</b>	<b>W-Stat.</b>
PRVCR does not homogeneously cause PERCAPITA	29.6296***
PERCAPITA does not homogeneously cause PRVCR	25.7479***
M2 does not homogeneously cause PERCAPITA	21.8646***
PERCAPITA does not homogeneously cause M2	13.9912***
M2 does not homogeneously cause PRVCR	43.5571***
PRVCR does not homogeneously cause M2	13.8437***

\*\*\*, \*\* and \* shows significance at 1%, 5% and 10% levels of significance respectively

From Table 5 indicates that the countries with high GDP have a bi-directional causality between finance and economic growth. This also confirms the studies done (Odhiambho, 2005), in his study in Tanzania and (Agbetsiafa, 2003) research in Botswana and found that the causality was bidirectional.

*Table 6: Results for Pairwise Causality test Medium GDP countries*

<b>Null Hypothesis:</b>	<b>W-Stat.</b>
PRVCR does not homogeneously cause PERCAPITA	6.8396***
PERCAPITA does not homogeneously cause PRVCR	8.3458***
M2 does not homogeneously cause PERCAPITA	6.6187***
PERCAPITA does not homogeneously cause M2	9.3307***
M2 does not homogeneously cause PRVCR	14.6774***
PRVCR does not homogeneously cause M2	7.0584***

\*\*\*, \*\* and \* shows significance at 1%, 5% and 10% levels of significance respectively

Table 6 indicates that the countries with the middle level of GDP also have a bi-directional causality.

*Table 7: Results for Pairwise Causality test low GDP countries*

<b>Null Hypothesis:</b>	<b>W-Stat.</b>
PERCAPITA does not homogeneously cause M2	7.0953***
M2 does not homogeneously cause PERCAPITA	7.6158***
PRVCR does not homogeneously cause M2	18.0752***
M2 does not homogeneously cause PRVCR	25.2827***
PRVCR does not homogeneously cause PERCAPITA	11.9045***
PERCAPITA does not homogeneously cause PRVCR	10.5919***

\*\*\*, \*\* and \* shows significance at 1%, 5% and 10% levels of significance respectively

Table 7 indicates that the countries with the low level of GDP also have a bi-directional causality.

The table above shows that there is a bidirectional causality, this means that in the initial levels of economic growth. The p values are less than the significance level therefore we reject the null hypothesis. This confirms the few studies that have reported a bi-directional causality between finance and growth in Africa; (Esso, 2010) in Cape Verde and Liberia; (Ndako, 2010) in Nigeria; (Odhiambho, 2005) in Tanzania and (Akinboade, 1998) in Botswana. Also (Agbetsiafa, 2003) in Kenya, Zambia, South Africa, Nigeria, Ghana, and Togo.

## 5 Conclusion and Recommendation

This study has reviewed the relationship between financial development and economic growth and then investigated the direction of causality and how it changes with the stages of development in 27 SSA countries from 1960-2015.

The findings were that both M2 and private sector credit have a positive correlation with GDP per capita which most researchers agree on. There is a negative correlation between trade openness and GDP per capita, this indicates that economic openness has undermined economic growth. This could be due to unfavorable international trade between Africa and the rest of the countries (Adusei, 2013).

The results from the Pairwise Dumitrescu Hurlin Panel Causality test provide basis for the conclusion that financial development and economic growth cause each other. This indicates that there is evidence of bidirectional causality between financial development and economic growth in the study countries. This implies that policies directed at the two and are efficiently implemented could lead to the economic growth and financial development.

Evidence gathered from the above analysis leads to the conclusion that the direction of causality does not change with development stages of the economy. This is because at all stages of development there is bidirectional causality.

Further studies could be done checking whether the direction of causality changes with the stages of financial development. This will confirm whether a developed financial market causes economic growth. Also research can be done on the direction of causality between a combination of financial development and stock market and economic growth. This is to figure out to what extent the stock market affects economic growth.

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