FINANCIAL DEVELOPMENT, INTERNATIONAL TRADE AND ECONOMIC GROWTH: THE CASE OF GHANA

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DEDICATION

This thesis is dedicated to Kwabena Twenefour and Adwoa Nyarko for working hard to educate their daughter.

ABSTRACT

This study aims to investigate the long run relationship and the possible direction of causality that may exist between financial development, international trade and economic growth in the case of Ghana for the period 1965-2017. The Autoregressive Distributed Lag bounds (ARDL) testing approach to cointegration and the Granger causality under the Vector error correction (VECM) model is employed to measure the relationships.

The results from the bounds test confirmed the existence of a long run relation among the series. Also, the results showed that the development of the financial sector was indeed, very conducive for growth whereas, international trade appeared to be a non-robust determinant of growth in Ghana. The causality test results suggested a unidirectional causality running from financial development to growth and from trade to growth. Thus, it was concluded that Ghana was characterized by both the supply-leading and trade-led growth hypotheses.

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CHAPTER 1

1.1 Introduction

A basic focus of development economics has been to find the determinants of growth in an economy. From time past, economists when considering the factors that lead to growth did not pay much attention to the roles of financial development and international trade (Shaheen et al, 2011) The presence of an impregnable and stable financial system is very beneficial to every economy. The financial sector provides a wide range of services to people, firms and the government in the economy. Its basic role in any economy is intermediation where it channels funds or resources from savers to prospective investors resulting in potential investment ventures which leads to economic growth. According to Coban (2015), a well-functioning financial system has an important role to play in supporting economic growth and providing accumulation of funds to serve commercial activities. The interest in this area started with Schumpeter (1911), who asserted that financial development leads to economic growth. Since then, the relationship between financial development and economic growth has attracted a lot of attention in the literature. There have been conflicting views in the literature with regards to the exact relation that exists between these two variables. However, in the face of apparent and ample contrasting studies on the relationship between financial development and economic growth, it is predominantly acknowledged that financial development is vital to economic growth of a country (Calderon &Liu, 2003; Apergis et all, 2007; Jung, 1986). World Bank (2001), reports that, financial development has an important role to play in the growth of an economy, that it is a basic requirement in the mitigation of poverty and significant in the enhancement of income distribution.

Some authors are of the view that financial development is an anti-growth phenomenon. (Van Wijnberg, 1983; Buffie, 1984). Others claim there existed no relation between financial

development and economic growth. Lucas (1988), suggested that policies that were geared towards the development of the financial sector was a waste of resources as it tends to turn attention from more important policies, hence, finance is an over-stressed cause of growth. He asserted that there existed no relation between financial system development and economic growth. Stern (1989), was of the same view.

Another argument in the literature has been on the trade-growth nexus. Trade has been recognized as one of the core determinants of growth thus the need to investigate this assertion. There have been mixed results in the literature with regards to causality. There has not been any consensus on direction of causality (export-led growth or growth-led exports). Some studies done also inferred the import-led growth hypothesis for some economies. Omisakin (2009), hence, states that, economic growth is a complex process and depends on several factors such as capital accumulation (human and physical), technological advancement, increase in labor output, institutional framework, etc. and that the Export-Led Growth theory shows only the growth-export relation. Thus, at any point in time, a researcher may find uneven outcome with regards to the growth-export relation and this will be dependent on which factors are included in the analysis and how the variables are defined in the hypothesis. The debate with regards to the direction of causality between trade and growth continue to be an interesting phenomenon in the literature.

A large number of studies have concentrated on finance and growth while the literature concerning international trade and finance are relatively few. Nonetheless, arising from the literature on international trade are some studies that propose that financial sector development is a potential source of comparative advantage for an economy (Jung et al; 2006). Other studies have also looked at the medium through which both financial development and international exchange impact economic growth. For example, an empirical study by Beck (2002) suggested that countries

with a better developed financial system have a higher export share and trade balance in manufactured goods which propel growth.

In the empirical literature also, financial development and international trade are seen as macroeconomic variables highly correlated with growth and thus, the need to investigate this assertion. This is because if the level of financial development does have effect on the structure of trade balance, then its importance for economic development beyond its positive impact on economic growth will be emphasized thus increasing the priority that policy makers will give to financial sector reforms. (Beck, 2002). Rahman et al (2015) also showed that financial development, international trade and capital are the drivers of economic growth both in the short run as well as long run.

Ghana is a developing country with GDP of US $65.5 billion and 2,202.3 US$ per capita income as at 2018 figures from the World Bank. It is naturally endowed with important natural resources such as gold, cocoa, bauxite, timber, diamonds, oil, aluminum and manganese ore. It is Africa's second biggest producer and exporter of gold and cocoa. It continues to grow economically but this growth does not reflect on its large natural resources it possesses. According to World Bank 2019 publication, Ghana was the second fastest growing economy in Africa in 2017 with growth of 8.1% driven by the mineral and oil sectors. Its Real GDP continued to expand in 2018 though at a slower rate than in 2017, still largely spurred by the mineral component of the industry sector. According to the report, capital accumulation has been a driving force for the Ghana's economic growth over the past decade. Though financial sector for Ghana has grown rapidly since 2010, financial access across regions and demographics is still low. On 2nd July,2019 in a press release, Pierre Laporte, World Bank Country for Ghana, Liberia and Sierra Leone, said that, there was the need for Ghana to invest more, diversify and increase productivity if it is to

achieve governments current strategy of transforming the economy through higher, inclusive and sustainable growth with the private sector as the main driver. This he said, was also in direct alignment with the World Bank's Africa regional strategy, which lays out economic transformation as a mechanism to create sustainable and inclusive growth.

Ghana is a credit- driven economy thus, business and economic activities are financed by bank loans to a large extent. Its financial system is heavily dominated by the banking system. For the past four to five years however, poor banking practices and weak supervision and regulations by the central bank led to a serious instability of the banking sector and other non-bank financial institutions. The soundness and health of the financial system was threatened and to a large extent the health of the economy as a whole. Remediation steps were taken by the Central Bank to stabilize the banking industry to prevent the crippling effect the crisis may have had on the economy. The challenges that arose in the banking sector are still being remedied, and the authorities hope to establish a stronger, and adequately well-capitalized banking sector to support economic growth.

On average, over the years, Ghana has experienced significant improvements in its financial and trading (exports and imports) sectors following the economic liberalization policies such as the Economic Recovery Program (ERP) and Structural Adjustment Program (SAP) in 1983 and 1986 respectively, that were implemented in the economy (Fosu, 2000 and Abdulai & Huffman, 2000). The economy has also recorded a notable increase in the rate of economic growth over the years. However, the question that remains unanswered is whether the increase in economic growth over the years had been spurred by the growth in the financial and trading sectors. For example, whereas Adusei (2013) argues that the development of the financial sector is detrimental to economic growth, Siaw & Frimpong (2010), Eso (2010) and Adu (2013) are of the view that financial development positively influences economic growth in Ghana. Adu et al (2013) concluded that the

growth inducing effect of financial development in Ghana is dependent on the type of measure used as a proxy of financial development. In terms of trade- growth nexus, Yenu (2018), Boakye & Gyamfi (2017) and Adu (2013) found positive significant effect of trade openness on economic growth whiles Abebrese et al (2017) arrived at a negative effect of trade on economic growth in Ghana. These contrasting findings demands further research into the relationship that exist among these variables.

1.2 Statement of the problem and justification of the study

In the literature, several studies have considered the relationship between financial development and economic growth in samples of countries. Other studies have considered the effect of international trade on the growth of an economy. Yet, most of these studies did not proceed further to examine the direction of causality among the variables. Also, studies that have considered the effects of financial development and international trade on economic growth concurrently are few. Studies on African economies are very minimal or almost non-existing. This study introduces deposit money banks' assets as a proxy for financial development. This variable has not been examined in the finance and growth literature on Ghana. To the best of my knowledge, no studies have been carried out for the Ghanaian economy that have looked at financial development, international trade and economic development jointly. In addition, the impacts of these two variables on economic growth and the causal relations that exist amongst them remains uncertain thus, demands further research into the subject area. This study aims to fill the gap in the existing literature in this regard.

I will develop a multiple regression model of economic growth that makes use of the bounds test approach to cointegration. As such, the contribution of my paper will be to enrich the existing literature on economic growth in Ghana. By choosing a set of independent variables

suggested by theoretical models of economic growth, I will estimate the effects of these variables on the growth rate, as well as determine the direction of causality in the growth model. These results can have great implications for policy formulations as policy makers' decisions can target the appropriate policies and strategies to adopt in ensuring the growth and development of the Ghanaian economy.

1.3 Research objective and questions

The main objective of my research paper will be to empirically examine the long run relationship and direction of causality that may exist among financial sector development, international trade and economic growth in Ghana for the period 1965-2017. In order to achieve this main objective, the following research questions will be addressed in my thesis:

1) Does a long run relationship exist between the development of the financial sector and real GDP growth in Ghana? What is the direction of causality?

2) Does a long run relationship exist between international trade and real GDP growth in Ghana? What is the direction of causality?

3) Does a long run relationship exist between the financial sector and international trade in Ghana? What is the direction of causality? Does this suggest an endogeneity issue for the growth model?

4) Is Ghana characterized by the supply-lead hypothesis or the demand-following hypothesis?

5) Is Ghana characterized by the trade-led Growth hypothesis or Growth-Led trade hypothesis?

1.4 Thesis Organization

Following the introduction, the structure of my study will be organized as follows: Chapter two will provide brief summaries of the existing literature on the research topic; Chapter three; the research data and methodology used; Chapter four will present the empirical results and discussion and finally, summary and conclusions and some policy recommendations in Chapter five.

CHAPTER 2

2.0. LITERATURE REVIEW

2.1 Theoretical foundations of growth.

The basis of modern theory of economic growth has been the Solow growth model developed by Robert Solow. It was the first neoclassical growth model and was built upon the Keynesians Harrod-Domar model. The Harrod and Domar models followed the Keynesian model and assumed constant rate of saving and capital output ratio and came up with a simple model for economic growth. They represented the relationship between output growth rate, saving rate and capital output ratio by the function:

$$g = s/k \tag{1}$$

where, g, s and k are output growth rate, saving rate and capital output ratio respectively. A major shortcoming of the Harrod-Domar model was the lack of substitutability between capital and labor depending on their relative prices. This made it less applicable for the market economies. Thus, Solow (1956) built his growth model in line with theirs but integrated explicit substitutability between capital and labor. He illustrated this concept via a Cobb- Douglas production function.

Solow built his model around the following assumptions: one composite commodity is produced (Y); firms in the economy make use of same technology(A) and produce output that use capital(K) and labor (L) as inputs. The production function is specified as:

$$Y = Af(K, L) \tag{2}$$

and it exhibits constant returns to scale. All consumers in the economy save a constant proportion "s" of their income and consume the rest.

i.e. $C = (1 - S)Y$ (3)

There is full employment of labor and the available capital stock.

A simple version of the Solow growth model can be represented by a Cobb Douglas production function,

$Y = AK^{\alpha}L^{\beta}$ (4)

Y, A, L and K have same definition above from equation 1; α is the share of capital in output as well as the output elasticity of capital whereas β is the share of labor in output as well as the output elasticity of labor where $0 < \alpha < 1,\ 0 < \beta < 1$ and $\alpha + \beta = 1$ The labor force and technology are assumed to grow at a constant rate n and g such that:

$L(t) = L(0)e^{nt}$ (5)

$A(t) = A(0)e^{gt}$ (6)

Defining output per worker y = Y/L and capital per worker k = K/L, δ= constant rate of depreciation, and s as a constant fraction of output that is saved and invested, the dynamic equation for 'k' in the steady state is given as:

$dk/_t = sk(t)^{\alpha} - (n + g + \delta)k(t)$ (7)

but growth in the capital stock is constant in the steady state i.e. $dk/_t = 0$ hence,

$sk(t)^{\alpha} = (n + g + \delta)k(t)$ (8)

Thus steady state capital:

$k^{ss} = \left(\frac{s}{n+g+\delta}\right)^{\frac{1}{1-\alpha}}$ (9)

and output in the steady state:

$$y^{ss} = A_t \left(\frac{s}{n+g+\delta}\right)^{\frac{\alpha}{1-\alpha}}. \quad (10)$$

Implications from the steady state results was that economies with higher rate of savings and higher technological progress have higher steady state level of output per capita than economies with lower saving rates and technology. Also, economies with high population growth and higher depreciation of capital stock tend to have lower level of per capita output. Those economies with higher capital share α tended to have higher output in the steady state. There is no growth in per capita income in the steady state unless it is steered by technological progress hence, technological progress was seen as the only driving force of growth in the Solow model. The Solow model predicted conditional convergence where poorer countries, along this convergence path grew faster. Only the exogenous rate of technological progress could explain variation in capita output growth across countries.

In a nut shell, the core prediction of the basic Solow model is that real GDP growth is driven by exogenous technological advances. Exogenous changes in total factor productivity can provide a temporary period of faster or slower growth, but that the long run growth rate always equals the sum of the population growth rate and the depreciation rate of the capital stock.

Solow's model predictions did not go well with some economists and did not reflect the real issues that economies faced. A major shortcoming was that the convergence of the progress of a national economy as this convergence could not be established in every national economy. Another critic stemmed from exogenous technological advancement being the only factor that could drive economic growth in the long run but at diverse levels of revenue based upon investments and population growth.

Some economists however have disagreed with the exogeneity of technology and its temporary effects on the rate of growth. This resulted in the endogenous growth theory developed initially by Romer (1986). A key feature of the endogenous growth theory is the elimination of the assumption of decreasing returns to capital. In these endogenous growth models, changes in the capital stock, the savings rate and technology result in permanent changes in the rate of growth (the so-called A-K model). Thus, the conditional convergence (economies converge to the same long run rate of growth within the same regions of countries) predicted by the Solow growth model no longer hold). Many variations of the endogenous growth models have been developed since Romer (1986). For instance, Lucas (1998) and Romer (1989) made technology endogenous (i.e. technology is determined by the actions of the economic agents described in the model) by introducing human capital and knowledge capital respectively together with physical capital in the production function. In Lucas' augmented Solow's production function, he defined human capital accumulation to be a direct result of studying and learning rather than being at work. The more people study and learn, the more skillful they will become. This will raise the available per capita human capital in the economy to complement the physical capital which will lead to an increase in the skills and productivity of workers. He saw this process to be a major source of economic growth. Lucas 'production function can be represented as:

$$Y = K^{\alpha}(\theta HL)^{1-\alpha} \tag{11}$$

with H being defined as the stock of human capital; θ is fraction of time spent on working and L is labor supply.

Romer (1989), incorporated accumulated knowledge into the production function. His version of the production version was re-expressed as:

$$Y = K^{\alpha}(AL)^{1-\alpha} \quad (12)$$

where the total labor force can either be employed in the knowledge production or final goods production sector. It is identical to the labor augmenting technology as in Solow. The A term represents endogenous accumulation of knowledge thus is as a result of a proportion of total labor workforce involved in research and development which leads to the invention of new ideas and better ways of doing things. These ideas are passed on to the intermediate sector who apply to the production of final goods hence, the invention of new capital goods. The overall productivity of these workers increase as they get access to the new and improved ways of doing things. Thus growth of the economy is attributed to human resources devoted to research and development.

Many endogenous growth theorists have sprung up since and their models involve the use of dynamic optimization tools for analyzing the capital accumulation process and identifying a set of elements or parameters key to the balanced growth path. (Bhattarai, 2004). Unlike Solow who assumed the savings rate to be exogenous, these models determine the savings rate in terms of the parameters of preferences and technology. Economists, since, have been augmenting the Solow growth model by incorporating other parameters which they consider key or paramount to explaining growth of economies as the world evolves. It had been extended to include elements of trade, finance, foreign direct investment, tourism, etc.

Romer (1990), in an endogenous growth model with increasing returns disclosed that trade restrictions lead to a reduction in market sizes which goes a long way to affect the growth of countries negatively and this can result in a reduction of worldwide growth rate. Romer (1990) argued further that investment decisions undertaken by economic agents cause technological change, and this influences economic growth. Rivera-Batiz & Romer (1991), exploited an analogy with consumer theory behavior to explain why trade restrictions tend to accelerate worldwide

growth sometimes and at other times, decelerate it. Using two similar regions; Europe and North America, they showed that trade restrictions reduce worldwide growth apparently.

Grossman & Helpman (1994) developed an innovation-based growth model by incorporating trade into the model and examining the impact of trade on growth in the long run. Aggregate production function was specified as:

$$Y = K^{\alpha} L_Y^{\beta} Z^{1-\alpha-\beta} \tag{13}$$

where $Y, K, and\ L$ maintain their respective definitions from equation (1) and Z is the aggregate measure of intermediate inputs. The model ignores depreciation and assumed good Y can be used for consumption or for investment purposes (good not consumed adds to the existing capital stock). Technological progress was modelled to be endogenous and resulted from the profit maximizing behavior of prudent entrepreneurs. Research is undertaken by these entrepreneurs to improve the quality of intermediate inputs that accelerate the productivity of physical capital. As productivity of physical capital is enhanced, it results in increased output production. The non-rival and non-excludability characteristics of knowledge results in spill over benefits being present. The endogenous learning was seen to prevent the marginal product of capital from falling to a level which makes investment unprofitable thus, innovation sustains both capital accumulation and growth. In this model, human capital is seen to be the measure of the size of effective labor thus with more labor, the economy can undertake more research and development or more manufacturing or both. Expansion of employment in the R&D generates an increased rate in innovation of product which spur growth. Prediction from the model is that larger economies tend to grow faster.

The model integrates trade between economies thus, economies interact with each other because in the real world, no country is an island on its own. Findings on endogenous innovation growth helps to explain how trade may speed the growth of an economy. As an economy opens up to other nations, it gets access to a larger and improved base of technological know-how. International trade results in growth because of transfers (through foreign direct investment) and imports of better technologies of production hence leading to growth. Also, when domestic industries are faced with international competition, they are forced to innovate products to suit the global market if they are to survive hence, redundancy in industrial research is reduced. As innovation is increased, productivity of capital is enhanced which leads to increased output hence growth of an economy. The innovation growth model developed by Grossman & Helpman (1994) thus provided a framework for a positive growth effect of trade through innovation incentives, technology diffusion and knowledge dissemination.

Another variation of growth-trade model is one developed by Grossman & Helpman (1990), where growth was related to trade openness. The model assumes a country consumes two final goods $Y\ and\ Z$. Good Y is produced locally due to the competitive advantage that the economy has in it's production whereas good Z is an imported good. The authors specified a production function in the form:

$$Y = A_Y L_Y^{1-\beta}\left[\int_0^n x(w)^{\alpha} dw\right]^{\beta/\alpha} \quad \text{with } 0 < \alpha, \beta < 1 \tag{14}$$

Where $Y =$ final good, $A_Y =$ constant, $x(w)\ and\ L_Y$ represent type 'w' intermediate goods and labor inputs, to final production, respectively, $n(t)$ denotes the number of available varieties of intermediate goods at time 't' on the market.

The relative global value of commodity Y in terms of the imported commodity Z(the terms of trade) is assumed exogenous and equivalent to one. A set of competitive monopolists are responsible for the production of these intermediates whose unit production requires one unit of labor. Hence, the marginal cost of production is equivalent to the wage rate 'w'. The model assumes constant elasticity of substitution between the varieties and with that, these producers individually fixes a price to be a constant mark-up over its marginal cost. This causes price to be specified as $px = w/a$. The intermediates bear the same price and the demand for each at any moment in time is such that $x = x(w)$. With this, Equation (14) can be re-specified as:

$$Y = A_Y L_Y^{1-\beta} X^{\beta} n^{\beta(1-a)/a}, \qquad \text{with} \quad 0 < \alpha, \beta < 0 \tag{15}$$

$Y, A_Y, and\ n(t)$ maintain their respective definitions as above, $X = nx$ denotes total number of intermediates used as well as the labor quantity integrated into these intermediates. Y is assumed to grow at a rate g$\beta(1-a)/_a$ in the steady state where $g = \dot{n}/n$ represents the rate at which new varieties are developed.

A new variable known as knowledge capital is introduced into the model. It is assumed that manufacturers are able to develop dn of new varieties of intermediate goods by devoting $({}^{a}/_{K})dn$ quantity of labor per unit time to research where a is a constant and K denotes the stock of knowledge capital readily available at any moment to the economy. The model identifies two sources of accumulating knowledge capital: domestic and international sources.

The domestic source of knowledge capital is modelled to be dependent on the accumulation of spillover benefits of new internal research to existing knowledge capital in the economy. On the other hand, international source of knowledge capital is modelled to be dependent on the degree of interrelatedness between domestic and foreign agents and one basic medium is the degree of trade

between these economies. Thus knowledge capital(K) is specified to be a function of the volume of trade [T(t)] and the varieties of intermediate inputs that exists in the economy $n(t)$. $n(t)$ also show the aggregated quantity of internal research in the economy.

$$K(t) = f[n(t), T(t)] \tag{16}$$

Where F(.) is assumed to be increasing in both variables and homogenous of degree one. The homogeneity assumption allows for the definition of intensive form of the knowledge capital function:

$$K/_n \cong \rho(.) \equiv f[1,\ T(t)/n(t)], \qquad \rho' > 0 \tag{17}$$

Households are introduced into the model where they are seen to be maximizing their intertemporal utility function hence their consumption of the final good $Y\ and\ Z$. Consumption of each good is seen to grow at the same rate of the final output at the steady state and hence, trade volume also grows at that same rate i.e.

$$\dot{T}/_T = g\beta(1-a)/a \tag{18}$$

From equation 18, the authors showed that the relative importance of international trade spillover as a source of the accumulation of domestic knowledge capital which spur growth in the long run is dependent on relative magnitude of $\beta(1-\alpha)/\alpha$. In the situation where $\alpha > \beta(1-\alpha)$, then cumulative trade experience does not have much significant contribution to domestic capital accumulation. The degree of trade openness cannot change this happening thus the kind of trade regime cannot affect long-run growth rate. Trade policies tend to stimulate or de-stimulate accumulation of knowledge and hence growth while moving the economy to its steady state level and not affecting real growth in the long run. Open trade policies tend to accelerate

contacts hence, increasing knowledge acquisition thus growth and vice versa. On the other hand, where, $\alpha < \beta(1-\alpha)$, then the ratio of trade volume to the number of varieties tend to infinity hence the knowledge acquired as residents have contacts with others from different economies continues to propel growth in the long run. A country more open to trade however converges quickly to the steady state. Where $\alpha = \beta(1-\alpha)$, once again, open trade policy (reduction in tariff rate) works through the model to boost productivity in the research lab. Technology is boosted and growth of the economy is hastened- this occurs through spillover benefit arising from contact with foreign markets and businessmen. Trade also creates the incentive for local research and development which leads to growth. Hence, Grossman & Helpman (1990) showed that, trade openness creates the grounds for new ideas and technologies to be transferred across economies leading to improvement in the productivity of workers and technological advancement thus growth. These benefits are however, largely dependent on how open an economy is to the rest of the world.

Some economists also searched the medium through which both trade and finance can impact trade. For example, Kletzer & Bardhan (1987), theoretically, used the Heckscher-Ohlin trade model with financial sector included in it to show that economies with well-developed financial sector have comparative advantage in industries and sectors that depend more on external source of finance leading to growth. Beck (2003) and Baldwin (1989) provided support for the hypothesis developed by Kletzer & Bardhan (1987).

At the empirical level, various studies have been carried out with regards to trade-growth, trade-finance and finance-growth nexus. However, the determinants or factors of economic growth continue to be a debate in the literature. The next sub-section is a review of some empirical works.

2.2 Review of some empirical related works.

Financial development is seen as a vital condition for economic growth (Calderon &Liu, 2003) to a large extent in the literature. However, a question often asked with regards to finance-growth nexus is whether development of the financial sector lead to growth in the economy or economic growth lead to financial development. Patrick (1966) presented two hypotheses to test the relationship and the direction of causality between financial development and economic growth. They are the supply-lead hypothesis and the demand-following hypothesis. The supply-lead hypothesis presupposes that financial development propels growth; consequently, causality runs from financial development to economic growth whiles the demand-following hypothesis suggests a causal relationship from economic growth to financial development (economic growth leads to financial development). Most works in the literature rely on these two hypotheses developed by Patrick to find out the possible relationship and direction of causality between financial development and economic growth. There have been mixed results in the literature regarding this relationship. The direction of causality between these two variables thus is unclear (Calderon & Liu, 2003, Ndlovu, 2013). Guryay et all (2007) stated that, there is the likelihood of obtaining a positive, negative or neutral relation between financial development and economic growth. Thus, it is essential that one knows the direction of causality between these two variables as it has varied inference when policy design is involved both in the short-term and long-term (Ndlovu, 2013.)

Besides exploring whether the development of the financial system impacts positively or negatively on economic growth, an emerging issue with regards to the finance-growth nexus in the literature has been the issue of direction of causality between the two variables. Consequently, several studies have aimed at developing a deeper understanding into this relationship. Empirical

works carried out to assess the relationship between financial development and growth can be categorized into four groups. The first includes works that gave support to the supply-leading hypothesis thus, a causality running from financial development to economic growth:

Jung (1986) explored the causality between financial and real development for 56 countries (19 developed and 37 least developed) with the use of the traditional Granger causality test. He also studied the temporal behavior of causality between the two variables of interest. Results from the studies showed that least developed countries were characterized by causal direction running from financial to economic development, whilst the opposite was true for developed economies. Ahmad & Malik (2009) also analyzed whether financial sector development impacts economic growth through its effects on total factor productivity growth and domestic capital using a sample of thirty-five (35) developing countries. The authors used a panel data set for the period 1970-2003. The econometric framework was based on an augmented growth model where output was regressed on total factor productivity, stocks of domestic and foreign capital and the stock of labor. The Generalized–Method –of Moments– (GMM) estimation technique that allows for regression of variables in both levels and differences was employed in their study. With this approach, the authors were able to account for the problem of endogeneity of the explanatory variables and "for country- specific effects in dynamic lagged variables model such as a growth one". The results from the study suggested that development of the financial sector has a positive impact on capital stock growth which also enhances economic growth. In addition, Hermes and Lensink (2003) studied how finance impacted growth via Foreign Direct Investment using a panel data set covering the period 1970 to 1995 on 37 Latin America and Asian countries and 30 Sub-Saharan economies. The authors concluded that, a more sophisticated internal financial system will be able to mobilize savings, screen and examine investment projects, hence facilitating higher economic growth.

Ahmad & Malik (2009) and Hermes & Lensink (2003) found support for the supply-led hypothesis in their studies.

De Gregorio & Guidotti (1995) analyzed the long run association between financial development and economic growth for a sample of 98 high-income and low-income countries and 12 Latin American countries. They found out that financial development notably increases economic growth but that this effect varied across countries and times. Considering this, a positive effect was found for most middle- and low-income countries though that of some high-income countries was weak. In Latin American however, it was shown that in the face of high inflation, financial development significantly reduced economic growth. Their study also showed the main mechanism through which financial development impacted growth was through the effectiveness, instead of the level of investment. Again, Adu et al (2013) examined the long run effect of financial development on economic growth in Ghana for the period 1961 to 2010 using eight alternative proxies as indicators of finance among a set of controls. The authors utilized the cointegration within the ARDL bounds testing approach. The results suggested the existence of a long run relationship among the variables in only three out of the eight alternative growth-finance models specified. Thus, in the long run financial development influenced growth positively when it was proxied by domestic credit to the private sector as a ratio to GDP and total domestic credit but, dampened economic growth when it was proxied by broad money stock to GDP ratio. Hence, the authors concluded the effect of financial development on economic growth was very sensitive to the choice of proxy.

Furthermore, Hussain & Chakraborty (2012) investigated the relationship between financial development and economic growth as well as the direction of causality in Assam, a state in India using time series data from 1985 to 2009. The authors concluded that financial

development contributed positively to Assam's economic growth. Also, results from the Granger causality test provided evidence to support the supply-leading hypothesis as a unidirectional causality running from financial development to economic growth was observed. Apart from this, Kargbo & Adamu (2009) did a study on Sierra Leone to investigate the relationship that existed between financial development and economic growth for the period 1970 to 2008. Results from the study suggested a significant positive impact of financial development on economic growth. The authors arrived at the finance-leading growth hypothesis thus, a unidirectional causality was observed running from financial development to economic growth. In addition, the results suggested investment served as a key mechanism through which financial development impacted growth.

Along with the above studies, Adusei (2013) investigated the relationship that existed between financial development and economic growth in the case of Ghana. He used annual time series for the period 1970 to 2010. The author made use of the Fully Modified Ordinary Least Squares (FMOLS) and the Error Correction Model (ECM) estimation techniques. Results from the study suggested that financial development was deleterious to economic growth, both in the long and short run when it was proxied by broad money supply to GDP ratio and domestic credit to GDP ratio. On the other hand, when financial development was proxied by credit to the private sector to GDP ratio, a positive but statistically insignificant association existed with economic growth. The GMM estimation technique, which has the ability to control for heterogeneity of regressors and serial correlation of errors, was used as a robust check for the long and short run findings in the study. Results from the Granger Causality test suggested a unidirectional causality from financial development (broad money supply) to economic growth thus, rendered support for

the supply-lead hypothesis. However, no causality was found between financial development and economic growth when financial development was proxied by domestic credit.

The second category includes works that arrived at the demand following hypothesis hence, causality running from growth to financial development. Ndlovu (2013) studied the Zimbabwean economy to determine if any causal relationship and cointegration existed between its financial sector development and economic growth. The Augmented Dickey Fuller and Phillips-Perron unit root tests were used to ensure the variables were integrated of order one. The Johansen test for cointegration was performed and the results indicated the existence of long run relationship among the variables. A multivariate Granger causality test examined the direction of causality and results from the study gave support for the demand-following hypothesis, suggesting that in Zimbabwe, economic growth leads to increasing financial deepening. A vector error correction model was also estimated to determine how financial intermediation and institutional reforms were efficacious in stimulating continual economic growth. Besides, Jenkins & Katircioglu (2010) in their study on the economy of Cyprus arrived at the demand following hypothesis (in the case of M2). Economic growth was seen to stimulate money supply.

Also, Quartey & Prah (2008) empirically tested the finance-growth hypothesis on Ghana using four alternative proxies of financial development such as broad money to GDP ratio, domestic credit to GDP ratio, private credit to GDP ratio and private credit to domestic credit ratio. Results from the study provided evidence in support of the demand-following hypothesis when growth of broad money to GDP ratio was used as a proxy of financial development. However, there was no evidence in support of either demand-following or supply leading hypothesis in the case of the other proxies of financial development used in the study. At last, no statistical evidence in support of Patrick's stages of development hypothesis was found in the case of Ghana. Moreover,

Odhiambo (2009 and 2010) investigated the relationship between financial development, interest rate reforms and economic growth. It was concluded that, South Africa was characterized by the demand-following hypothesis as a unidirectional causality that runs from economic growth to financial development was observed. Boulila & Trabelsi (2004) investigated the causal link between financial development and economic growth with data series spanning 1960 to 2002 in the Middle East and North Africa (MENA) regions. Results from the Granger causality test provided evidence to support that development of the real sector lead finance. The demand-following hypothesis was arrived at. Evidence in support of the demand-following hypothesis was also present in studies by Odhiambo (2008) and Rachdi & Mbarek (2011) on Kenya and the MENA groups (Egypt, Morocco, Tunisia, and Turkey) respectively.

There are yet, some empirical works that argue that both financial development and economic growth complement each other thus, making the two mutually causal. To this effect, a bi-directional causality between the two variables is expected. These studies fall under the third category. Takaendesa & Odhiambo (2007) did a study on two Southern African countries-Zimbabwe and Malawi. The authors used Johansen and Juselius and Hsiao's test procedures to show that the direction of causality between financial development and economic growth is very susceptive to the choice of measurement of financial development. A bi-directional causality was seen to characterize the Malawian economy while the supply leading hypothesis predominated the Zimbabwean economy. Calderon & Liu (2003), used a pooled data of a hundred and nine (109) developing and industrial economies and utilized the Geweke decomposition test to investigate the direction of causality between financial development and economic growth. They found out that, financial development tends to magnify economic growth through more rapid capital accumulation and technological changes. Evidence of bidirectional causality between financial development and

economic growth was present when they split the study into two sample data. Thus, their study gave support to the supply leading hypothesis at one stage, then demand following hypothesis at the other stage. The direction of causality between financial development and economic growth thus remains unclear. Again, Demetriades & Hussein (1996) examined the causal relationship between financial development and economic growth for sixteen (16) developing countries. Results from the study suggested a bidirectional causality to a large extent and some evidence of reverse causation between them. The authors also stated that the patterns and direction of causality between financial development and economic growth varied across countries.

Fantessi & Kiprop (2015) conducted a study to investigate the relationship between financial development and economic growth in the West African Economic and Monetary Union (WAEMU) with the use of annual time series spanning 1981 to 2010. The authors concluded that financial development influences economic growth positively in these regions. The authors found that the causality between the variables was a bidirectional one. Wood (1993), and Akinboade (1998) also observed a bidirectional causality between financial deepening and economic growth in their works.

Additionally, Abebrese et al (2017) employed the ARDL estimation technique and Granger causality test to examine the association that existed between financial development and economic growth, as well as the direction of causality in Ghana for the period 1970 to 2013. The authors used domestic credit to the private sector and domestic deposit, both as a percentage of GDP, as measures of financial development. Results from the study suggested a positive (negative) significant influence of domestic credit to the private sector (domestic deposit) on economic growth. With regards to the direction of causality, a unidirectional causality was observed running from domestic credit to economic growth and from economic growth to domestic deposit. Thus,

the authors concluded that, Ghana was characterized by both the finance-led growth hypothesis and growth-led finance hypothesis.

Ghirmay (2004), Baliamoune-Lutz (2008), and Eso (2010) obtained mixed causality results in their works. Ghirmay (2004) conducted a study on thirteen (13) Sub-Saharan African countries to explore the causal relationship that existed between financial development and economic growth in those economies. The results showed that eight of the economies were characterised by the finance-led growth hypothesis. There was evidence of a bidirectional causality between financial development and economic growth in six other economies. The author concluded that development in the financial system will lead to acceleration of economic growth in these countries. Esso (2010) did a study on ECOWAS countries and arrived at the finance-led growth hypothesis for Cape Verde, Cote d'Ivoire, Ghana, Guinea and Liberia whiles bidirectional causality was concluded for Cape Verde and Sierra Leone. In the same vein, Baliamoune-Lutz (2008) obtained mixed causality results between financial development and economic growth in his study on three North African countries namely Algeria, Egypt and Morocco.

Darrat (1999) also investigated the finance-growth nexus on three Middle-Eastern countries namely Saudi Arabia, Turkey and the United Arab Emirates (UAM). Whereas, results from the multivariate Granger causality test suggested financial deepening lead to economic growth thus, rendered support for the supply-leading hypothesis in the case of Turkey, the UAM was seen to be characterized by the demand-following hypothesis in the long run as a unidirectional causality from economic growth to financial development was observed. Both the demand-following and supply-leading hypotheses were confirmed for the Saudi Arabia country. In the short run however, the supply-leading hypothesis was evident in both Turkey and UAM whiles neither of the hypothesis was confirmed for Saudi Arabia. Thus, results from the study provided evidence to support the

view that financial deepening lead economic growth. However, the strength of this evidence is dependent upon the country and the proxy of financial deepening used.

The last group includes works that found no causality between financial development and economic growth. Lucas (1988) and Stern (1989) arrived at this conclusion in their works.

Trade-growth nexus is another area in the literature that has received much attention thus, several theoretical and empirical studies have been carried out to find the relation that exist between trade openness and economic growth and these have yielded varying and sometimes conflicting outcomes. Most studies have basically focused on the contributory role of exports in exploring the relationship between trade and economic growth. Thus, the two underlying theories that have mostly been put to empirical test in the Trade-Growth nexus are the Export-Led Growth Hypothesis(which posits that export expansion is one of the key determining factors of growth and that the overall growth of economies can be attained not only via labor and capital increase but by exports expansions; thus, a unidirectional causality from exports to economic growth) and Growth-Led Exports Hypothesis which postulate causality from growth to exports i.e. an expansion of an economy gives rise to expansion of the export sector.

Some studies that have been carried out on the exports-growth nexus includes Hye & Siddique (2011), who explored the link that existed among exports, economic growth and terms of trade for Pakistan. The Ng-Perron unit root test was employed and results showed the variables were integrated of order one. Using the Autoregressive distributed lag model, a long run relation was established among the variables thus, it was observed from the study that cointegration existed when real exports and real GDP were dependent variables. The rolling window regression on the other hand confirmed a positive association between exports and GDP. The results showed that the Pakistan economy was characterized by the export-led growth theory in this case.

Bashir et al (2015) also examined the Exports-Led Growth hypothesis on the Pakistan economy with the use of Johansen cointegration test, a vector error correction model and Granger causality techniques. The authors empirically tested the extended Solow growth model on the country. Gross domestic product was regressed on gross capital formation, labor stock, a consumer price index and the terms of trade. The results from the Johansen co-integration technique suggested a strong long run relationship between exports and economic growth, after an Augmented Dickey Fuller unit root test was carried out to ensure the variables were integrated of order one. Finally, a vector error correction model was estimated. They obtained results which gave similar implications as Hye & Siddique's- The Pakistan economy was characterized by the export-led growth theory. Shaheen (2011) found evidence for the same theory for the Pakistan economy. Similarly, Deme (2002) did a study on Nigeria and got results which gave support to the trade-led growth hypothesis. This finding is in contrast to that of Alimi & Muse (2012) who arrived at results which gave support to the Growth-Led Export hypothesis for Nigeria. Jordan & Fiona (1998), and Henriques & Sardorsku (1996) also confirmed the growth-led exports hypothesis for Australia and Canada respectively.

Were (2015) investigated the trade-growth nexus based on a cross-country data. Results from the study was consistent with the literature concerning the positive impact of trade on economic growth to a large extent. However, it was observed that this positive impact of trade on economic growth was only significant for the developed and developing economies. This effect was not significant for the least developed economies which predominantly, constitute African countries. Alici & Ucal (2003) did a study on the Turkey economy using quarterly data on exports, industrial production and foreign direct investment for the period 1987.1 to 2002.4. The Vector Auto Regression(VAR) model was used to analyze the existence of causality between exports,

foreign direct investment and domestic performance. The estimation results showed that exports and growth were causally related in the long run and with the direction of causality running strictly form exports to growth. Hence, their results were in line with the Export-Led Growth hypothesis. In addition, Vlastou conducted a study on 34 African countries to examine the relationship between trade openness and economic growth over the period 1960 to 2003. In terms of causation, a unidirectional causality running from trade openness to economic growth was observed though, the author arrived at a negative significant impact of trade openness on economic growth. Jung & Marshall (1985) empirically tested the export-growth nexus with the use of data on thirty-seven (37) developing countries. The Granger causality methodology was utilized in the study. The results suggested a weak support for the export-led growth hypothesis.

There are, however, some studies that found bi-directional causality between growth and exports. Dritsaki et al (2004) used data on the Greece economy for a period of 42 years to find out what relationship existed between trade and GDP. The authors used the Johansen cointegration test with three lags to establish the existence of a long run relation among the variables. The Vector Auto regression model with an error correcting mechanism was estimated. They employed the standard granger causality test and discovered a bidirectional causal relation between exports and economic growth. Wernerheim (2000) investigated the cointegration and causality in the export-GDP nexus for Canada. Employing the Augmented Dickey Fuller and Phillips-Perron unit root tests, Granger causality test and Johansen cointegration tests, he obtained similar results as Dritsaki (2004) regarding the relation between exports and growth i.e. a bidirectional causality. Hence, his study did not lend support to whether growth preceded exports or exports preceded growth

Chen (2007) did a study to ascertain whether the Taiwan economy was characterized by the export-led growth (ELG) or Growth-Driven Export (GDE) theory. He employed the vector

correction model and bounds testing methodology and found out that, bidirectional causal relationship existed between its exports and output. In addition, he found the existence of a long run level equilibrium relationship among exports, output, terms of trade and labor productivity. Apart from this, Dar et al (2013) examined the export-growth nexus in the context of India with the use of wavelets based correlation and cross correlation methodology. The authors observed a strong positive association between exports and output growth. Also, the results of the wavelet cross-correlation suggested a bi-directional causal relation between the two variables.

Omisakin (2009) investigated the importance of the contributory role of exports to economic growth in Nigeria. The empirical model was based on an augmented Solow production function where output was regressed on capital, labor, exports, imports and exchange rate. The author tested for the stationarity of the variables under consideration with the use of Ng-Perron modified unit root test instead of the standard Dickey Fuller test based on the fact that, the former unit root test is appropriate for smaller samples. The study employed Toda-Yamamoto non-causality test which presented a bidirectional relation between output and exports and, the, Autoregressive Distributed Lag (ARDL) bounds testing cointegration method which showed that the variables were cointegrated. Results obtained showed that exports were indeed very significant to economic growth in Nigeria. In the same vein, Sakyi et al (2015) in their study on 115 developing countries, got results that provided evidence of a bidirectional causality between trade and economic growth. Also, Chow (1987) observed a strong bi-directional causality between exports growth and industrial growth in his study on eight newly industrializing economies. On the other hand, Tekin (2012) found no significant causality between foreign aid, trade openness and real GDP per capita in his study on twenty-seven (27) least developed African countries for the period 1970-2010.

There are still others that obtained mixed results in their works. Cruadros et al (2004) carried out a study to jointly analyze the Export-Led Growth hypothesis and Foreign Direct Investment growth nexus for Mexico, Brazil and Argentina from the 1970's to the late 2000's. Their results were a mixed one. The ELG hypothesis was evident in Mexico and Argentina that is, a unidirectional causality form exports to growth was found for the two countries. The case of Brazil was different as the ELG hypothesis was rejected. A unidirectional causality from growth to exports was rather found. The existence of FDI-growth nexus was also confirmed for the countries

Nasreen (2001) obtained similar mixed outcome from a study of some eight (8) Asian developing economies. Using panel homogenous causality hypothesis, it was shown that economic growth impacted exports significantly in the selected panel. Bi-directional causality between exports and growth was obtained on the other hand, when the panel non-homogenous causality hypothesis was used. Results from the use of heterogeneous causality hypothesis, however, supported the Growth-led exports for the Pakistan, Sri Lanka and Indonesia economies. Malaysia and Thailand economies were characterized by the Export-led growth theory whiles bidirectional causality was present for India and the Philippines. The case of Bangladesh was different. It was characterized by neither the Export-led growth theory nor growth-export theory. A neutral hypothesis was realized in its case.

Gries et al (2009) examined the trade-growth nexus on sixteen Sub-Saharan African countries. Results from the study suggested the absence of a significant long run relationship among the variables for most of the samples under study. A unidirectional causality was observed running from economic growth to trade openness in Ethiopia, Gabon, Kenya, Mauritius, Senegal, Sierra Leone and Togo. Thus, these economies were concluded to be characterized by the growth-

led trade hypothesis. However, a bidirectional causality between trade and growth existed for Cameroon, Cote d'Ivoire, Nigeria and Rwanda. No causal relation was found between the two series in the case of Burundi, Ghana, Madagascar, South Africa, and Gambia.

There are some economists who are of the view that economic growth can be stimulated by not only exports but imports as well hence, the Imports-Led-Growth hypothesis. However, empirical studies that look into the relationship between imports and economic growth remain very minimal. Moroke & Manoto (2015) stated in their work that, the failure to account for imports will cause a deficit in an economy's balance of payments. The authors also wrote that, both growth in exports and imports were linked stereotypically thus, a false relationship between exports and economic growth will result in if imports are not controlled for. Studies such as Mahaderan & Suardi (2008) examined both the Export-led Growth and Import-Led Growth hypotheses on Japan and Korea. The results indicated that, whereas economic development in Japan was import-led growth, GDP growth in Korea was not significantly impacted by either exports or imports. In the same vein, Thangavelu & Rajaguru (2004) used time series data and the vector error correction model to examine the relationship that existed between international trade and efficiency of labor for nine fast growing Asian countries. The results from the study suggested that imports influenced the development in output more importantly than exports. In addition, a unidirectional causality from imports to output development was observed in India, the Philippines, Malaysia, Indonesia, Taiwan and Singapore. Likewise, Katircioglu (2012) in his study on the Sub-Saharan economy confirmed import-led growth hypothesis. However, studies by Humpage (2000) provided support for the growth-led imports hypothesis as a unidirectional causality was observed running from income to imports at quarterly frequencies. A positive association between imports and economic growth was established in the studies.

Moroke & Manoto (2015) investigated the long and causal relationship between exports, imports and economic growth in South Africa. The authors obtained results that confirmed the existence of a long run relationship among the variables. A unidirectional causality from export to GDP and from imports to GDP was observed hence, the authors concluded that South Africa was characterized by both the import-led growth and export-led growth hypotheses.

In the literature also, are works that investigates into the relationship that exists between financial development and trade (proxied to a large extend, exports). Most have focused especially on the roles finance play on exports whiles a few presented the direction of causality between them. Beck (2002 and 2003), looked at the link that existed between financial development and trade in manufactured good for 65 countries over the period 1966 and 1995. He mentions in his work that many economists are of the view that the link between financial development and trade is that of demand-driven thus, financial sector development follows rather than leads the real sector development – economies that specialized in specific industries tend to create the demand for a well-developed financial sector. He found that, economies with higher levels of financial development have higher shares of manufactured exports in GDP and in total merchandise exports hence higher trade balance in manufactured goods. He suggested that financial development leads to exports increase in industries that are highly dependent on external source of finance.

Also, Bilas et al (2017) investigated if any relationship existed between financial development and international trade in the Croatian economy. They used the Auto-Regressive Distributed lag(ARDL) bounds testing approach to show that financial development impacted negatively on international trade in the long run. However, a positive relationship existed between them in the short run. The results from a Granger causality test suggested a unidirectional causality from financial development to international trade in the Croatian economy. Jung et al (2006) tested

the hypothesis that economies with higher(lower) financial development levels will have higher exports share and trade balances in industries with less(more) tangible assets. The authors concluded that economies with relatively developed financial sectors have a comparative advantage in industries characterized by intangible assets.

Awudu et al (2018) studied how finance impacts trade using a sample of forty-six (46) African countries. They showed that financial development was detrimental to trade when it was proxied by private credit but positively related to trade when proxied by domestic credit. The study, also presented a U-shape relation between exports and private credits meaning finance can impact trade only when it exceeds a certain threshold. They concluded by stating by financial markets may be detrimental to trade for economies with low level of financial development but beneficial to trade in economies with a well-developed and well-functioning financial system.

Coban (2015) obtained mixed results with regards to finance-trade nexus. He examined the causal relation between the export performance of firms in manufacturing sector and financial development in two dimensions as banking sector and stock market development in Turkey. The results from the study indicated a bidirectional causality between development of stock market and exports performance. A unidirectional causality was seen from exports to the banking sector development from the beginning periods till after the second year when the relationship becomes a bidirectional one. Hence, the direction of causality of the banking sector and export performance differ according to groups.

There are empirical works in the literature that have investigated the medium through which both finance and trade impact growth. Chow (1987) postulated that financial development improves the comparative advantage of industries in an economy which leads to growth. These two (financial development and international trade) are mutually interdependent hence highly

correlated with each other and for that matter economic growth. Findings from his study also gave support to the export-led growth strategy. Similar findings were obtained by Balaguer & Cantavella-Jorda (2002) in their study on the Spain economy. These authors however looked as international tourism which can be considered as trade instead of exports and found a unidirectional causality from tourism (trade) to economic growth.

There are yet some empirical works in the literature that have looked at financial development, international trade and economic growth concurrently.

Jekins & Katircioglu (2010) used the bounds test for co-integration and Granger causality tests to determine if any long run equilibrium relationship existed between financial development, international trade and economic development in Cyprus, and the direction of causality among them. The authors used annual time series data covering the period 1960-2005 and the variables used in the regression model were real GDP, real broad money, real domestic credit provided by the banking sector as proxies for financial development, and real exports and imports of goods and services. The authors used both the Augmented Dickey Fuller and Phillips-Perron unit root tests as a means of checking for stationarity and correcting or accounting for any auto-correlation that the time series data may be characterized with. The empirical results obtained from the study suggested that the three variables were cointegrated, thus a long run equilibrium existed amongst them. The Granger causality tests under the vector error correction model and vector autoregressive model were then estimated. The results suggested a unidirectional causality running from real GDP to M2, exports and imports and from imports to exports. The study also suggested a unidirectional causation from M2 to imports and a bidirectional causation between domestic credit and imports in the short run. The demand following hypothesis (in the case of M2), output-driven exports and

output-driven imports hypotheses were supported, hence economic growth can be said to stimulate growth in international trade and the money supply in Cyprus.

Katircioglu (2012) did a similar study on the Sub-Saharan economy using same modelling approach as Jenkins & Katirciouglu (2010). He used the bounds test for level relationship within the autoregressive distributed lag model approach and results from the study confirmed the existence of a long run equilibrium relation between financial development, international trade and economic development. A conditional granger causality test was performed and unidirectional causalities were seen running from M2 and Domestic credits to economic growth; M2 to imports and from economic growth to exports. Empirical results from his study however gave support to the supply-leading hypothesis and the import-led growth hypothesis was also confirmed instead.

Shaheen et al (2011), also did a study on the Pakistan economy using the Autoregressive-distributed Lag approach for cointegration and Granger causality to investigate the long run relation and direction of causality between financial development, international trade and economic development. Results from the bounds test cointegration showed the existence of a long run relation amongst the variables after employing unit roots tests (the augmented Dickey Fuller and Phillips-Perron tests) to see if variables under consideration were stationary. Error correction model was estimated. The authors also employed the Cumulative Sum (CUSUM) and Cumulative Sum of Square (CUSUMQ) tests to check for parameters consistencies. The supply-led growth hypothesis was confirmed for the Pakistan economy according to this study as a unidirectional causality was found from financial development to economic growth. Also, a unidirectional causality was found from financial development to international trade and from international trade to economic growth. Financial development was concluded as a stimulant for economic growth.

Rahman et al (2015), employed the auto-regressive distributed lag bounds testing approach to cointegration to explore the relationship that existed amongst financial development, international trade and economic development for Australia. The empirical model is based on an augmented production function where real Gross Domestic Product per capita was regressed on real domestic credit to private sector per capita (proxy for financial development), real trade openness per capita and real capital use in per capita. In other to account for non-stationarity in the data series arising from structural breaks which can render the regression results spurious, the authors used Zivot-Andrews, (1992) and Clemente et all (1998) structural break unit root test instead of the ordinary Augmented Dickey fuller test because, in the face of breaks, the ADF test is invalid. The unit root test showed that all variables had unit roots. Findings from the ARDL bounds testing approach with two lags of the variables showed that long run relationship existed between the three variables of interest. This finding was also confirmed from the Johansen cointegration test approach. Estimating the vector error correction model granger causality test, a bidirectional causality between international trade and economic growth was obtained on one hand while the supply-led hypothesis was confirmed for Australia as unidirectional causality was seen running from financial development to economic growth. Financial development, international trade and capital were seen to be the driving forces of economic growth for Australia.

Katiricioglu et al (2007) also examined the possible cointegration and direction of causality between financial development, international trade and economic growth in India using annual data covering the period 1965-2004. The Dickey Fuller and Phillips-Perron unit roots tests were employed to test for the order of integration of the variables. The tests suggested the variables were integrated of order one, thus stationary at first differences. The authors used the Johansen trace test for cointegration with one lag of the variables and the results suggested that there exists a long run

relationship between financial development, international trade and economic growth in the case of India. The error-correction model was estimated to determine the direction of causality. A unidirectional causality was suggested that runs from real income to exports and imports, from exports to imports, M2 and domestic credit, from M2 to imports and from imports to domestic credit. A bidirectional causality was found between real income and M2 and between real income and domestic credit. Thus, neither the supply-led or demand-following hypothesis could be confirmed for India from the study. Output-driven exports and output-driven imports were however seen to characterize India thus economic growth can be said to stimulate growth in international trade in India.

Omoke Philip (2009) studied the causal relationship that existed among financial development, trade openness and economic growth in Nigeria for the period 1970-2005. He employed the augmented Dickey Fuller and Phillips-Perron unit root test to the variables and found out that they are non-stationary in levels but stationary in first difference. Using the Johansen and Juselius multivariate cointegration test, findings showed there existed no cointegration among the different measures of financial development (Domestic credit, private credit, broad money(M2) all as percentages of GDP), trade openness and economic growth. Estimating the model with two lags for the variables, results from granger causality test indicated a uni-directional causality that runs from economic growth to trade openness, economic growth to domestic credit and money supply respectively, trade openness to domestic credit and money supply to trade openness. Findings from the study provides support for the supply-led hypothesis and growth-led trade theory for Nigeria.

Considering the discussion of some works in the literature above, the finance-growth and trade-growth relations are varying. The differing views and conclusions put forward by various researches concerning the subject topic can be said to be as a result of data length, proxy indicators

of finance and trade respectively and the estimations framework. The exact relations that exist among these variables are complex and continue to be an issue of debate among researchers thus the need for case-by-case study in view of each economy's distinctive attributes.

CHAPTER 3

3.0 DATA, MODELLING AND METHODOLOGICAL FRAMEWORK

This chapter presents the design of the study, the data sources, appropriate variable measurement and definitions, descriptive statistics characterizing the variables (such as the mean, median, standard deviation etc.) and the various econometric estimation techniques to be employed in the study.

3.1 Data sources

In research, there are mainly two types of data that researchers make use of. They are primary and secondary sources of data. The data used in this study is purely secondary and includes variables measuring economic growth, financial development and international trade of the Ghanaian economy covering the period 1965-2017. The time series annual data on Gross Domestic Product per capita, trade openness, domestic credit to the private sector, broad money supply, domestic banks assets, gross capital formation, government expenditure and inflation were sourced from the World Development Indicators (WDI) and Global Financial Development (GFD) databases.

3.2 Definition and measurement of the variables

In regression analysis, there are mainly two primary variables we work with- the dependent variable also known as the endogenous variable (the main variable which we are trying to predict) and the independent variables also known as the exogenous variables (changes in these variables are suspected to have effects or cause changes in the dependent variable). Thus, in data analysis, we examine the impact of changes in the independent variables on the dependent variable.

In order to examine the possibility of a long run relationship and determine the direction of causality among economic growth, financial development and international trade, an empirical growth model is developed. The dependent variable is real economic growth and the independent variables include financial development, international trade, gross capital formation, government expenditure and inflation.

3.2.1 Dependent variable- Economic growth.

In the literature, researchers who have investigated the relationship between "trade and growth" and "finance and growth" have made use of different measures of Gross Domestic Product (GDP) to denote economic growth. GDP is defined as the "sum of gross value added by all resident producers in the economy plus product taxes, and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources" (World Bank Indicators). Real GDP growth, per capita GDP, and the level of real GDP are the common measures of GDP that various researchers have used in the literature on growth.

For example, Adu et al (2013) used the percentage change in real GDP as a proxy for economic growth while Adusei (2013) used the percentage change in real GDP per capita as a measure of economic growth. On the other hand, Antonio (2012) used both measures of real growth in his work. The following studies also used the percentage change in real GDP as the suitable measure of economic growth. (Shaheen et al, 2011; Dritsaki et al, 2004; Jenkins & Katircioglu,2010; Shahbaz & Rahman ,2012; Alimi & Muse ,2013; Abdul & Feridun, 2011). However, studies by Rahman et al ,2015; Abebrese et al, 2017; Keho ,2017; Shabaz, 2010; Loesse ,2010; used the percentage change in real GDP per capita. Jordan & Alan (2002) and Awokuse (2008) adopted the growth rate in real GDP as a measure of economic growth in their works.

Conforming to these studies, -the annual percentage change in real gross domestic product per capita (*RGC*)-is used as a measure of economic growth in this study. Gross Domestic Product per capita is defined as gross domestic product divided by population.

3.2.2 Independent variables

3.2.2.1 Financial development

Financial development can basically be seen as the development in the size, efficiency and stability of, and access to, the financial system. Development in the financial sector results when financial markets, instruments and intermediaries interrelate to reduce transactions costs (costs of acquiring information, enforcing contracts and executing transactions) and mitigate risk incurred in the financial system. The development of the financial sector has been viewed as a vital condition for economic growth in the literature. Thus, in order to understand the process of financial development and its impact on economic growth, there is a need to find a suitable measurement for it.

However, because of the very wide characteristics of financial sector development, it is difficult to identify a direct way of measuring it. Regardless, in the literature distinct measures of GDP have been used by researches as proxies for financial development on a larger scale.

Antonio (2012) used the ratio of M2 to GDP and the ratio of M2 minus currency to GDP as proxies for financial development. Loesse (2010) also proxied financial development using credit to the private sector as a percentage of GDP. Omoke (2009) used private credit as a percentage of GDP, domestic credit as a percentage of GDP and broad money as proxies for financial sector development, whereas Jordan & Alan (2002) employed the ratio of total credit to GDP and the spread between borrowing and lending rates of interest as financial development proxies. Shaheen et al (2015) and Jenkins & Katircioglu (2010) used real domestic credit provided

by banks and real broad money(M2) in their respective studies as proxies for financial development.

In line with the above, in this study, domestic credit to the private sector as a percentage of GDP (*DCPS*) (De Gregorio and Guidotti, 1995; Adusei, 2013; Siaw & Adam, 2010; Loesse, 2010; Abdul & Feridun, 2011; Awudu et al, 2018); real broad money as a ratio to GDP (*BMS*) (Antoni, 2012; Adu et al, 2013) and deposit money banks' assets as a percentage of GDP (*DMBA*) (King & Levine, 1992; Kumar & Bird, 2020) are used as proxies for financial development.

3.2.2.2- International Trade

International trade simply refers to the exchange of goods and services between countries. It is a very important phenomenon as trading globally presents consumers access to goods and services which otherwise couldn't be produced domestically or could be but at very expensive prices. In the literature international trade has been proxied by either solely exports, imports or a combination of both. In this study, the trade variable is proxied by trade openness which is computed as the sum of real exports and real imports of goods and services relative to real GDP(*IT*) (Omoke, 2010; Adu et al, 2013; Abebrese et al, 2017). This measure is used to describe the level of Ghana's integration with the international market.

3.2.2.3 Control Variables

In other to enrich my analysis, I specify additional variables that are thought to affect growth. These include gross capital formation as a percentage of GDP (*GCF*) (proxy for capital stock growth), general government final consumption expenditure to GDP ratio (*GOV*) (proxy for real gross government expenditure) and inflation (*INF*) (proxied by or as measured by the annual

growth rate of the GDP implicit deflator to show the rate of price changes in the economy as a whole).

The real GDP per capita (real output) and trade openness variables are in their natural log forms whiles inflation is in percentages. All other variables are expressed as a percentage of GDP. Real GDP per capita is at 2010 USD constant prices.

3.3 Model specification

In line with Adu et al, (2013) and following Jalil & Feridun (2011); Khan (2018) and other works, the following empirical model is presented in this studies:

$$RGC_t = \theta_0 + \theta_1 t + \theta_2 FD_t + \theta_3 IT_t + \theta_4 GCF_t + \theta_5 GE_t + \theta_6 INF_t + \mu_t \quad (19)$$

Where RGC_t denotes the natural log of real Gross Domestic Product per capita (annual percentage changes in this variable is a measure of economic growth), FD_t represents financial development, IT_t is the log of trade openness, GCF_t is gross capital formation (% of GDP) (a proxy for the growth in the capital stock), GE_t is general government final consumption expenditure (% of GDP) and INF_t stands for inflation. In this study, three different proxies of financial development are used: domestic credit to the private sector, real broad money and deposit money banks' assets (all as a % of GDP). The parameters to be estimated are $\theta_0, \theta_1, \theta_2, \theta_3, \theta_4, \theta_5, and\ \theta_6$, "t" is the trend component and μ_t is the random error term assumed to be drawn from a normal distribution with constant variance.

3.3.1 A-priori expectations

On account of the theoretical and empirical literatures reviewed, the growth theory predicts a positive relation between financial development and economic growth (Jalil & Feridun, 2011;

Khan, 2008; Rahaman et al, 2015). Thus, a positive relationship between the three proxies of financial development (domestic credit to the private sector, broad money and domestic money banks' assets) and economic growth is expected in this study. In the same vein, trade openness is expected to have a positive impact on economic growth (Grossman & Helpman, 1994). Also, gross capital formation is anticipated to have a positive impact on economic growth (Mankiw et al, 1992). While government expenditure is also expected to have a positive impact on economic growth (Abebrese et al, 2017), inflation on the other hand is presumed to have a negative association with economic growth. (Gregorio, 1992; Fisher 1993)

3.4 Methodology and estimation technique

The empirical examination carried out in this study involves three steps. The first involves exploring the stationarity of the variables with the use of various unit root tests. The second step is to explore for the possibility of a long run relation among the variables under study. Afterwards, either both long and short run models (in the presence of cointegration) or short run model (in absence of cointegration) will be constructed. The last step is to carry out a causality test among the variables via the granger causality test.

3.4.1 Unit root tests

Before performing a cointegration test for equation (1), there is the need to check for the stationarity level of the variables in the model. The unit root test checks for the presence of unit roots in the variables to determine if differencing is required. The ARDL bound test cointegration technique can be used whether the series are I (1) or I (0) thus, it avoids the unit root pre-testing. However, there is the need to carry out the unit root test in this study to ascertain that none of the series is integrated of order two (2) as this will render the computation of the F-test for cointegration

invalid. The Augmented Dickey Fuller (ADF) and Phillips-Perron unit root tests are the two common forms of methods used for checking the stationarity of series in most empirical works. The Augmented Dickey-Fuller as the name suggests is an augmented form of the Dickey-Fuller unit root test which involves estimating the model:

$$A_t = \beta_0 + \delta_t + \omega A_{t-1} + \mathcal{E}_t \tag{20}$$

Which can also be re-written as

$$\Delta A_t = \beta_0 + \delta_t + \aleph A_{t-1} + \mathcal{E}_t \tag{20a}$$

By means of the ordinary least squares (OLS). The issue of serial correlation of the error term however introduces some setbacks. To resolve this issue, the lags of the first differences of A_t is included on the right hand of the equation in (20a). Rewriting equation (20a) generates the popularly known Augmented Dickey-Fuller model in equation (21)

$$\Delta A_t = \beta_0 + \delta_t + \aleph A_{t-1} + \sum_{i=1}^{n} \theta_i \Delta A_{t-i} + \mathcal{E}_t \tag{21}$$

Where, A_t is the macroeconomic time series; Δ represents the first difference of the time series A_t being tested; $\aleph = w - 1$ in equation 20a, and A_{t-1} is the first lag of the time series; ΔA_{t-1} is the lagged first difference of the series included to account for the problem of serial correlation in the errors ; n is the maximum lag length and $\mathcal{E}_t$ is the random error term assumed to be stationary.

The Phillips Perron unit root test is used as alternative to the Augmented Dickey-Fuller unit root test in this study. The test entails fitting equation (20a) whose results are used to calculate the test statistics. The test estimates equation (20) and corrects or accounts for any form of serial correlation and heteroscedasticity in the errors $\mathcal{E}_t$ nonparametrically by adjusting the Dickey-Fuller test statistics. An advantage the Phillips-Perron unit root test has over the Augmented Dickey Fuller

is that, the former's test statistics are robust to common forms of heteroscedasticity in the errors $\mathcal{E}_t$.

In both the ADF and PP models, the null hypothesis that $\aleph_t$ equal zero against the alternative that $\aleph < 0$ are tested. If the null hypothesis is rejected, it indicates the series is stationary i.e. do not exhibit a unit root. Failure to reject the null means the series is non-stationary (has a unit root) thus, follows a random walk.

One basic problem of the discussed traditional unit root tests (ADF, PP) is that, they do not allow for the possibilities of structural breaks that may occur in the series. Hence, in the presence of breaks, they are inappropriate procedures for testing for the presence of a unit root. Perron (1989) showed that, the ADF tests tend to be bias towards the conclusion of a unit root if there exists a one-time break in the mean of the series. Hence, the study deemed it appropriate to also check for the level of integration of the variables by means of the Zivot-Andrews (1992) unit root test in addition to the ADF and PP tests. Their unit root test is a built up on the original Perron's (1989) unit root test which allows for an exogenously determined break date or time in the series. However, a variation of the ZA unit root test is that, it allows for a single break-point date to be endogenously determined. Thus, they presume that the exact time for which the break occurs is not known. The ZA tests for unit root is carried out in three models: model A which allows for a one-time change in the intercept of the series; model B which permits a one-time change in the slope of the trend function, and model C which includes one-time changes in both the intercept and slope of the trend function of the series. Zivot & Andrews (1992) employed the following three equations of which each equates the three mentioned models above to test the null for the presence of a unit root versus the alternative of a one-time structural break.

$$A_t = \beta_o^A + \delta_t^A + \aleph^A A_{t-1} + \alpha^A DU_t(\wedge) + \sum_{i=1}^{n} \theta_i^A \Delta A_{t-i} + \mathcal{E}_{t1} \qquad \text{Model A}$$

$$A_t = \beta_o^B + \delta_t^B + \aleph^B A_{t-1} + \Omega^B DT_t^*(\wedge) + \sum_{i=1}^{n} \theta_i^B \Delta A_{t-i} + \mathcal{E}_{t2} \quad \text{Model B}$$

$$A_t = \beta_o^C + \delta_t^C + \aleph^C A_{t-1} + \alpha^C DU_t(\wedge) + \Omega^C DT_t^*(\wedge) + \sum_{i=1}^{n} \Delta\theta_i^C A_{t-i} + \mathcal{E}_{t3} \quad \text{Model C}$$

Where $DU_t(\wedge)$ represents the intercept dummy which takes the value of 1 if $t > T\wedge$ and zero otherwise. $\wedge = T_\beta/T$ and T_B is the time break; $DT_t^*(\wedge)$ corresponds to the slope dummy which equals $t - T\wedge$ if $t > T\wedge$ and zero otherwise; all other terms maintain their definition in equation (21).

In all the three models above, the null hypothesis is that $A_t = \beta_0 + A_{t-1} + \mathcal{E}_t$. Failure to reject the null hypothesis means that, the series A_t contains a unit root excluding any structural break. Otherwise, the series is a trend-stationary process with a one-time break occurring at an unknown point in time.

3.4.2 Cointegration test (the ARDL estimation technique)

The study utilizes the Auto Regressive Distributed Lag model (ARDL) bounds testing approach to cointegration recently developed by Pesaran et al, (2001) which is based on a general to specific modelling technique and is applicable regardless of the integration levels of the variables of interest (be it I (0) or I (1) provided none is integrated of order two. (I (2))

The ARDL model is one containing the lagged value(s) of the dependent variable, current and lagged values of the independent variables as regressors. Unlike the Vector Auto Regressive (VAR) model, the ARDL model combines both endogenous and exogenous variables. In situations where data sample sizes are small and finite, the ARDL model is more efficient relatively. Also, the long run estimates obtained from this model are unbiased.

The bounds test for cointegration within the Auto Regressive Distributed Lag model (ARDL) is employed in the study in order to analyze the long run relationship (test for cointegration) among economic growth, financial development, international trade and other variables considered determinants of growth of an economy. This technique was formulated and initiated by Pesaran and Shin (1995 and 1998), Pesaran et al. (1996), Pesaran (1997) and Pesaran et all (2001) to test for cointegration among variables. It was later revised by Nayaran (2005) for usage in smaller data sample sizes (30 to 80 observations). This procedure has advantages over other cointegration tests such as the Johansen (1991) and Engle and Granger (1987) cointegration approach in the sense that, it is flexible as it can be used in cases where variables are of different orders of integration. Thus, unlike other cointegration techniques, the ARDL allows for the usage of both variables that need no differencing to become stationary (I (0)) and those that become stationary after first differencing (I (1)). It however, does not allow for variables that become stationary only after second differencing (I(2)). Hence, it can be applied whether the regressors in the model are purely I (1), I (0) or mutually cointegrated (Pesaran ,1997). Secondly, this technique allows for different optimal lag lengths to be assigned to the variables in the model. In the face of smaller data sample size, the ARDL technique is relatively more efficient as the other techniques require large data sample size for their validity to hold. Also, through a simple linear transformation, an unrestricted Error Correction model can be attained from the ARDL bounds testing approach. This technique integrates short run dynamics from the long run equilibrium without loss of long run information. Variables in the ARDL model stand as a single equation thus, this technique is devoid of residual correlation (Puatwoe & Piabuo, 2017).

Having listed some advantages associated with the ARDL, the study formulates the following ARDL model framework to explore the cointegration among the variables:

$$\Delta RGC_t = \sum_{i=1}^{p^1} \alpha_{11i}\,\Delta RGC_{t-i} + \sum_{i=0}^{q^2} \alpha_{12i}\,\Delta FD_{t-i} + \sum_{i=0}^{q} \alpha_{13i}\,\Delta IT_{t-i} + \sum_{i=0}^{q} \alpha_{14i}\,\Delta GCF_{t-i}$$
$$+ \sum_{i=0}^{q} \alpha_{15i}\Delta GE_{t-i} + \sum_{i=0}^{q} \alpha_{16i}\Delta INF_{t-i} + \beta_{01} + \alpha t + \beta_G RGC_{t-1} + \beta_{FD} FD_{t-1}$$
$$+ \beta_{IT} IT_{t-1} + \beta_{GCF} GCF_{t-1} + \beta_{GE} GE_{t-1} + \beta_{INF} INF_{t-1} + \mu_{1t} \qquad (22)$$

Equation (22) is re-estimated using each of the variables on the right hand side as a dependent variable. This is the case of equations (22a) - (22e).

$$\Delta FD_t = \sum_{i=1}^{p} \alpha_{21i}\,\Delta FD_{t-i} + \sum_{i=0}^{q} \alpha_{22i}\,\Delta RGC_{t-i} + \sum_{i=0}^{q} \alpha_{23i}\,\Delta IT_{t-i} + \sum_{i=0}^{q} \alpha_{24i}\,\Delta GCF_{t-i}$$
$$+ \sum_{i=0}^{q} \alpha_{25i}\Delta GE_{t-i} + \sum_{i=0}^{q} \alpha_{26i}\Delta INF_{t-i} + \beta_{02} + \delta t + \beta_G RGC_{t-1} + \beta_{FD} FD_{t-1}$$
$$+ \beta_{IT} IT_{t-1} + \beta_{GCF} GCF_{t-1} + \beta_{GE} GE_{t-1} + \beta_{INF} INF_{t-1} + \mu_{2t} \qquad (22a)$$

$$\Delta IT_t = \sum_{i=1}^{p} \alpha_{31i}\,\Delta IT_{t-i} + \sum_{i=0}^{q} \alpha_{32i}\,\Delta RGC_{t-i} + \sum_{i=0}^{q} \alpha_{33i}\,\Delta FD + \sum_{i=0}^{q} \alpha_{34i}\,\Delta GCF_{t-i}$$
$$+ \sum_{i=0}^{q} \alpha_{35i}\Delta GE_{t-i} + \sum_{i=0}^{q} \alpha_{36i}\Delta INF_{t-i} + \beta_{03} + \gamma t + \beta_G RGC_{t-1} + \beta_{FD} FD_{t-1}$$
$$+ \beta_{IT} lnIT_{t-1} + \beta_{GCF} GCF_{t-1} + \beta_{GE} GE_{t-1} + \beta_{INF} INF_{t-1} + \mu_{3t} \qquad (22b)$$

$$\Delta GCF_t = \sum_{i=1}^{p} \alpha_{41i}\,\Delta GCF_{t-i} + \sum_{i=0}^{q} \alpha_{42i}\,\Delta RGC_{t-i} + \sum_{i=0}^{q} \alpha_{43i}\,\Delta FD_{t-i} + \sum_{i=0}^{q} \alpha_{44i}\,\Delta IT_{t-i}$$
$$+ \sum_{i=0}^{q} \alpha_{45i}\Delta GE_{t-i} + \sum_{i=0}^{q} \alpha_{46i}\Delta INF_{t-i} + \beta_{04} + \sigma t + \beta_G RGC_{t-1} + \beta_{FD} FD_{t-1}$$
$$+ \beta_{IT} IT_{t-1} + \beta_{GCF} GCF_{t-1} + \beta_{GE} GE_{t-1} + \beta_{INF} INF_{t-1} + \mu_{4t} \qquad (22c)$$

[1] The lag order "p" in equations 22 to 22e are different in each summation term.

[2] Similarly, the "q" lag order is different in each summation term in equation 22 through to 22e

$$\Delta GE_t = \sum_{i=1}^{p} \alpha_{51i}\, \Delta GE_{t-i} + \sum_{i=0}^{q} \alpha_{52i}\, \Delta RGC_{t-i} + \sum_{i=0}^{q} \alpha_{53i}\, \Delta FD_{t-i} + \sum_{i=0}^{q} \alpha_{54i}\, \Delta IT_{t-i}$$
$$+ \sum_{i=0}^{q} \alpha_{55i} \Delta GCF_{t-i} + \sum_{i=0}^{q} \alpha_{56i} \Delta INF_{t-i} + \beta_{05} + \nu t + \beta_G RGC_{t-1}$$
$$+ \beta_{FD} FD_{t-1} + \beta_{IT} IT_{t-1} + \beta_{GCF} GCF_{t-1} + \beta_{GE} GE_{t-1} + \beta_{INF} INF_{t-1} + \mu_{5t} \quad (22d)$$

$$\Delta INF_t = \sum_{i=1}^{p} \alpha_{61i}\, \Delta INF_{t-i} + \sum_{i=0}^{q} \alpha_{62i}\, \Delta RGC_{t-i} + \sum_{i=0}^{q} \alpha_{63i}\, \Delta FD_{t-i} + \sum_{i=0}^{q} \alpha_{64i}\, \Delta IT_{t-i}$$
$$+ \sum_{i=0}^{q} \alpha_{65i} \Delta GCF_{t-i} + \sum_{i=0}^{q} \alpha_{66i} \Delta GE_{t-i} + \beta_{06} + \varsigma t + \beta_G RGC_{t-1} + \beta_{FD} FD_{t-1}$$
$$+ \beta_{IT} IT_{t-1} + \beta_{GCF} GCF_{t-1} + \beta_{GE} GE_{t-1} + \beta_{INF} INF_{t-1} + \mu_{6t} \quad (22e)$$

Where $RGC_{t,}\, FD_{t,}\, IT_t\ , GCF_{t,} GE_t\ , and\ INF_{t,}$ maintain their respective definitions as explained in equation (19) above. Δ represents the difference operator and $\beta_G, \beta_{FD}, \beta_{IT}, \beta_{GCF}, \beta_{GE,} and\ , \beta_{INF}$ are parameters to be estimated. "P" and "q" are the ARDL optimal lag lengths of the variables chosen using the Akaike information criterion. $\mathrm{t} = 1, 2, \ldots, \mathrm{T}$ and μ_{it} is the error term, also known as the unobservable zero mean white noise.

The next step of the ARDL bounds test procedure is to test for the possible long run relationship that may exist among the variables with the use of the F-statistic. The F-test will be carried out on the joint null hypothesis that the coefficients of the lagged variables ($\beta_G RGC_{t-1}$, $\beta_{FD} FD_{t-1}$, $\beta_{IT} IT_{t-1}$, $\beta_K K_{t-1}$, $\beta_{GCF} GCF_{t-1}, \beta_{GE} GE_{t-1}, \beta_{INF} INF_{t-1}$) are zero. β_G, β_{FD}, β_{IT}, β_{GCF}, β_{GE}, β_{INF} coefficients correspond to the long run relationship whiles the α_{1i}, α_{2i}, α_{3i}, α_{4i} and α_{5i} coefficients constitute the short run dynamics of the model.

Hence, the bounds test procedure will specify the null hypothesis in equations (22) to (22e) as:

$H_0: \beta_G = \beta_{FD} = \beta_{IT} = \beta_{GCF} = \beta_{GE} = \beta_{INF} = 0$ signifying the non-existence of a long run relationship among the series. (absence of cointegration)

The alternative hypothesis is specified as

$H_1: \beta_G \neq \beta_{FD} \neq \beta_{IT} \neq \beta_{GCF} \neq \beta_{GE} \neq \beta_{INF} \neq 0$. This implies the existence of a long run relationship among the series (presence of cointegration).

Failure to reject the null hypothesis means no long run relationship exist among the variables i.e. the variables do not move together towards the steady state in the long run. Hence, any deviation arising from shocks to the system has no tendency to be restored back. The short run model (ARDL) is specified in this case. On the other hand, rejection of the null hypothesis in favor of the alternative signifies the existence of a long run relationship among the variables. The error correction model is specified in this regard.

The F-test used in the bounds test has a non-standard distribution hence, two bounds of critical values at various significance levels proposed by Pesaran et al, (2001) are utilized. Thus, the F-statistics that will be calculated will be compared to the 1%, 5% and 10% critical values of Pesaran et al, (2001). They present two set of critical values. The first set assumes all the variables are I (0) (the lower critical bounds assumes the variables are I (0) hence there exist no cointegration among them) whiles the second set assumes the all the variables are I (1) (meaning the upper critical bound assumes all the underlying variables are I (1) hence there exist co-integration among them). Thus, the decomposed critical values by Pesaran et al, (2001) into upper critical bounds (I (1)) and lower critical bounds (I (0)) helps to make an appropriate cointegration conclusion. If the estimated F-stat value is greater than the upper critical values, we reject the null hypothesis of no cointegration among the series irrespective of whether the variables are I (0) or I (1). However,

when the F-stat falls below the lower critical bounds, we fail to reject the null hypothesis of no cointegration among the series. On the other hand, if the F-stat value lies in between the lower and upper critical values bounds; the test is inconclusive.[3] These two critical bounds values by Pesaran et al, (2001) were developed for a sample size of 1,000 based on 40,000 replications of a stochastic stimulation so, Narayan (2005) following their methodology, computed new sets of critical bounds values for usage in smaller sample sizes (30 to 80 observations). The number of observations of each variable in this study is 53, so the critical bounds values of Narayan (2005) are applied instead of those of Pesaran et al, (2001) as they are considered more appropriate for smaller observations.

The study relies on results from the bounds test to determine whether to specify a short-run(ARDL) model or an Error correction model (ECM) [one made up of both the short run and long run dynamics]. Thus, if the results show that the variables are cointegrated, then the (ECM) model is specified and estimated. However, if the results indicate that the variables are not cointegrated, then the short run (ARDL) model is adopted.

If a long run relationship is seen to exist among the variables, the short term dynamics will be captured by the error correction model as follows:

$$\Delta RGC_t = \alpha_{01} + \alpha t + \sum_{i=1}^{p} \alpha_{1i} \Delta RGC_{t-i} + \sum_{i=1}^{q} \alpha_{2i} \Delta FD_{t-i} + \sum_{i=1}^{q} \alpha_{3i} \Delta IT_{t-i} + \sum_{i=1}^{q} \alpha_{4i} GCF_{t-i} + \sum_{i=1}^{q} \alpha_{5i} \Delta GE_{t-i} + \sum_{i=1}^{q} \alpha_{5i} \Delta INF_{t-i} + \Omega ECT_{t-1} + \varepsilon_t \quad (23)$$

All variables maintain their respective definitions from equation (19). Ω indicates or measures the speed of adjustment parameter. The ECT shows the speed of adjustment back into the long run equilibrium following short run shocks to the model. Hence, it shows the extent to

[3] Inconclusiveness of the test results will require additional information on the specified model to proceed with the ARDL bounds methodology. As such, information about the cointegration rank of the forcing variables will have to be known. (see Pesaran et al, 1999).

which disequilibrium in GDP in the previous year is adjusted or corrected for in the current period. If Ω takes on a positive value, we have a situation of divergence (any shock to the system in the short run will cause it to diverge away from its long run equilibrium level) whereas a negative Ω means convergence (the system following any external shock still converges to its long run equilibrium level). It is however, ordinarily expected to be negative and be statistically significant thus additionally rendering support for the existence of cointegration or long run relationship among the series.

The associated long run growth equation is specified as:

$$RGC_t = \delta_0 + \delta_1 t + \sum_{i=1}^{p} \delta_1 RGC_{t-i} + \sum_{i=1}^{q} \delta_2 FD_{t-i} + \sum_{i=1}^{q} \delta_3 IT_{t-i} + \sum_{i=1}^{q} \delta_4 GCF_{t-i} + \sum_{i=1}^{q} \delta_5 GE_{t-i} + \sum_{i=1}^{q} \delta_4 INF_{t-i} + \omega_t \quad (24)$$

Where FD, IT, GCF, GE, INF are the long run explanatory or driving variables of growth. "q" is the optimal lag length for the long run growth model and it will be selected on the basis of the Akaike Information criterion(AIC).

3.5 Goodness of fit

The parameter stability of the model will be tested by applying the following diagnostic tests for normality, serial correlation and heteroscedasticity.

Normality.

The Jarque-Bera (JB) test (a type of Lagrange multiplier test) is used in order to test the normality of the errors of the estimated models. The test matches the skewness and kurtosis of the data with those from normal distribution to determine if it is normally distributed or not. Hence, JB test statistics which follows asymptotically a chi-square distribution is computed. The null of

the JB test is that, the errors are normally distributed against the alternative that they are not. The P-value associated with the test statistics is relied upon to make a conclusion. Specifically, the null that the errors are normally distributed is rejected when a p-value is lesser than the specified significance level. Otherwise, fail to reject the null.

Serial correlation.

The study makes use of the Breusch-Godfrey (BG) test to examine the presence of serial correlation in the errors of the estimated models. This test is also known as the Lagrange multiplier test for serial correlation. Unlike the Durbin-Watson test which is limited to detecting first order autocorrelation, the BG test is designed to discover serial correlation in errors up to any order *P* (where *P* is a pre-specified integer). The test extracts and utilizes the residuals from the estimated models, based on which the BG LM test statistic is calculated. Thus, the test regresses the residuals on the original regressors and the lagged residuals up to order *p*. The null hypothesis of this test is that, there is no serial correlation in the errors of any order up to *P*. The null is rejected if the p-value is lesser than the chosen significance level. Otherwise, we fail to reject the null and conclude that the errors are not serially correlated.

Heteroscedasticity.

The White's (1980) test is employed to test for the presence of heteroscedasticity in the errors of the estimated models of the study. The null hypothesis of the absence of heteroscedasticity in the errors is tested against the alternative of the presence of heteroscedasticity. The test involves running a regression of the squared residuals on the original regressors and their squared terms as well as their cross terms (if data size allows). A test statistic which is the number of observation multiplied by R-squared from the model (NR2) and follows chi-square distribution is computed

thereof. The associated P-value of the test statistics is used in making a decision. Specifically, when the p-value is greater than the specified significance level, fail to reject the null hypothesis and conclude that, the errors are homoscedastic. Otherwise, the null is rejected.

In addition to the white test, the study utilizes the Autoregressive Conditional Heteroscedasticity (ARCH) test to assess the presence of conditional heteroscedasticity in the errors of the model. The null hypothesis that, there is no ARCH up to order q in the residuals is tested versus the alternative that, there is ARCH effect in the residuals. The ARCH test runs a regression of the squared residuals on a constant and the lagged squared residuals up to order q. An F-statistics from the test regression which follows a chi-square distribution is calculated. The null hypothesis is rejected if the probability value is lesser than the specified significance level. Otherwise, fail to reject the null.

Ramsey RESET test

The Ramsey (1969) test is employed in order to test whether the functional forms of the estimated models in the study are mis-specified or not. RESET symbolizes Regression Specification Error Test. This test is a general test for specification errors such as omitted variables (the model does not include all relevant series), inappropriate functional form (whether all or some of the series should be log transformed, have powers, reciprocals or some other forms) and correlation between the explanatory variables and the error term which can arise from measurement errors in the regressors or presence of lagged values of the dependent variable and serially correlated errors.

The test runs a regression of the original functional form and adds powers of the predicted values of the dependent variable (constituting the linear combinations of powers and cross product

terms of the regressors). The test computes an F-statistics and log-likelihood ratio to test the null hypothesis that the coefficients on the powers of the fitted values are all zero (the model is correctly specified) against the alternative that they are not. A p-value associated with the F-statistics is used to make a conclusion. Hence, a p-value lesser than the chosen significance level leads to the rejection of the null hypothesis (the model is not rightly specified). Otherwise, fail to reject the null hypothesis.

3.5.1 Stability tests

Structural changes in the Ghanaian economy increases the likelihood of subjecting the macroeconomic series to one or multiple breaks. Hence, in this study, the stability of the short-run and long-run coefficients is checked by means of the CUSUM[4] and CUSUMQ tests suggested by Brown et al (1975). These tests are general tests for structural changes in the sense that, they do not require a prior determination of where the break takes place as opposed to the chow test which necessitates break point(s) to be specified. The CUSUM is a critical test for instability in the intercept whiles the CUSUMQ is a vital one for instability in the variance of the regression error. Hence, in order to make a valid conclusion that the period of the study equation remains stable, the study relies on the information provided by the estimated CUSUM and CUSUMQ stability tests.

3.6 Test for causality.

If two or more variables are I (1) and also cointegrated, then a granger causality in at least one direction should exist (Engle & Granger, 1987). The ARDL approach only discloses the existence of cointegration relationship among the variables. It doesn't reveal any causality

[4] It has been shown that no form of CUSUM test will detect structural break if the change is orthogonal to the regressors or occurs early (or late) in the sample period. CUSUM tests have a weak power to reject a false null hypothesis of stability, and their finite sample power is a decreasing function of the sample size (see Garbade (1977), Proberger et. al (1990), Turner (2010) among others)

information about the variables. The study thus conducts a granger causality test to ascertain the direction of causality that may exist among the variables. Once a long run relationship is seen to exist among the variables, the following error correction model based granger causality is applied to investigate the direction of causality among them:

$$\begin{bmatrix} \Delta RGC_t \\ \Delta FD_t \\ \Delta lnIT_t \\ \Delta GCF_t \\ \Delta GE_t \\ \Delta INF_t \end{bmatrix} = \begin{bmatrix} a_1 \\ a_2 \\ a_3 \\ a_4 \\ a_5 \\ a_6 \end{bmatrix} + \sum_{i=1}^{p} \begin{bmatrix} b_{11i} b_{12i} b_{13i} b_{14i} b_{15i} b_{16i} \\ b_{21i} b_{22i} b_{23i} b_{24i} b_{25i} b_{26i} \\ b_{31i} b_{32i} b_{33i} b_{34i} b_{35i} b_{36i} \\ b_{41i} b_{42i} b_{43i} b_{44i} b_{45i} b_{46i} \\ b_{51i} b_{52i} b_{53i} b_{54i} b_{55i} b_{56i} \\ b_{61i} b_{62i} b_{63i} b_{64i} b_{65i} b_{66i} \end{bmatrix} \times \begin{bmatrix} RGC_{t-i} \\ \Delta FD_{t-i} \\ \Delta lnIT_{t-i} \\ \Delta GCF_{t-i} \\ \Delta GE_{t-i} \\ \Delta INF_{t-i} \end{bmatrix} + \begin{bmatrix} \alpha \\ \beta \\ \delta \\ \gamma \\ \theta \\ \varsigma \end{bmatrix} [ECT_{t-1}] + \begin{bmatrix} \nu_{1t} \\ \nu_{2t} \\ \nu_{3t} \\ \nu_{4t} \\ \nu_{5t} \\ \nu_{6t} \end{bmatrix} \quad (25)$$

Where Δ is the difference operator, ECT_{t-i} is the lagged residual which will be obtained from the long run ARDL relationship in equation 6; $\nu_{1t}, \nu_{2t}, \nu_{3t}, \nu_{4t}, \nu_{5t}, \nu_{6t}$ are independently and normally distributed error terms with zero means and constant variance. The causality test is performed without the ECT_{t-1} if no cointegration is found amongst the variables in question. There are two sources of causality. They are the short run causality and the long run causality. For there to be a long run causality, a significant t-statistic will be required on the coefficient of the ECT_{t-1}. However, if the F-statistics on the first differences of the variables are statistically significant, then we can infer a short run causality. In addition to this, a strong causality can be inferred through the joint significance of the error correction terms and the independent lagged terms.

CHAPTER 4

4.0 EMPIRICAL RESULTS AND ANALYSIS

This chapter presents empirical results and analysis of the various tests that were discussed in chapter three. All the regression tables for this study have been grouped in the appendix at the end of the thesis paper.

4.1 Descriptive statistics

Table 3 presents a descriptive statistics of the variables of the study under panel (I) as well as correlations between the series under panel (II). From the table, it can be observed that the log of real GDP per capita (RGC) has an average value of 6.912 and was at its highest peak at 7.461 in 2017. Also, the three proxies of financial development (DCPS, BMS and DMBA) and trade openness in log also averaged 8.591, 22.655, 11.314 and -0.765 respectively. In addition, most of the series exhibit positive sign of skewness. The p-value associated with the Jarque-Bera test statistics suggest that, the null hypothesis that the variables are normally distributed cannot be rejected for DCPS, BMS, DMBA, GCF and GE but is rejected in the case of RGC, LTO and INF at the 5% significant level.

Under panel (II), it is observed that a strong positive correlation exists between RGC and DCPS, BMS, DMBA and LTO whereas a moderate negative correlation exists between RGC and INF. Also, a positive correlation is seen to exist between RGC and GCF and GE but this association is a weak one. “However, correlation does not imply causation” (Keho, 2017). A strong positive correlation is observed to exist between the three proxies of financial development. The positive correlation between RGC and the three proxies of financial development can be compatible with the supply-leading hypothesis or the demand-following hypothesis. In terms of GDP and trade, the

positive correlation can be consistent with the trade-led growth, growth-led trade or a two-way causality between them.

4.2 Stationarity analysis

The first step in estimating the existence of a long run relationship among financial development, international trade and economic growth is to test the stationarity properties of these series. It is of great importance especially for policy implications. For instance, if the economic growth series is found to be non-stationary, then shocks to the economy by certain economic policies (such as fiscal, monetary, stabilization policies) will have a permanent effect on the levels of real output. Otherwise, these policies are seen to have a temporal effect if the economic growth series is a stationary one. In the same vein, if the financial development and trade variables are non-stationary, but stationary of the same order as economic growth, then financial and trade polies adopted to ensure an improvement in the efficiency of the financial and trade sector will have a permanent effect. However, these policies will have a temporary effect if the variables are stationary in levels.

In this study, the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Zivot-Andrews (ZA) unit root tests were employed to examine the stationarity levels of the variables. Tables 3.1 and 3.2 report the Augmented Dickey-Fuller and Phillips-Perron unit root test results of the variables both in levels and first differences while Tables 3.3 and 3.4 presents that of the Zivot-Andrews unit root test. Though the Auto Regressive Distributed Lag (ARDL) approach can be used regardless of the order of integration of the variables, there is a need to ensure that none of them is integrated beyond order two (2) as it renders the cointegration test invalid. This is because, the F-statistics for establishing the existence of cointegration among the variables rests on this assumption.

From Table 3.1, when the ADF unit root was carried at the intercept levels only, it was observed that variables such as the log of real GDP per capita, domestic credit to the private sector (% of GDP), broad money (% of GDP), deposit money banks' assets (% of GDP), log of trade openness, gross capital formation (% of GDP) and the inflation rate all had a unit root, while government expenditure was stationary. When the test was augmented with a trend term, the same results were found. However, carrying out the test without an intercept and trend, all variables appeared to be non-stationary. The Phillips-Perron (PP) unit root test results support the findings from the ADF unit root test except that, in addition to the government expenditure series, the inflation rate was also found to be stationary at levels when the test was carried out with the intercept only, both trend and intercept, and without trend and intercept. The PP test is taken into consideration in this study because its procedure calculates a residual variance which is robust to auto-correlation. Hence, with the exception of the government expenditure and inflation rate variables, the study failed to reject the null hypothesis of the presence of a unit root of the variables at levels at the 1%, 5% and 10% significance levels. These variables are thus non-stationary and said to be integrated of order one (1).

From Table 3.2, the unit root tests were carried out on the first differences of each series. All the variables became stationary when the tests were carried out with intercept only, both trend and intercept, and without an intercept and trend term. Thus, the null hypothesis of the presence of a unit root in the series was rejected at the 1% significance level. Using the Akaike Information Criterion(AIC), the optimal lag length used to carry out the ADF unit root test was two (2), whiles that of the Phillips-Perron test was based on the Newey-West Bandwidth. The test has suggested that, treating the variables as a mixture of I (0) and I (1) processes is appropriate and thus provides

justification for the adoption of the ARDL approach which allows for both I (1) and I (0) series to be incorporated in the same equation.

The results from these two traditional tests may be biased as they do not take into the consideration the possibility of any structural breaks that may be occurring in the series. In the literature, failure to examine the existence of a structural break in the generation of a data process could engender a considerable decrease in the statistical significance of these traditional unit root tests, thus providing a misleading hypothesis test. Hence, in this study I complement the ADF and PP unit root tests with the Zivot-Andrews (Zivot and Andrews, 1992) unit root test in order to discover the existence of any possible structural break in the series. The procedure allows for a structural break to be identified at an unknown break point. The test was carried out under three (3) scenarios: for intercept only, for trend only, and for both intercept and trend. From Table 3.3, when the unit root test was conducted for intercept only, all the variables were seen to be non-stationary without any exogenous breaks in their means as the null hypothesis of a unit root without any exogenous break in means could not be rejected at the 1%, 5% and 10% significance level. Carrying out the ZA test with trend seemed to provide the same results as the unit root with intercept, except for the fact that the domestic money banks assets variable appeared to be stationary at the 10% significance level. At both intercept and trend, every other variable was seen to have a unit root without any exogenous break in both their means and trend, except for the inflation rate variable. The null hypothesis of a unit root without any exogenous break in both mean and trend in the variable was rejected at all significance levels and thus the inflation rate series was determined to be stationary with a break in its mean and trend. From Table 3.4, the results suggest that when the unit root test was carried out on the variables in their first differences, all the series were found to be stationary with time breaks in their respective means, trends and both means and

trends. Therefore, the null hypothesis of the presence of a unit root without any structural break was rejected at the 10%, 5% and 1% significance level.

The ZA unit root test identified a break in the trend of real Gross Domestic Product per Capita in 1984. The breakpoint in 1984 coincides with the year following the implementation of the Economic Recovery Program(ERP) policies under the International Monetary Fund and the World Bank. The ERP program was supplemented by the Structural Adjustment Program(SAP) in 1986. This ERP program was purposed to halt the decline in economic growth and to stabilize the economy. The economy responded positively to the ERP program which resulted in notable shift in the growth of real GDP from about -4.6% in 1983 to 8.3% in 1984.

From the discussions above, the results from the unit root tests have established the fact that most of the variables are non-stationary at the levels but are stationary in their first differences. Hence, they suggest that none of the series are integrated beyond I (1).

4.3 Cointegration Analysis

After establishing that the variables are stationary at I (1), the next step is to explore the existence of any possible cointegration among the variables. The presence of a cointegrating relationship suggests that a long run equilibrium is shared among economic growth, financial development, international trade, gross capital formation, government expenditures and the inflation rate, as proposed by theory. In this study, the long run equilibrium relationship between the variables are investigated with the use of the bounds tests for cointegration within the ARDL model.

The initial step in the bounds testing methodology is to choose appropriate lag lengths of the variables in the computation of the F-statistics that will be used to investigate whether

cointegration exists among the variables or not. The maximum lag length for each variable was set to three. The computational process is very sensitive to the number of lags selected thus, the study relied on the AIC to select the optimal lag structure in the model.

Tables 3.5, 3.6, and 3.7 present the results of the F-statistics of the ARDL bounds testing for Models A, B AND C respectively. The study employed three different proxies of financial development namely: domestic credit to the private sector, broad money supply and deposit money banks asset. These proxies are used one at a time to examine their individual effects on economic growth hence, three alternative growth models are specified. In all three models, the test was carried out with a constant and a trend. In the literature, due to the prevailing interrelationship that is thought to exist among financial development, international trade and economic growth, endogeneity problems are likely to arise. Following the work of Lawal et al (2016), equation (22) is re-evaluated by making each of the regressors serve as a dependent variable to address any endogeneity problem.

In Table 3.5 (Model A), financial development is proxied by domestic credit to the private sector. It is observed that, when economic growth is regressed on the rest of the variables, a significant long run equilibrium is said to exist among the variables as the calculated F-statistics exceeded the upper critical bounds at the 1% significance level, leading to the rejection of the null hypothesis of no level relationship among the variables. However, when the regression was normalized in financial development and international trade (i.e. when DCPS and LTO were made to serve as dependent variables respectively), no cointegration was seen to exist among the variables as the calculated F-statistics from these models fell below the lower critical bounds. The null hypothesis of no levels relationship among the variables could not be rejected in these

instances. Normalizing the regression in the three control variables also proved the existence of compelling long run relationship among the variables.

In Table 3.6 (Model B), financial development is proxied by broad money as a percentage of GDP. Similar to the results in Table 3ai, when the log of real GDP per capita is treated as a predicted variable, a compelling and significant long run relationship is established among the series that is significant at the 1% significance level. Normalizing the regression in trade once again resulted in the absence of cointegration among the series as the calculated F-statistics fell below the lower critical bound. However, when broad money is used as a dependent variable, the null hypothesis of no levels relationship among the variables is rejected at the 5% significance level, suggesting that the variables are cointegrated. Like the previous results, keeping each of the three control variables as dependent variables resulted in the rejection of no levels relationship. Cointegration was present in these models.

In Table 3.7(Model C), deposit money banks' assets (% of GDP) is used a proxy of financial development. In the growth model, that is, when the log or real GDP per capita was regressed on the rest of the variables, the outcome of the calculated F-statistics was no different from the ones observed in Models A and B. A significant and compelling existence of a long run relationship among the variables was established as the F-statistics exceeded the upper critical bounds at the 1% significant level. The null hypothesis of no level relationship among the variables was once again rejected in Model C. Normalizing the regression in domestic money banks assets and trade openness, the null hypothesis of no levels relationship could not be rejected just like the case of Model A. Cointegration is seen to be absent in these models. Keeping each of the control variables as a dependent variable results in the rejection of no level relationship among the variables. Like results from Models A and B, cointegration was seen to exist when the regression was normalized

in these variables. The same number of regressors were used in the three alternative specifications, thus the same critical values were used for their test statistics.

To summarize the cointegration results from the three models, it is concluded that there exists cointegration between real GDP and its driving forces. Hence, a long run relationship is seen to exist among economic growth, financial development, international trade, gross capital formation, government expenditure and the inflation rate in the case of Ghana for the period 1965-2017. When trade openness is treated as a forcing variable, cointegration is seen to exist, but when it is treated as an outcome variable, cointegration is seen to be absent. The case of financial development is a mixed one. Cointegration is seen to be absent when domestic credit to the private sector and deposit money banks assets are used as proxies and treated as outcome variables. Using broad money as a proxy and an outcome variable however, cointegration was seen to exist. The treatment of these three proxies as forcing variables was characterized by the presence of cointegration.

Now that cointegration has been established between the variables, the next step is to estimate the long and short run impacts of financial development, international trade, gross capital formation, government expenditure and inflation on the economic growth of Ghana

4.3.1 Long run results.

Model A

Table 3.8 presents the results of the long run relationship among the variables when economic growth is the dependent variable. In this model, domestic credit to the private sector is the measure of financial development. Although theory predicts a positive impact from trade openness and gross capital formation to economic growth, the coefficients on these variables in the study are seen to be negative. Domestic credit to the private sector is seen to have a positive

relationship with economic growth that is statistically significant at the 1% significance level. Specifically, a one percent (1%) increase in domestic credit to the private sector (% of GDP) is associated with a 0.039 percent (%) increase in real GDP per capita. This significant results obtained is in agreement with McKinnon & Shaw (1973) and the endogenous growth theorists concerning the relationship between financial development and economic growth. They postulate that financial development impacts the growth of an economy positively via investment. In the endogenous growth theory, emphasis is placed on the role of financial sector development in the promotion of innovations, income distributions and the speed of technological progress (King and Levine,1993a). Thus, in line with prior expectations, in the long run, the development of the financial sector measured by DCPS leads to increased growth of the Ghanaian economy. This result is validated by the findings of Adu et al (2013), Abebrese et al (2017) and Beck et al (2000), but in contrast to Adusei et al (2013) who found a positive but statistically insignificant association between domestic credit to the private sector and economic growth.

International trade is measured by the degree of openness of an economy in terms of trade with the rest of the world. The results in Table 4ai suggest a negative association with economic growth in the long run. This means that trade with the world over the years has had a detrimental effect on the growth rate of the economy. However, the result was found to be statistically insignificant. This results contradicts the notion of comparative advantage and the endogenous innovation-based growth model developed by Grossman & Helper (1994) that proposed that as an economy opens up to the rest of the world, it gets access to a larger and improved base of technological know-how that results in increased production. The framework for a positive growth effect of trade through innovation incentives, technology diffusion and knowledge diffusion is not

supported in this model. This result agrees with the findings of Adusei et al (2013) and Abebrese et al (2017), but contradicts those of Lewal et al (2016) and Rahaman et al (2015).

From the Table 3.8, gross capital formation as a percent of GDP (proxy of investment) has a negative and statistically significant association with the log of real GDP per capita (economic growth.) This negative association contradicts the Solow growth theory which predicts a positive contribution from the capital stock to economic growth through a production function. A unit increase in gross capital formation is associated with a 0.027 decrease in economic growth. That is, in the long run, increases in investment is associated with a decline in economic growth (new investments were not enough to replace worn out capital and still contribute positively to capital stock growth hence a reduction in economic growth). Thus, domestic investments in the economy over the years have been inadequate to drive growth positively. This finding is in agreement with conclusions by Abebrese et al (2017) and Adu et al (2013), but is not consistent with findings by Mankiw et al (1992) and Aryeetey & Fosu (2005).

The estimated coefficient on the government expenditure series is 0.079 and is statistically significant at the 1% significance level. This suggests that a positive association exists between the government expenditure series and the log of real GDP per capita (economic growth). Put specifically, when government expenditure (% of GDP) increases by 1%, economic growth also increases by 0.079. That is to say, increases in government expenditure on elements such as education, construction of roads and water systems or on research and development that leads to the invention of new technology has the ability to propel growth in the long run. This finding however, contradicts the "crowding-out effect" theory - as government undertakes expansionary fiscal policies and increases its expenditure more than its revenue, it can result in a budget deficit and in order to finance the deficit, it borrows. A budget deficit increases the demand for financial

capital. This leads to a reduction in the financial capital made available to private firms and investors to invest in physical capital in the economy. As postulated by the neoclassical economists, increased growth is caused by increased investment in physical capital, thus a reduction in investment as a result of crowding out by government expenditure will lead to a reduction in the growth of the economy. This result is corrobated by the findings of Abebrese et al (2017) and Mankiw & Scarth (2008).

In this model, the inflation rate has the expected negative sign. It is negatively associated with economic growth. This is in agreement with the theoretical postulation that high inflationary levels are associated with reduced levels of economic growth as high inflation rates increase nominal interest rates which in turn, tend to increase the cost of borrowing. This leads to a reduction in investment by the private sector and hence reduced growth. Empirical works by Fischer (1993) and Gregorio (1992) support the negative association between inflation rates and economic growth. Though a negative relationship between inflation and the log of real GDP per capita (economic growth) was arrived in this model, it is not statistically significant.

It was observed that there was a trend in real GDP per capita of 1.4% growth over the time period that was statistically significant at the 1% significance level.

Model B

The long run association between the variables when financial development is measured by the broad money supply (% of GDP) is reported in Table 3.9. The log of real GDP per capita is still the dependent variable in this model. The results show a positive association between financial development (BMS) and economic growth in the long run. This relationship is no different from when financial development was proxied by domestic credit to the private sector in Model A. Hence, an increase in the supply of money is associated with an increase in economic growth.

Specifically, a one percentage increase in the broad money to GDP ratio coincides with a 0.017 increase in economic growth and this is statistically significant at the one percent (1%)significance level. This finding conforms to the Keynesian view that changes in money supply lead to changes in real output levels and prices, but is in contrast with the monetarist view that changes in the money supply affects only prices but not real output levels (money neutrality). An increase in the money supply tend to lower interest rates which encourages investments in the long run, spurring growth. The result agrees with findings by Chaitip et al (2015), but disagrees with Adusei et al (2013) and Ogunmuyiwa & Ekone (2010) who found that the money supply had no significant predictive power in explaining real output levels.

Similarly, to model A, trade openness maintained a negative but insignificant relationship with the log of real GDP per capita (economic growth). This is of no surprise as the Ghanaian economy over the past years has become a net importer, thus rather than add to its trade balance and hence GDP, high imports reduce real GDP and result in negative growth. Gross capital formation and government expenditure; both as a percentage of GDP, also maintained their negative and positive- statistical significance associations with the log of real GDP per capita as in Model A. That is, a one percentage increase in gross capital formation (government expenditure) is associated with a 0.030 (0.067) decline (increase) in economic growth and these relations were statistically significant at one percent (1%).

Inflation also preserved its negative association with economic growth, but in this model, the association was statistically significant, Hence, a one-point increase in inflation rate (as measured by the annual growth rate of the GDP implicit deflator) is associated with a 0.011 decline in economic growth, statistically significant at one percent (1%). This result is in contrast with the "Mundell-Tobin effect" theory about the positive relationship between inflation and economic

growth. Based on the neo-classical growth theory, Mundell (1963) and Tobin (1965) showed that rises in nominal interest rates as a result of inflation will cause people to invest more than they consume, and that increases in investments will lead to an increase in capital accumulation that will enhance growth of the economy. The result here is in conformity with the long run growth model originated by Stockman (1981) using the "cash-in-advance" constraint assumption. Unlike Mundell (1963) and Tobin (1965) who viewed real money balances and investments as substitutes, Stockman (1981) viewed them as complements and since individuals will reap the profit of these investments in the form of money, inflation tends to diminish both the real money balance and investment which hurt economic growth. Empirical work by Gregorio (1996) lends support to the robust negative relation between inflation and economic growth.

The positive trend in real GDP per capita over the period was seen to be still significant in this model at 2.2%.

Model C

In the third and final growth model, financial development was proxied by deposit money banks assets to GDP ratio. The long run estimates are presented in table 4.0. Like the previous models, a positive and statistically significant association was estimated between financial development and the log of real GDP per capita (economic growth). Thus, as deposit money banks increase their assets by one percent, economic growth also increases by 0.017. This has also lent support to the positive impact of financial development (measured by the size of financial institutions) on economic growth in the literature. As banks increase their assets, hence their size, they increase their ability to extend more loanable funds to private investors and small business to undertake productive projects which tend to increase economic growth in the long run. Thus, they help in the allocation of scarce capital to the most productive sectors, spurring economic growth.

This result however is in contrast to conclusions by Kumar & Bird (2020), Prochniak & Wasiak (2017) and La Porta et al (2002) that increases in bank size had a negative impact on economic growth.

Trade in this model was estimated to have a positive correlation with economic growth unlike the results in Models A and B. The study found weak evidence of a positive and statistically significant relation but only at the10 percent significance level. Put specifically, as Ghana opens up its trade with the rest of the world by one percent, a 0.177 increase in economic growth results. This result agrees with the comparative trade advantage theory and corroborates empirical findings by Dollar (1992), Frankel & Romer (1996) and Rahman et al (2015).

Among the three control variables, gross capital formation and government expenditure preserved their robust and statistically negative and positive relation with economic growth respectively. A one percent increase in gross capital formation is associated with a 0.022 decline in growth of the economy, whiles a percent increase in government expenditure is associated with a 0.055 increase in economic growth. These relations are statistically significant at the one percent significance level. The relation between government expenditure and economic growth is supported by findings from Van Wijnbergen (1983). The author concluded that increases in government expenditure impacted economic growth positively in Turkey. Inflation had the expected negative relationship with economic growth, but this relation was not statistically significant. A time trend was indicated overall positive growth in the log of real GDP per capita in the long run.

To summarize the long run relationship, the results suggest that all three measures of financial development can be said to be robust determinants of economic growth. Trade openness on the other hand, cannot be said to be a robust determinant of economic growth in the long run as

its coefficient changes as the specification of the growth function changes. In Models A and B, trade openness had a negative and insignificant association with economic growth, but in Model C, it attained a positive and marginally significant association with economic growth. Among the three control variables, gross capital formation and government expenditure maintained their significantly negative and positive relations with economic growth respectively, and can be viewed as robust determinants of economic growth in the long run. Inflation is not a robust determinant of economic growth in the long run, just like the trade openness variable. The time trend was seen to characterize the positive growth of the log of real GDP per capita in the long run.

4.3.2 Short run results

Tables 3.81, 3.91 and 4.1 present the estimates of the short run impacts of financial development, international trade and the control variables on economic growth.

In Table 3.81, domestic credit provided to the private sector is the measure of financial development. The error correction term (ECT_{t-1}) measures the speed of adjustment back to a long run equilibrium following short run shocks to each of the independent variables in the model. That is, it shows the extent to which the endogenous variable responds to changes in the independent variables while returning to its long run equilibrium. Put differently, the model estimates how the disequilibrium in the log of real GDP per capita in the previous year adjusts in the current year, captured by the lag of the error correction term. The negative and statistical significance of the ECT_{t-1} is as expected and lends support to the existence of a long run relationship among the series, hence convergence in the long run. The coefficient of -0.492 in the growth specification equation in model A suggests that the short run deviations from the long run equilibrium are restored by 49.2 percent towards the long run equilibrium path each year. Any deviations created in the previous year will be corrected at a speed of approximately 49 percent in the current year.

With regards to the short run impacts, domestic credit extended to the private sector does not appear to be a robust determinant of economic growth. Its coefficient suggests a negative and insignificant relation with economic growth. This result contradicts findings from the long run estimates, but does agree with conclusions made by Adusei et al (2013), but contrast those of Adu et al (2013) and Abebrese at al (2017). The lag of domestic credit extended to the private sector had a negative and significant impact on the growth of the economy. That is, credit extended to private enterprises in the previous year tend to be deleterious to economic growth in the short run. Turning the focus to trade openness, its coefficient is positive, suggesting a positive relationship with economic growth, unlike the negative relationship observed in the long run. This positive association was statistically insignificant, thus contrasting the comparative trade advantage theory and empirical findings by Rahman et al (2015) who found a positive significant relation between trade openness and economic growth in the short run in the case of Australia. On the other hand, the study suggests a positive and significance impact of trade openness on economic growth in the short run but with a lag of one and two years. Hence, trade openness increases economic growth in the short run but with a lag effect that is 0.061 and 0.045 points.

Looking at the variables that were controlled for in this study, a negative and statistical relation was observed between gross capital formation and economic growth. This finding is the same as what was observed in the long run. Thus, in the short run, a one percent increase in the gross capital formation to GDP ratio results in a 0.003 reduction in economic growth. Like in the long run, it contradicts the positive impact of capital accumulation on economic growth that theory postulates. However, a positive and significant lagged impact of gross capital formation to GDP ratio on economic growth was estimated. Thus, investments in the previous year contributed positively to economic growth in the current year. Government expenditure to GDP ratio still

maintained a positive and statistically significant association with economic growth. This also confirms the long run relation that was obtained between these two series. Specifically, a one percent increase in government expenditure to GDP ratio will result in a 0.010 increase in economic growth. This result corrobates that of Abebrese at al (2017). Also, the results showed that, expenditure by the government in the previous year and two lead to a reduced economic growth.

Model B

Table 3.91 summarizes the short run estimates and error correction term from the ARDL model when broad money supply as a percentage of GDP is used as a measure of financial development. The coefficient of the lag of the error correction term is negative and statistically significant at the one percent significance level. This is very good for the model as it signifies convergence in the long run, i.e. the confirmation of the existence of a long run relation among the series. The negative coefficient of -0.266 signifies that there is a return to equilibrium in the long run after any distortions in the short run at an annual adjustment rate of 26.6 percent.

A negative and significant relation is estimated between broad money supply and economic growth. Hence, in the short run, the broad money supply exerts a negative impact on economic growth unlike the positive impact it has on growth in the long run. To be specific, increasing the ratio of broad money to GDP by one percent leads to a 0.010 reduction in economic growth. This could mean that in the short run, growth in real output levels in the Ghanaian economy are overshadowed by excessive increases in the money supply that tend to result in increases in the general price level thus ends ups hurting growth. This results contradicts findings from Puatwoe & Piabuo (2017) who arrived at a significant positive short run association between monetary mass (M2) and economic growth in Cameroon.

Trade openness is estimated to have a positive and statistically significant impact on economic growth in the short run. This finding is a deviation from the negative non-significant relation found between trade and economic growth in the long run. Thus, if the levels at which Ghana opens up to the rest of the world in terms of trade increases by one percent, a 0.049 increase in growth will result in the short run that is statistically significant at the five percent significance level. This finding agrees with that of Keho (2017) who also arrived at a positive impact of trade openness on growth in the short run for Cote d'Ivoire. It was also observed that trade has a positive lag effect on economic growth.

Turning attention to the control variables in the model, the coefficient of gross capital formation is estimated to be negative and statistically significant, signifying that it impacts negatively on economic growth in the short run. It is consistent with the long run equilibrium results that were also obtained. Increasing investment by one percent in the short run decreases economic growth by 0.005. This contradicts the theoretical postulation about the positive impact of investment on GDP growth. It is however in agreement with the conclusion made by Puatwoe & Piabuo (2017). A positive (negative) one (two) year lag impact of investment on growth was also observed from the results. Just like in the long run, a positive relationship was estimated between government expenditure and economic growth in the short run. However, this was statistically insignificant. Besides this, a statistical negative lag impact was observed from government expenditure to economic growth. The results also suggest that inflation exerts a negative impact on economic growth in the short run that is statistically significant at the one percent significance level. This is consistent with theoretical predictions. Besides this, a statistically significant positive impact of inflation on the growth of the economy was reported but with a lag effect of one and two years.

Model C

In this growth specification equation, financial development is proxied by deposit money bank assets (DMBA). The estimated coefficient on the lag of the error correction term was negative and statistically significant at the one percent significance level. This signifies that, the adjustment process of the system to restore equilibrium in the long run is potent. The negative coefficient of -0.267 suggests that, approximately 27 percent of the previous year's deviations are corrected for in the current year. This further confirms a long run relationship among the series.

Contrary to the long run results, increases in the size of bank assets had a detrimental effect on economic growth in the short run. This was statistically significant at the five percent significance level. A one percent increase in the ratio of money banks' assets to GDP is associated with a 0.007 reduction in economic growth. This is in contrast to the positive influence of financial development on economic growth suggested in the literature. It is however in agreement with the findings of Kumar & Bird (2020) who asserted that increases in bank sizes (expand their assets), economic growth was seen to decline in the Asia-Pacific region. Once again, a positive but insignificant relation was seen to exist between trade openness and economic growth in the short run. This result contradicts the comparative advantage theory. Trade with the rest of the world in the previous year did impact economic growth positively in the current year.

With regards to the control variables, gross capital formation is estimated to have a negative association with economic growth in the short run, but is not statistically significant. Government expenditure is also observed to have a positive but insignificant relation with economic growth, thus opposing the findings in the long run. On the other hand, an increase in government spending in the previous year is estimated to result in a decline in economic growth whiles spending by the government two years ago influenced growth positively.

4.3.3 Diagnostic tests.

The assumptions of the least square model must hold in order for least squares to be the best linear unbiased estimator(BLUE). These include assumptions regarding the normality of the error term, serial correlation, and heteroscedasticity of the errors. In order to validate the results of the estimated short and long run equations of the ARDL model, the study tested each of the three different growth model specifications using diagnostic tests for normality, serial correlation, autoregressive conditional heteroscedasticity(ARCH) effects and unknown forms of heteroscedasticity of the errors. The Jarque-Bera(JB) test statistics was used in determining the normality of the errors, whiles the Breusch-Godfrey(BG) test was utilized to test for any serial correlation that may be present in the errors. In order to detect heteroscedasticity of the errors, the study relied on the White and ARCH tests. The study also employed the Ramsey reset test to detect if the functional form of the short run model was correctly specified.

Table 4.2 presents results of the various diagnostic tests carried out on the three growth models specified in this study. The chi-square, F-statistics, and probability values reported for each of the model tests suggest that they all meet or satisfy the assumptions of the classical linear regression model. Thus the results indicate that the errors of the short run models are normally distributed, not serially correlated and free from heteroscedasticity and any ARCH effects in all three models. The Ramsey reset test also confirmed that the functional form of the short run model was well specified.

4.3.4 Model stability.

In order to examine the stability of the long and short run relationship between the log of real GDP per capita (economic growth) and its determinants, the Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares (CUSUMQ) method proposed by Brown et

al (1975) was applied at the five percent significance level. The study relied on the critical bounds of the five (5) percent significance to make a conclusion. That is, when the plot of the CUSUM and CUSUMQ test statistics lies within the critical bounds of the five percent significance level, then we cannot reject the null hypothesis of the stability of the coefficients in the error correction model. Otherwise, when the plots lie outside these critical boundaries, the stability of the coefficients of the model can be safely rejected (Bahmani-Oskooee & Ng, 2002).

Figures 1.1 and 1.2, 2.1 and 2.2, and 3.1 and 3.2 represent the plots of the CUSUM and CUSMQ test statistics for models A, B and C respectively. From the figures, it is observed that the plots of the CUSUM and CUSUMQ values of the three specified growth models lie within the critical boundaries of the five percent significance level. Thus, it is concluded that there is no indication or evidence of any significant structural instability. The estimated coefficients of the models in the study are stable.

From the results of the diagnostics and stability check of the models, it is concluded that the error correction models presented in the study are an appropriate characterization of the short and long run effects of the determinants of economic growth.

4.4 Granger Causality Analysis

According to Engle and Granger (1987), if cointegration is seen to exist among series, then some form of causality from one direction at least can be inferred. Though the bounds testing approach under the ARDL model establishes a long run relation among the series, it does not provide insights into the direction of causality amongst them. Having established that the series are cointegrated, Granger causality test under the vector error correction (VEC) model is applied to ascertain the direction of causality among the series.

Table 5.1 presents the results of the Granger causality test for economic growth and its determinants when financial development is proxied by domestic credit to the private sector. The significance of the ECT lends support to the presence of long run causality among the variables. It was found that in the long run, a unidirectional causality exists with the causality running from financial development (DCPS) to economic growth and from trade openness to economic growth. Thus, the null hypotheses that domestic credit to the private sector and trade openness do not Granger cause economic growth were rejected. This lends support to the supply-leading and Trade-led Growth hypotheses for Ghana. Government expenditure is also estimated to Granger cause economic growth in the short run. Economic growth was found to Granger cause inflation. This joint causality lends support to the long and short run findings.

Table 5.2 present the results of the Granger causality test of the second growth model. Here the broad money supply is the measure of financial development. The results suggest evidence for a long run causality among the series. A unidirectional causality running from trade to economic growth is observed in the long run, lending support for the trade-led-growth hypothesis. There is evidence of the finance-led-growth as well. In the short run, trade openness is seen to granger cause economic growth. Both government expenditure and inflation have a short run causal effect on economic growth. A feedback hypothesis is confirmed between gross capital formation and trade openness. In addition, inflation is Granger caused by gross capital formation and government expenditure. Joint causality which is both long-and-short-run causality, validates findings of the long and short run causalities.

The results from Table 5.3 suggest that there exists a long run unidirectional causality from trade to economic growth and from finance to economic growth. Thus, the third growth model specification also lends supports to the supply leading hypothesis, meaning that financial

development (proxied by deposit money banks asset) Granger causes economic growth in Ghana. The Trade-led growth hypothesis is also confirmed. In the short run however, it is estimated that there is a unidirectional causality from economic growth to financial development (DMBA). Trade is estimated to also Granger cause economic growth in the short run. A bi-directional causality is found between gross capital formation and trade openness. Trade openness Granger causes both government expenditure and inflation in the short run as well. Aside from all this, both economic growth and gross capital formation were estimated to have a causal effect on inflation in the short run. The outcome of both the long and short run causalities are confirmed by the joint causality tests.

CHAPTER 5

This chapter presents summary of key findings of the study, conclusion, limitations of the study and some policy recommendations.

5.1 Summary and Conclusion

The concept of economic growth and its determinants continues to be a subject of debate in the literature. To a large extent, financial development and international trade have been identified as part of the key drivers of growth of economies in recent times. Various researches have been carried out in the literature to empirically test this assertion on a wide number of economies. However, varying and sometimes conflicting results have been arrived at by these researches mainly due to factors such as methodology, sample period under study, variables used as measurements of financial development and international trade economic development and, most importantly, country specific effects. Thus, the exact relations that exist among these variables still remain uncertain and calls for a case by case study in view of each economy's distinctive features.

For this reason, the main objective of this study is to empirically examine the possible long run relationship and the direction of causality that may exist among financial sector development, international trade and economic growth in Ghana for the period 1965-2017. In this study, the log of real GDP per capita is used as a measurement of economic growth, trade openness as a proxy of international trade, domestic credit to the private sector, broad money, and deposit money banks' assets as proxies for financial development. All three financial development proxies are expressed as a percentage of GDP. The study controls for gross capital formation (% of GDP), government expenditure (% of GDP) and inflation rates.

The ARDL bounds testing approach to cointegration proposed by Peasaran et al (2001) was utilized as the tool for measuring the relationships. This procedure has as its basic advantage the inclusion of variables which have different order of integration be it I (0) or I (1) or mutually cointegrated provided none is integrated of order two (2). The Zivot-Andrews unit root test in addition to the ADF and PP unit roots tests was employed to test the order of integration of the variables in the study and the results confirmed none of the variables was integrated beyond I (1). Finally, the VECM Granger Causality Approach was adopted to investigate the causal relationship that may exist among the variables.

Three growth models (A, B, and C) was analyzed in the study where each proxy of financial development was used one at a time. The results from the ARDL bounds testing approach suggested the existence of a long run relationship between economic growth and financial development, economic growth and trade openness, and economic growth and the other controlled variables in all three models. Also, results from the long run models indicated a positive and significant impacts from each financial development proxy to economic growth. Thus it was concluded that the development of the financial sector in Ghana was indeed conducive for the country's growth in the long run. In addition, short run models were estimated and in contrast to the long run results, a negative association was observed to exist between these proxies and economic growth. That of domestic credit to the private sector was however not significant whereas the association of the broad money supply and deposit money banks' assets with economic growth were significant. Domestic credit extended to the private sector can be said to be a non-robust determinant of growth in the short run. These findings confirm findings of Adusei et al (2013) on Ghana.

Trade was observed to have a negative and non-significant relation with economic growth in the two models where financial development was proxied by domestic credit to the private sector and broad money supply. These results are in contrast to the positive effect of trade on growth that theory suggest but, it is of no surprise as the Ghanaian economy over several years including the period of study has become a net importer, thus rather than adding to its trade balance and hence GDP, high imports reduce real GDP and result in negative growth. The findings confirm conclusions made by Adusei et al (2013) and Abebrese et al (2017) on Ghana. However, a marginally significant and positive relationship between trade and economic growth was observed in the third model where financial development was proxied by deposit money banks' assets. Thus, trade is seen to be a non-robust determinant of growth as its sign alternates as the growth model changes. Results from the short run model showed trade impacted positively on growth but with lagged effects.

The controlled variables gross capital formation and government expenditure maintained their significantly negative and positive relations respectively with economic growth and are said to be robust determinants of economic growth in the long run. The significance of the estimated coefficient on the inflation variable also changed as the growth model was re-specified thus, was seen to be a non-robust determinant of growth in Ghana.

The negative and statistically significant coefficient estimated for the lag of the error correction term in all three error correction models further lent support to the existence of a long run relationship between growth and its determinants. The coefficients of -0.492, -0.266, and -0.267 in models A, B, and C respectively, indicates that the short run deviations from long run equilibrium are restored by 49.2%, 26.6%, and 26.7% towards the long run equilibrium paths each year.

Performing a causality analysis, the results suggested a unidirectional causality running from all the three financial development proxies to economic growth and from trade to economic growth. Hence, in the long run, both the supply-leading and trade-led growth hypotheses can be confirmed for Ghana.

5.2 Limitation(s) of the Study

The main drawback of this study is the lack of availability of data which limited the choice of proxies for financial development and international trade and the length of study. Also, the sample size used in this study prevented the inclusion of a structural break dummy and its interactions with other independent variables. This would have corrected the model for both changes in intercepts and slopes. However, the loss of degrees of freedom would have created an estimation problem.

Ghana is a distinct country with its own unique features thus, results from this study are only true and applicable for the economy and cannot be extended to another country as, every economy has their own features.

5.3 Recommendation(s) for Further Research.

Financial development has broad dimensions and as such could not be captured by only three proxies. It is recommended that future researches into the subject area explore other measurements and data from equally reliable databases and sources. Since independence in 1957, Ghana has experienced political upheavals at various times. In addition, the economy has received substantial foreign aids over the years. To determine the impacts of these variables on economic growth in Ghana, the model used in this study can be extended to include a dummy variable

representing the form of government (political instability) and a continuous variable representing foreign aid.

5.4 Policy Recommendations

In response to some key findings that were arrived at in this current study, the following policy recommendations are suggested. Financial sector development was observed to have a significant positive impact on economic growth thus, it is suggested that the Bank of Ghana and other key stakeholders in the financial sector continue to undertake financial sector liberalization, regulatory and reform policies geared towards developing the sector to enhance the growth of the economy. Specifically, the authorities should adopt policies that put less restrictions on credit to the private sector. A major issue with regards to finance in Ghana has been the persistent high lending rates and hence high borrowing cost which stifles private investments or the activities of the private sector. The private sector relies on credit from the banks to fund their projects thus, the study recommends the monetary authorities undertake policies to reduce the policy rate which is also reflected in the rate at which banks lend to the private sector. Reduction of policy rate will mean lower cost of borrowing and this will help promote access to and the availability of credit to the private sector. Lower cost of borrowing will attract potential and productive investors who will channel these resources in the form of credits into productive projects and investments to encourage production in the economy and hence promote economic growth. The results also suggested a positive impact of broad money on economic growth and as such, it is recommended that the monetary authorities pursue appropriate and optimum monetary policies aimed at stimulating economic growth in Ghana. The bank size is measured in terms of its total assets and an aspect of these assets is the bank loans it gives out to the public and private sectors. Proper initiatives which will enhance the ability of the banks to increase their assets and hence extend more loanable funds

to the private and public sectors should be adopted. This will increase the availability of credits and as such, the public sector will be able to fund basic and necessary social projects aimed at improving the welfare of the citizens in addition to the productive investment projects undertaken by the private sectors in the economy.

While most central banks enjoy the benefit of independence to pursue economic policies devoid of political influences, the Central Bank of Ghana has been denied this autonomy since its establishment The governor is appointed by the president and it continues to serve directly or indirectly as an annex to the Ministry of Finance. Because of this interrelation, the central bank is sometimes seen to serve the political agenda of the president through certain policies it pursues whether it is prudent or not. To enable the Central Bank to pursue sound and effective regulatory and financial reforms aimed at providing a stable and impregnable banking environment in the economy, it is recommended that policies be put in place to make it a complete independent body.

In contrast to the positive impact of trade on economic growth, both theoretically and empirically, a negative and positive non-significant relationship between trade and economic growth at the five percent significance level, was arrived at in this study. This is not surprising since Ghana continues to be a net exporter with consumption goods as the main component of imports sprinkled with a few intermediate products which could aid in the manufacturing process of other final goods. It continues to exports mainly raw materials such as cocoa, gold, timber, etc. which are valued lower on the international market. The study thus, recommends the government to adopt policies aimed at diversifying the export base of the economy whiles ensuring that some value is added to the produce before they are exported. Import substitution polices is largely recommended to reduce the rates of imports in the country. Policies which will enhance the creation of more manufacturing companies as well as enabling them be able to produce most of the goods

locally is highly recommended. Also, the over reliance and preference of Ghanaians for imported consumption goods to locally produced ones also needs to be addressed. There should be policies in place to encourage the patronage of made-in-Ghana goods. One way of achieving this is by government providing subsidies to these companies so that they are able to produce these goods at a cheaper or almost same price as the imported ones.

The current president of Ghana and his government embarked on the creation of one district, one factory project geared towards producing some goods locally whiles increasing employment levels in the economy. This project is a step in the right direction and as such work, effort and resources need to be pumped into this plan to ensure its success.

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APPENDIX 1

Table 3- Descriptive statistics

Panel I	RGC	DCPS	BMS	DMBA	IT	GCF	GE	INF
Mean	6.912	8.591	22.655	11.314	-0.765	14.861	11.062	28.703
Median	6.874	8.251	22.513	8.946	-0.780	14.120	10.928	22.164
Maximum	7.461	15.882	34.108	27.663	0.149	29.002	16.765	123.061
Minimum	6.542	1.542	11.305	2.424	-2.761	3.378	5.861	-3.878
Std. Dev.	0.230	4.759	5.753	8.022	0.632	6.483	2.322	22.308
Skewness	0.868	0.160	-0.018	0.592	-1.000	0.283	0.043	1.987
Kurtosis	3.092	1.586	2.270	2.074	3.922	2.376	2.786	8.012
Jarque-Bera	6.681	4.642	1.181	4.987	10.724	1.567	0.118	90.331
Probability	0.034	0.098	0.554	0.083	0.005	0.457	0.943	0.000
Observations	53	53	53	53	53	53	53	53
Panel II								
RGC	1.000							
DCPS	0.823	1.000						
BMS	0.582	0.750	1.000					
DMBA	0.915	0.907	0.648	1.000				
IT	0.527	0.761	0.650	0.573	1.000			
GCF	0.254	0.555	0.546	0.313	0.841	1.000		
GE	0.051	0.045	0.181	-0.044	0.221	0.241	1.000	
INF	-0.359	-0.461	-0.298	-0.354	-0.466	-0.292	-0.374	1.000

APPENDIX 2

Test for Stationarity

The ADF and PP unit root tests

3.1- Variables at levels

Null hypothesis: Variable has a unit root						
Variables	intercept		With trend and intercept		without intercept and Trend	
	ADF	PP	ADF	PP	ADF	PP
RGC	0.641	0.917	-0.481	-0.585	1.359	1.196
DCPS	-1.024	-0.945	-2.025	-1.965	-0.112	-0.112
BMS	-1.741	-1.810	-2.072	-2.174	-0.153	-0.154
DMBA	-0.695	-0.028	-2.350	-1.441	-0.101	0.861
IT	-1.174	-1.347	-1.960	-2.093	-1.027	-0.985
GCF	-1.223	-1.968	-1.418	-2.582	-0.244	-0.729
GOV	-3.239**	-3.240**	-3.424*	-3.497*	-1.024	-1.100
INFL	-2.457	-5.450***	-2.507	-5.402***	-1.024	-2.567**
Note: ***, **, * represents Rejection of the null hypothesis at 1% ,5% and 10% respectively						

3.2- variables at first difference

Null hypothesis: Variable has a unit root						
Variable	intercept		With Trend and intercept		Without intercept and Trend	
	ADF	PP	ADF	PP	ADF	PP
RGC	-4.898***	-4.898***	-5.555***	-5.506***	-4.693***	-4.719***
DCPS	-6.357***	-7.987***	-6.439***	-8.151***	-8.029***	-8.029***

BMS	-7.003***	-7.003***	-6.934***	-6.934***	-7.065***	-7.065***
DMBA	-4.147***	-4.147***	-4.715***	-4.471***	-4.184***	-4.184***
IT	-5.432***	-5.237***	-5.394***	-5.173***	-5.468***	-5.275***
GCF	-7.424***	-8.219***	-7.342***	-8.117***	-7.497***	-8.313***
GOV	-7.751***	-9.332***	-7.665***	-9.185***	-7.812***	-9.304***
INFL	-8.994***	-16.86***	-9.045***	-19.52***	-9.087***	-17.07***
Note: ***, **, * represents Rejection of the null hypothesis at 1% ,5% and 10% respectively						

The Zivot-Andrews unit root test

3.3 - Variables at levels

Null hypothesis: Variable has a unit root without any exogenous structural break			
Variable	Intercept	Trend	Intercept and Trend
RGC	-3.219(1975)	-3.511(1984)	-3.630(1981)
BMS	-3.218(1978)	-2.571(1984)	-3.259(1978)
DMBA	-3.872(1997)	-4.189*(1989)	-4.084(1988)
DCPS	-3.656(1997)	-3.768(1984)	-3.867(1972)
IT	-2.798(1986)	-2.253(1978)	-3.660(1985)
GCF	-3.002(2007)	-2.287(2002)	-3.137(1993)
GOV	-4.398(1992)	-3.935(1982)	-4.610(1985)
INFL	-3.871(1977)	-4.082(1979)	-5.598***(1985)

Note: The attached years represents the period for which a structural break was identified in the series. *Rejection of the null hypothesis at 1% **Rejection of the null hypothesis at 5% ***Rejection of the null hypothesis at 10%

3.4- Variables at 1st difference

Null hypothesis: Variable has a unit root without any exogenous structural break			
Variable	Intercept	Trend	Intercept and Trend
RGC	-6.341*** (1975)	-6.092*** (1976)	-7.141*** (1984)
BMS	-7.356*** (1985)	-7.014*** (2001)	-7.400*** (1985)
DMBA	-5.033*** (2001)	-5.242*** (2008)	-5.627*** (1997)
DCPS	-7.122*** (1984)	-7.019*** (2000)	-7.254*** (1997)
IT	-8.306*** (1983)	-5.739*** (1987)	-8.871*** (1983)
GCF	-8.467*** (2006)	-7.818*** (1994)	-8.989*** (2006)
GOV	-6.683*** (1984)	-6.231*** (1993)	-6.645*** (1984)
INFL	-9.722*** (1984)	-9.060*** (1987)	-9.679*** (1984)

Note: The attached years represents the period for which a structural break was identified in the series. *Rejection of the null hypothesis at 1% **Rejection of the null hypothesis at 5% ***Rejection of the null hypothesis at 10%

Zivot-Andrews critical table

Critical values at	Intercept	Trend	Intercept and Trend
1%	-5.34	-4.80	-5.57
5%	-4.93	-4.42	-5.08
10%	-4.58	-4.11	-4.82

APPENDIX 3

Bounds Testing within the ARDL models

3.5) Model A[5] (DCPS is a proxy of financial development)

Estimated Model	Optimal Lag Length	F-Statistics	Outcome
F_{RGC}(RGC/FD, IT, GCF, GOV, INF)	1,2,3,2,3,0	9.610***	Cointegration exist
F_{FD}(FD/RGC, IT, GCF, GOV, INF)	1,0,0,0,3,0	3.402	No Cointegration
F_{IT}(IT/RGC, FD, GCF, GOV, INF)	2,0,0,2,1,3	2.744	No Cointegration
F_{GCF}(GCF/RGC, FD, IT, GOV, INF)	2,3,2,0,3,0	5.473**	Cointegration exist
F_{GOV}(GOV/RGC, FD, IT, GCF, INF)	3,0,3,0,2,0	6.186***	Cointegration exist
F_{INF}(INF/RGC, FD, IT, GCF GOV)	3,3,3,1,3,3	5.401	Cointegration exist

Note: ***, ** and * represents statistically significant at the 1%, 5% and 10% significance level.

Source: computed using Eviews 10 package.

3.6) Model B (BMS is a proxy of financial development)

Estimated Model	Optimal Lag Length	F-Statistics	Outcome
F_{RGC}(RGC/FD, IT, GCF, GOV, INF)	1,1,3,3,3,3	6.850***	Cointegration exist
F_{FD}(FD/RGC, IT, GCF, GOV, INF)	1,2,3,3,3,3	4.735**	Cointegration exist
F_{IT}(IT/RGC, FD, GCF, GOV, INF)	3,3,3,2,1,0	3.646	No Cointegration
F_{GCF}(GCF/RGC, FD, IT, GOV, INF)	2,3,2,0,3,1	6.514***	Cointegration exist
F_{GOV}(GOV/RGC, FD, IT, GCF, INF)	1,0,0,0,1,0	4.606**	Cointegration exist
F_{INF}(INF/RGC, FD, IT, GCF GOV)	3,1,2,3,2,3	6.506***	Cointegration exist

Note: ***, ** and * represents statistically significant at the 1%,5% and 10% significance level.

Source: computed using Eviews 10 package.

[5] The number of observations used for all three models after adjustments is 50

3.7) Model C (Deposit money banks' assets)

Estimated Model	Optimal Lag Length	F-Statistics	Outcome
F_{LG}(RGC/FD, IT, GCF, GOV, INF)	1,2,2,1,3,0	5.644***	Cointegration exist
F_{FD}(FD/RGC, IT, GCF, GOV, INF)	2,2,0,0,0,0	1.517	No Cointegration
F_{IT}(IT/RGC, FD, GCF, GOV, INF)	2,3,3,2,1,0	2.961	No Cointegration
F_{GCF}(GCF/RGC, FD, IT, GOV, INF)	3,3,0,0,1,0	5.592***	Cointegration exist
F_{GOV}(GOV/RGC, FD, IT, GCF, INF)	1,0,0,0,0,0	5.106**	Cointegration exist
F_{INF}(INF/RGC, FD, IT, GCF GOV)	1,0,0,0,0,1	10.515***	Cointegration exist

Note: ***, ** and * represents statistically significant at the 1%,5% and 10% significance level.

Source: computed using Eviews 10 package

Critical values of the Bounds testing methodology.

source	1%		5%		10%	
	LB-I(0)	UB-I(1)	LB-I(0)	UB-I(1)	LB-I(0)	UB-I(1)
Narayan (2005)	4.21	5.52	3.15	4.29	2.70	3.70

NB: LB- Lower Bound and UB- Upper Bound

APPENDIX 4

3.8) Long run coefficients of the estimated ARDL model When DCPS is a proxy for Financial development.

Dependent variable= RGC		
Variable	Coefficient	T-Statistics
DCPS	0.039***	8.751
IT	-0.012	-0.200
GCF	-0.027***	-6.859
GOV	0.079***	8.794
INF	-0.0006	-1.111
@TREND	0.014***	9.475
Note: ***, ** and * represent statistically significant at 1%, 5% and 10% respectively.		

3.81) Short run coefficients and the error correction estimate from the ARDL.

Dependent variable = RGC		
Variable	Coefficient	T-Statistics
Constant	2.831***	8.970
D(DCPS)	-0.002	-0.763
D(DCPS(-1))	-0.013***	-4.619
D(IT)	0.016	0.789
D(IT(-1))	0.061***	2.715
D(IT(-2))	0.045**	2.173

D(GCF)	-0.003**	-2.329
D(GCF(-1))	0.006***	3.557
D(GOV)	0.010***	3.873
D(GOV(-1))	-0.022***	-6.214
D(GOV(-2))	-0.015***	-4.575
ECT(-1)	-0.492***	-8.938
R^2	0.734	
Adjusted R^2	0.657	
F-Statistics	9.551	
D-W statistics	1.956	
ECT = RGC – (0.038*DCPS – 0.0117*LTO – 0.0268*GCF + 0.0787*GOV – 0.0006*INF + 0.0144*@TREND		
Note: ***, ** and * represent statistically significant at the 1%, 5% and 10% respectively.		

3.9) Long run coefficients of the estimated ARDL model When BMS is a proxy for Financial development

Dependent variable : RGC		
Regressors	Coefficient	T-statistics
BMS	0.017***	2.909
IT	-0.065	-0.468
GCF	-0.030***	-3.802
GOV	0.067***	3.869
INF	-0.011***	-4.316
@TREND	0.022***	7.156

3.91) Short run coefficients and the error correction estimate from the ARDL.

Dependent variable = RGC		
Constant	1.581***	7.656
D(BMS)	-0.010***	-5.195
D(IT)	0.049**	2.317
D(IT(-1))	0.075***	3.248
D(IT(-2))	0.097***	3.937
D(GCF)	-0.005***	-3.183
D(GCF(-1))	0.003*	1.865

D(GCF(-2))	-0.003**	-2.351
D(GOV)	0.004	1.623
D(GOV(-1))	-0.016***	-4.705
D(GOV(-2))	-0.016***	-4.684
D(INF)	-0.001***	-4.551
D(INF(-1))	0.002***	5.508
D(INF(-2))	0.0006***	3.054
ECT(-1)	-0.266***	-7.607
R^2	0.756	
Adjusted R^2	0.658	
F-Stat	7.725	
DW	1.686	
ECT = RGC – (0.0169*BMS – 0.0646*LTO – 0.0300*GCF + 0.0667*GOV – 0.0113*INF + 0.0223*@TREND		
Note: ***, ** and * represent statistically significant at 1%, 5% and 10% respectively.		

4.0) Long run coefficients of the estimated ARDL model When DMBA is a proxy of Financial development

Dependent variable= RGC		
Variable	coefficient	T-Statistics
DMBA	0.017***	3.728
IT	0.177*	1.702
GCF	-0.022***	-2.704
GOV	0.055***	2.841
INF	-0.0003	-0.317
@TREND	0.013***	3.279
Note: ***, ** and * represent statistically significant at 1%, 5% and 10% respectively.		

4.1) Short run analysis

Dependent variable = RGC		
Variable	Coefficient	T-Statistics
Constant	1.678***	6.859
D(DMBA)	-0.007**	-2.231
D(DMBA(-1))	-0.006	-1.384
D(IT)	0.021	0.890
D(IT(-1))	0.056**	2.407
D(GCF)	-0.0023	-1.470
D(GOV)	0.0022	0.854

D(GOV(-1))	-0.011***	-3.488
D(GOV(-2))	0.005*	-1.788
ECT(-1)	-0.267***	-6.818
R2	0.628	
Adjusted R2	0.544	
F-Statistics	7.498	
D-W statistics	1.699	
ECT= RGC – (0.0174*DMBA + 0.1775*LTO – 0.0221*GCF + 0.0549*GOV – 0.0003*INF + 0.0131*@TREND)		
Note: ***, ** and * represent statistically significant at the 1%, 5% and 10% respectively.		

4.2) short and long run diagnostic test

TEST	Model A		Model B		Model C	
	F-Stat	probability	F-Stat	probability	F-Stat	probability
x^2 *NORMAL*	0.374	0.830	0.803	0.669	3.210	0.201
x^2 *SERIAL*	0.943	0.401	0.775	0.471	1.465	0.246
x^2 *WHITE*	1.199	0.319	0.504	0.943	1.309	0.250
x^2 *ARCH*	0.079	0.780	0.832	0.366	3.998	0.0514
x^2 *REMSAY*	0.908	0.348	0.062	0.805	0.010	0.919

STABILITY DIAGNOSTIC

Fig 1.1- Model A

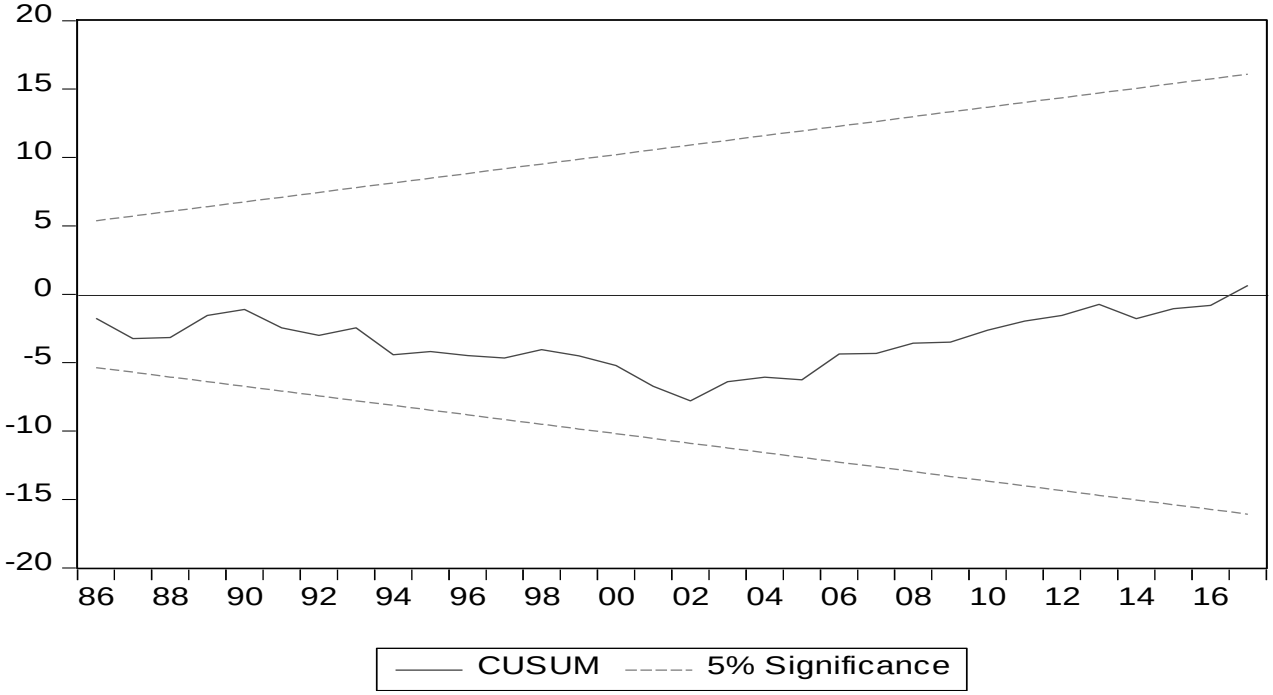


Fig 1.2- Model A

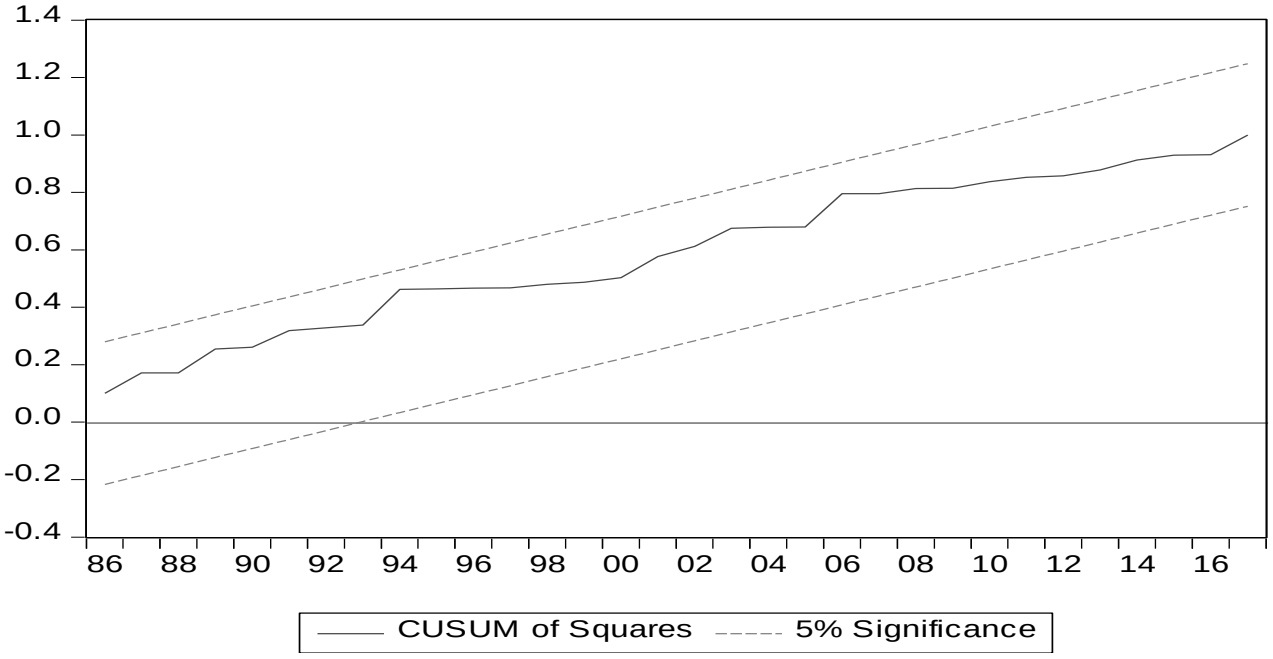


Fig. 2.1 - Model B

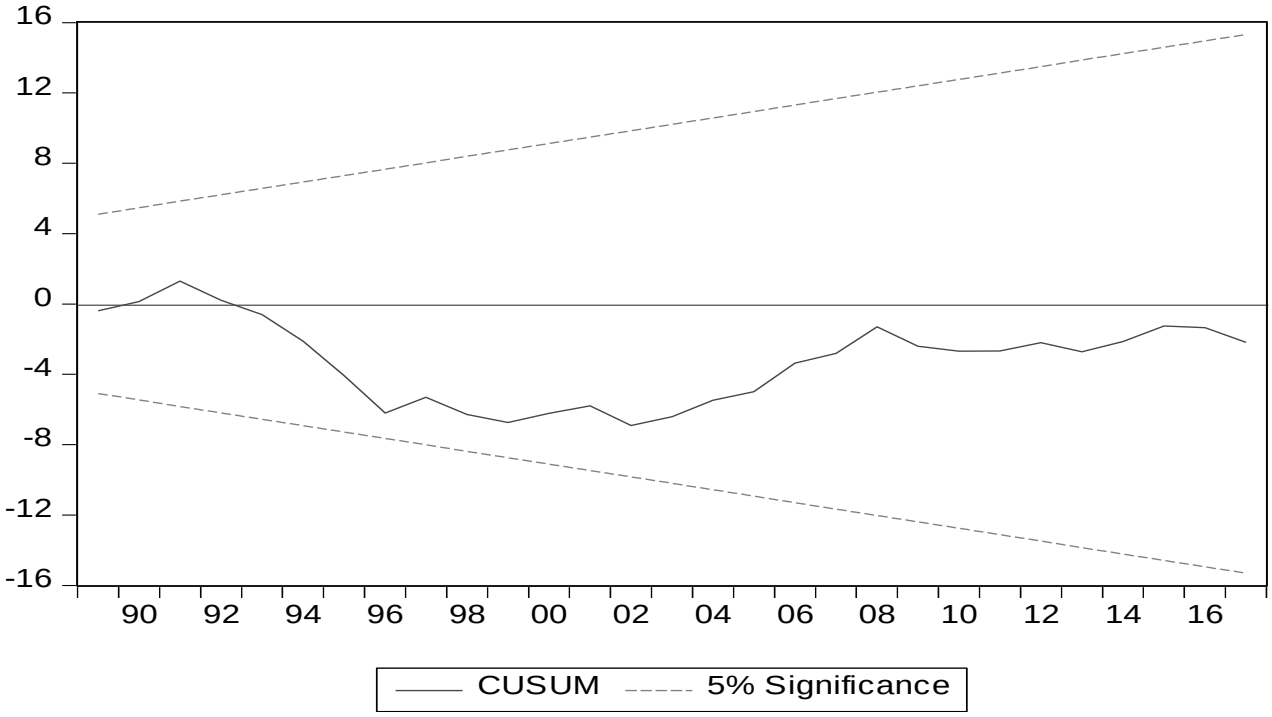


Fig 2.2-Model B

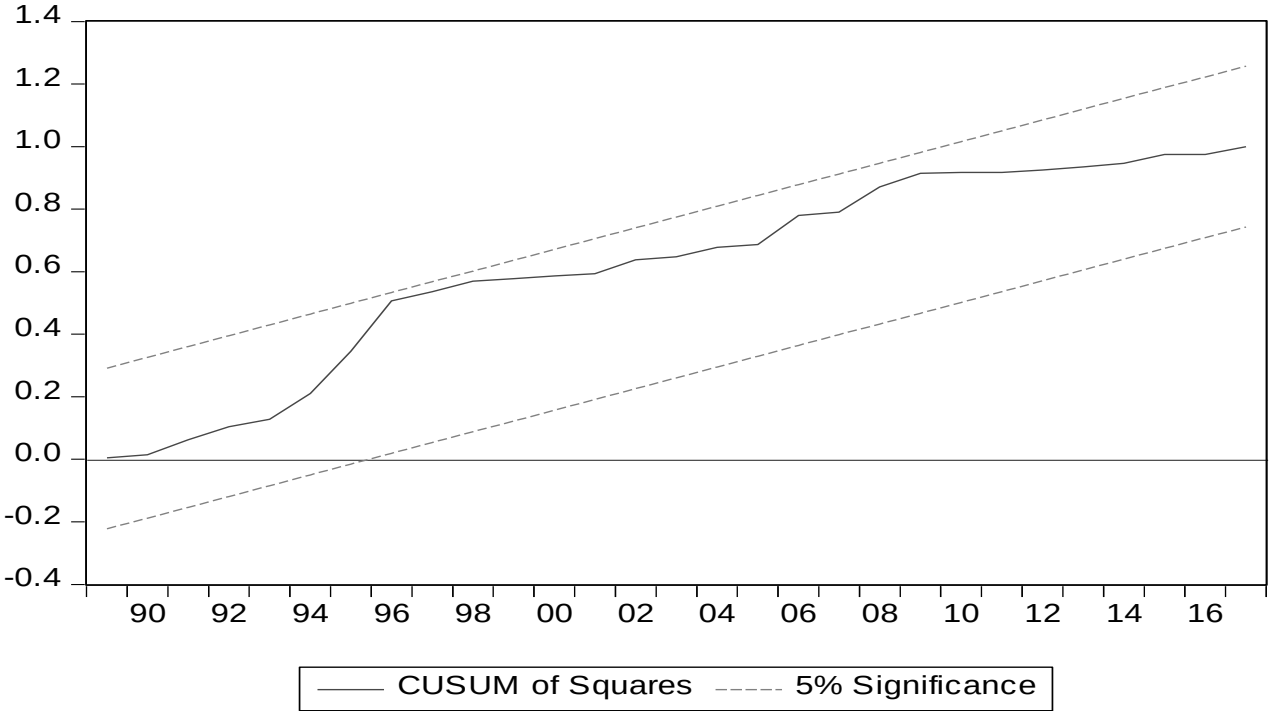


Fig 3.1 - Model C

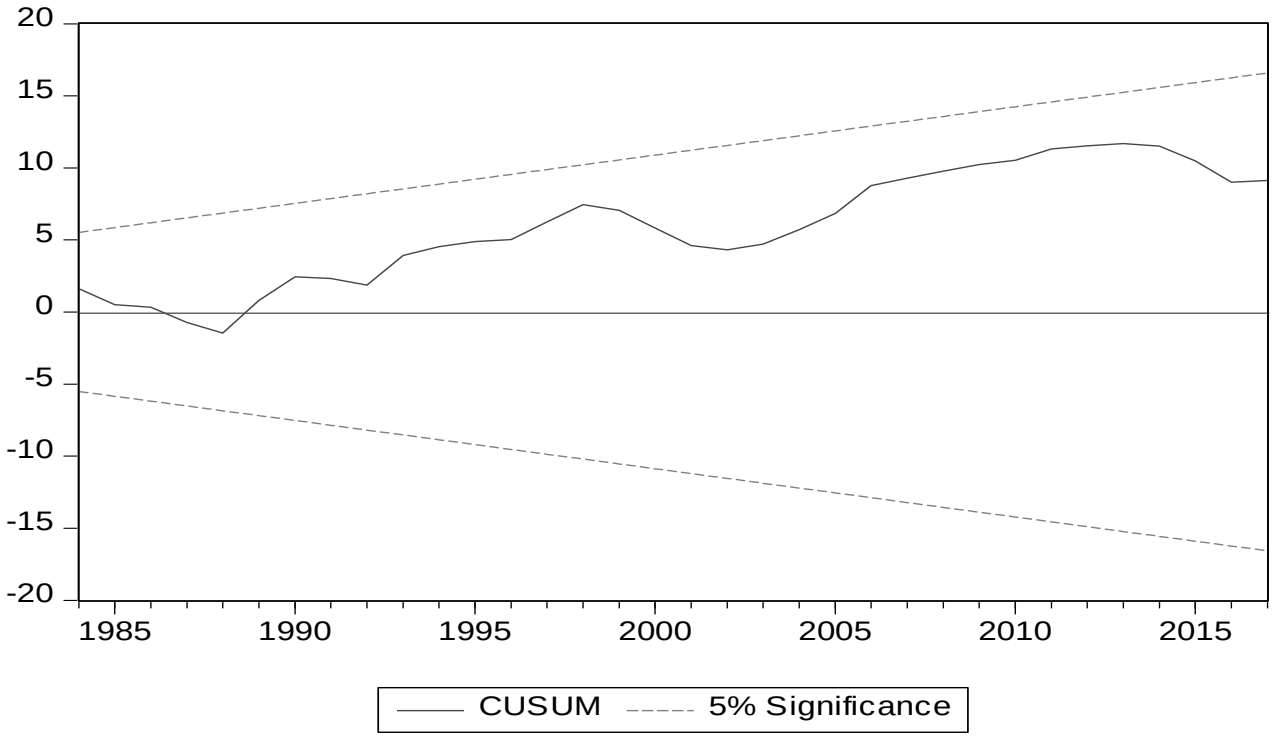
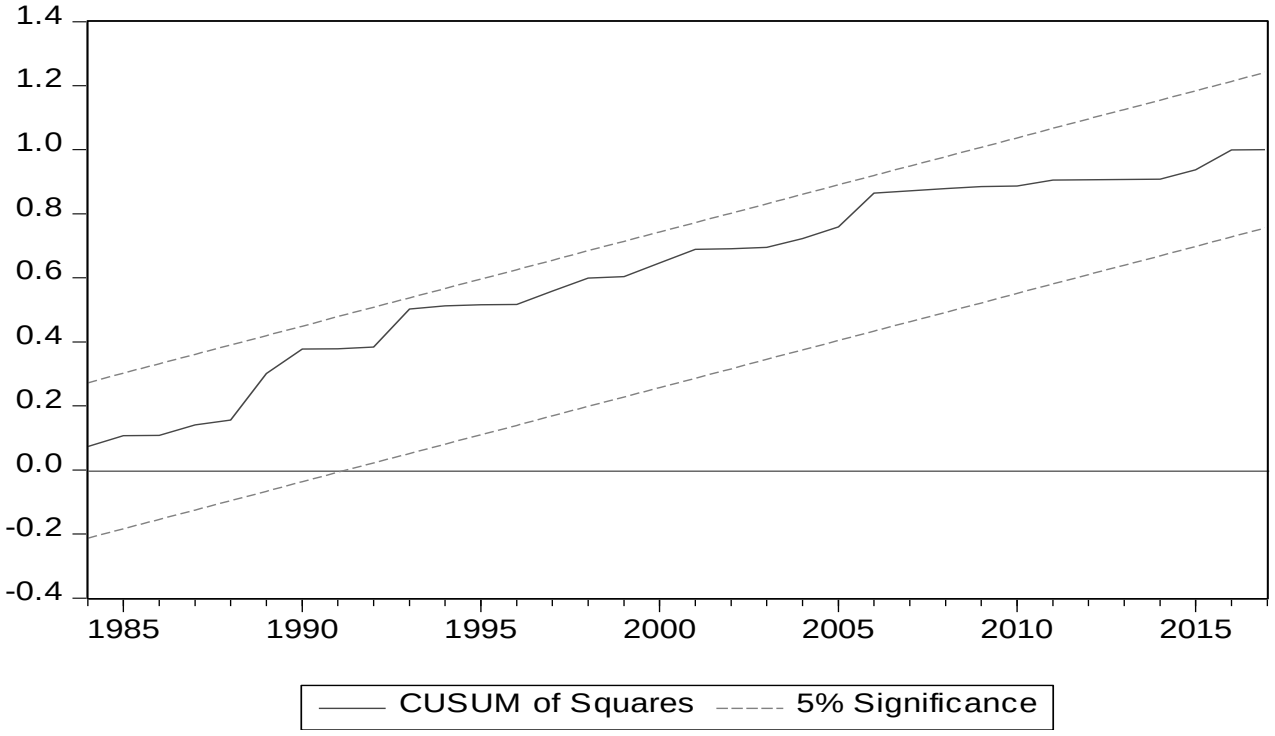


Fig 3.2- Model C



APPENDIX 5

CAUSALITY TEST ANALYSIS

Table 5.1- ***DCPS*** is a proxy for financial development

Dependent variables							
Independent variables		ΔRCG_t	$\Delta DCPS_t$	ΔIT_t	ΔGCF_t	ΔGOV_t	ΔINF_t
Short run causality	ΔRGC_{t-1}	..	4.164** (0.041)	0.038 (0.846)	0.016 (0.898)	0.779 (0.377)	4.345** (0.037)
	$\Delta DCPS_{t-1}$	4.052** (0.044)	..	0.152 (0.697))	1.658 (0.198)	0.215 (-0.643)	0.299 (0.584)
	ΔIT_{t-1}	13.164*** (0.000)	0.034 (0.853)	..	3.913** (0.048)	4.599** (0.032)	5.550** (0.019)
	ΔGCF_{t-1}	0.019 (0.890)	0.108 (0.743)	3.672* (0.055)	..	4.133** (0.042)	4.915** (0.027)
	ΔGOV_{t-1}	10.120*** (0.002)	0.106 (0.742)	0.224 (0.636)	1.487 (0.223)	..	0.118 (0.732)
	ΔINF_{t-1}	0.165 (0.685)	0.301 (0.583)	0.184 (0.667)	0.374 (0.541)	2.807* (0.094)	..
Long run causality	ECT_{t-1}	-0.228*** [-4.324]	5.864 [2.324]	0.358 [1.057]	-2.510 [-0.500]	6.939 [2.657]	-101.08 [-3.229]
Joint long- and	ΔRGC_{t-1}, ECT_{t-1}	..	..	..	..	..	..
		18.761*** (0.000)	..	..	..	..	..

short run causality	$\Delta DCP_{t-1,}$ ECT_{t-1}						
	$\Delta IT_{t-1,} ECT_{t-1}$	29.034^{***} (0.000)	..	..	..	..	..
	$\Delta GCF_{t-1,}$ ECT_{t-1}	22.274^{***} (0.000)	..	..	..	..	..
	$\Delta GOV_{t-1,}$ ECT_{t-1}	19.033^{***} (0.000)	..	..	..	..	..
	$\Delta INF_{t-1,} ECT_{t-1}$	19.259^{***} (0.000)	..	..	..	..	..

Note: ***, ** and *represent statistically significant at the 1% ,5 % and 10% significance level respectively. Probability values are in circle brackets whilst T-statistic values are in square brackets

Table 5.2- ***BMS*** is a proxy of financial development

Dependent variables							
Independent variables		ΔRGC_t	ΔBMS_t	ΔIT_t	ΔGCF_t	ΔGOV_t	ΔINF_t
Short run causality	ΔRGC_{t-1}	..	0.004 (0.951)	0.123 (0.726)	0.006 (0.940)	0.065 (0.798)	0.192 (0.661)
	ΔBMS_{t-1}	0.0009 (0.993)	..	0.369 (0.544)	2.306 (0.129)	0.047 (0.828)	0.179 (0.672)
	ΔIT_{t-1}	11.883*** (0.000)	2.191 (0.139)	..	5.484** (0.019)	2.709* (0.099)	0.183 (0.669)
	ΔGCF_{t-1}	1.762 (0.184)	0.069 (0.793)	3.011* (0.083)	..	1.238 (0.266)	5.519** (0.018)
	ΔGOV_{t-1}	4.657** (0.031)	8.865*** (0.003)	0.065 (0.798)	0.659 (0.417)	..	4.275** (0.039)
	ΔINF_{t-1}	5.136** (0.023)	4.621** (0.032)	0.965 (0.326)	-0.0005 (0.994)	1.149 (0.284)	..
Long run causality	ECT_{t-1}	-0.094** [-2.33]	13.634 [5.689]	0.096 [0.414]	-4.096 [-1.207]	0.684 [0.345]	-104.194 [-6.160]
Joint long- and short run causality	$\Delta RGC_{t-1,}$ ECT_{t-1}	..	..	..	..	..	..
	$\Delta BMS_{t-1,}$ ECT_{t-1}	6.667** (0.036)	..	..	..	..	..

	$\Delta IT_{t-1,} ECT_{t-1}$	12.600^{***} (0.002)	..	..	..	..	..
	$\Delta GCF_{t-1,}$ ECT_{t-1}	8.087^{**} (0.018)	..	..	..	..	..
	$\Delta GOV_{t-1,}$ ECT_{t-1}	6.242^{**} (0.044)	..	..	..	..	..
	$\Delta INF_{t-1,} ECT_{t-1}$	7.011** (0.030)	..	..	..	..	..

Note: ***, ** and *represent statistically significant at the 1% ,5 % and 10% significance level respectively. Probability values are in circle brackets whilst T-statistic values are in square brackets

Table 5.3- ***DMBA*** is a proxy for financial development**.**

Dependent variables							
Independent variables		ΔRGC_t	$\Delta DMBA_t$	ΔIT_t	ΔGCF_t	ΔGOV_t	ΔINF_t
Short run causality	ΔRGC_{t-1}	..	6.666** (0.010)	0.241 (0.623)	0.119 (0.730)	0.131 (0.718)	4.165*** (0.041)
	$\Delta DMBA_{t-1}$	0.063 (0.802)	..	1.252 (0.263)	3.302* (0.069)	0.244 (0.621)	0.839 (0.360)
	ΔIT_{t-1}	5.560** (0.018)	0.245 (0.621)	..	2.702* (0.100)	4.664** (0.031)	8.289*** (0.004)
	ΔGCF_{t-1}	0.016 (0.898)	0.330 (0.566)	4.077** (0.044)	...	1.559 (0.212)	3.493* (0.062)
	ΔGOV_{t-1}	8.604*** (0.003)	0.563 (0.453)	0.402 (0.526)	0.270 (0.603)	..	0.249 (0.618)
	ΔINF_{t-1}	3.409* (0.065)	0.908 (0.341)	0.587 (0.443)	0.0003 (0.985)	1.933 (0.164)	..
Long run causality	ECT_{t-1}	-0.205*** [-4.215]	3.723 [2.004]	0.432 [1.390]	-6.466 [-1.422]	1.350 [0.506]	-72.712 [-2.369]
Joint long- and	$\Delta RGC_{t-1,}$ ECT_{t-1}	..	..	..	..	..	..
	$\Delta MBA_{t-1,}$ ECT_{t-1}	19.791*** (0.000)	..	..	..	..	..

short run causality	$\Delta IT_{t-1,} ECT_{t-1}$	27.906^{***} (0.000)	..	..	..	..	..
	$\Delta GCF_{t-1,}$ ECT_{t-1}	21.080^{***} (0.000)	..	..	..	..	..
	$\Delta GOV_{t-1,}$ ECT_{t-1}	18.086^{***} (0.000)	..	..	..	..	..
	$\Delta INF_{t-1,} ECT_{t-1}$	18.086^{***} (0.000)	..	..	..	..	..

Note: ***, ** and *represent statistically significant at the 1% ,5 % and 10% significance level respectively. Probability values are in circle brackets whilst T-statistic values are in square brackets.